Dublin Airport

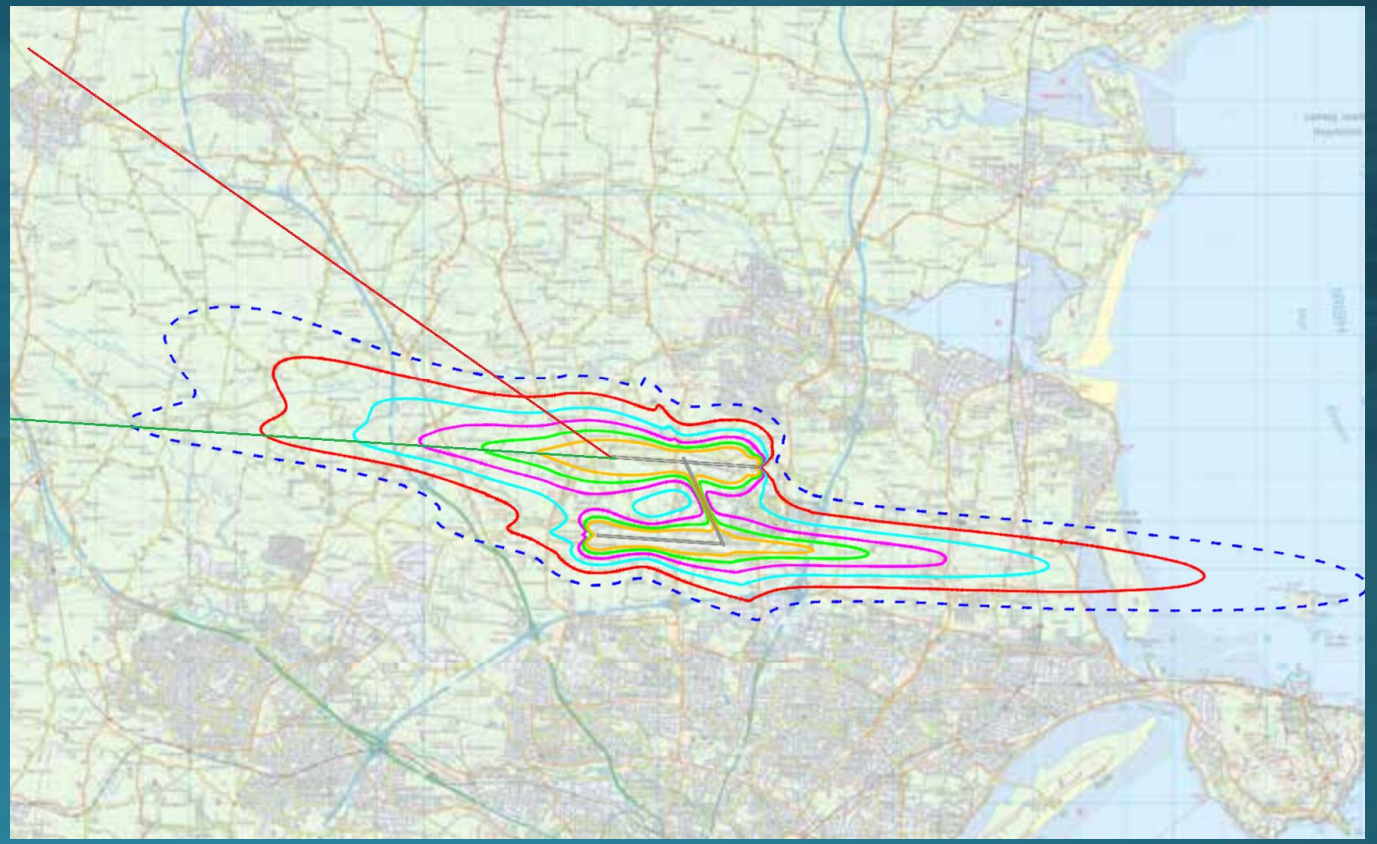
Noise Mitigation

What Creates Noise?

- Aircraft Jet Blast causes the most noise.
- The more power an aircraft uses for take off, the more noise it makes.
- The lower the aircraft is flying at high power, the more noise reaches the ground at high decibels.
- The more an aircraft turns, the less it can climb, therefore the straighter the departure, the lower the noise footprint.
- The more tailwind used , the more power required, the less the aircraft can climb, the more noise.

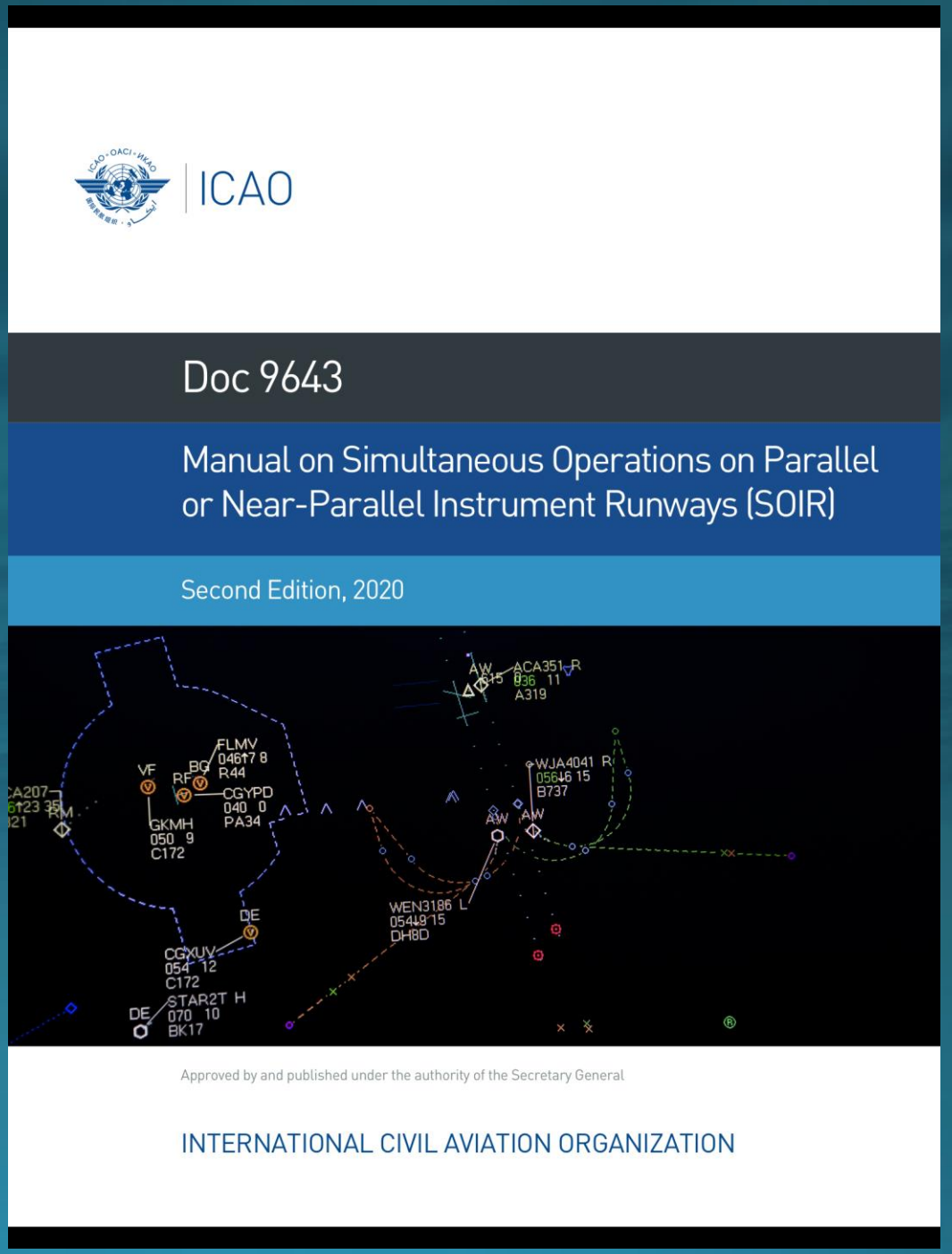
Current Noise Situation

- Departures from 28R are turning early to the north (Red Line) , causing huge noise complaints from residents who were not part of the planning noise consultation.
- Planning application departure procedures were to fly straight ahead (Green line) to a distance and altitude before turning.
- The DAA state this cannot be done, here we will look at what can be done to minimise the noise levels.
- The DAA claim they are being forced to fly certain routes by the IAA Irish Aviation Authority, to comply with ICAO regulations. But these new routes are not the minimum turn tracks.
- The IAA claim they just approve procedures not dictate them.



Parallel Runway Operations

- All procedures are outlined in the ICAO (International Civil Aviation Organisation) DOC 9643.
- This document has been published since the early 2000's, and requires Airports to comply to these restrictions.
- The DAA would submit departure and arrival procedures to the IAA for approval.
- The current departure (SIDS) and arrival (STAR) procedures are in compliance with these procedures, however departures off 28R with a 10 degree turn are possible under these procedures.



Parallel Runway Operations

- We have two requirements to fulfil.
- Separation from Departures off parallel runways, MODE 3, and
- Separation from a missed approach from one runway, and the departure from the parallel runway MODE 4.
- Departures from parallel runways must diverge by at least 10 degrees and turn within 2nm of the runway.
- This means that if the DAA wish to depart off 28L and 28R at the same time a turn of 10 degrees is required from 28R

Chapter 3

INDEPENDENT INSTRUMENT DEPARTURES FROM PARALLEL RUNWAYS (MODE 3)

3.1 GENERAL

Parallel runways may be used for independent instrument departures if:

a) both runways are used exclusively for departures (independent departures); or

b) one runway is used exclusively for departures, while the other runway is used for a mixture of arrivals and departures (semi-mixed operation); or

c) both runways are used for mixed arrivals and departures (mixed operation).

3.2 REQUIREMENTS AND PROCEDURES

3.2.1 Procedures for independent instrument departures from parallel runways are contained in the PANS-ATM, Chapter 6, 6.7.2.2. It states that independent IFR departures may be conducted from parallel runways provided:

a) the runway centre lines are spaced by a minimum distance of 760 m (2 500 ft) (see Annex 14, Volume I); however, when the spacing between two parallel runways is less than the specified value dictated by wake turbulence considerations, the runways are considered as a single runway with regard to separation between departing aircraft. For further detail regarding wake turbulence on departure, refer to Circular 350, *Guidelines for the Implementation of Reduced Divergence Departures*.

b) the nominal departure tracks diverge by at least (see Figure 3-1):

1) 15 degrees immediately after take-off; or

2) 10 degrees where:

i) both aircraft are flying an RNAV or RNP instrument departure; and

ii) the turn commences no more than 3.7 km (2.0 NM) from the departure end of the runway;

c) a suitable ATS surveillance system capable of identifying the aircraft within 1.9 km (1.0 NM) from the end of the runway is available; and

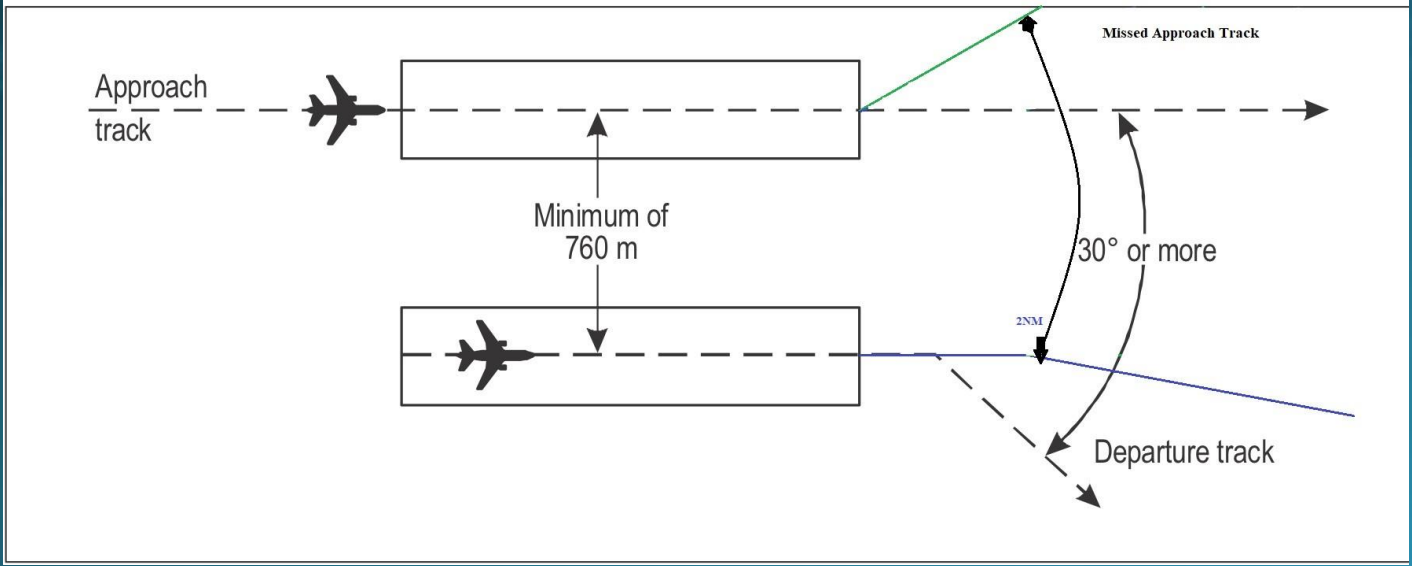
d) ATS operational procedures ensure that the required track divergence is achieved.

Parallel Runway Operations

The required 30 degree separation between the missed approach of one runway and the departure track of another runway can be achieved by turning the departure or missed approach.

The green line shows the missed approach turning south by 30 degrees.

The Blue line shows the required turns for a 10 degree departure off 28R.



Chapter 4

SEGREGATED OPERATIONS ON PARALLEL RUNWAYS (MODE 4)

4.1 GENERAL

4.1.1 Theoretical studies and practical examples indicate that maximum aerodrome capacities can be achieved by using parallel runways in a mixed mode of operation. In many cases, however, other factors (such as the landside/airside infrastructure, the mix of aircraft types, and environmental considerations) result in a lower, achievable capacity.

4.1.2 Other factors (such as non-availability of landing aids on one of the parallel runways or restricted runway lengths) may preclude the conducting of mixed operations at a particular aerodrome.

4.1.3 Because of these constraints, maximum aerodrome capacity may, in some cases, only be achieved by adopting a fully segregated mode of operation, i.e. one runway is used exclusively for landings, while the other is used exclusively for departures.

4.1.4 The advantages to be gained from segregated parallel operations, as compared with mixed parallel operations, are:

a) separate monitoring controllers are not required;

b) no interaction between arriving and departing aircraft on the same runway and consequential reduction in the number of potential missed approaches;

c) an overall less complex ATC environment for both radar approach controllers and aerodrome controllers; and

d) a reduced possibility of pilot error due to selecting the incorrect instrument approach procedure.

4.2 REQUIREMENTS AND PROCEDURES

4.2.1 Segregated parallel operations may be conducted on parallel runways provided:

a) the runway centre lines are spaced by 760 m (2 500 ft) (see Annex 14, Volume I); and

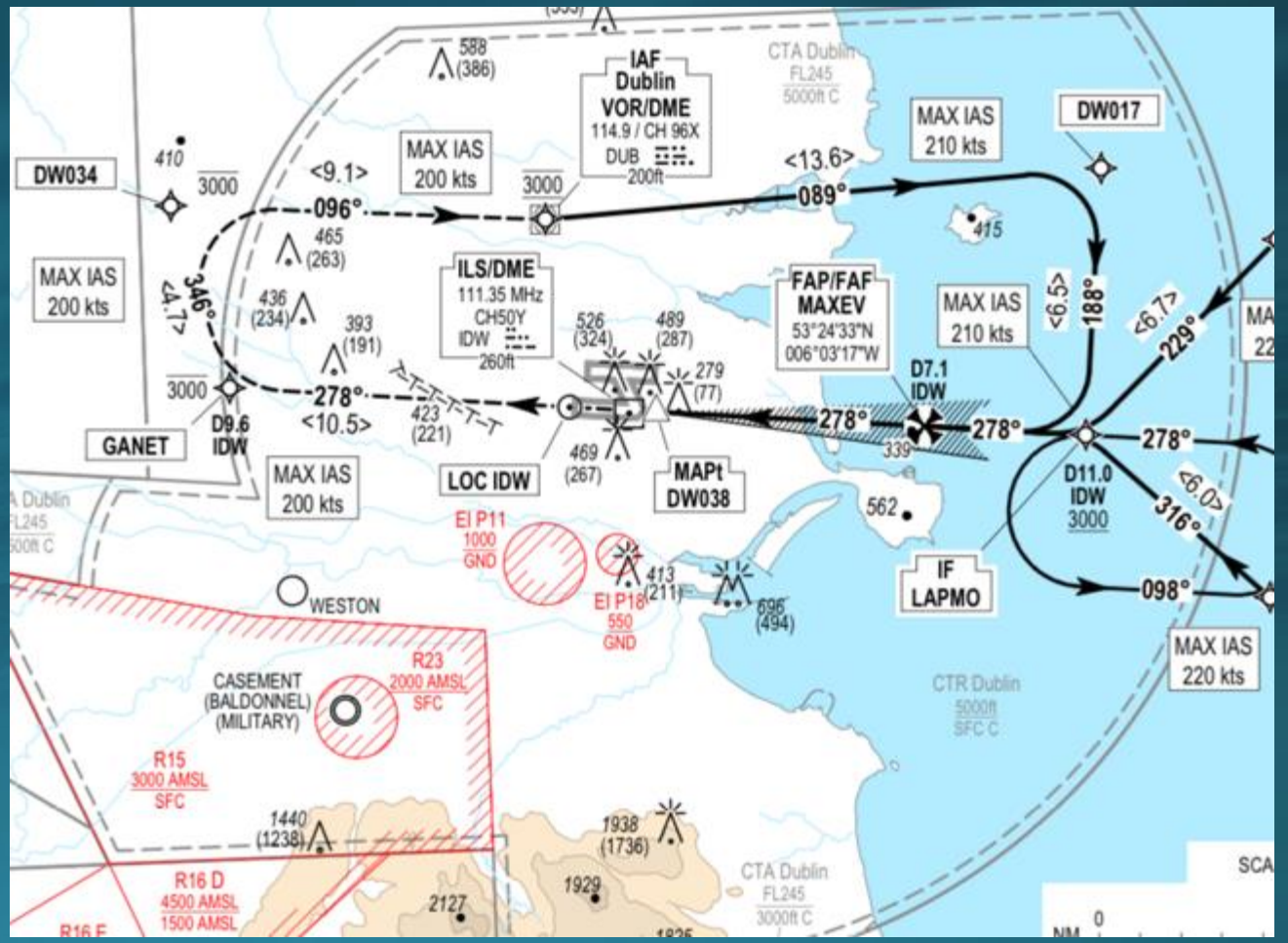
b) the nominal departure track diverges immediately after take-off, by at least 30 degrees, from the missed approach track of the adjacent approach.

4.2.2 The following types of approaches clearances may be used in accordance with segregated parallel operations, provided that an ATS surveillance system and the appropriate ground facilities conform to the standard necessary for the specific type of approach:

Parallel Runway Operations

Departure from 28R, Arrival on 28L.

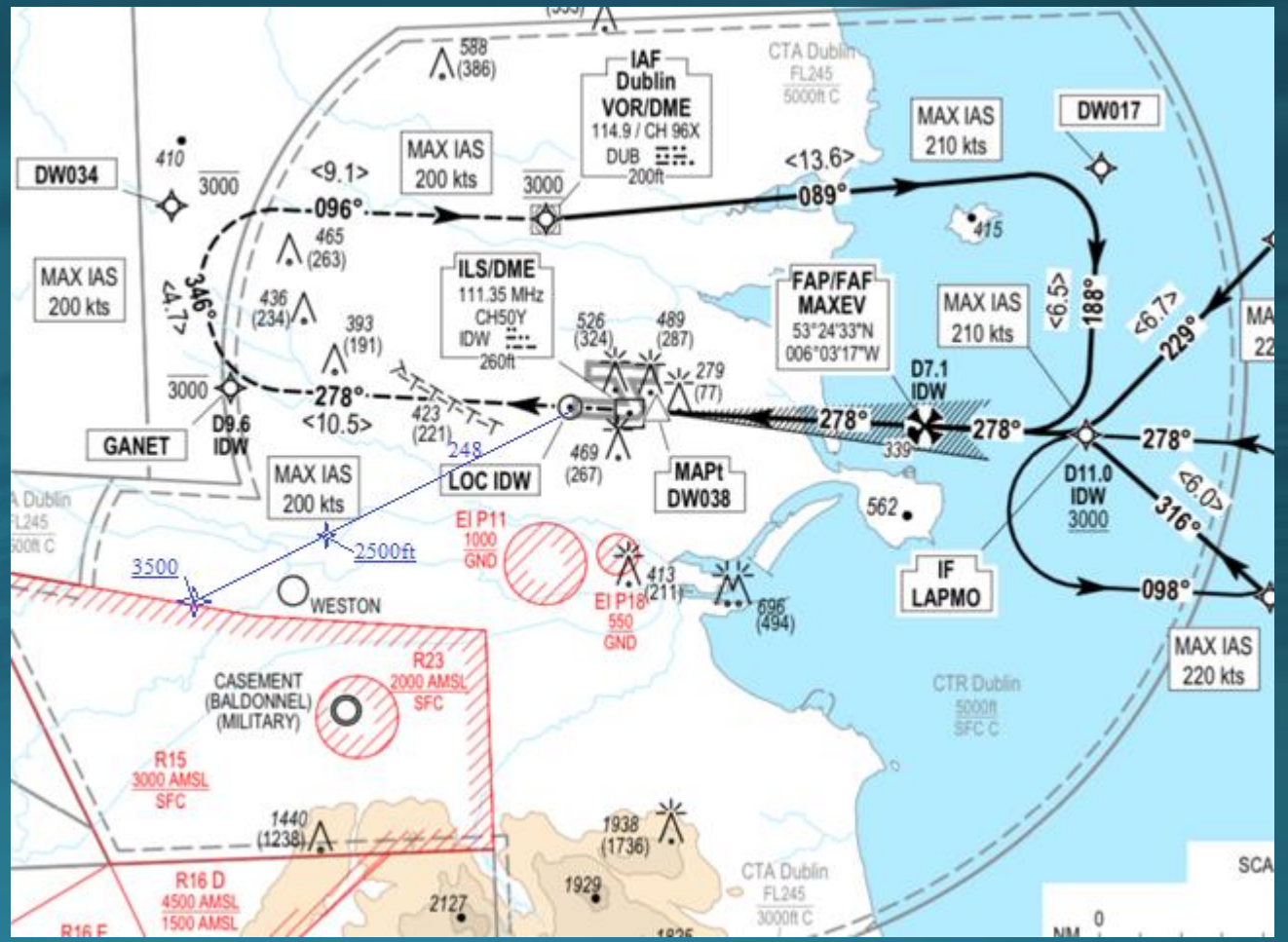
- Currently the DAA operate one runway for departures 28R, and one runway for arrivals 28L.
- The DAA could operate departures off both 28L and 28R, spreading the noise equally to residents south and north of the airport
- The only requirement is that the departure tracks diverge by 10 degrees by 3,7 Km.
- However this is dependant on the missed approach of the arrival runway.
- Currently the missed approach off 28L is straight ahead, therefore requiring a 30 degree turn to the right off 28R.
- Changing the go around off 28L to turn to the south would enable straight departures off 28R.



Parallel Runway Operations

Departure from 28R, Arrival on 28L.

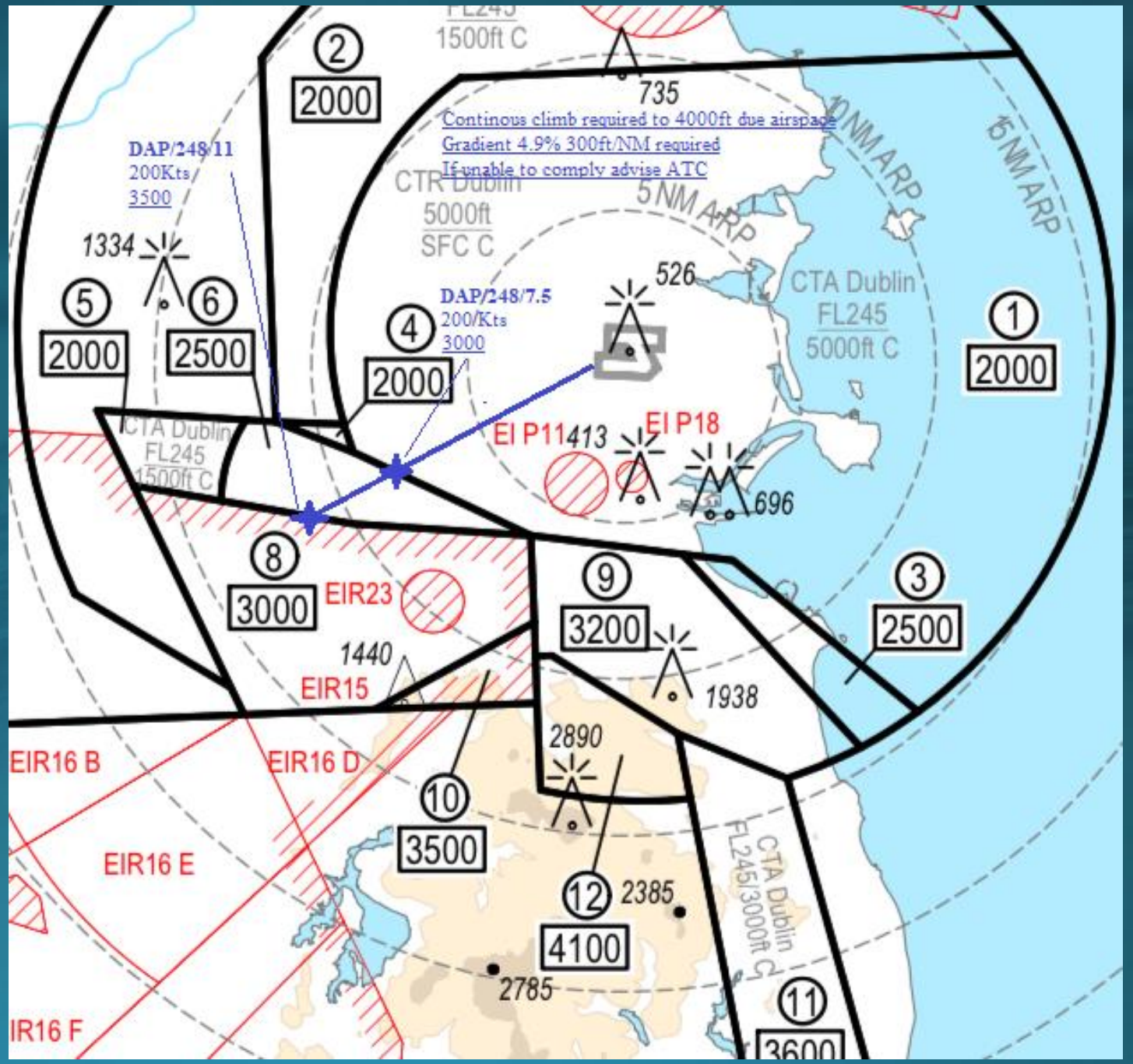
- Here we can see a proposed missed approach from 28L in blue. This would give a 30 degree divergence to the departure from 28R.
- The aircraft are required to climb above airspace at Weston and EIME Baldonnel.
- A straight departure off 28R would limit departure off one runway only, therefore a 10 degree turn north off 28R should be used to allow both runways to be used for departure.
- Go arounds are in frequent, so the noise footprint would be maybe 3 flights per day, rather than a departure every 90 seconds from 28R.
- Noise generated from a missed approach is very low compared to a departure, as the aircraft reaches the altitude quickly, and then has low power and low speed.



Parallel Runway Operations

Departure from 28R, Arrival on 28L.

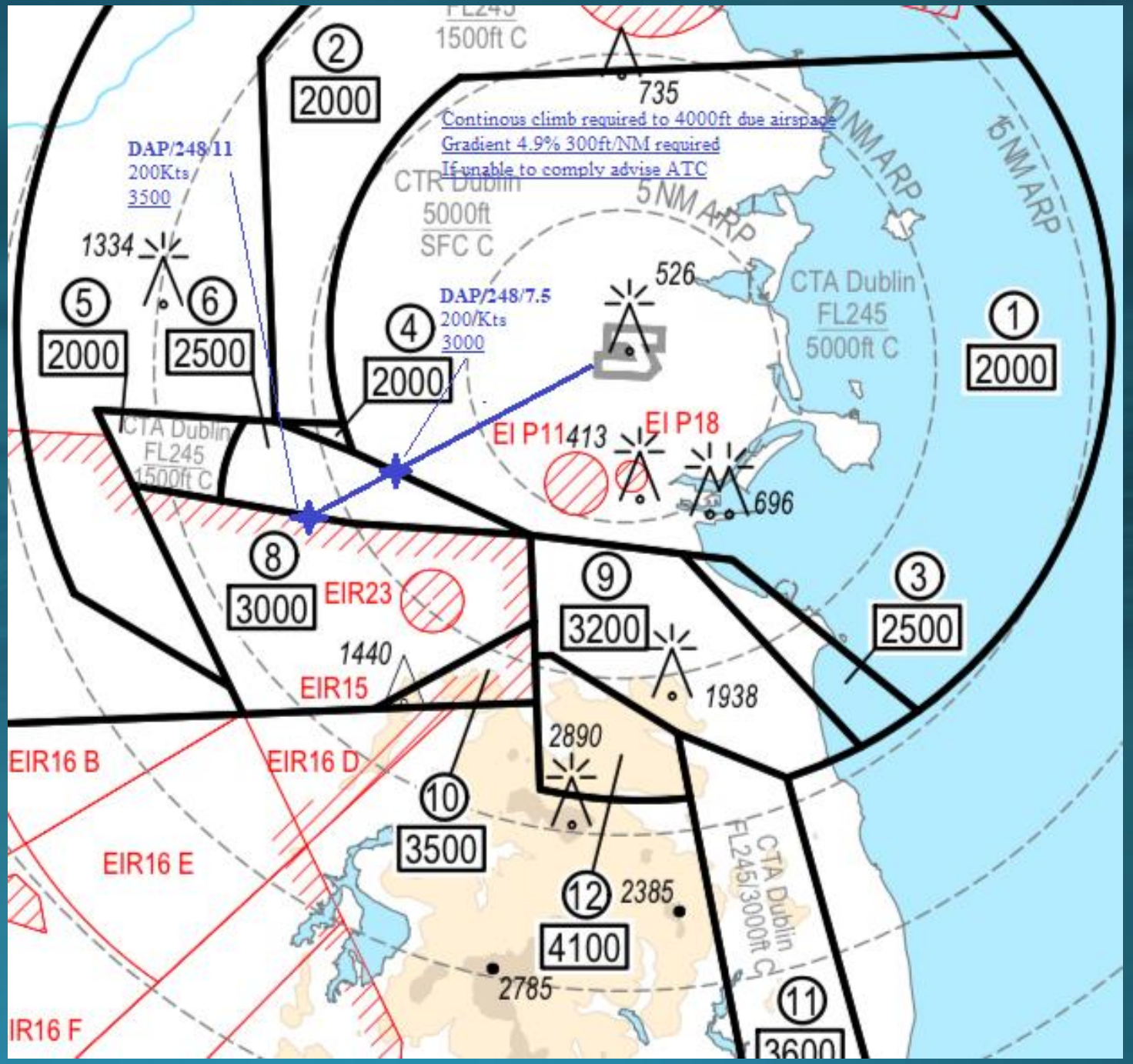
- Here we can see a proposed missed approach from 28L in blue. This would give a 30 degree divergence to the departure from 28R with a 10 degree turn north.
- This proposed missed approach is overlayed on the Minimum radar altitude chart, eg this is the minimum altitudes that ATC can use day to day in different areas.
- This would require a climb gradient of 4.9% which is far lower than the achievable gradient with all engines operating.
- This altitude restriction is 500ft above the minimum Altitude.
- Using the minimum altitudes reduces the required gradient to 4.03%
- Most airlines will not fly a missed approach with one engine failed, and would fly straight ahead instead.
- This would be informed to ATC by the pilot, and Departures would have to stop momentarily until the aircraft lands.
- This is normal practice across the world.



Parallel Runway Operations

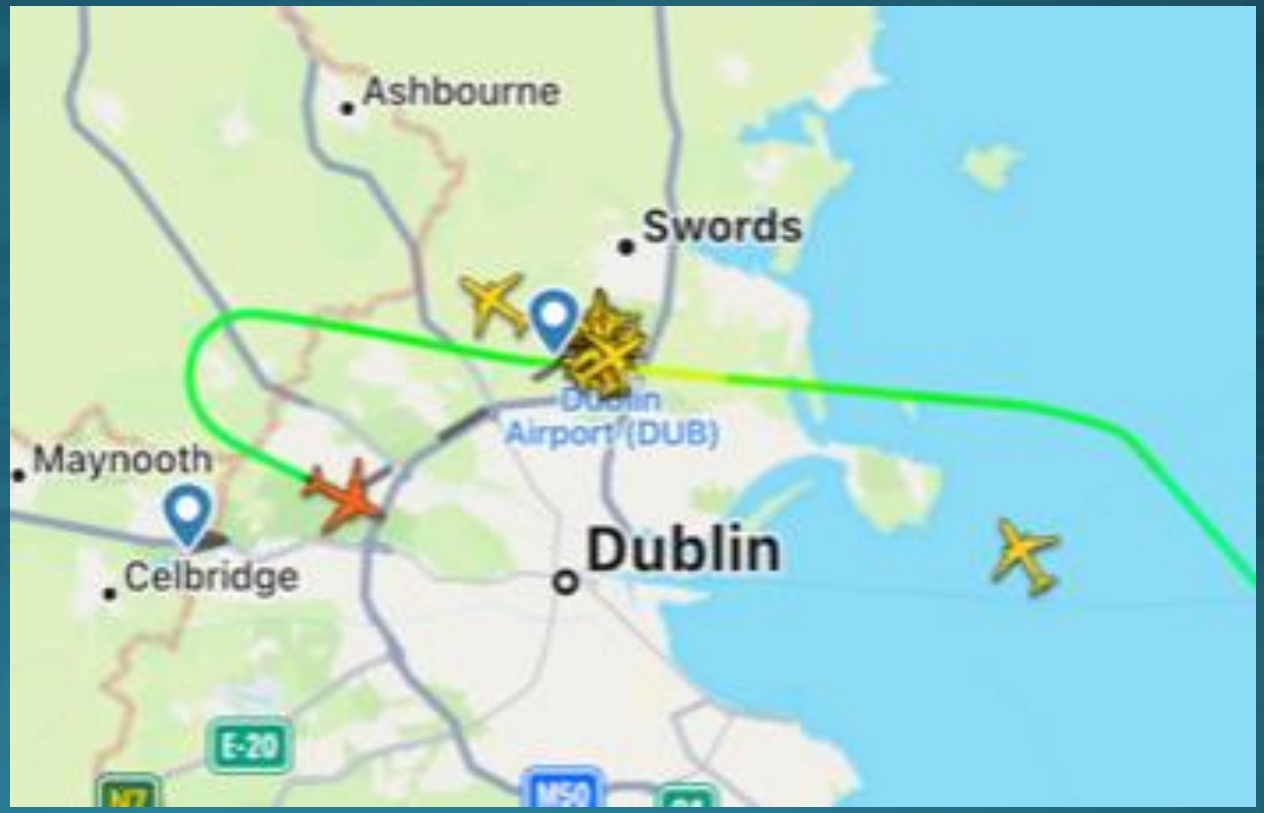
Departure from 28R, Arrival on 28L.

- The Aircraft would perform a missed approach to DAP, then track left 30 degrees 248 to 7.5 miles.
- This gives a distance of 9.4 miles to the turn point with a climb of 4.9% to 3000ft.
- The Missed approach point is at an altitude of 200ft and must climb continuously to 4000ft, eg maintain the go around Flap configuration until level.
- This minimum 3000ft at the turn point is 500ft above the minimum radar altitude.
- Using the minimum altitude reduces the gradient required to 4.03%.
- The aircraft can then be radar vectored by ATC.



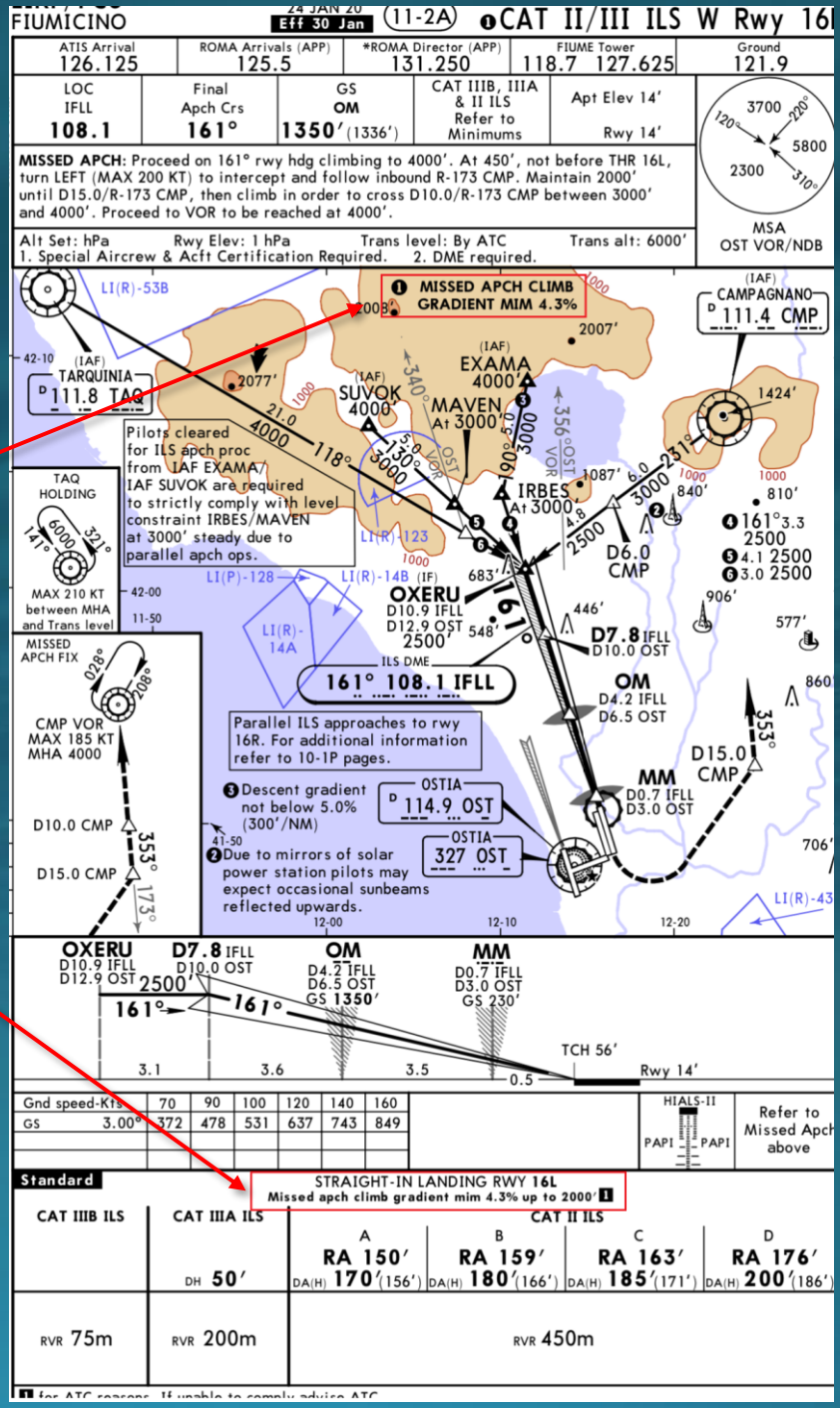
South 28L Proposal.

- The DAA state that this left turn from the south runway is not possible over Dublin city at 4000ft, due to Baldonnel.
- Here is an actual screenshot of an aircraft performing a missed approach from 28L, and ATC instructed them to fly south.
- In this picture you can see the aircraft turned south, while Baldonnel airspace was active.
- Also to note a departure from the north 28R in progress.



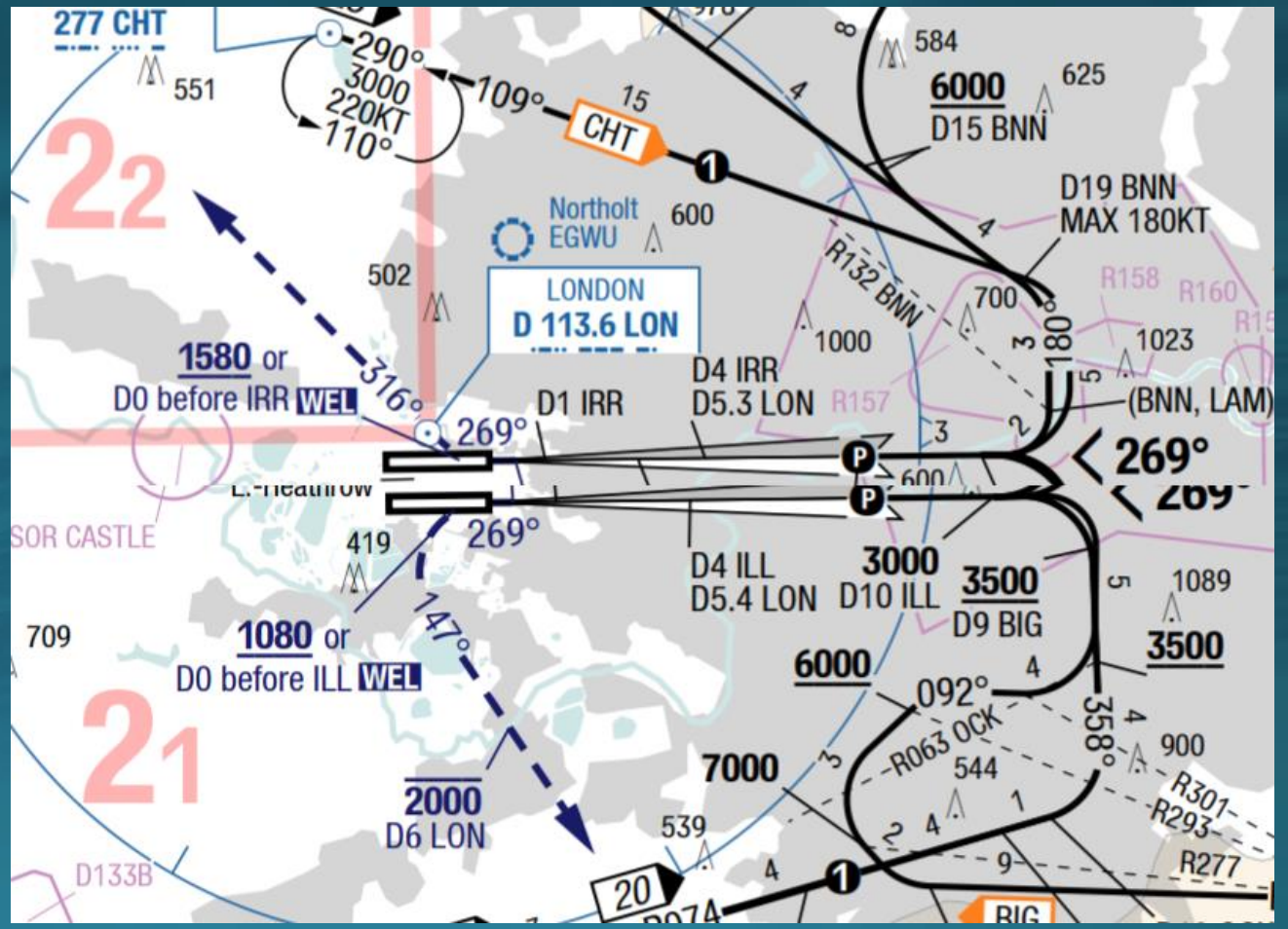
Examples of Missed Approach Turns

- The standard missed approach gradient is 2.5%. Eg 2.5 feet climb per 100 feet forward.
- Airports can apply a higher gradient if required for airspace restrictions, and it must be notified on the chart.
- See an example of LIRF (Rome), 16L has a higher gradient required due to airspace restrictions. This is a higher gradient than required in Dublin 28L.
- Pilots must inform ATC if unable to comply.
- If in Dublin 28L a pilot cannot comply due to engine out operations, this would be an emergency, and ATC would have to stop departures momentarily until the aircraft has touched down.
- This is because the aircraft would normally request a straight ahead missed approach, and would therefore not have the required 30 degrees track divergence required.



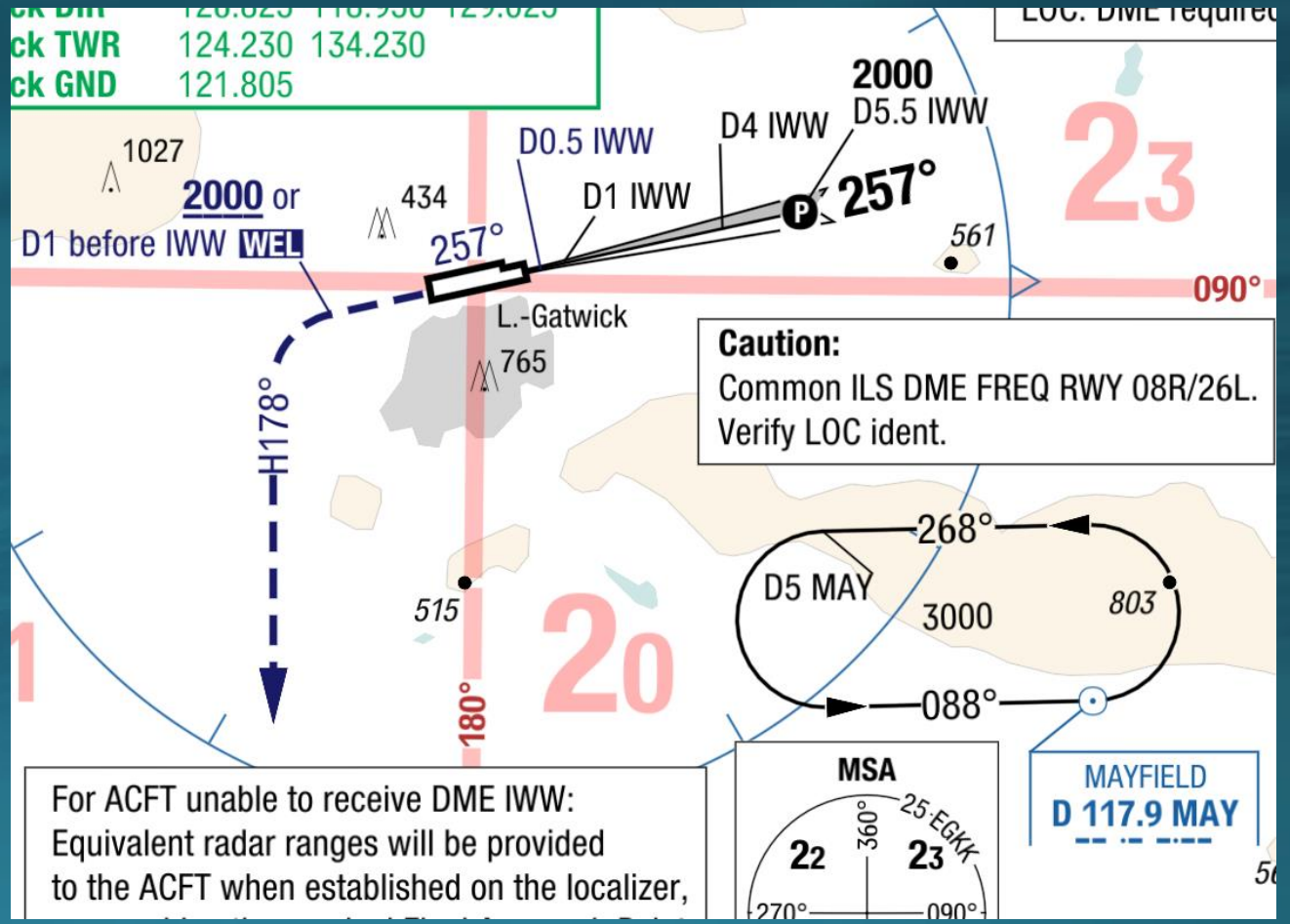
Examples of Missed Approach Turns

- Here is an example of London Heathrow.
- Most airports around the world turn the missed approach track away from the runways immediately, to allow greater flexibility for the departure tracks.
- The missed approach tracks turn away from the runway, enabling the minimum turn of 10 degrees divergence between runway departures.
- London Heathrow uses one runway for take off and one for landing just like Dublin. The runways swap at 3pm daily to spread the noise.



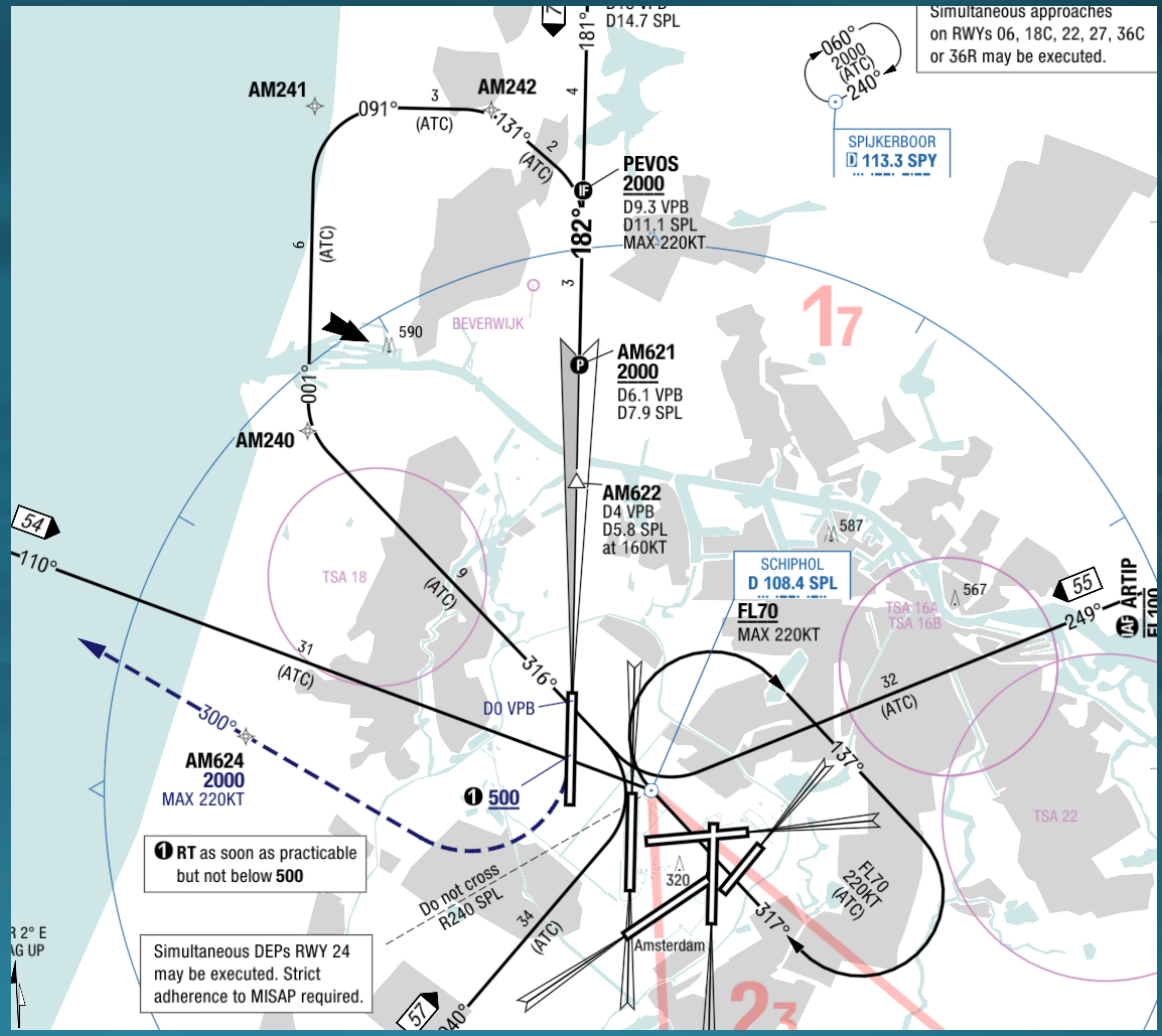
Examples of Missed Approach Turns

- Here is an example of London Gatwick.
- The missed approach turns south immediately once an altitude of 2000ft has been achieved due to obstacle clearance.



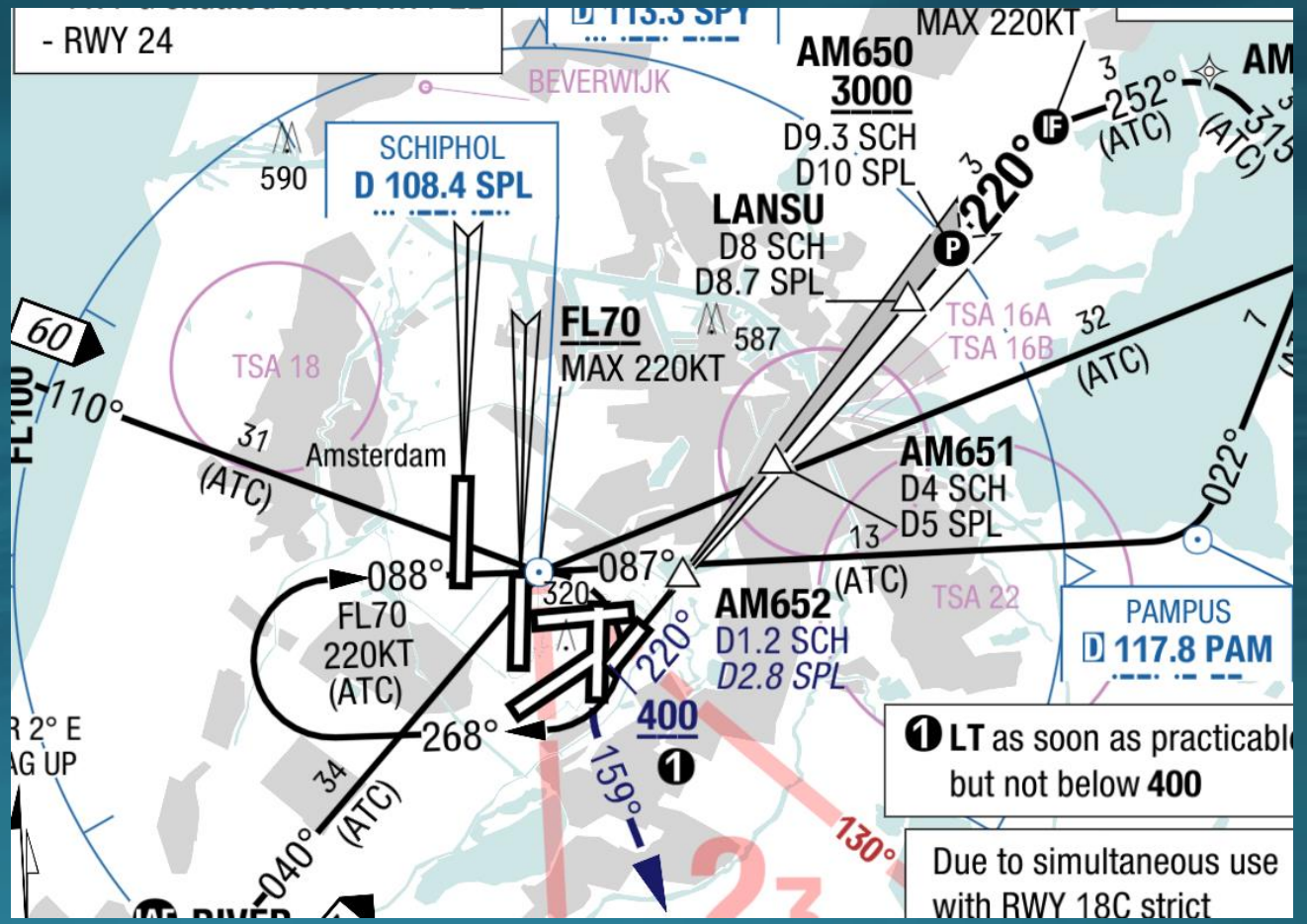
Examples of Missed Approach Turns

- Here is an example of Amsterdam.
- The missed approach turns immediately by greater than 90 degrees to avoid conflict with departing traffic from runway 24.



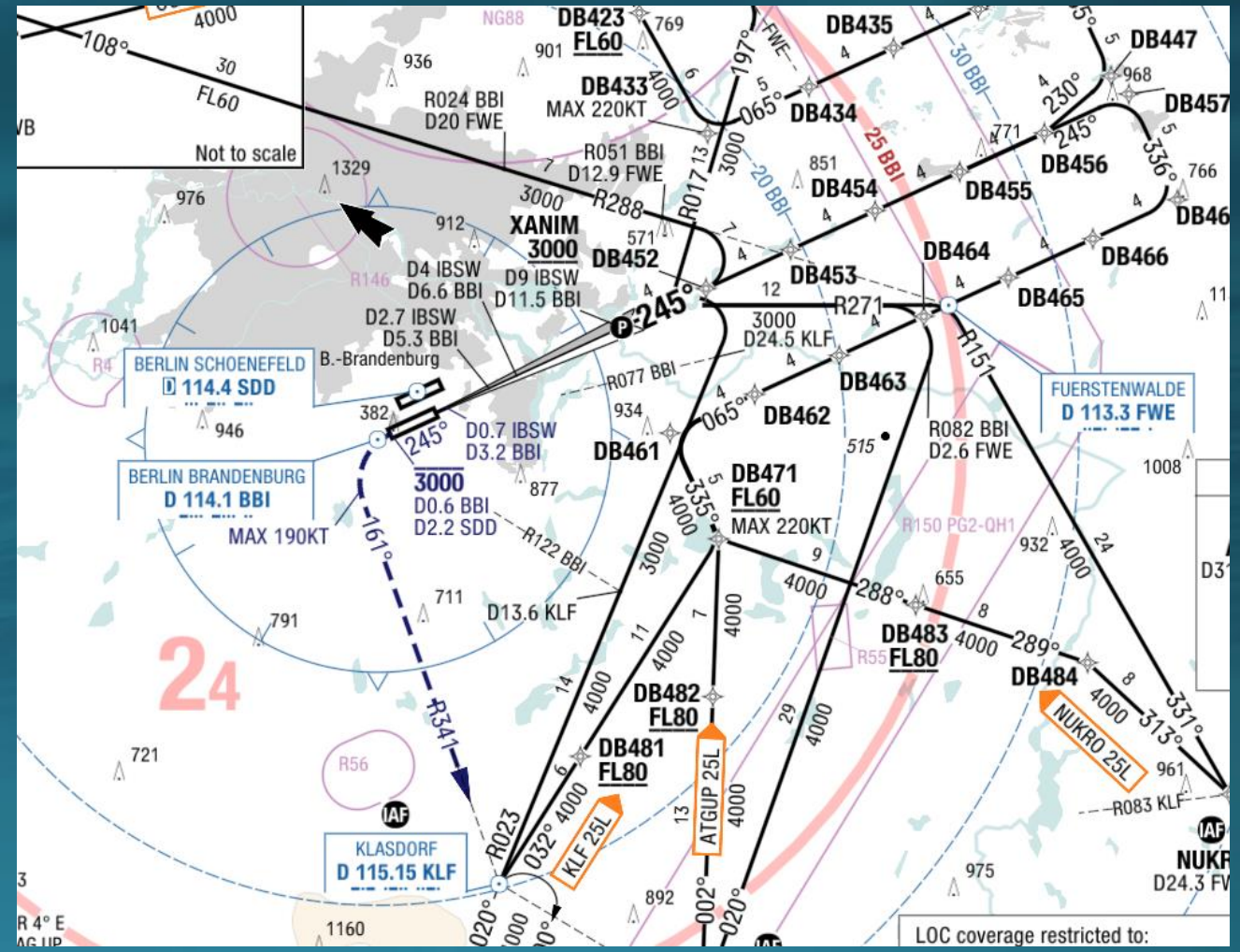
Examples of Missed Approach Turns

- Here is an example of Amsterdam runway 22.
- The missed approach turns immediately to avoid conflict with departing traffic from runway 24.



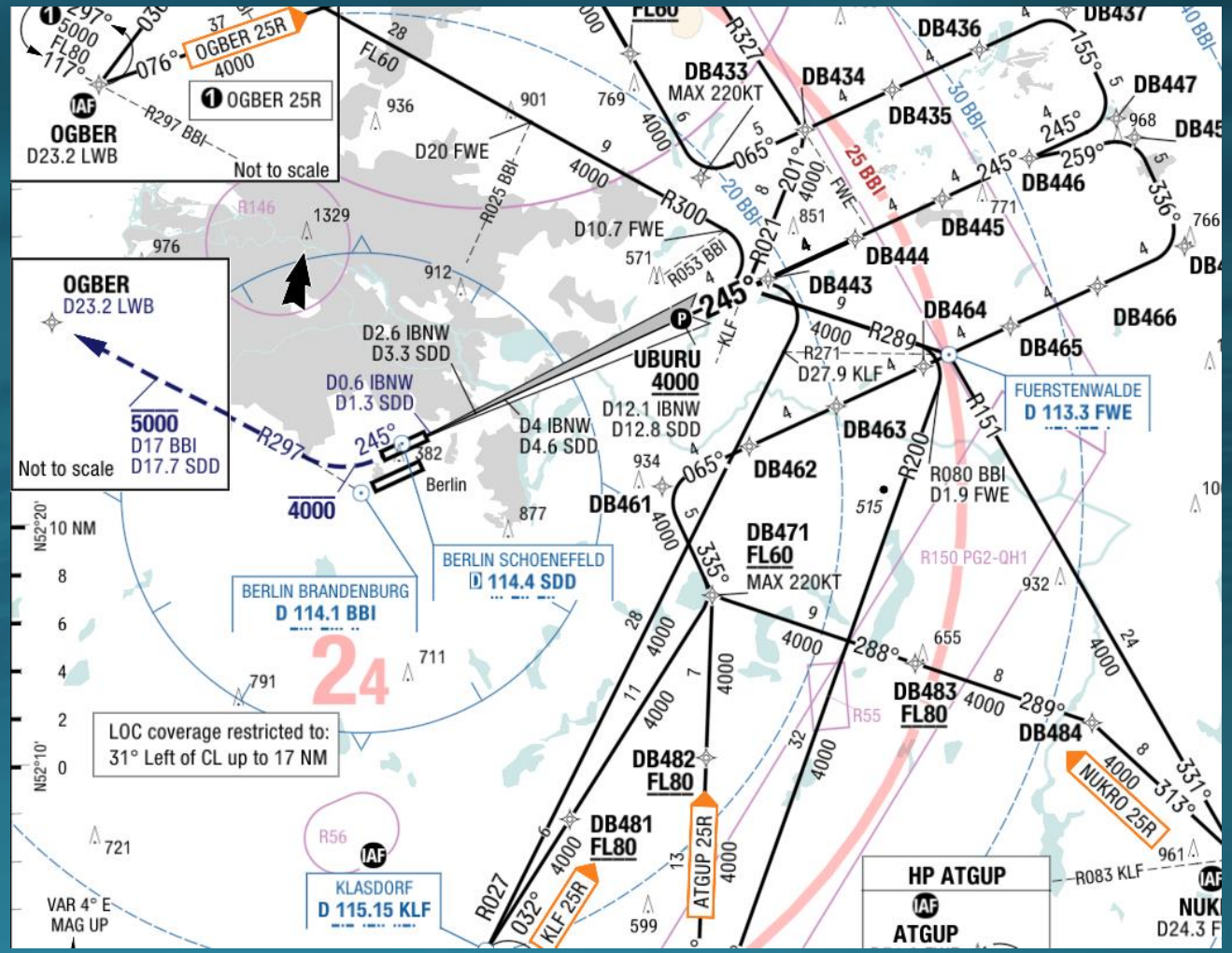
Examples of Missed Approach Turns

- Here is an example of Berlin runway 25L.
- The missed approach turns immediately to avoid conflict with departing traffic from runway 25R.



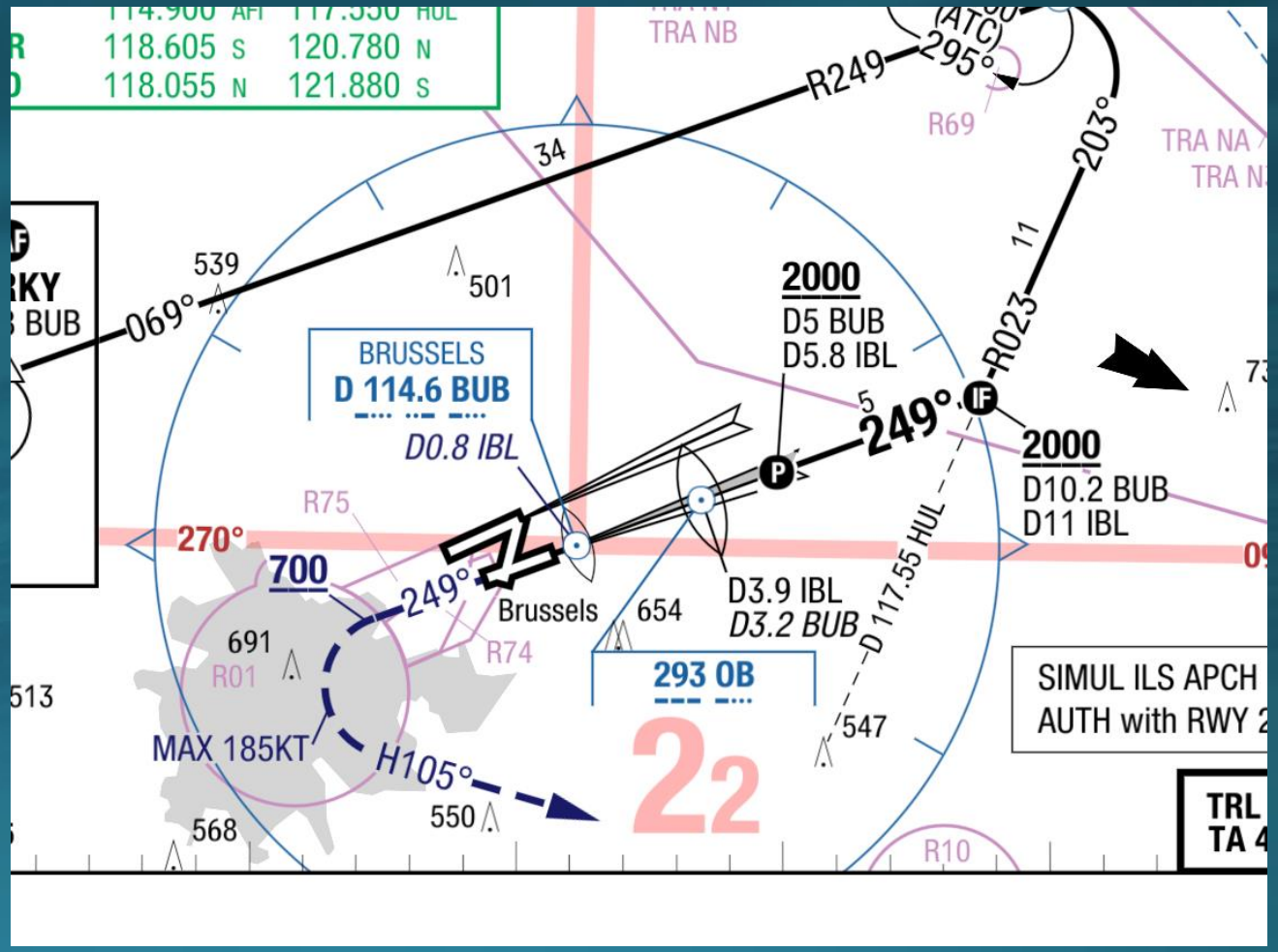
Examples of Missed Approach Turns

- Here is an example of Berlin runway 25R.
- The missed approach turns immediately to avoid conflict with departing traffic from runway 25L.



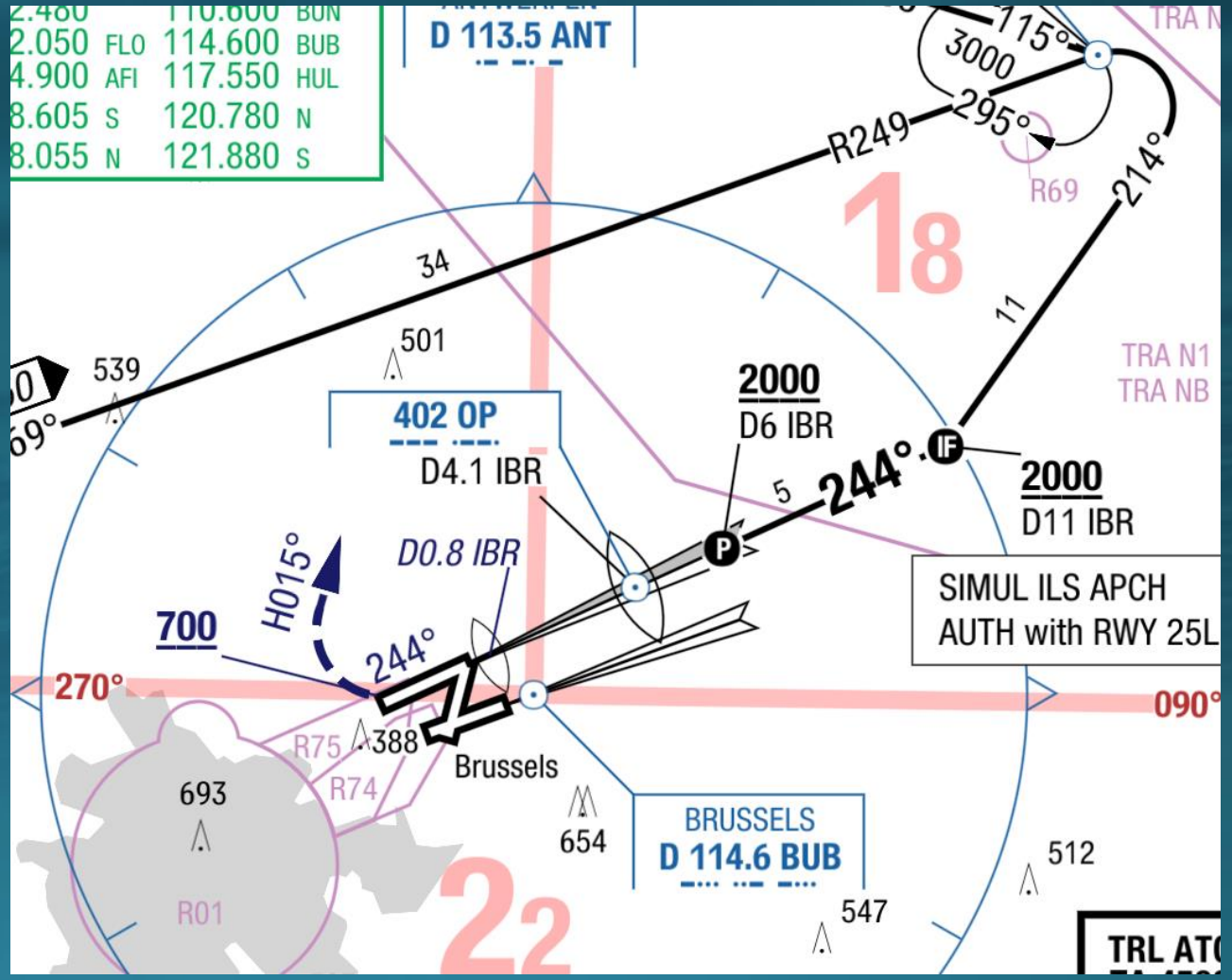
Examples of Missed Approach Turns

- Here is an example of Brussels runway 25L.
- The missed approach turns immediately to avoid conflict with departing traffic from runway 25R.



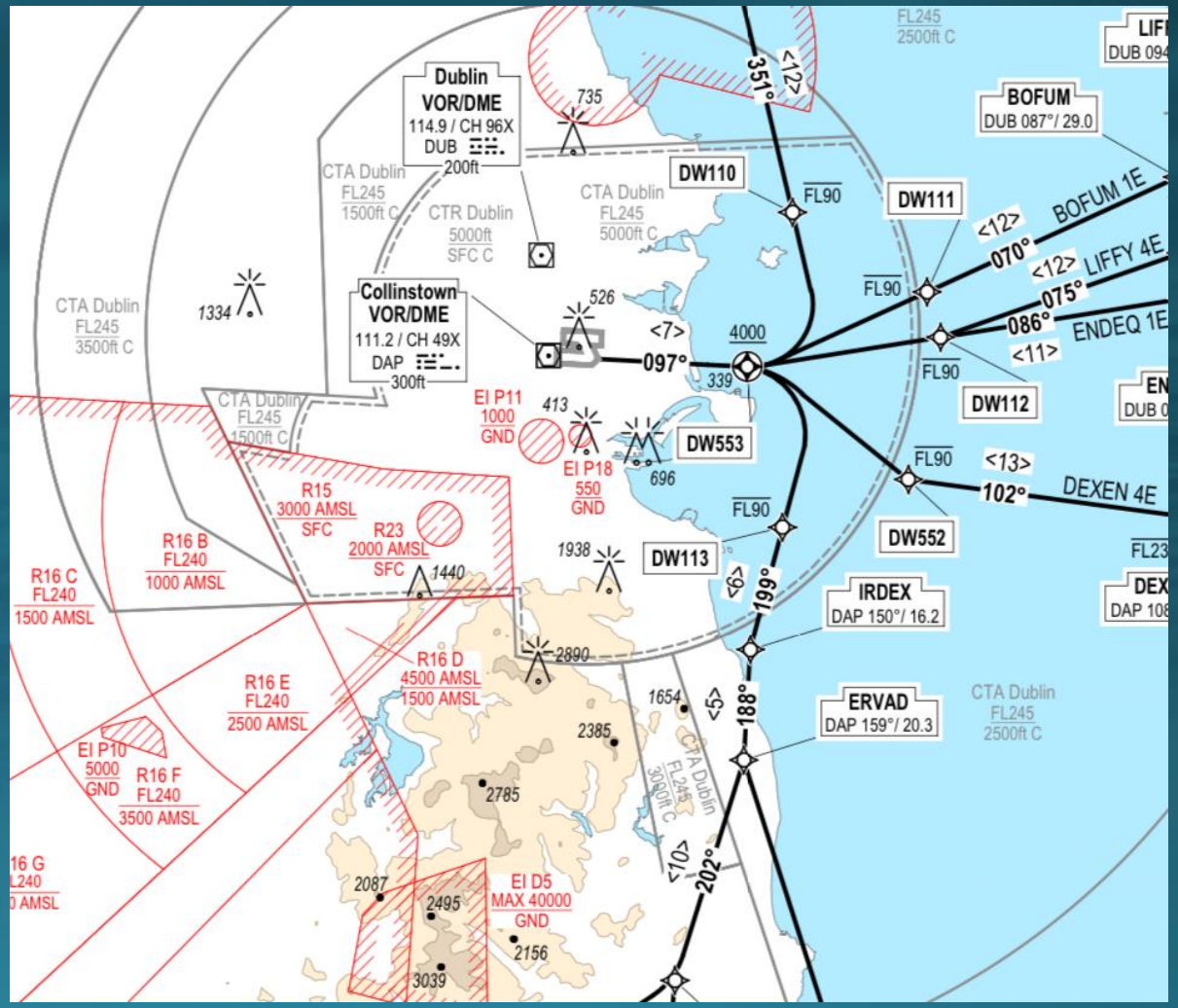
Examples of Missed Approach Turns

- Here is an example of Brussels runway 25R.
- The missed approach turns immediately to avoid conflict with departing traffic from runway 25L.
- As shown turning missed approach traffic at large angles is custom and practice so as not to limit any departure traffic.
- Dublin airport could turn the missed approach off 28L south to not limit the departures off 28R, and reduce the noise.
- This would also enable full use of both runways to the maximum efficiency, while minimising the noise to its neighbours.



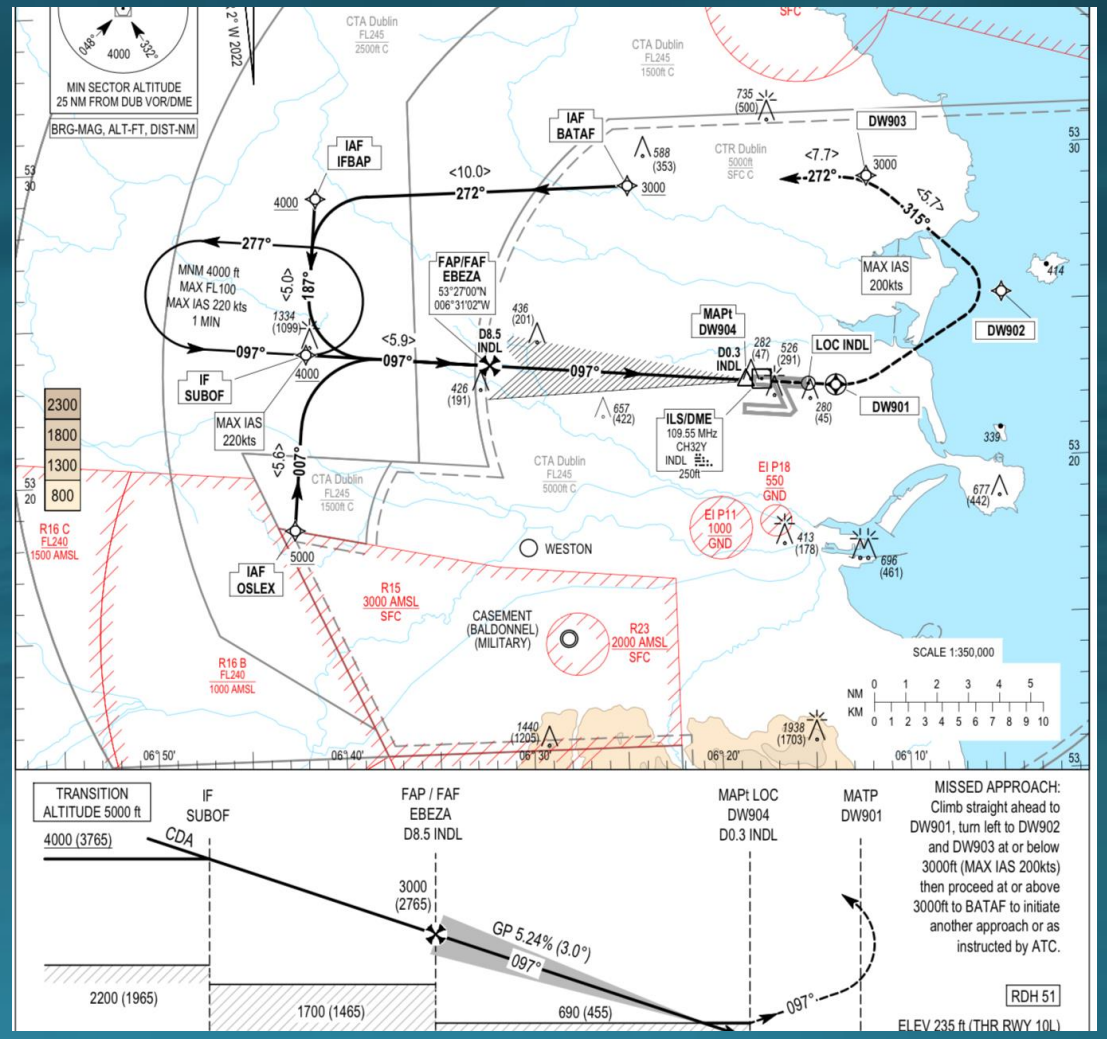
Easterly Operations

- Here you can see the Departure from 10R. This is from the South runway to the east.
- This has the Aircraft climbing straight ahead.



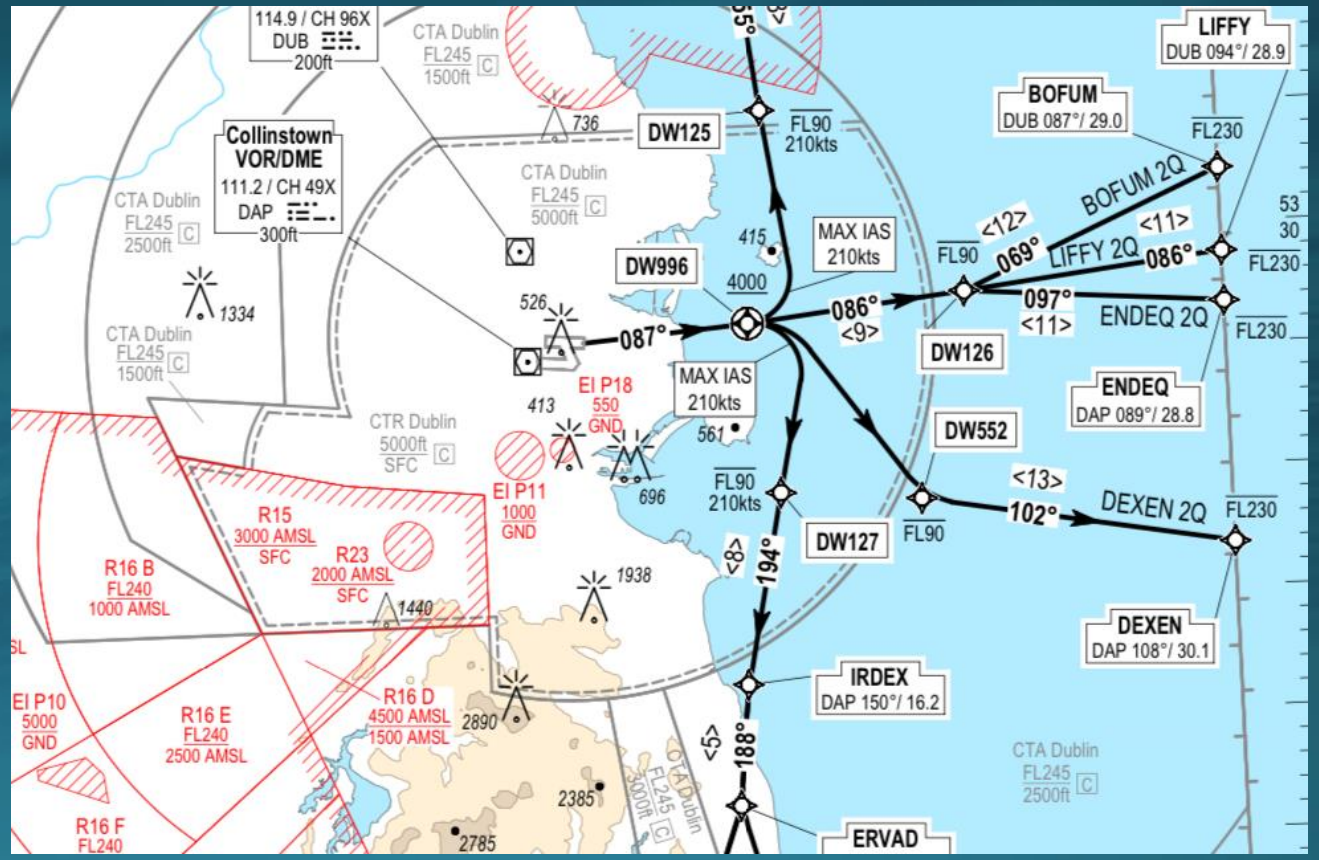
Easterly Operations

- Here you can see the Missed approach procedure from 10L (North runway). This procedure turning 30 degrees to the left allows a straight ahead departure of the south 10R.
- The turns must start by 2 nm from the departure end of the runway.
- This same procedure could be used for the west operations, and allow reduced turns from 28R.



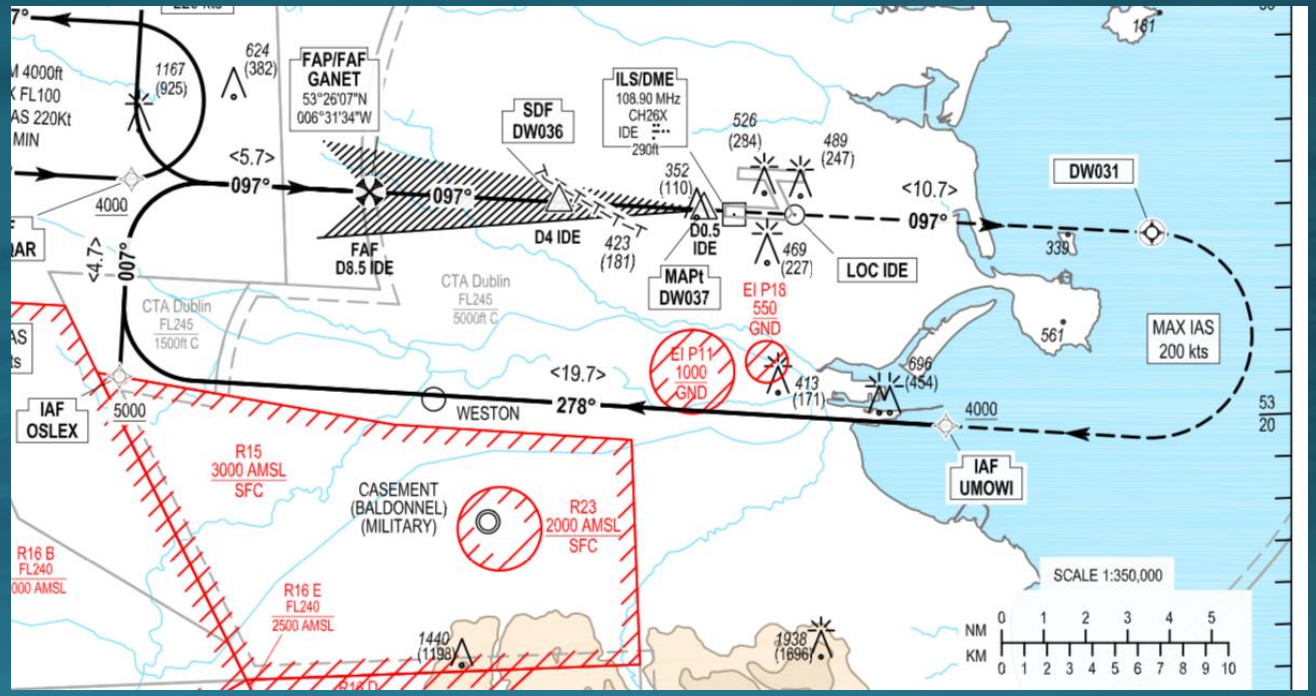
Easterly Operations

- Here you can see the departure track from 10L. It has a turn 10 degrees to the left.
- This does not give the required 30 degrees from the south missed approach, therefore departures off 10L are not allowed if 10R is in use for arrivals.
- All arrivals easterly are on to 10L, and departures are from 10R, therefore the east operations complies with all divergence restrictions, and allows departures from both 10L and 10R simultaneously.



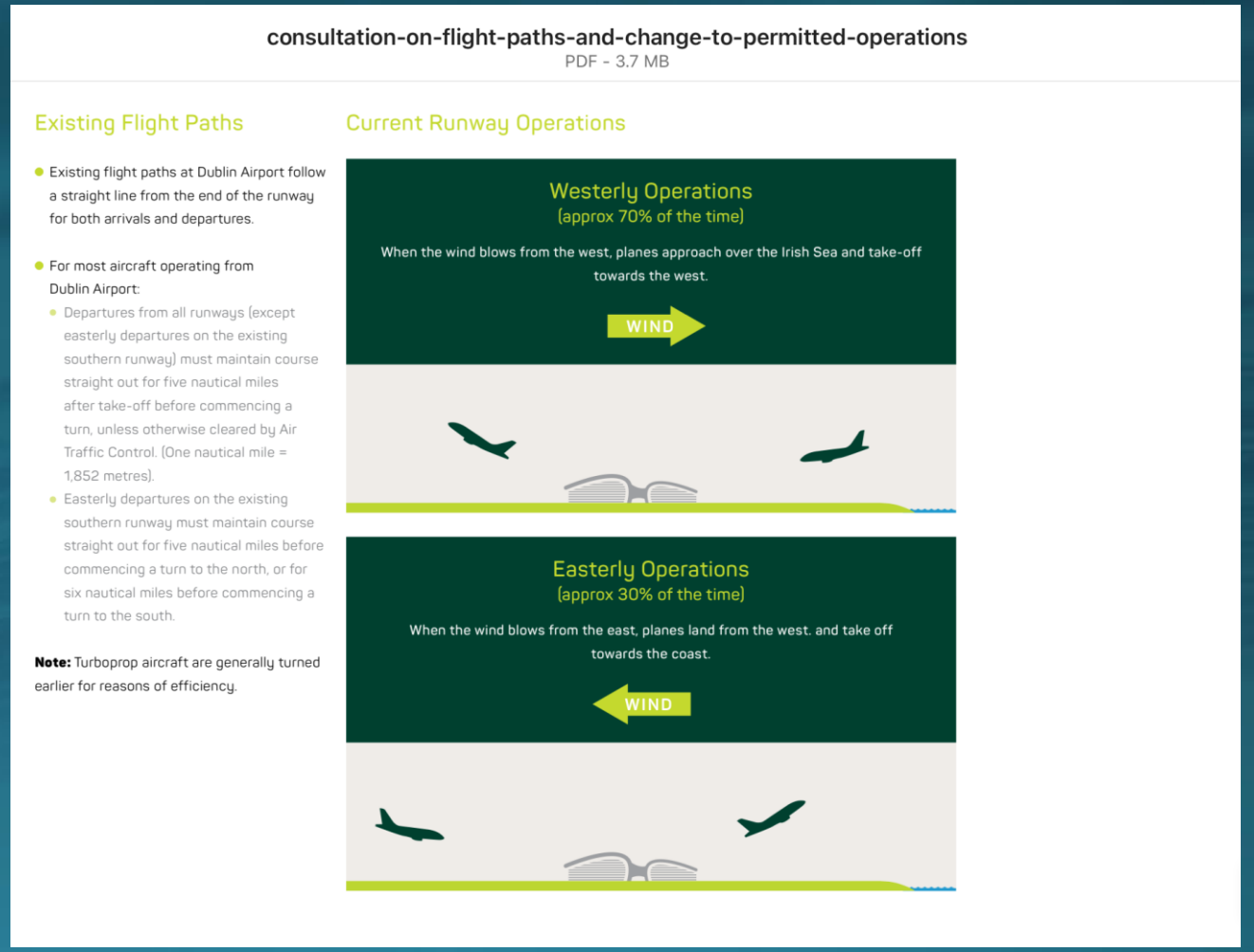
Easterly Operations

- Here you can see the missed approach from 10R. This is from the South runway to the east.
- This has the Aircraft climbing straight ahead, and turning south over Dublin city.



How Can The DAA Reduce Noise?

- Use full runway length for departure as standard. Currently pilots must request to use full length. The longer the runway available, the lower the power required for take off, and therefore less noise.
- Use headwinds. The DAA's own published procedures state that the westerly runway will be used with westerly winds, and the east runway for easterly winds.
- Currently the DAA will enforce ATC to change to the west runway with up to 10 kts of easterly wind. Tailwinds also mean aircraft cannot climb as quickly, require more power, creating more noise.
- The current turn from 28R at 400ft is against the DAA's own published procedures which state that all aircraft must fly straight until 500ft before turning.



consultation-on-flight-paths-and-change-to-permitted-operations
PDF - 3.7 MB

Existing Flight Paths

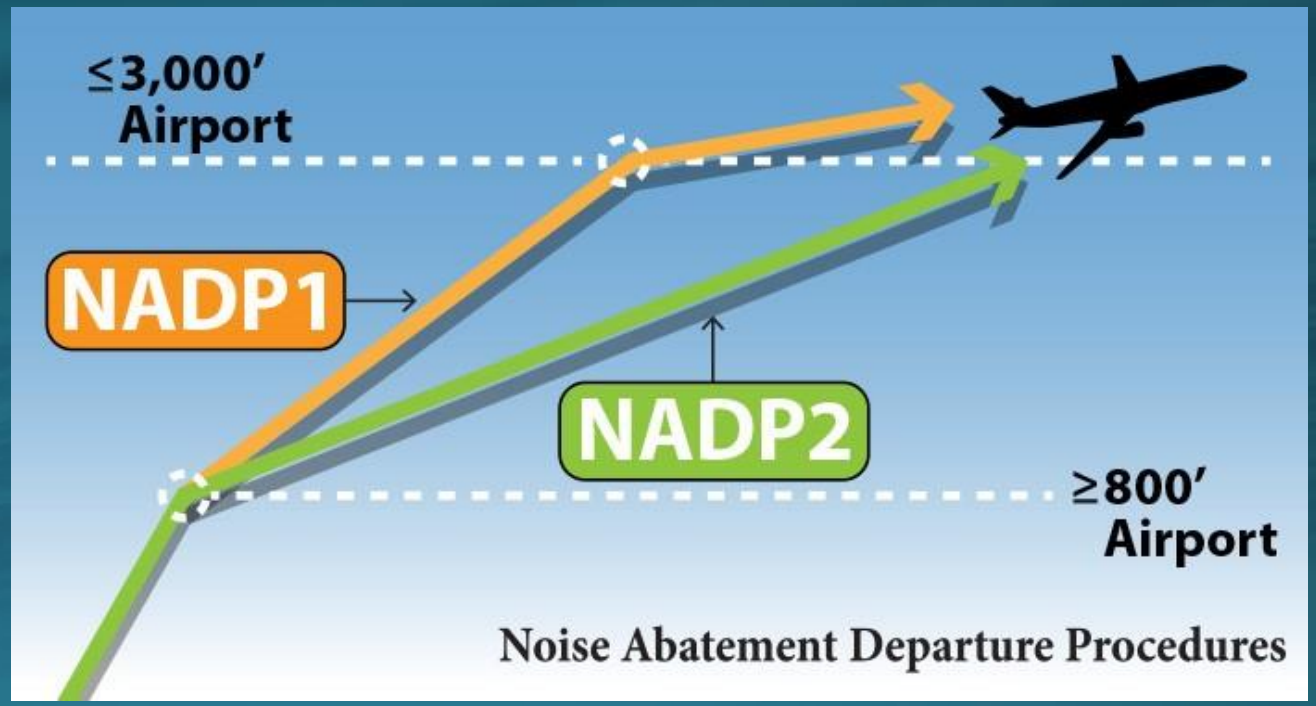
- Existing flight paths at Dublin Airport follow a straight line from the end of the runway for both arrivals and departures.
- For most aircraft operating from Dublin Airport:
  - Departures from all runways (except easterly departures on the existing southern runway) must maintain course straight out for five nautical miles after take-off before commencing a turn, unless otherwise cleared by Air Traffic Control. (One nautical mile = 1,852 metres).
  - Easterly departures on the existing southern runway must maintain course straight out for five nautical miles before commencing a turn to the north, or for six nautical miles before commencing a turn to the south.

Note: Turboprop aircraft are generally turned earlier for reasons of efficiency.

Current Runway Operations

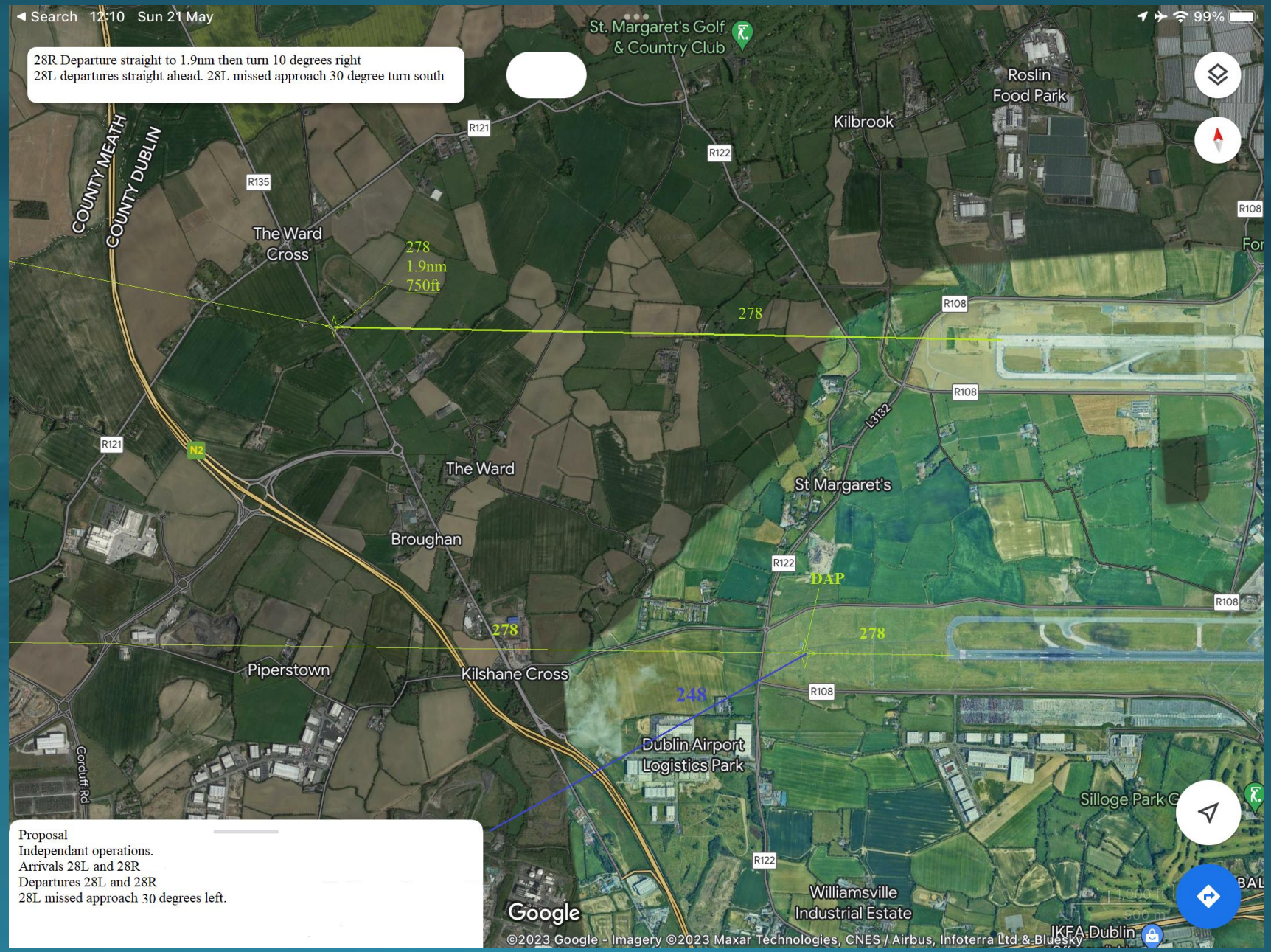
How Can The DAA Reduce Noise?

- Use noise abatement departure procedure 1 (NADP1)
- The current procedure in Dublin airport is to use NADP 2. The aircraft climbs to 1500ft above the runway, reduces power and accelerates. Retracting the take off flaps. This combined with the turns, means the aircraft cannot climb fast.
- Using NADP 1 will enable the aircraft to climb continuously to 3000ft above the runway before accelerating. This reduces noise dramatically, which is in use around Europe.



Proposed Routes
10 Degree Turn 28R

- 28R Departure 10 degree turn at 1.9 miles.
- Turn must be started by 2 miiles / 3.7km.
- Missed approach 30 degrees left 28L
- Angle between Departure track and missed approach 30 degrees required.
- This would allow departures on 28L and 28R.
- Missed approach would climb above Weston, and avoid EIME airspace.
- Missed approach track would also be above EIME VOR 28 Approach.



Proposed Routes
10 Degree Turn 28R

- 28R Departure 10 degree turn at 1.9 miles.
- Turn must be started by 2 miles / 3.7km.
- Missed approach 30 degrees 28L
- Angle between Departure track and missed approach 30 degrees required.
- This would allow departures on 28L and 28R.
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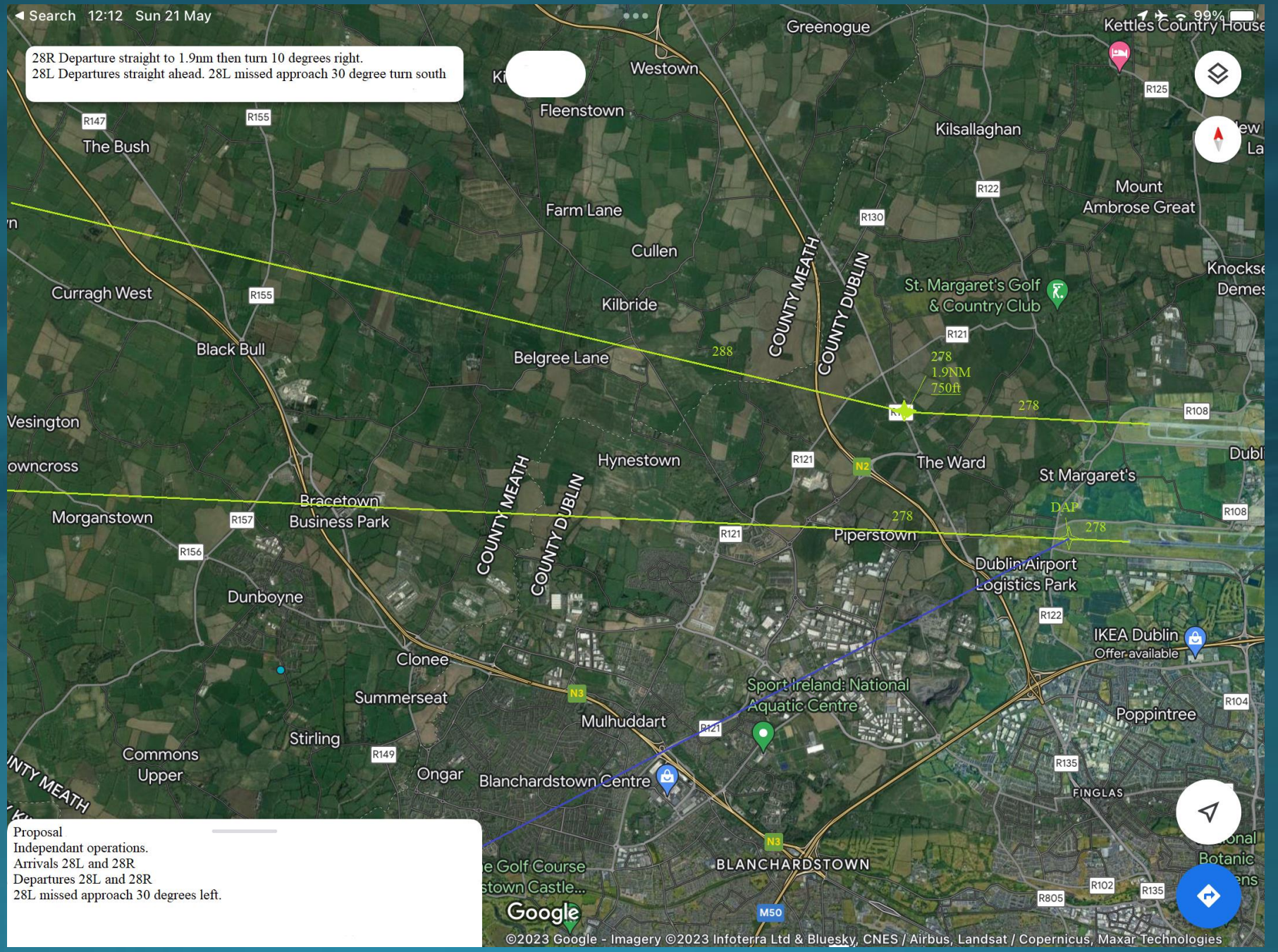
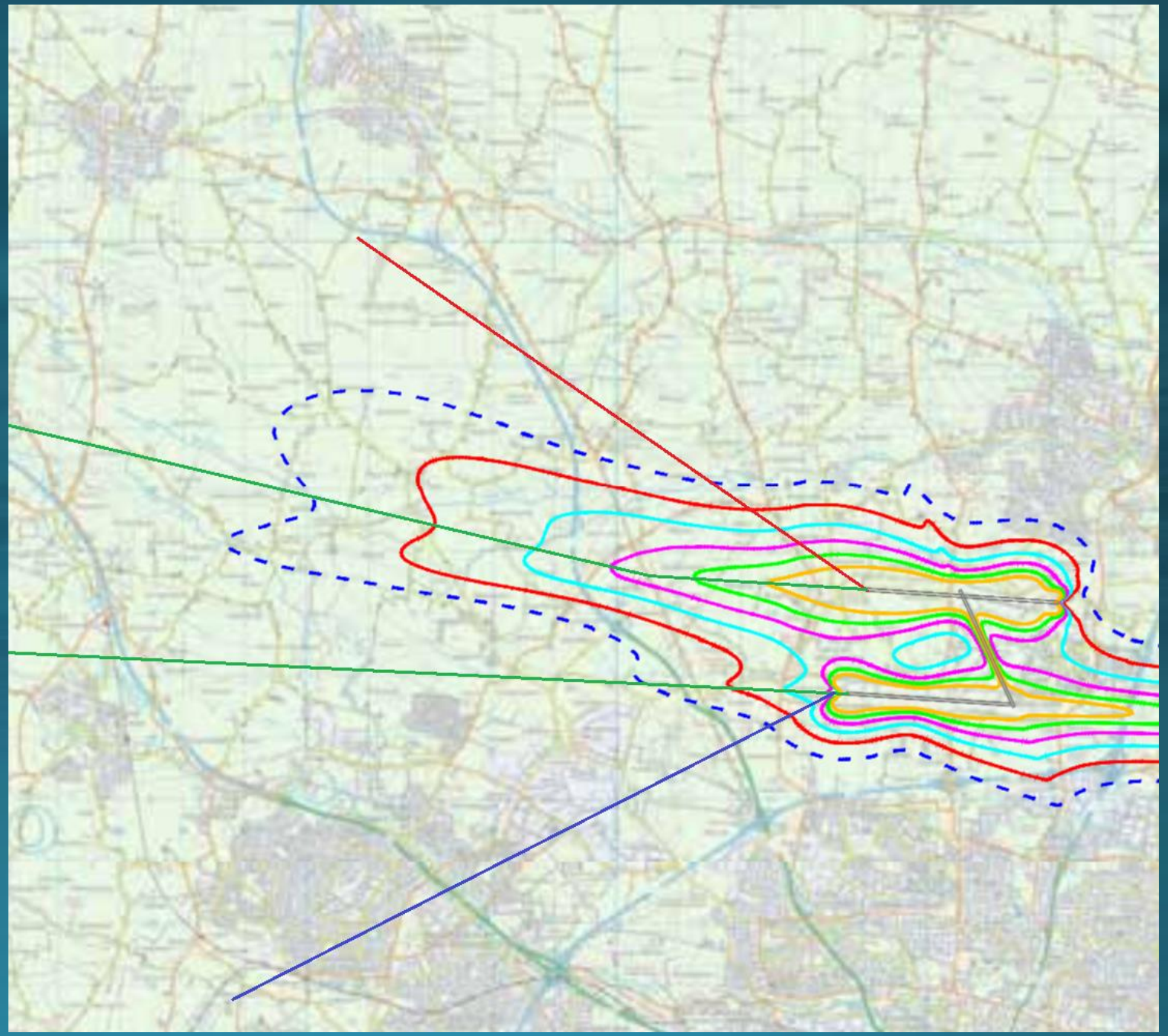


Proposed Routes
10 Degree Turn 28R

- The red Line is the actual departure track off the new North runway. It can be clearly seen it is well outside the planned noise contour chart.
- The proposed 10 degree turn shown in green would allow departures from both runways at the same time, and be flying through the area defined in the noise contour chart.
- The Blue line is the required change to the missed approach track.
- This proposed procedure will allow the DAA to expand with their goals into the future while protecting residents from noise.
- This is a win for all parties concerned, and protects the expansion of Dublin Airport into the future.



Summary

- Use Full length runway 28R as standard
- Use NADP 1 as standard in Dublin airport
- Use maximum 5 kts of tailwind for departures
- Change the missed approach for runway 28L to fly to the south as proposed.
- Departures off 28R to straight ahead to 1.9 nm, then fly to 10nm and above 3000ft before turning on track, or
- Departures off 28R climb ahead to 1.9nm, then turn north by 10 degrees and climb to 10nm before turning.
- Instruct ATC to enforce speed restrictions. Currently ATC demand an increase to 290 kts airspeed soon after departure.
- Make 250kts below 10000ft mandatory.
- Instruct ATC to not direct aircraft off the published routes until above 5000ft.
- Introduce a penalty to airlines that do not comply with speeds and track keeping. This is standard practice across Europe.