LJLA Airspace Transition

Design Options Longlist (Images)

Document Details

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Issue 1	Initial	14th May 2019
Issue 2	Expansion of Section 1 to describe process by which Longlist was developed. This additional information was requested by CAA. Document title amended to Design Options Longlist (Images)	22nd May 2019

Approval Level	Authority	Name
Author		
Reviewer		

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1 Longlist Development

1.1 Background

The LJLA Airspace Transition project is currently at Stage 2 – Develop and Assess - of the CAP 1616 Airspace Design process. Step 2A requires the change sponsor to develop a comprehensive list of options (longlist) that address the Statement of Need and that align with the Design Principles developed in Stage 1.

This document provides enlarged images of each of the options developed, against a backdrop of both an Ordnance Survey roadmap and an aeronautical (VFR) chart and should be read alongside the LJLA Airspace Transition Design Principles Evaluation document.

1.2 How the Longlist was Developed

1.2.1 Overview

The procedure designs were developed by CAA Approved Procedure Designers (APD). The APD began by considering the Statement of Need, Constraints and Design Principles as defined in Stage 1 of the CAP1616 process. An explanation of how each of these were applied to the development of the longlist is contained below

1.2.2 Extract of Statement of Need

The full Statement of Need is available in Stage 1A of the airspace portal and the key elements in terms of design are illustrated by the following extracts. The first illustrates the complexity of the airspace around LJLA with Manchester above and to the east, with restrictions to the west that enable overland access for general aviation. There is also a low-level corridor between LJLA and Manchester Airport used by general aviation users. This complexity in the airspace led the APD to immediately discount any options that would require extension of the extant airspace.

[*The Liverpool Control Zone (CTR) currently operates below the Manchester Control Area (CTA) up to 2,500 ft AMSL (Class D airspace). The ATZ dimensions are Surface to 2,000 ft and the Liverpool CTR extends from the Surface to 2,500 ft AMSL. West of a north-south line through Liverpool, the Liverpool CTA extends from 2,500 ft to 3,500 ft AMSL (Class D airspace). To the west and north of Wallasey the Liverpool CTA extends from 1,500 ft to 3,500 ft (Class D airspace) in order to create an overland route for General Aviation traffic around the Wirral peninsular to Wallasey. To the west of Liverpool, coincident with Airways L10 and L975, are 8nm long portions of Class D airspace extending up to 3500 ft AMSL (airway base) and designated as Liverpool CTA. Further airspace is delegated to Liverpool by PC Wallasey Sector, but close cooperation with Manchester Approach is necessary when operating in these areas. A further area of Class A airspace to the south is also delegated to Liverpool up to 4000 ft AMSL*]

The second extract from the Statement of Need relates to the implementation of Performance Based Navigation (PBN) instrument flight procedures and implies the requirement for more efficient interfaces with the enroute structure.

[… *to meet the airline demand for PBN Infrastructure and improved resilience and redundancy of its airport operations. The improved efficiencies will also help to protect capacity for any future growth. Introduction of PBN Procedures will drive new*

procedure designs that minimise delays and allow for more efficient interfaces with adjacent air traffic organisations. An aspiration of LJLA is to introduce procedures that also offer environmental benefits, wherever possible within the constraints of PANS OPS compliant final designs.]

1.2.3 Constraints

Five constraints were identified during Stage 1 ASSESS:

1. C1: Instrument Flight Procedures must be PANS-OPS 8168 compliant;
2. C2: Instrument Flight Procedures must be safe.
3. C3: Integration with Future Airspace Strategy (North) - FASI (N)[1]
    a. Manchester TMA
    b. Scottish Terminal Control Area
    c. Belfast Terminal Control Area
    d. Irish Sea Sector Ops
    e. (see also C4 below)
4. C4: Fixed airway entry and exit points, and runway position
5. C5: Integration with other local airspace users
    - Prestwick Centre;
    - Manchester Airport
    - City Airport
    - Hawarden Aerodrome
    - RAF Shawbury
    - BAES Warton
    - Blackpool Airport
    - Tilstock Parachute Centre
    - General Aviation Community

1.2.4 Application of the Constraints to the Options Development

Constraints **C3** and **C4** are the necessary starting points for developing the design options to ensure connection to the enroute airways structure:

- The options for the SIDs have a fixed start point (the runway) and a fixed end point for integration into the enroute structure.
- The design of Approach Procedures are standard T-bar shaped RNAV Approaches which must line up to the runway.
- The Transitions link the enroute Standard Arrival Routes (STAR) to the start of the Approach procedure into LJLA; Transitions are required to follow the most expeditious route.

C3 and C4 were the primary starting point for the designers to consider; when the start and end points of the procedures (e.g. the fixed enroute waypoints and the runway position) are already defined, there are a limited number of routes that can be plotted between them that remains PANS-OPS compliant (C1) and flyable, especially in such constrained airspace (expansion of which was immediately rejected due to Manchester and other airspace).

[1] FASI(N) is a combination of airspace redesign modules that comply with the UK's Future Airspace Strategy through the provision of Performance Based Navigation routes, Standard Instrument Departures and Standard Arrival Routes which facilitate continuous climb and continuous descent operations, user preferred routes, Flexible Use of Airspace and simplified boundaries between controlled and uncontrolled airspace. The redesign and modification will include the Manchester Terminal Control Area, Scottish Terminal Control Area, Belfast Terminal Control Area and Irish Sea sector operations.

The requirement for all design options to be PANS OPS 8168 compliant (C1) means that the parameters of the IFP, e.g. shape, accuracy, turn areas and obstacle clearances are predetermined (to a degree) in ICAO document *PANS-OPS 8168 Aircraft Operations – Volume 2 Construction of Visual and Instrument Flight Procedures*. This is the international standard for all IFPs.

The IFPs must be safe (**C2)** and therefore the APDs had to take into account the minimum requirements for separation from terrain and obstacles, and from other procedures/volumes of airspace which further limited the number of feasible options. The primary means by which it is intended to provide safety assurance evidence to support the options is a Safety Case developed in accordance with CAP760[2]. The Safety Case is under development and the first stage (Hazard Identification) took place during Stage 2B where one option was discarded on safety grounds. More information on the Safety Assessment is contained in Section **Error! Reference source not found.** of the Initial Options Appraisal in Stage 2B on the airspace portal.

1.2.5 Application of the Design Principles to the Options Development

The APDs first applied the constraints as above to the design process to produce an initial list of viable options. These were refined to take into account the Design Principles, for example the APD attempted to incorporate tighter turns to avoid overflying sensitive areas such as schools, hospitals and residential areas such as those in Runcorn and The Wirral. Further efforts were made to route aircraft above the motorways or industrial areas where higher ambient noise already exists or to route aircraft over the Mersey to avoid overflight of residential areas. A new hold was designed to ensure aircraft waiting for clearance for final approach would be kept over the sea instead of flying the racetrack pattern above the airport and the villages in the vicinity. In applying the Design Principles, the APDs remained conscious of the constraints throughout and immediately discarded potential options that may well have met the design principles but, for example, simply weren't flyable or failed to allow sufficient distance for aircraft to reach the required altitude constraints of the enroute waypoints.

1.2.6 Longlist Development Summary

The longlist of options developed by the APD represents all the viable options that can be considered, given the constraints and design principles detailed above. Variations of the options as listed are certainly physically possible to draw on a map however they would contravene the constraints, or the prioritised shortlist of Design Principles that were developed during Stage 1 of the project.

1.3 The Longlist

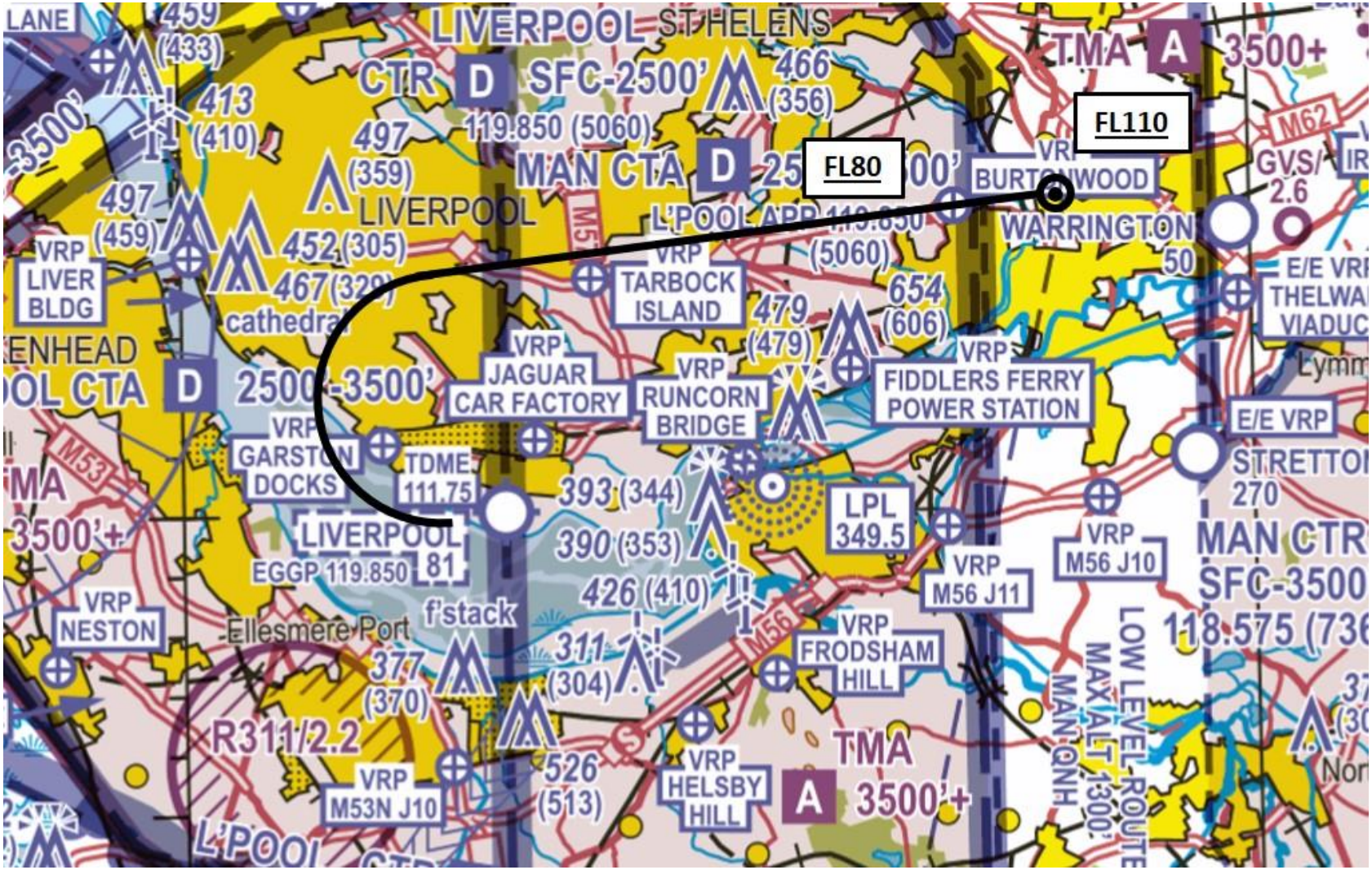
Annex A1 includes the images of the Longlist of procedures marked on an OS roadmap for the benefit of communities and non-aviation stakeholders, and on the VFR aeronautical chart for the benefit of aviation stakeholders.

[2] CAP760: Guidance on the Conduct of Hazard Identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers

A1 Standard Instrument Departures

A1.1 Runway 27 SID AGGER

A1.1.1 Option 1



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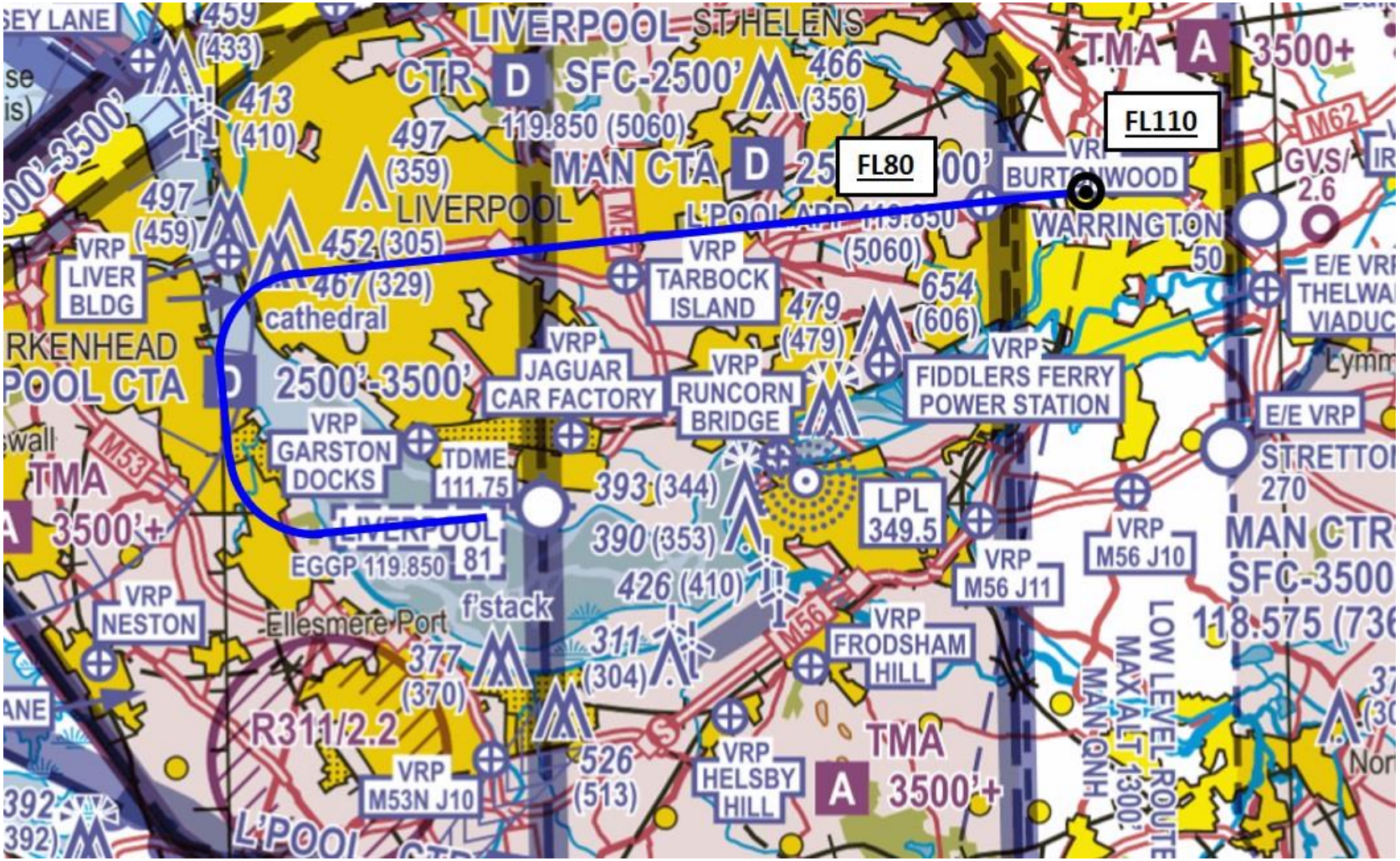
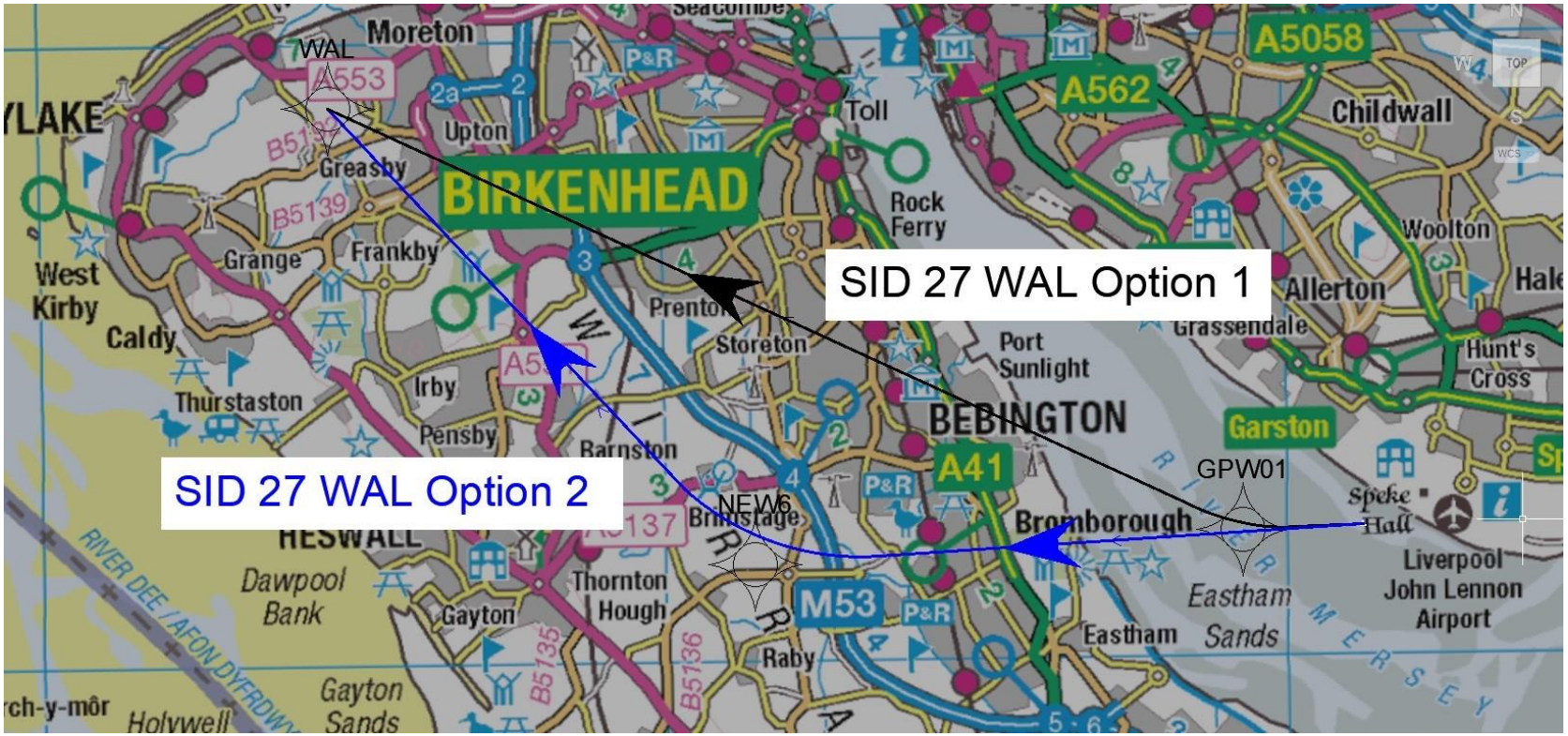


A1.1.3 Option 3

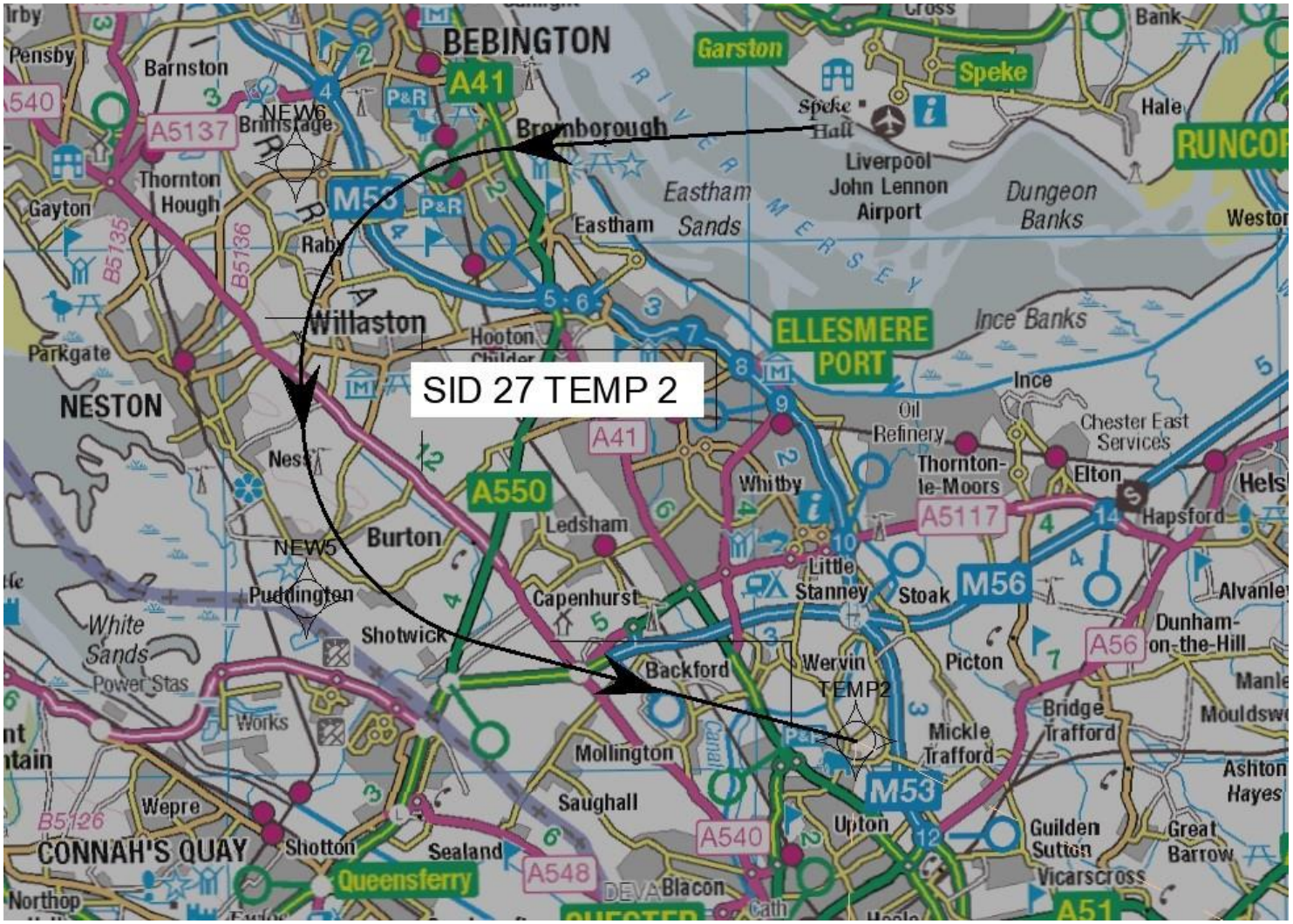
A1.2 Runway 27 SID WAL

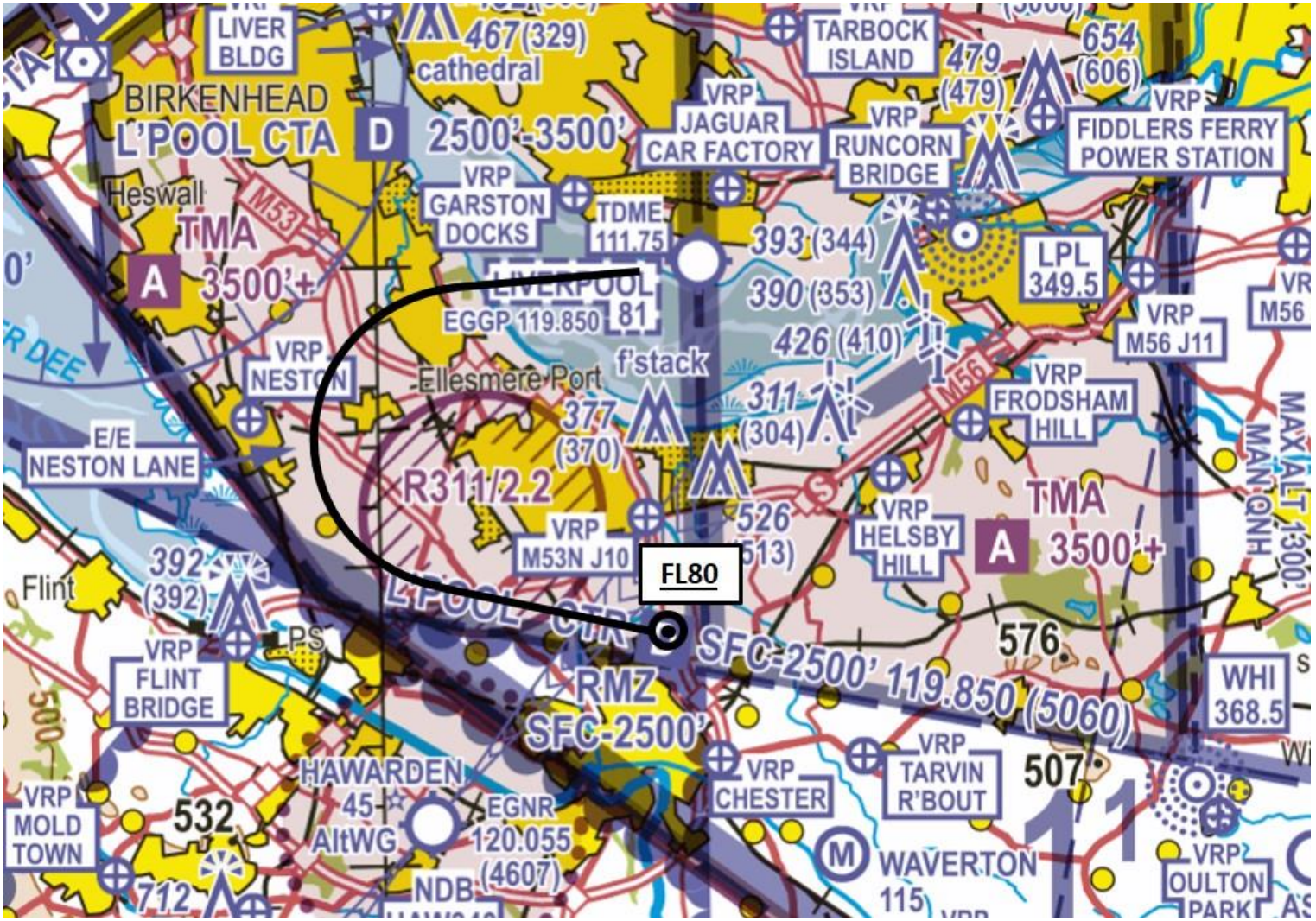


A1.2.1 Option 1

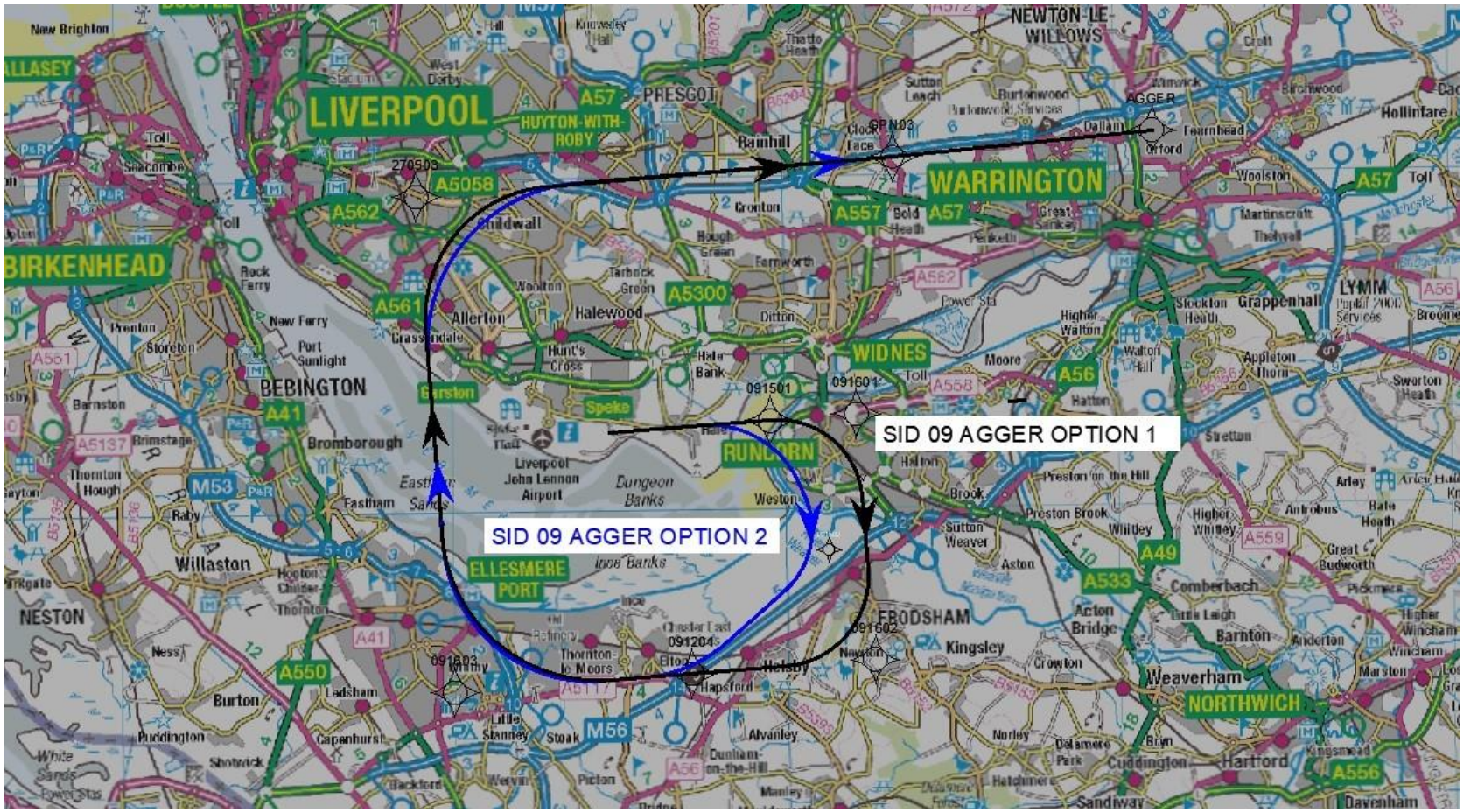
A1.2.2 Option 2

A1.3 Runway 27 SID TEMP2

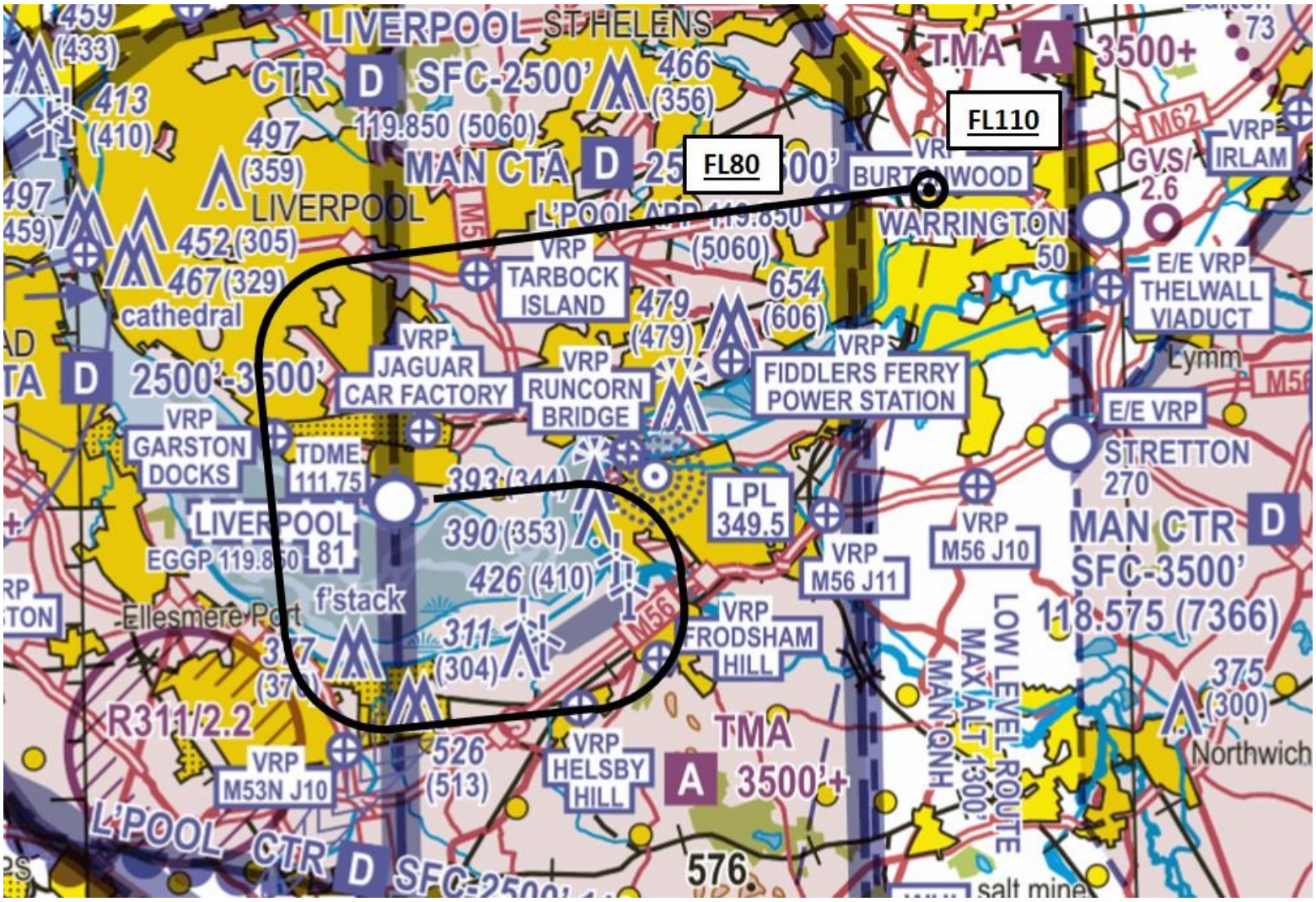




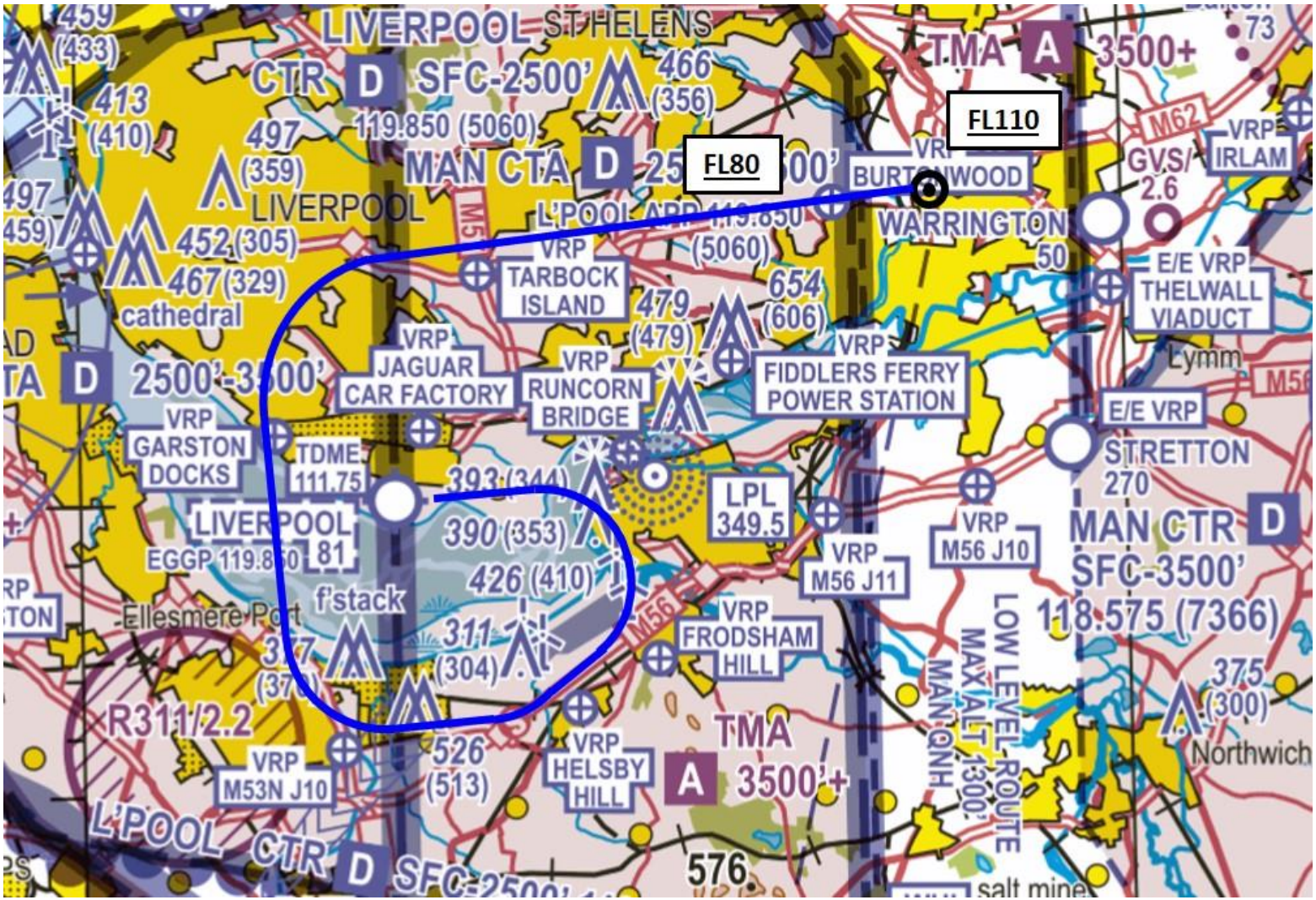
A1.4 Runway 09 SID AGGER



A1.4.1 Option 1



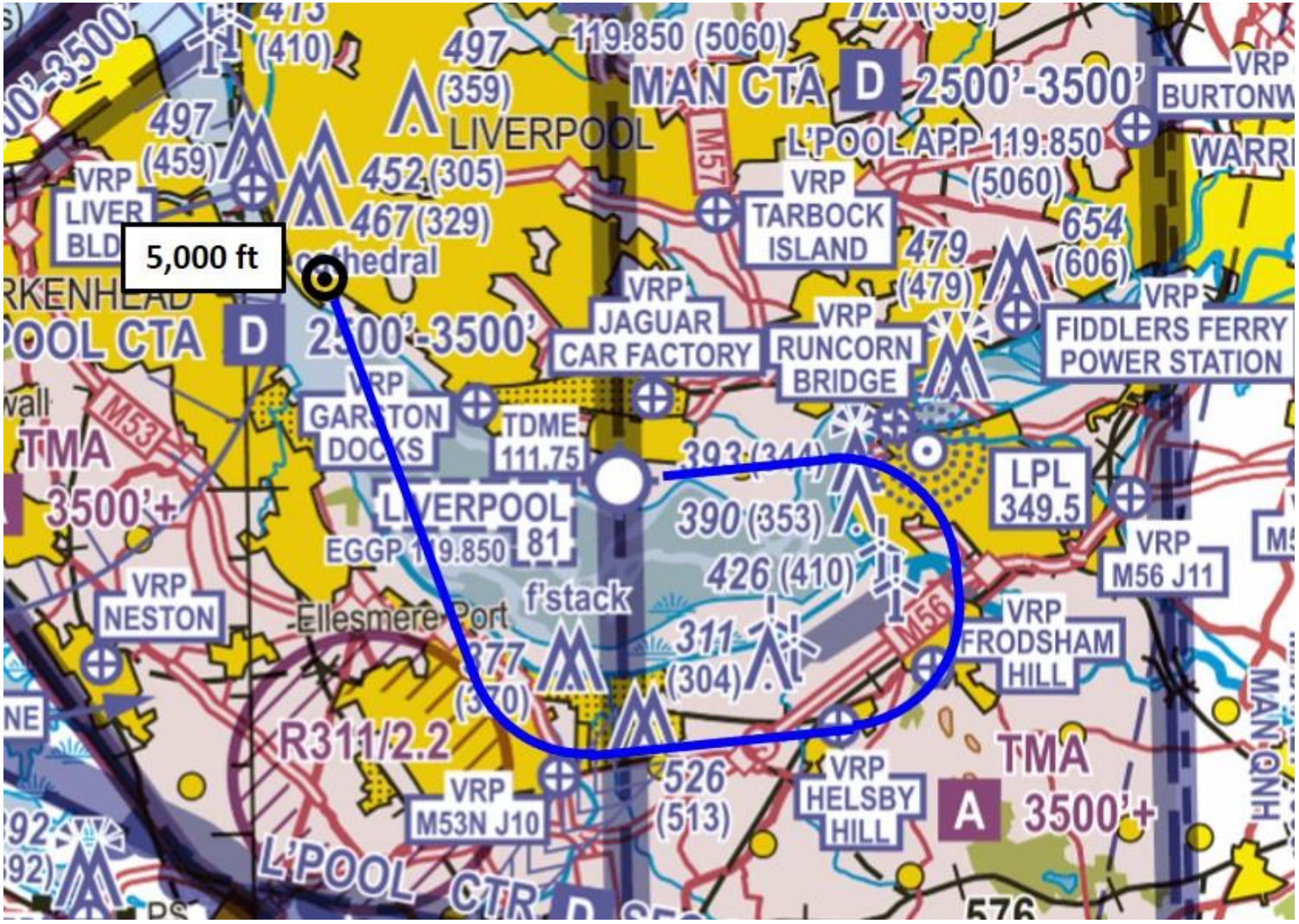
A1.4.2 Option 2



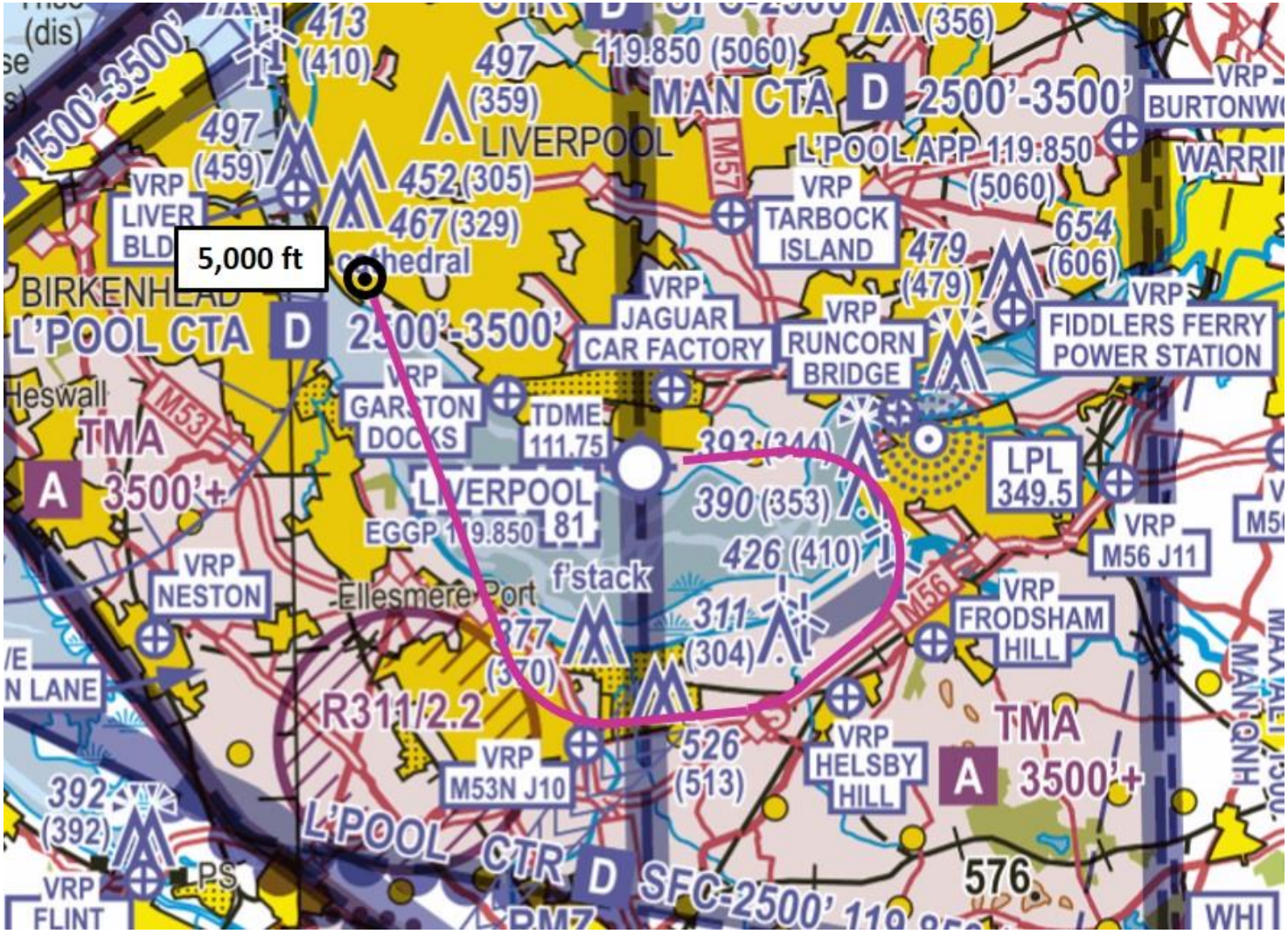
A1.5 Runway 09 SID CAVEN

A1.5.1 Option 1

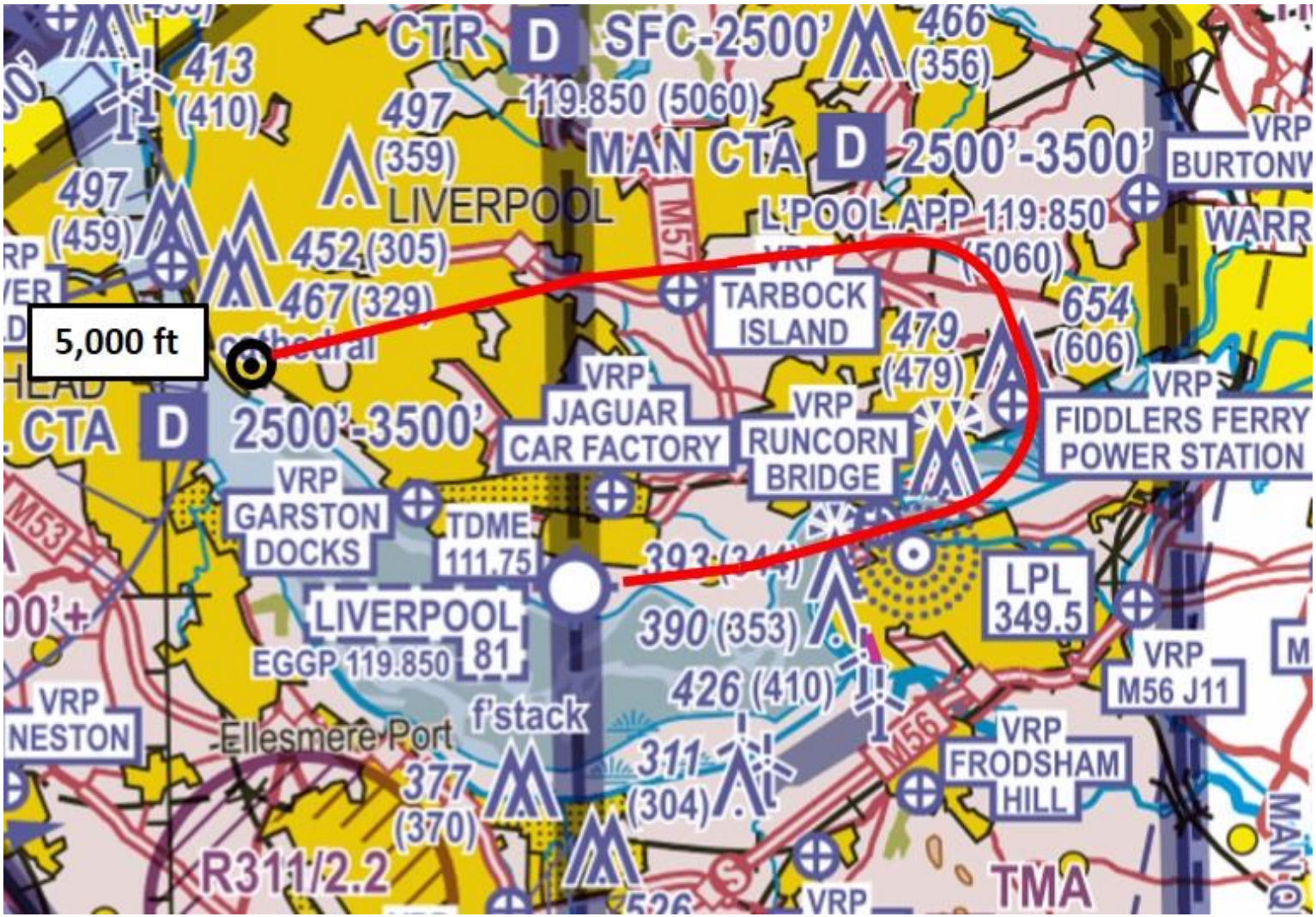
A1.5.2 Option 2



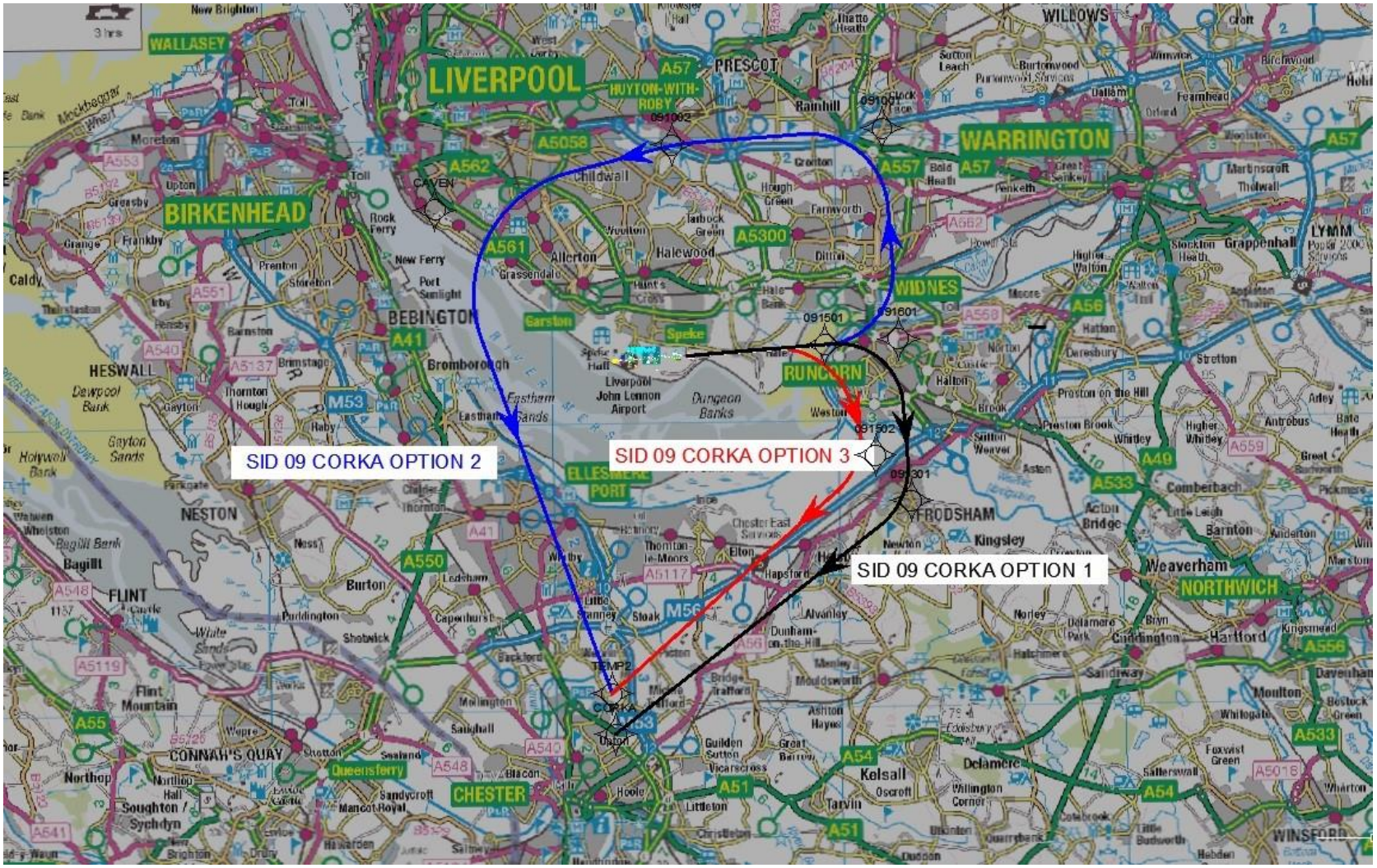
A1.5.3 Option 3



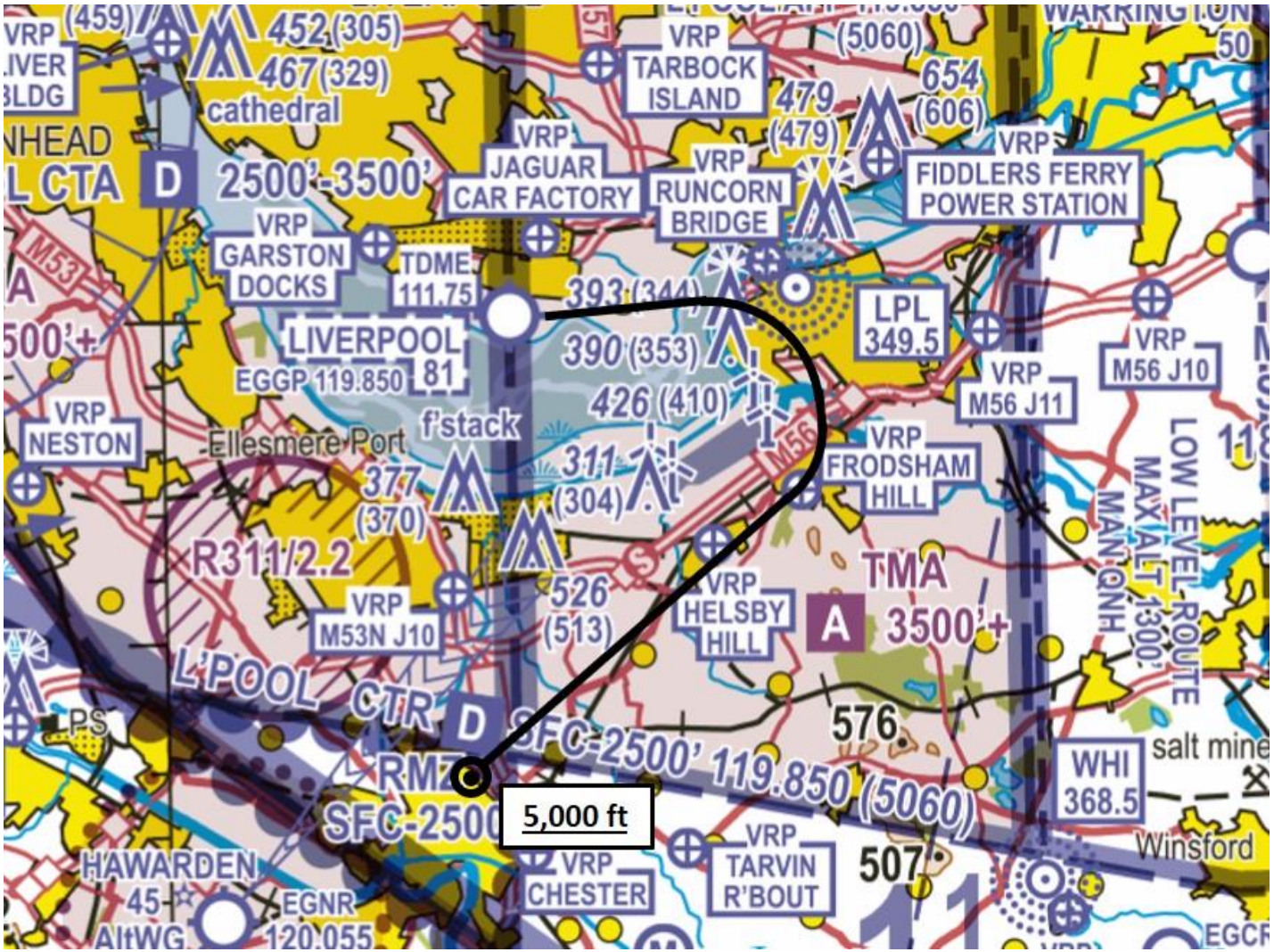
A1.5.4 Option 4



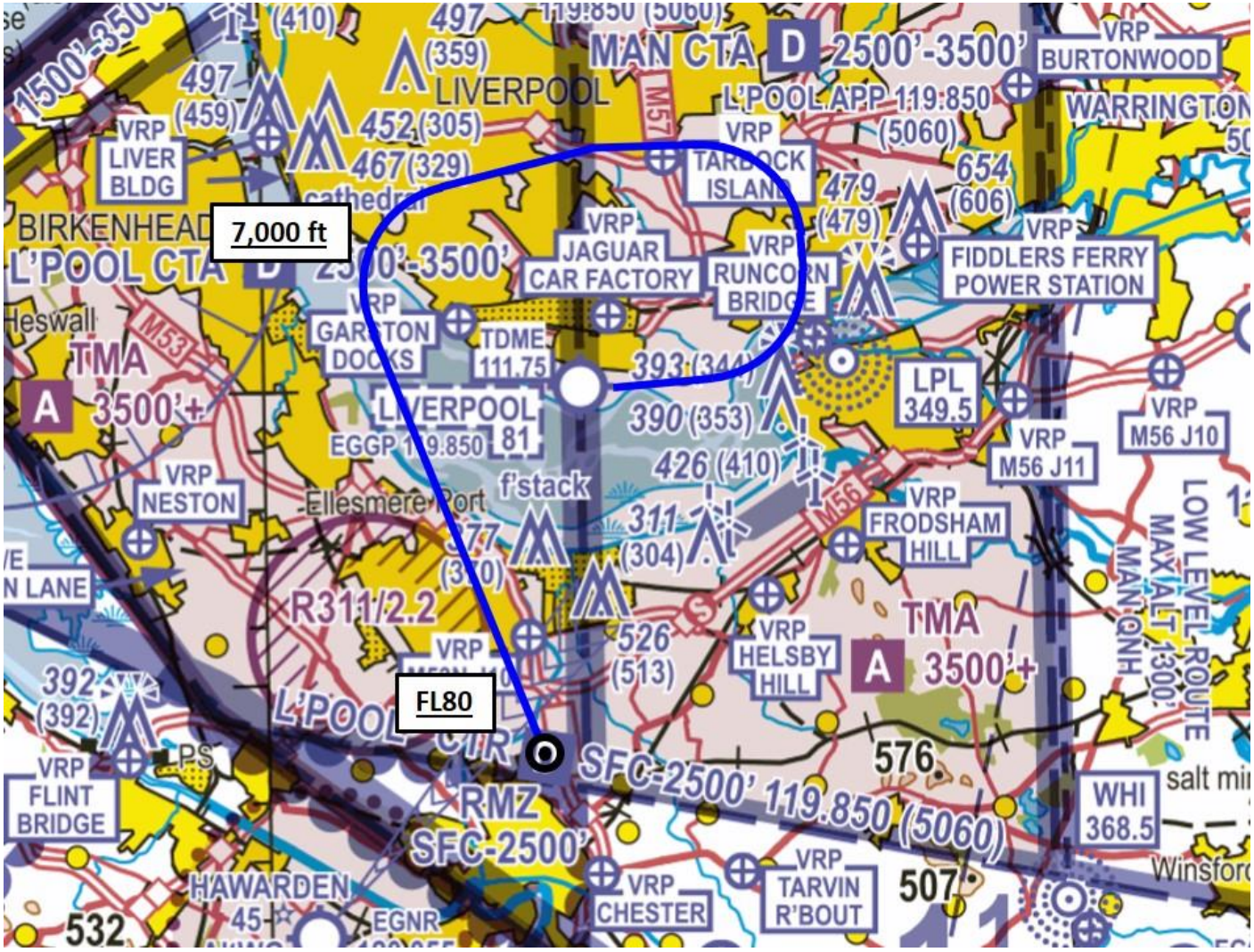
A1.6 Runway 09 SID CORKA



A1.6.1 Option 1



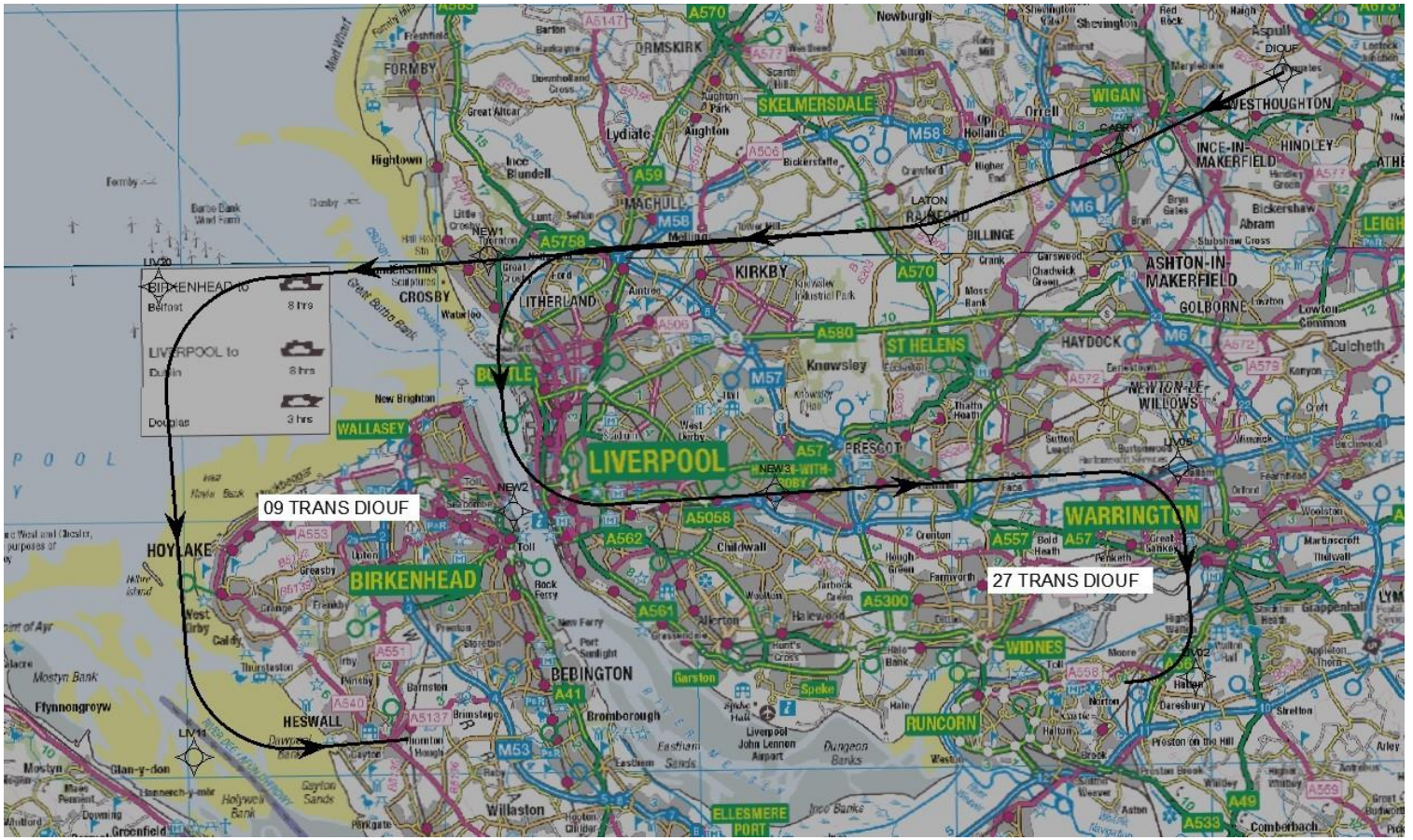
A1.6.2 Option 2



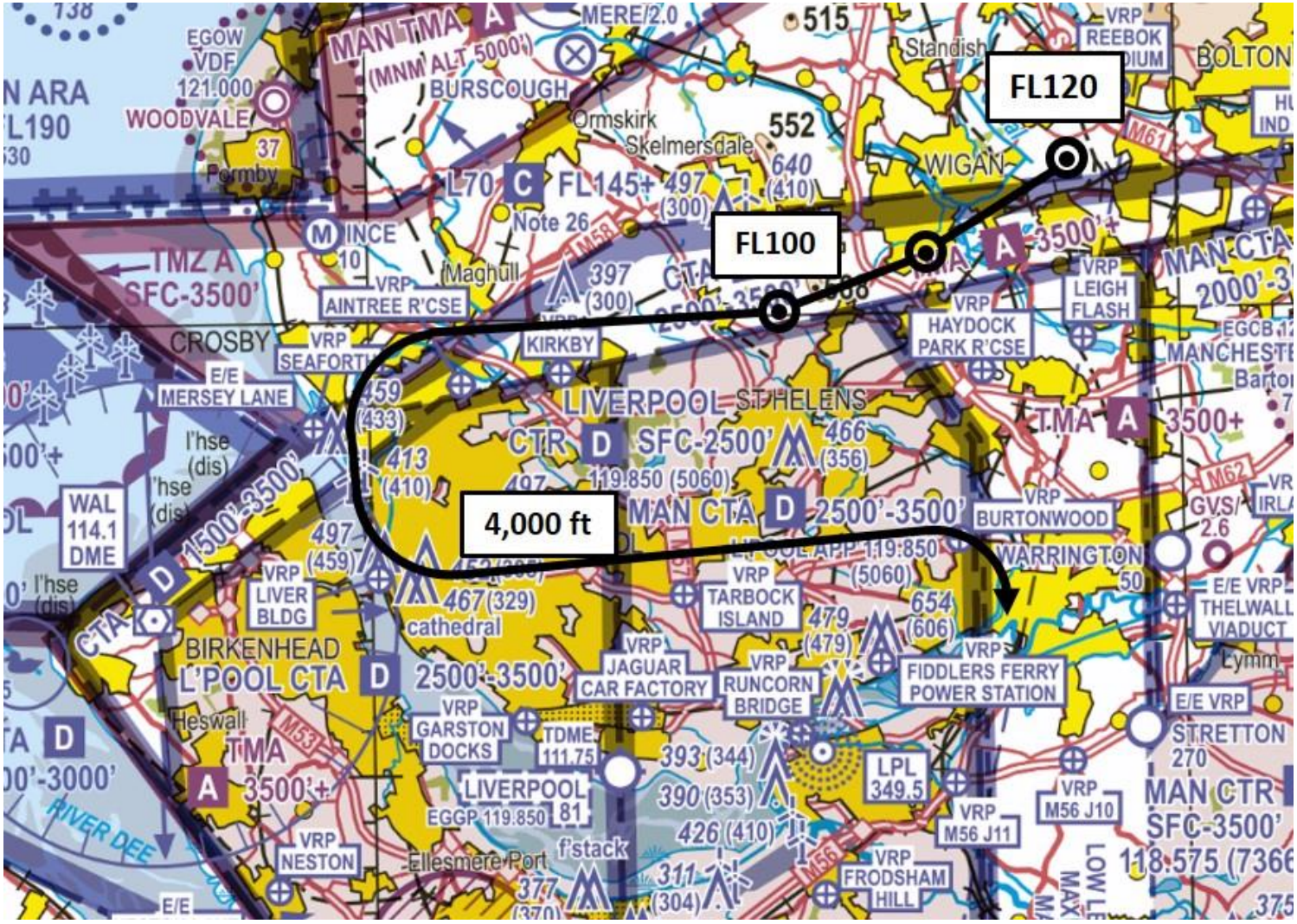
A1.6.3 Option 3

A2 Transition Procedures

A2.1 Transition DIOUF



A2.1.1 Runway 27

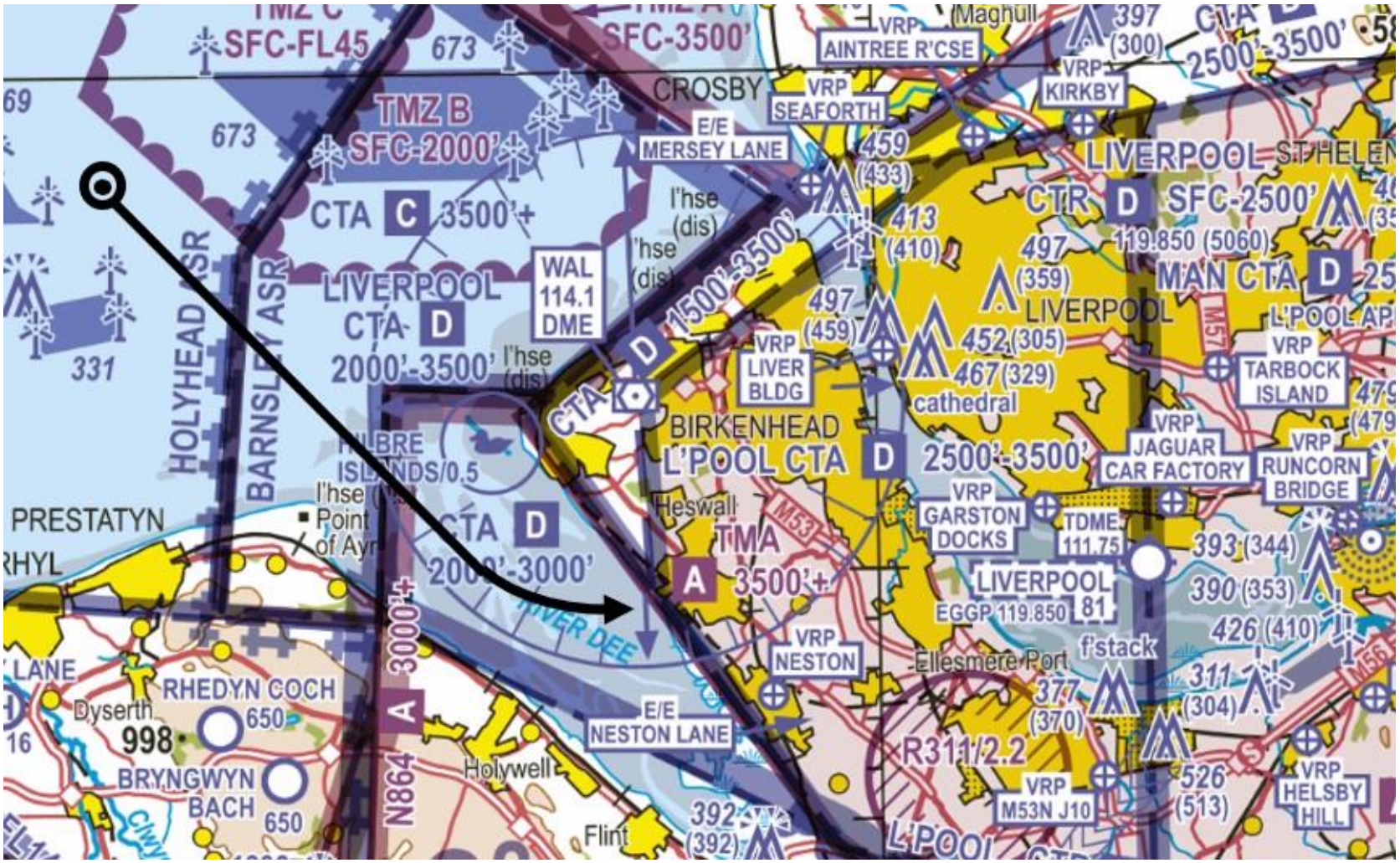


A2.1.2 Runway 09

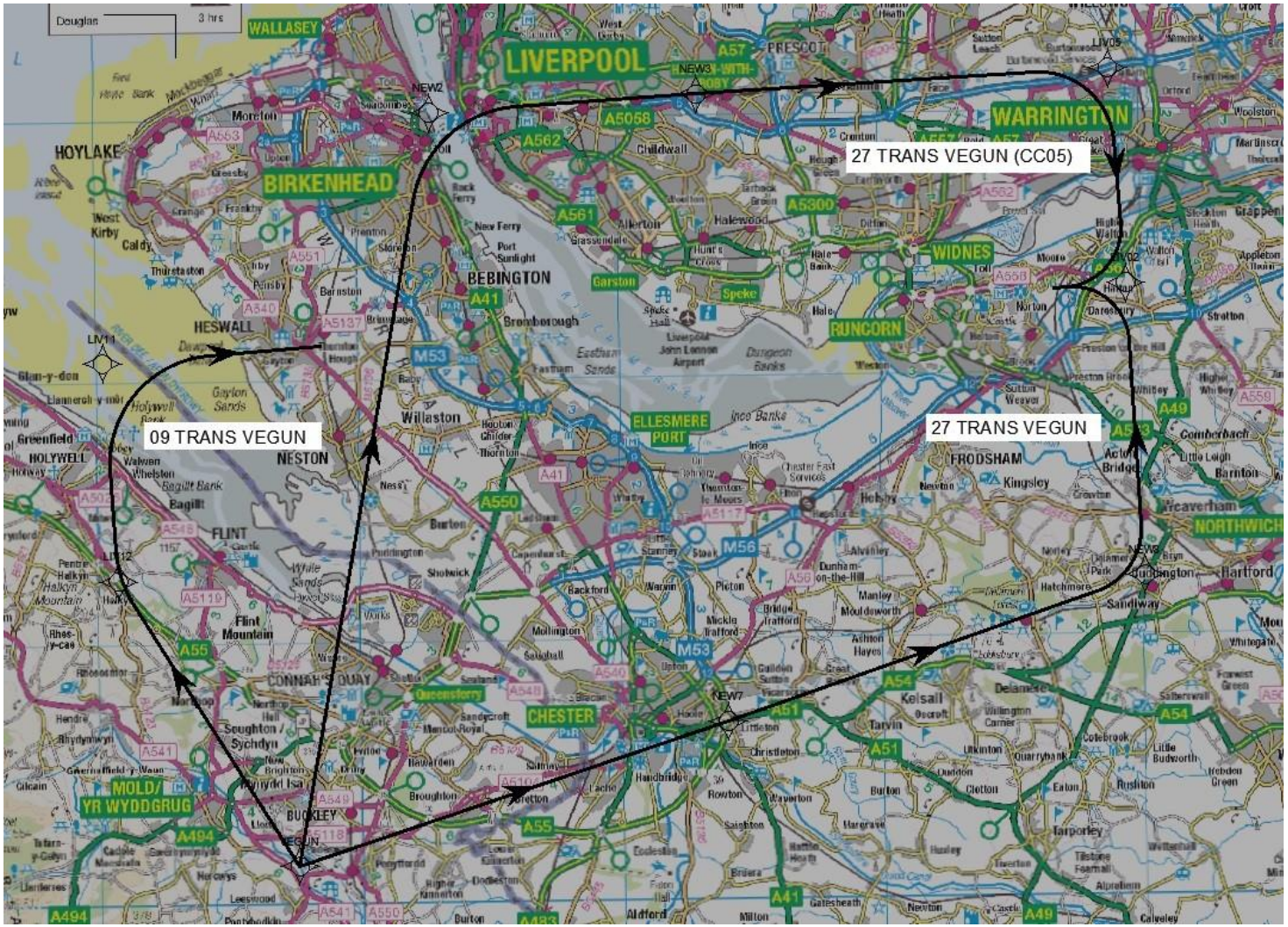
A2.2 Transition NOMSU

A2.2.1 Runway 27

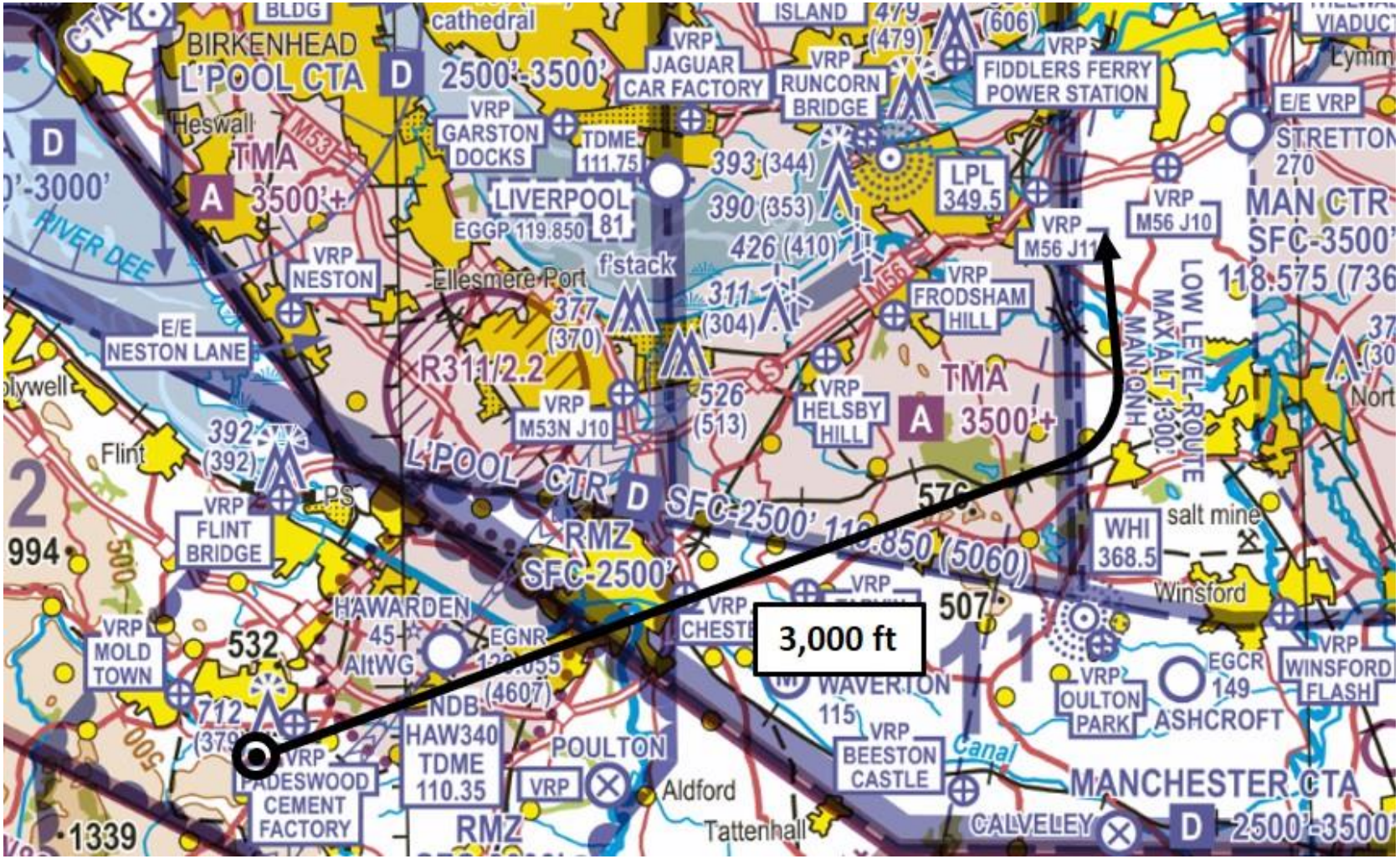
A2.2.2 Runway 09



A2.3 Transition VEGUN



A2.3.1 Runway 27

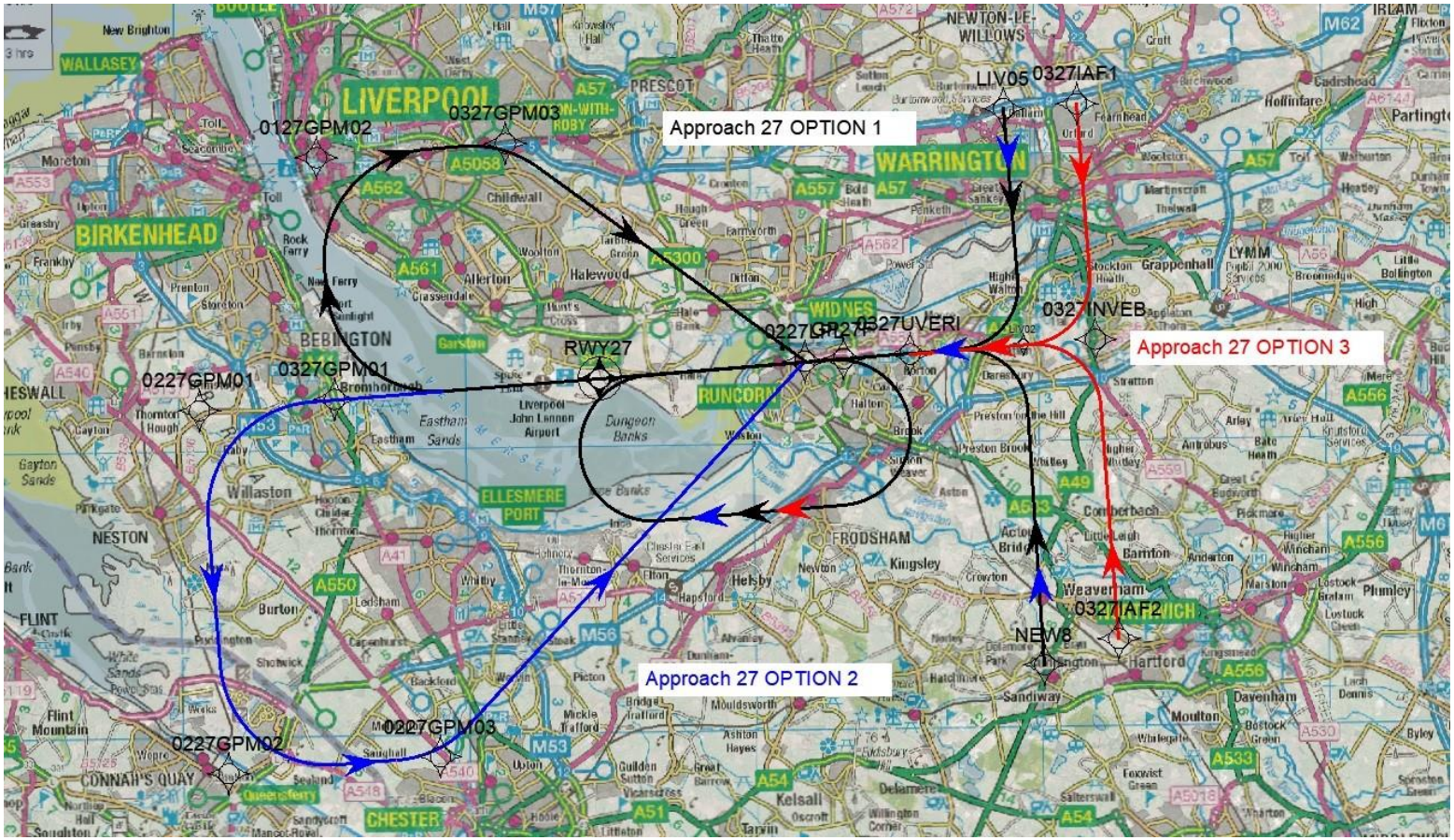


A2.3.2 Runway 27 – VEGUN (CC05)

A2.3.3 Runway 09

A3 Instrument Approach Procedures

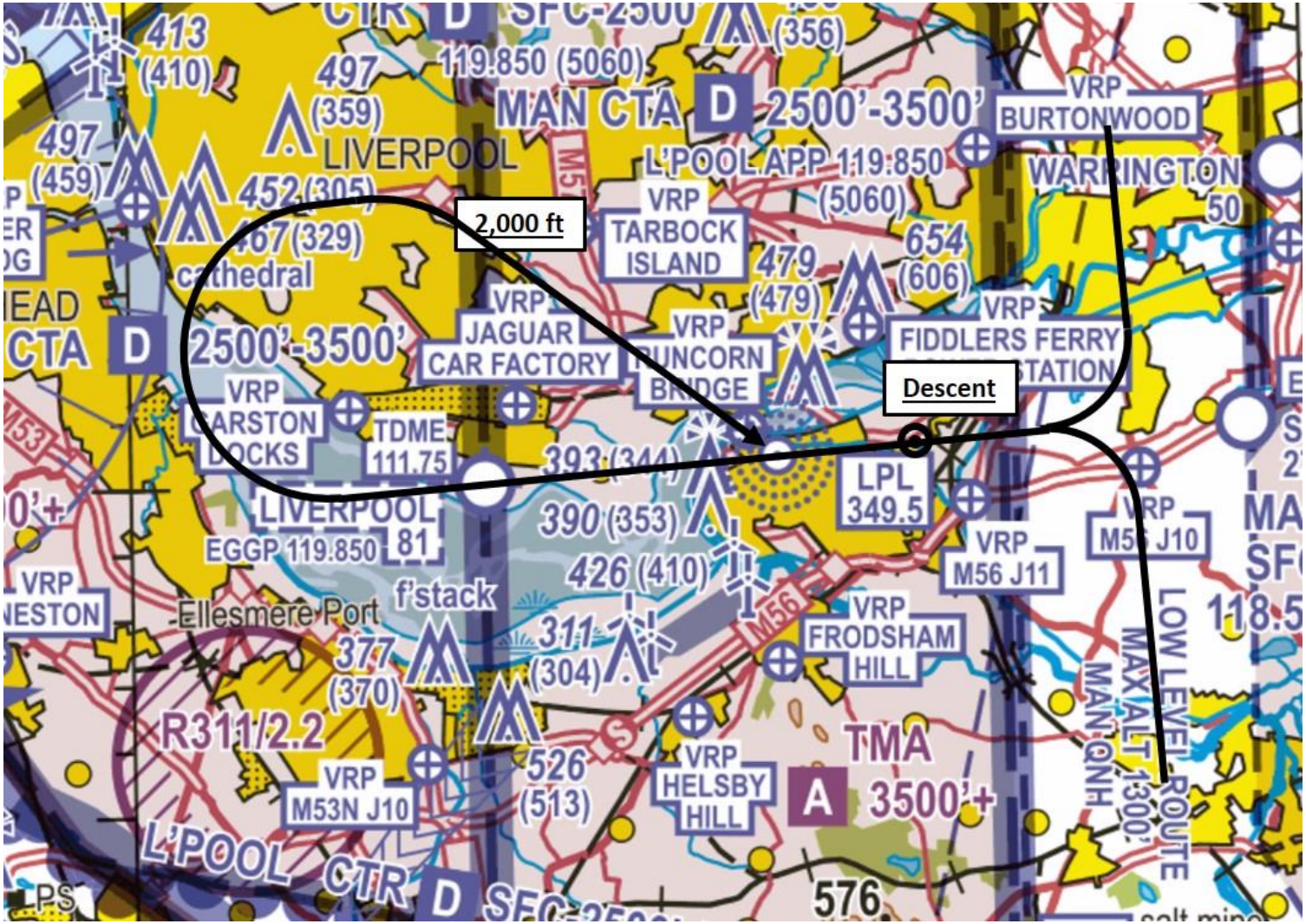
A3.1 Instrument Approach Procedure Runway 27



A3.1.1 Option 1

A3.1.2 Option 2

A3.1.3 Option 3

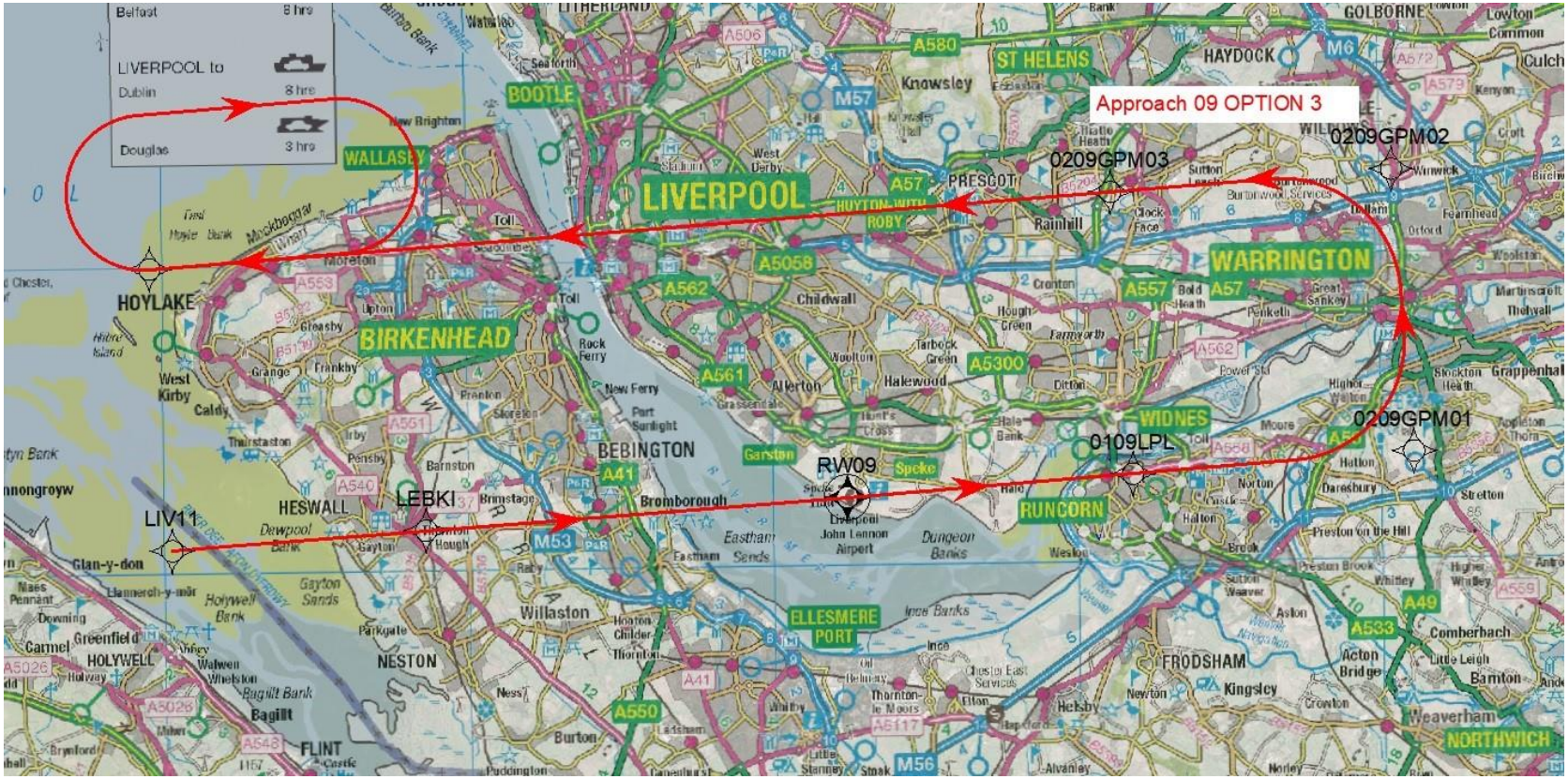


A3.2 Instrument Approach Procedure Runway 09

A3.2.1 Option 1

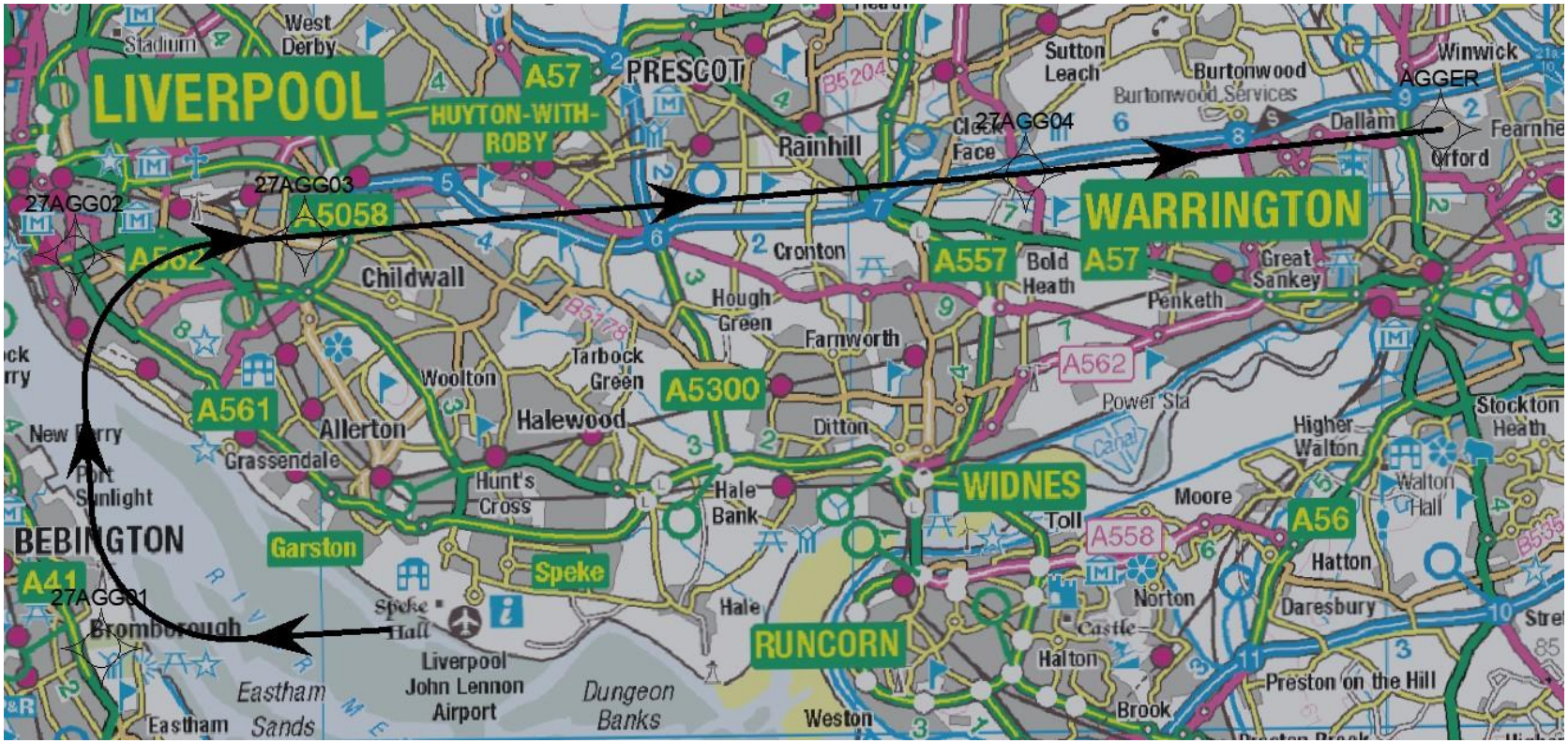
A3.2.2 Option 2

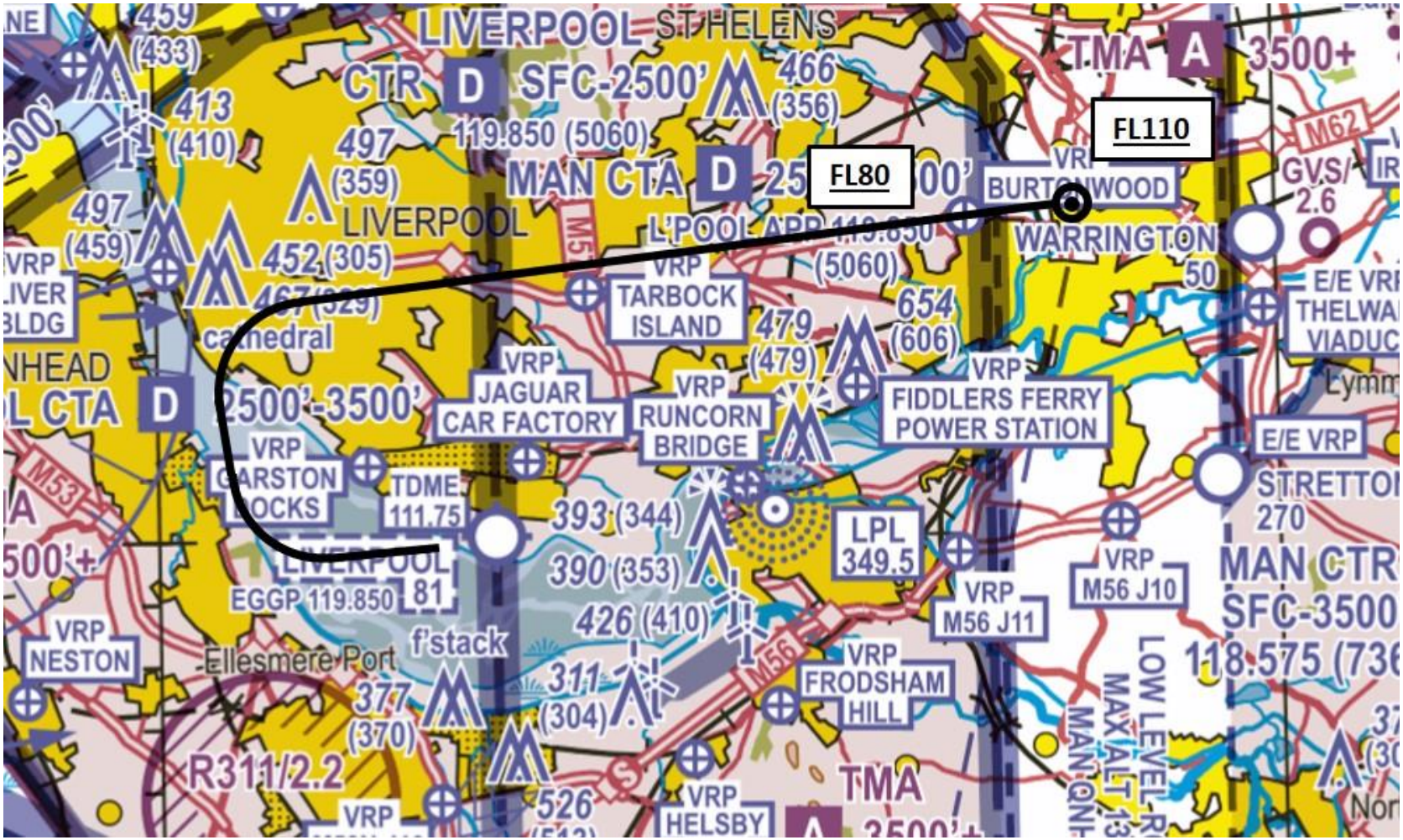
A3.2.3 Option 3



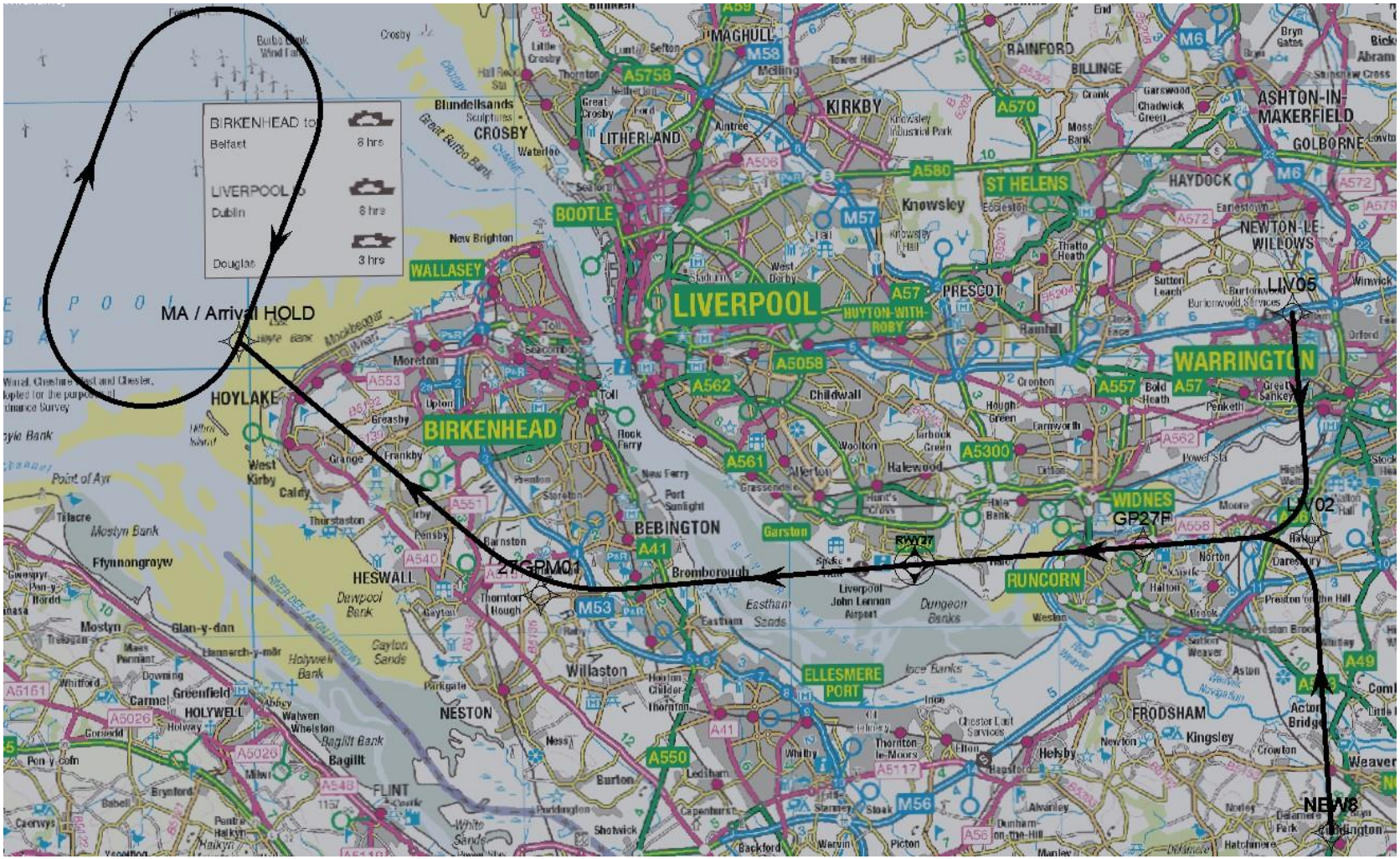
A4 Post Engagement Design Options

A4.1 Runway 27 SID AGGER





A4.2 Instrument Approach Procedure Runway 27



A4.3 Instrument Approach Procedure Runway 09