

ANNEX E TO PIR REPORT DATED APRIL 2017

RNAV 1 SID route design for Route 4 in strong south to south-westerly winds

This section discusses the performance of the modified RNAV 1 SID under strong south to south-westerly wind conditions when compared to the performance of the initial RNAV 1 SID. It also reports on discussions held at two Gatwick Airport Limited hosted Flight Operations Performance and Safety Committee meetings held on 25 May 2016 and 27 July of 2016 and consideration of a 190KIAS speed limited SID to counter this wind effect. Finally, this section comments on the GAL letter dated 20 December 2016 titled Conclusion of the Route 4 RNAV 1 SID Monitoring Period, where the airport discusses the 190KIAS speed limited SID option.

Background

As discussed in the original CAA Post Implementation Review CAP 1346 Annex 3, PIR Operational and Technical Report, the initial RNAV 1 SID had issues of resilience under strong southerly wind conditions. The effect of such wind conditions leads to a significant increase in groundspeed as the aircraft turn north. Although the initial RNAV 1 SID was speed constrained at 220KIAS¹, the addition of a >40 knot wind vector at between 2,000 feet and 3,000 feet led to the examples of aircraft ballooning to the north of downwind track, leading on occasions to phenomena such as waypoint bypass and even turn reversals. It was this SID behaviour that the modified RNAV 1 SID was intended to address, providing a degree of rigour in terms of aircraft performance under such strong southerly wind conditions.

The modified SID retains the 220KIAS speed constraint in the wrap-around turn, but the route construction has been simplified in order to avoid the potential of waypoint bypass. Rather than the two fly-by turns at KKW04 followed by KKN06 used in the initial SID design – see Figure 1, the modified RNAV 1 SID – see Figure 2, commences a Course to Fix (CF) turn onto the downwind track, having over flown KKW02, a waypoint located 2.0NM along the runway track from the departure end of Runway 26L. The CF path terminator leg type provides a natural dispersion of aircraft tracks, taking as it does, account of aircraft weight, speed and bank angle authority in order to compute the path steering command to complete

¹ Within the Instrument Flight Procedure (IFP) design, the 220KIAS (Knots Indicated Air Speed) constraint is designed as a maximum speed. Within the aircraft Flight Management System on a climb procedure this is interpreted as a “target speed”, as the aircraft seeks to accelerate into a clean and efficient configuration.

the turn onto the downwind track of 078 degrees before reaching the next waypoint at KKE09.

The advantage of this design construction is that there is no minimum stabilisation distance to infringe between consecutive fly-by waypoints. The stabilisation distance is the distance the aircraft Flight Management System (FMS) requires in order to ensure completion of one fly-by turn before commencement of the next. The disadvantage of the modified RNAV 1 SID design is that it is left to individual FMS and aircraft manufacturers to compute the path from the commencement of the course change through to the downwind leg capture.

Figure 1 - Initial RNAV1 SID (LAM 1X)

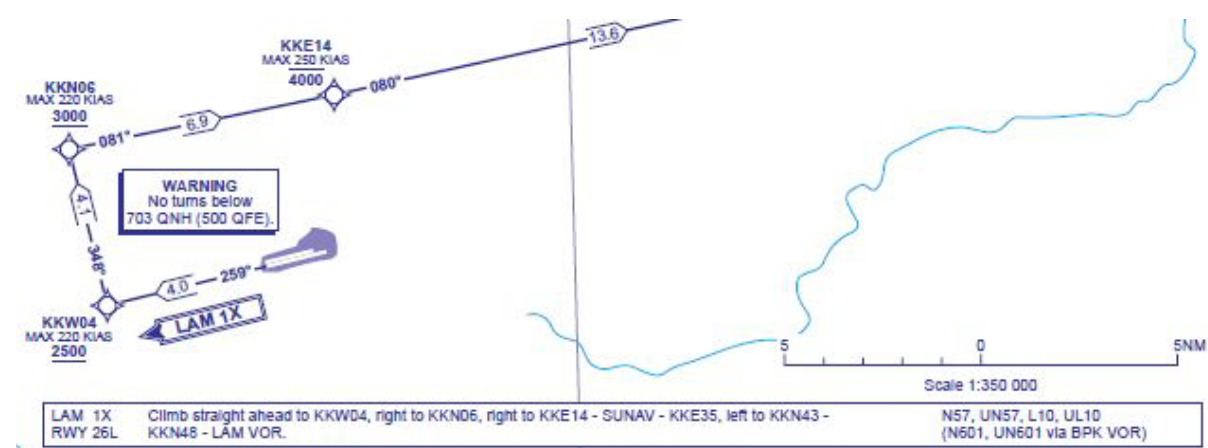


Figure 2 – Modified RNAV 1 SID (LAM 2X)

