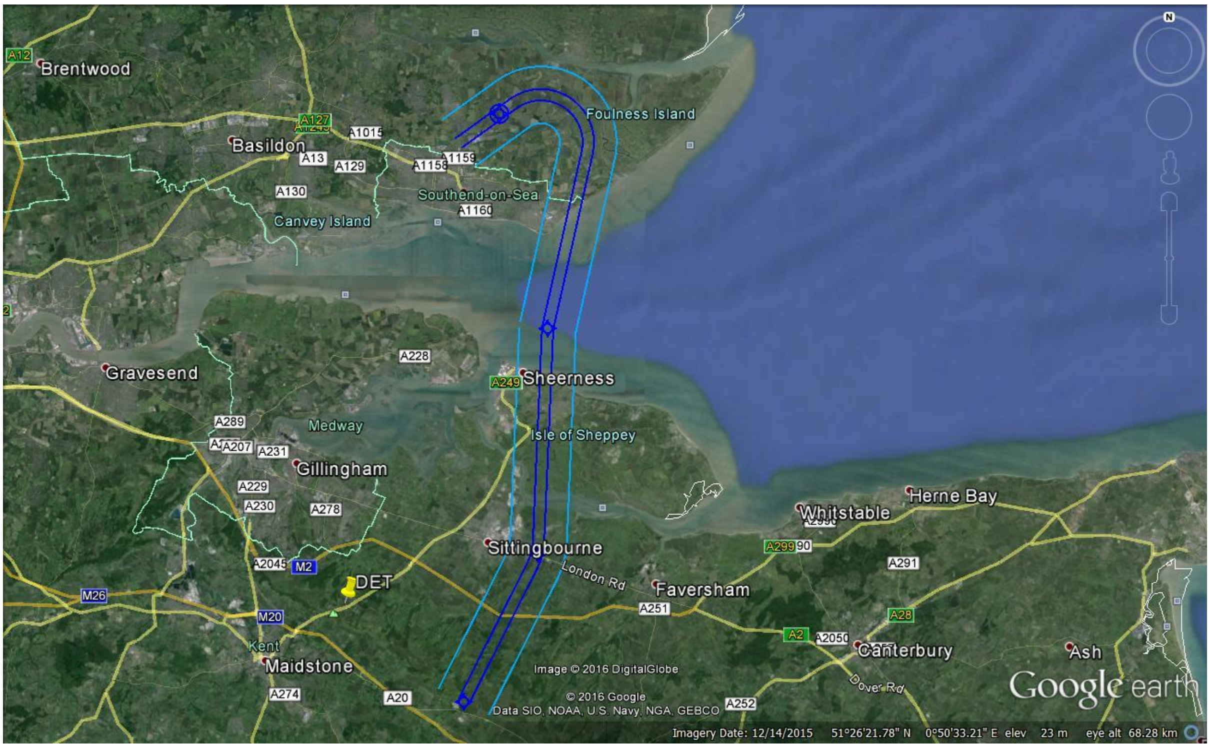
# London Southend Airport
# Airspace Change Proposal

Introduction of Standard Instrument Departure Procedures
to Routes in the London Terminal Control Area

**Sponsor Consultation - 2016**

## Annex F to Part B
## of the Consultation Document
## Runway 05 Departures to the South



# Contents of Annex F to Part B

# 1. Runway 05[1]: Departures to the South (EMKAD).

1.1. The procedure is known as the **EMKAD 1G** SID and is not a direct replication of either the PDR although it closely reflects the current routing of departing aircraft to the south. It should be noted that aircraft departing from LSA to the south have not, for many years, followed the published route of the PDR via Detling (DET). This is explained in Section 3 below.

1.2. It is important to note that this SID procedure will only be available when the Shoeburyness Danger Area complex in the Thames Estuary to the southeast of LSA is not active[2]. The procedures to be used when the Danger Area complex is active are outlined in Section 5 below.

1.3. As detailed **Part B** of the consultation document, EMKAD is a new navigation position within the LTMA to the northwest of Ashford. It has been established by NATS on a new LTMA Transit Route (Airway) M91 as part of the LAMP Phase 1a airspace changes to reduce the number of departure procedures from LCY and LSA[3] and to ensure that LSA departing aircraft can be adequately separated from other airspace constraints. (This was part of the NATS consultation on the LAMP Phase 1a airspace changes and is not a part of this consultation.) It also ensures that aircraft departing from LSA will be contained within controlled airspace and adequately separated from other airspace constraints. The introduction of Airway M91 does not form part of this consultation.

1.4. Current utilisation of this route (based on Summer 2015 figures) is approximately 44 flights per week when runway 05 is in use. Forecast traffic growth is expected to lead to approximately 130 flights per week in 2021.

1.5. Figures F1 and F2 below show historic tracks of easyJet and Stobart Air aircraft departing from runway 05 to the south over comparable 5-week period in July/August 2014 and 2015 respectively[4].

[1] As detailed in the main body of the Consultation Document, prior to November 2015 the runway designation at LSA was Runway 06. From November the designation is Runway 05 due to magnetic variation changes. For ease of reference, the runway is referenced as Runway 05 throughout this document, notwithstanding that for the presentation of historic data it was then designated Runway 06.

[2] Shoeburyness Danger Areas D136, D138, D138A and D138B are typically active between 0830 and 1800 (local) Mondays to Fridays unless otherwise notified. Thus the EMKAD SID is available, in general, prior to 0830 and after 1800 weekdays and at weekends.

[3] The introduction of Airway M91 enables the previous 3 southbound PDRs to Dover (DVR), Lydd (LYD) and Southampton (SAM) to be combined and replaced by a single SID procedure to EMKAD.

[4] It should be noted that the departures in 2014 took place before the introduction of controlled airspace around LSA and thus may include depiction of track deviations below 3500ft to avoid unknown aircraft in proximity to their intended route.

1.6. Also, as detailed in Section 5 of **Part A** of the Consultation Document, once aircraft are beyond the end of the NAPs they may be tactically routed by LTC or LSA controllers for integration with other traffic flows. This is depicted in the track plots by some plots tracking to the west and east of the core route. Further to the south, once aircraft are climbing to their cruising level under the jurisdiction of LTC Sectors they are given more direct routings to their destinations in accordance with standard ATC practice.

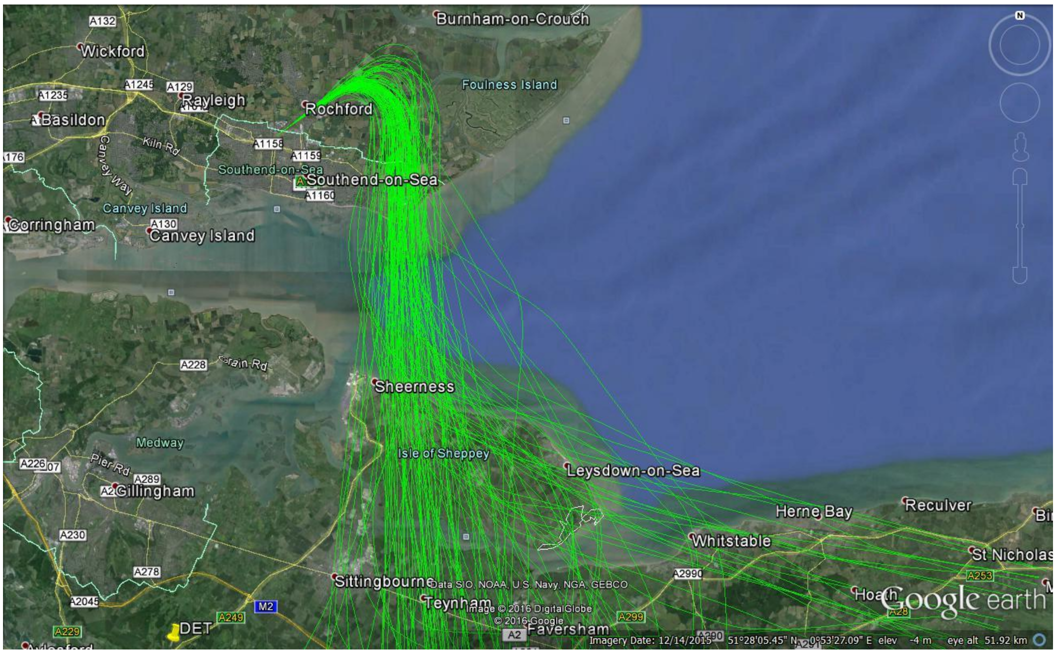



**Figure F1: Runway 05. Historic departure tracks to the south, 5-week period Jly/Aug 2014**

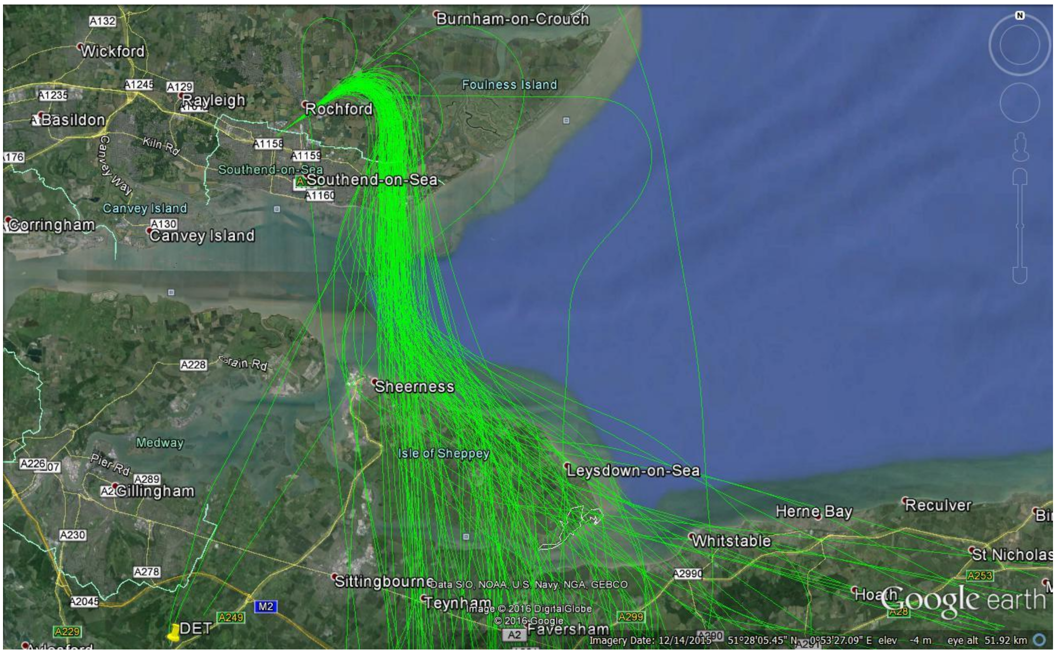



**Figure F2: Runway 05. Historic departure tracks to the south, 5-week period Jly/Aug 2015**

## 2. The EMKAD 1G SID procedure

2.1. Climb on course 055°M to MCE02[5] to cross MCE02 at or above 900ft (7% minimum climb gradient) then on course 055°M to not below 1500ft. Turn right to MCS13 on course 193°M, then to MCS21, then to EMKAD. Cross MCS13 3000ft; cross MCS21 at 3000ft; cross EMKAD at 3000ft. Maximum speed 210kt IAS to MCS13 then maximum speed 250kt to EMKAD.

2.2. A schematic diagram of the SID is shown in Fig F3 below and a diagram of the SID overlaid on an Ordnance Survey map is shown at Appendix F1.

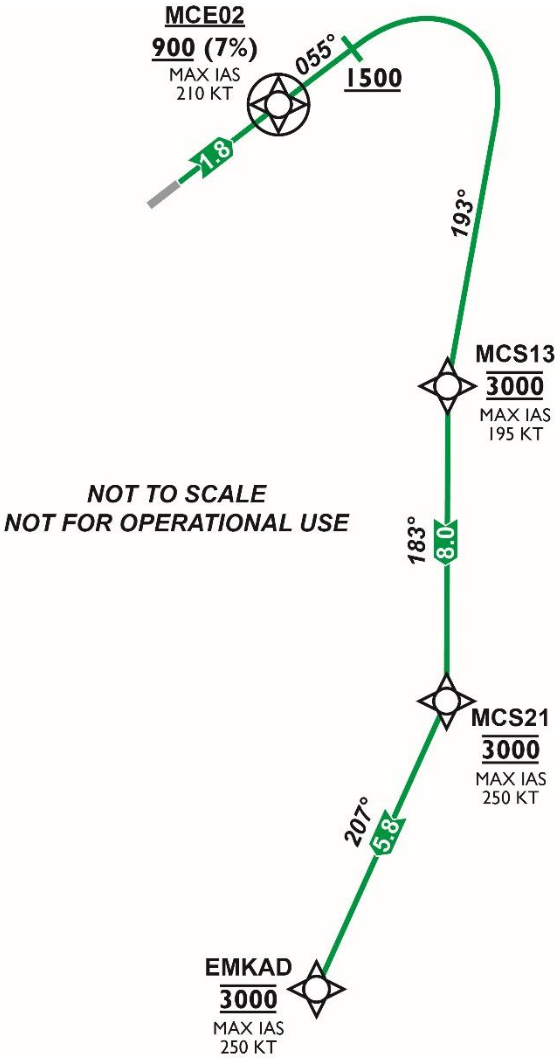



**Figure F3: EMKAD 1G SID**

2.3. Waypoint MCE02 is a flyover waypoint located 1.8NM from the end of the runway, which reflects the earliest point at which the NAPs allow a fast climbing aircraft (i.e. above 1500ft) to turn left, as detailed in paragraph 15.3 of **Part B** of

[5] Flyover waypoint designators are always underlined, flyby waypoint designators are not underlined.

the consultation document. It is necessary to locate the waypoint at 1.8NM instead of at 1.0NM to take account of the Fix Tolerance of the RNAV waypoint to ensure that aircraft, under the worst navigational circumstances, do not start to turn before reaching 1NM from the end of the runway. The procedure then requires aircraft to continue to climb straight ahead until a minimum altitude of 1500ft has been reached, which is the lowest turn altitude specified in the NAPs. A minimum altitude of 900ft is specified at MCE02 which is based on a 7% climb gradient.

2.4. The SID then turns right across the Thames Estuary towards Sheppey on a route comparable to the current tactical radar-directed routing (See paragraph 3 below). Extra routing flyby waypoints, MCS13 and MCS21 are added to ensure that the nominal route of the SID remains within the controlled airspace boundary and also passes to the east of Sheerness and Sittingbourne before turning towards EMKAD.

2.5. The initial course towards MCS13 has been determined by the nominal procedure design turn radius for a turn at 195kt at 25° bank angle in still air. This limits the radius of turn in order to retain the southerly track within controlled airspace. The position of MCS13 is the closest it can be placed to MCE02 under the procedure design criteria and the speed limit is relaxed at this point to allow aircraft to accelerate to their normal operating speed. An altitude of 3000ft is specified at MCS13, although for normal climb performance most aircraft will be expected to reach 3000ft before this point.

2.6. MCS13 and MCS21 are located so that the flight path to EMKAD does not directly overfly Sittingbourne and thus reflects the current flight paths of departing aircraft in this respect. Moreover, the specification of a navigable track in the SID, as opposed to a radar heading in the current procedure, will reduce the dispersion of aircraft tracks over and to the immediate south of Sheppey. From MCS21 the route makes a small right turn towards the end point at EMKAD where it joins Airway M91.

## 2.7. Vertical constraints

2.7.1. The upper limit of the SID procedure is 3000ft and is dictated, procedurally, by the inbound leg of the LCY Point Merge Approach procedure (introduced as part of the NATS LAMP Phase 1a airspace arrangements) descending along the Thames Estuary to 4000ft and is necessary for the flight safety requirements in the design of crossing procedures. This is depicted in Figure F4 below.

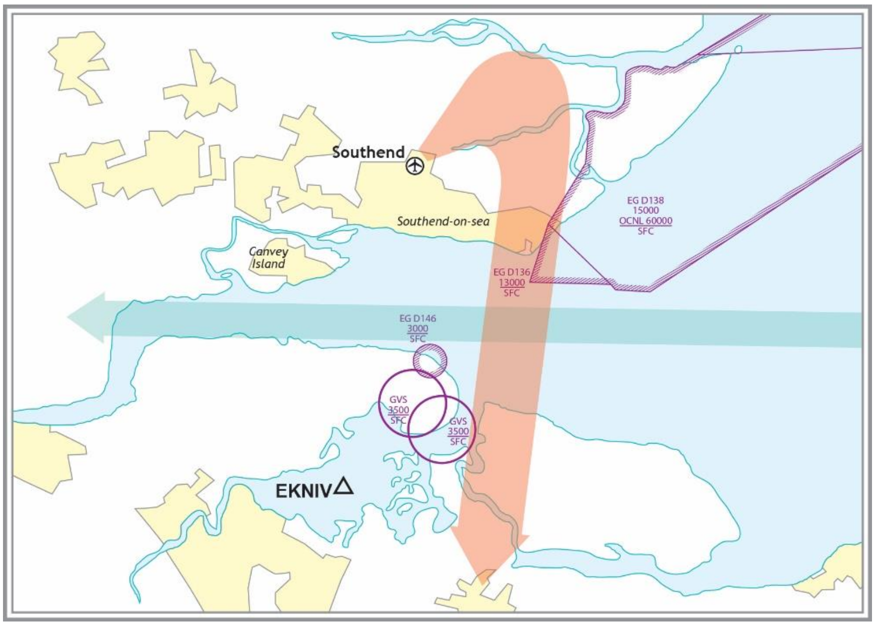



**Figure F4: Schematic diagram of procedure conflicts between LSA departures (red) and LCY approach path (blue).**

2.7.2. Once adequately separated to the south of the LCY approach procedure it would normally be acceptable to introduce a “stepped climb” to a higher level. However, safety concerns about “stepped climbs” in SID procedures, and the presentation of SSR Mode S data on controllers data displays, as explained in paragraph 15.3 of **Part B** of the consultation document, mean that it is necessary for the published upper limit for the whole SID procedure to remain at 3000ft for airspace safety reasons rather than allowing a “designed-in” stepped climb to a higher level[6].

2.7.3. On a day-to-day basis, however, if there was not an actual aircraft in conflict, then aircraft departing from LSA would be given climb clearance to a higher level under the direction of the radar controller. Standing Agreements between LSA ATC and the appropriate LTC sectors will be in place to ensure that clearance to a higher level can be given at the earliest opportunity.

2.7.4. Furthermore, standard ATC operating rules require that aircraft within controlled airspace must be retained at least 500ft above the controlled airspace base level. Thus it is incumbent upon LTC controllers to ensure that climb clearance is given to departing aircraft in good time so that they can reach at least 4000ft by the southern boundary of the Southend Control Area (approximately the Swale Estuary).

[6] It should be noted that the basic procedures, as published, form a vital part of the Loss of Communication procedures and thus must be “procedurally” safe with respect to other procedures and flight paths in the airspace. In the “live” traffic situation, where air traffic controllers and pilots remain in communication with each other, the controllers are able to improve on both the vertical profile and the nominal routing of the SID procedure and thereby achieve the most effective use of the airspace and efficient flight profiles for all.

2.7.5. Empirical evidence indicates that aircraft could regularly be expected to be above 4000ft[7] before reaching MCS13 and above 6000ft by MCS21, notwithstanding that this cannot be specified as part of the procedure. Figure F5 below provides a colour-coded plot of historic climb performance of departing aircraft routing to the south over a 5-week period in Summer 2015.

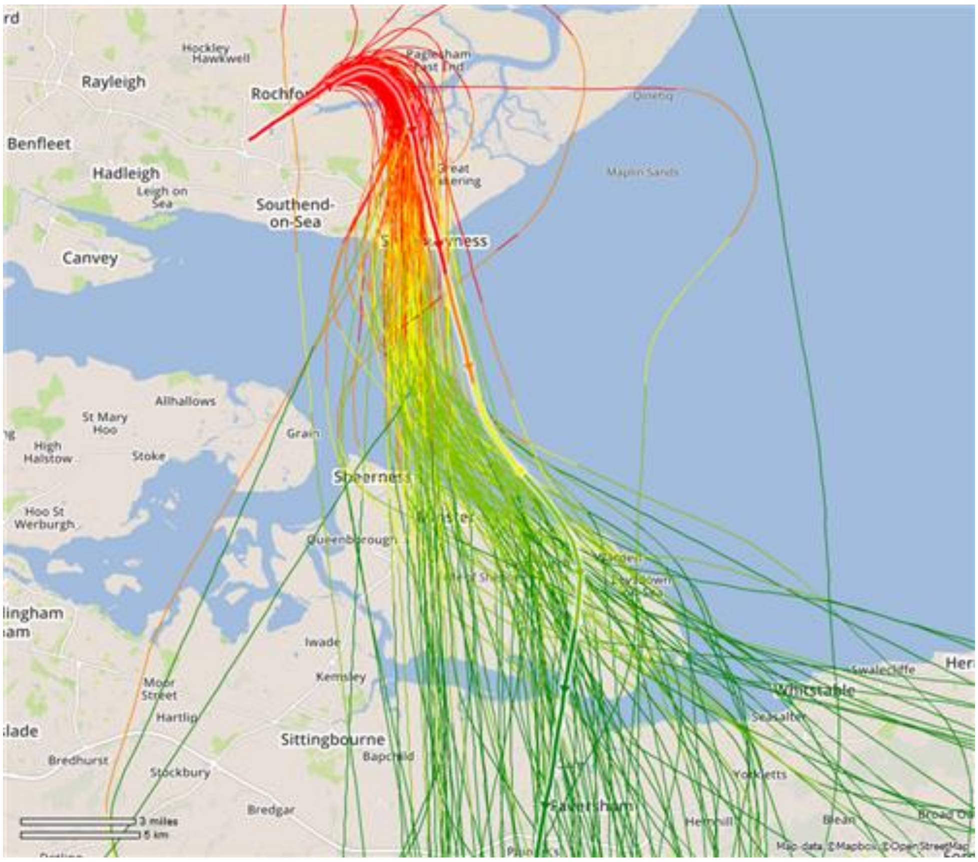



**Figure F5: Colour coded climb profile of departing flights Summer 2015.**
[Colour coding: Below 3000ft red; 3000 – 4000ft orange; 4000 – 5000ft yellow; 5000 – 7000ft light green; above 7000ft dark green.]

2.7.6. It can be seen from these plots that the majority of aircraft have been given climb clearance above 3000ft well before crossing the Thames Estuary and are generally in the level band 5000ft – 7000ft before reaching the Sheppey. Some are higher, above 7000ft, and almost all are above 7000ft before crossing the Swale.

2.7.7. Whilst the effects of the realigned LCY arrival procedure along the Thames Estuary will, to a certain extent, limit the ability for controllers to issue climb clearance as early as previously, nonetheless it is anticipated that early climb clearance will be available for the majority of LSA departing flights. LSA will be monitoring closely the climb profiles of departing aircraft following the

[7] An A319 given unrestricted climb clearance in typical weather conditions could be expected to be at approximately 5000ft by MCS03.

introduction of the SID procedures, both with respect to the revised LTMA arrangements as a whole and with respect to the performance of aircraft departing on the EMKAD SID itself.

## 2.8. Radar Vectoring

2.8.1. As noted in Sections 5 and paragraph 9.4 of **Part A** of the consultation document it is essential that controllers retain the operational flexibility to integrate aircraft flight paths with one another to achieve the most effective and efficient overall traffic flow and to get departing aircraft climbing to their cruising levels as quickly as possible. The NAPs at LSA place no constraints on the routing of aircraft beyond 1.0NM from the end of the runway or above 1500ft. Therefore, once aircraft have completed the NAP segment of the SID procedure, controllers may use radar vectoring where necessary to achieve the most efficient and expeditious flight profiles of aircraft at the lower levels of the TMA airspace.

2.8.2. Aircraft departing from LSA towards the south have, for many years, been radar vectored to the east of the PDR as explained in Section 3 below. This has led to a wide dispersion of the resulting tracks because of the variation in turning radius of aircraft at different speeds and in varying weather conditions as depicted in Figures F1, F2 and F5 above.

2.8.3. The proposed SID procedure introduces formal navigation guidance to the route together with speed control to reduce the variation in turning performance. The alignment of the SID is more compatible with the airspace arrangements in the eastern part of the LTMA than the previous PDR alignment via DET. It is also compatible with the LAMP Phase 1a airspace arrangements and LTC Sectorisation in the LTMA.

2.8.4. The introduction of the SID procedure is likely to lead to a reduced operational requirement for ATC tactical intervention in the routing of aircraft in the earlier stages of departure. The operational interface between LSA ATC and LTC Sectors will be focussed more on leaving the aircraft on the SID route rather than being radar vectored. However, the option of radar vectoring must remain available to ensure that controllers can achieve the most effective flight profiles and give climb clearance at the earliest opportunity.

2.8.5. Further to the south, once established in the Airways System and climbing towards their cruising levels under the jurisdiction of LTC Sectors, re-routing of aircraft towards their destinations will continue to take place, as depicted in Figures F1, F2 and F5 by the wide dispersion of tracks south of Sheppey, when aircraft are generally above 7000ft.

# 3. Differences between the EMKAD 1G SID and the PDR and the current routing of departing aircraft

3.1. A diagram showing the proposed EMKAD 1G SID overlaid on the current routing of departing aircraft as detailed below is shown at **Appendix F2**. The widths of the swathes depicted in **Appendix F2** are ±1NM from the nominal route centre-line for the outer swathe, which represents the "worst case" flight safety navigational tolerance used for procedure design, and ±0.2NM for the inner swathe, which represents what we expect to be the day-to-day navigation accuracy expected on RNAV-1 routes (based on experience of other ATM applications of RNAV-1 operations elsewhere).

3.2. The published PDR has, since its inception, been aligned on the Detling (DET) VOR/DME ground navigation facility located near to Maidstone. However, as traffic in the LTMA has grown this routeing has become increasingly untenable, tactical radar-directed ATC clearances, instead of following the PDR, have been the normal ATC practice for many years. A formal radar-directed routing some way to the east of the PDR has been in use by LTC for both LSA and LCY departures. The procedure (known internally between LSA ATC and NATS LTC as "Thames Gate") aims the departing aircraft towards a corridor approximately 5NM wide which encompasses, approximately, the Isle of Sheppey in a south-easterly direction. LCY and LSA departures are routed on radar headings towards[8] the "Gate" before being tactically directed towards their LTMA exit routing. This arrangement enables climb clearance and deconfliction to be achieved much more effectively than via DET.

3.3. However, the LAMP Phase 1a airspace development requires changes to be made to the handling of LCY arriving traffic, which will now all route along the Thames Estuary descending to 4000ft. The LAMP Phase 1a development team have concluded that the most effective routing for LSA outbound flights, as formal SID procedures, would be beneath the LCY arrival stream from the east and with a similar alignment to the "Thames Gate" routing.

3.4. To facilitate the southbound routing of both LSA and LCY departures, NATS has established a new Airway M91 in the LTMA aligned SODVU (approximately Billericay) - EKNIV (approximately Medway Estuary) - EMKAD (approximately Challock) - LYD VOR/DME. (NB. This Airway is above 4000ft and is not the subject of this consultation as it was encompassed within the NATS consultation on LAMP Phase 1a.) LSA departures from runway 05 will join the new Airway at EMKAD.

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[8] There is no fixed or "standard" route via the Thames Gate. It is simply an initial "aiming" area and aircraft are turned south or routed further east dependant on the immediate traffic situation. Thus, random traffic dispersion can occur anywhere between the Isle of Grain and the eastern extremity of the Isle of Sheppey and comprises both LCY and LSA departing traffic.

3.5. The Danger Area Yantlet[9] and the Gas Venting Stations[10] (GVS) on the Isle of Grain must not be overflown in the procedure design. This precludes the LSA SID being aligned more to the west towards EKNIV. Therefore, LSA departures from runway 05 must join the new Airway at EMKAD, remaining to the east of the Danger Area and GVS.

3.6. In developing the SID procedure, LSA have been able to add a slight deviation from a direct track to EMKAD in order to improve the alignment of the route across the Isle of Sheppey and avoid direct overflight of the centre of Sittingbourne.

3.7. It should be noted that the PDRs were, historically, not designed to any formal procedure design criteria and tracks were not specified with reference to the navigation infrastructure. It is therefore not possible to provide an exact comparison between the nominal track of the SID procedure (designed to PANS-OPS criteria) and the unused PDR.

3.8. Similarly, the current "Thames Gate" operation is based on radar headings which are influenced by the actual traffic situation at the time rather than on a single, predetermined track. Moreover, the different turning radius of aircraft at different speeds and under different weather conditions results in a spread of actual tracks across the ground. Thus the comparison in **Appendix F2** can only be made with respect to the "core" alignment of the historic tracks as derived from the airport NTK equipment.

3.9. Procedure design speed limits were not applied to the PDR or "Thames Gate" operation, other than the standard international airspace speed limit of 250kt IAS outside controlled airspace. We have applied a speed limit of 195kt IAS for the initial turn of the SID procedure to limit the easterly extent of the initial turn by faster aircraft and reduce the overall spread of tracks. In selecting an appropriate speed limit a fine balance is necessary between the preferred operating configurations and speeds of the variety of aircraft using the route and the ATM and environmental objectives. The application of the speed limit ensures that LSA departing aircraft do not fly further to the east than is necessary in the initial turn and assists in resolving the conflict between LSA departures and LCY arrivals as quickly as possible. The procedure design initial speed limit is removed as soon as is practicable within the procedure design criteria.

3.10. Further to the south along the route we have added waypoints MCS13 and MCS21 to assist in avoiding extensive overflight of Sheerness and Sittingbourne before turning towards EMKAD. It can be seen from the diagram at **Appendix F2**

[9] Danger Area D146 at Yantlet has an avoidance area of radius 0.54NM (1000m), surface to 3000ft ALT.

[10] Gas Venting Stations are sites where venting of methane gas under high pressure may take place without prior notice. The recommended avoidance area is 1NM radius up to 3500ft ALT.

that the majority of flights have in the past been widely dispersed and have routinely flown slightly to the east of Sheerness and Sittingbourne. The formal navigation guidance embedded within the SID, together with the RNAV1 navigation standard will reduce significantly the dispersion of aircraft following the SID at the lower levels.

3.11. With respect to the upper limit of the procedures, before the introduction of controlled airspace the PDR specified an upper limit of 3400ft for departing aircraft until within 5NM of DET. This was to ensure that the aircraft remained outside controlled airspace until given further climb clearance by LTC, the base level of controlled airspace being 3500ft. However, where both aircraft are inside controlled airspace the vertical separation to be applied by ATC is 1000ft. Thus, with the introduction of controlled airspace at LSA in April 2015 the upper limit of the PDRs has been changed to 3000ft.

3.12. To ensure that standard separation is maintained with the introduction of SIDs, the initial level incorporated in the procedure design for LSA SID procedures must be 3000ft. However, under the standard ATC rules aircraft in controlled airspace must be retained at least 500ft above the base level. Therefore it is incumbent upon LTC controllers to ensure that climb clearance is given to departing aircraft so that they can reach at least 4000ft by the southern boundary of the Southend Control Area (approximately at the Swale Estuary), notwithstanding that this cannot be specified within the procedure design.

# 4. Other Options considered

4.1. **Use of flyby waypoints**:

4.1.1. The use of flyby waypoints throughout the procedure design is the preferred methodology for aircraft navigation systems and was considered in the outline development of the procedure design.

4.1.2. However, the positioning of an initial flyby waypoint (to define the start of the first turn following noise abatement) which would meet both the procedure design criteria and the definition of the NAP would result in the track "rolling out" of the turn towards the south being substantially to the east of the desired routing. The initial waypoint would be need to be close to Burnham-on-Crouch (due to the constraints of the procedure design criteria), resulting in a greater number of faster-climbing aircraft flying closer to Burnham-on-Crouch before starting to turn.

4.1.3. Conversely, using a flyover waypoint, together with Course to Altitude (CA) leg, to define the start of the turn allows the dispersion of departing aircraft of differing climb performance, as provided for in the NAP, to be retained.

4.1.4. Therefore, LSA has elected to utilise the flyover waypoint configuration, together with CA to enforce the minimum turn altitude requirement, for the procedure design configuration rather than flyby configuration.

4.2. **Route via EKNIV**: Whilst a route via EKNIV was considered for commonality with the route from runway 23, is was not possible to design a route that would avoid the Yantlet Danger Area and GVS airspace (See footnotes 5 and 6) on the Isle of Grain or the area in which inbound aircraft routing towards runway 05 from the south would be operating. Furthermore convergence with LCY outbound routes and LCY inbound aircraft descending above would reduce the opportunities for early climb clearance for both LSA and LCY departing aircraft. This option, therefore, was not considered feasible.

4.3. **Route further east**: Alignment of the SID further to the east than proposed was initially constrained by proximity to Manston Airport and its arrival and departure procedures, although that constraint has subsequently been removed through closure of Manston Airport. Furthermore, not all of the controlled airspace requested by LSA in its previous ACP was approved by the CAA. Thus, immediately to the south of the Shoeburyness Danger Areas and the Southend Control Area (CTA) there is insufficient controlled airspace to contain a SID procedure routing to the east of the Isle of Sheppey or to the east of the Danger Area complex. This option is therefore not feasible.

4.4. **Higher procedure altitudes**:

4.4.1. The new arrival procedures to LCY from the Point Merge area to the east are aligned along the Thames Estuary descending westbound to 4000ft. This is an essential feature of the LAMP Phase 1a airspace configuration which is designed to meet the objectives of the CAA FAS.

4.4.2. The departure procedures from LSA must, necessarily, route beneath the LCY arrival procedures until procedurally clear to the south. Procedurally this would normally be between waypoints MCS13 and MCS21. Thus the allocation of a higher initial procedure altitude to LSA departure procedures is not feasible.

4.4.3. Furthermore, the flight safety requirements detailed in paragraph 2.6 above also preclude the inclusion of higher "stepped climb" altitudes in the SID.

4.4.4. However, as noted in paragraph 2.6 above, when there is no conflicting traffic LSA departing aircraft would always be given climb clearance before reaching Sheppey. Standing agreements will be in place between LSA ATC and LTC to ensure that climb clearance is given at the earliest opportunity with respect to other aircraft.

4.5. **Not publishing a SID procedure**:

4.5.1. It is noted in paragraph 1.2 above that the EMKAD 1G SID procedure will not be available for significant periods during weekdays when the Shoeburyness Danger Area complex is active[11]. Therefore LSA considered whether the publication of a formal SID at all would be as justified.

4.5.2. On balance LSA concluded that publishing a SID procedure would be justified as it would provide a formalised procedure to be used before and after the activity of Shoeburyness and at weekends and would provide continuity for flight planning in enabling aircrews to plan their flights from runway 05 in a similar way to runway 23.

4.5.3. Similarly it would also provide for continuity of the ATM interfaces between LSA ATC and LTC that are afforded by formalised flight procedures.

[11] The procedures to be used when the Danger Area Complex is active are detailed in Section 5 below.

# 5. When Shoeburyness Danger Areas are active

5.1. During the periods when the Shoeburyness Danger Areas[12] are active (normally Monday to Friday 0830 to 1800 local) it is essential that departing aircraft do not enter the Danger Area airspace. Therefore the SID procedure will not be available. This will be clearly annotated on the SID Chart in the AIP.

5.2. Avoidance of the Danger Area airspace is normally achieved by Southend ATC issuing individual ATC clearances to departing aircraft and providing radar vectoring as necessary to assist pilots in avoiding the Danger Areas. This arrangement has been in place for many years and will not change as a consequence of the introduction of SID procedures. (For aircraft departing on non-SID ATC clearances, obstacle clearance requirements for "Omni-Directional Departures" are to be published by LSA in accordance with recent CAA Policy.)

5.3. Once aircraft are safely to the west of the Danger Area complex they will then, normally, be routed directly towards EMKAD, which is effectively the same track spread as via the current radar-directed "Thames Gate" routing. Thus there will be no changes in the day-to-day operation of aircraft when the Danger Area complex is active.

[12] Shoeburyness Danger Area complex, D136 Surface to 13000ft; D138 Surface to 13000ft; D138A Surface to 6000ft; D138B Surface to 5000ft.

# 6. Environmental impact

6.1. It can be seen from the diagram at **Appendix F2** that the nominal route of the SID very closely reflects both the NAP and the main core of the historically achieved tracks of aircraft using the "Thames Gate" operation, within the constraints of the procedure design criteria.

6.2. The Airport Noise Contours are not affected by the change from PDR or tactical "Thames Gate" routing to SID as detailed in **Part A** Section 7. The increase in contour size from 2014 to 2021 would occur irrespective of whether the departure procedures remain as current or are changed to SIDs.

6.3. The formal definition of a route through the Danger Area airspace (when not active) allows a route to be defined after the NAP which is slightly to the east of the previous routing towards "Thames Gate" which, for most aircraft passes directly overhead the Shoeburyness built up area. Without a defined track, some fast-climbing aircraft could turn across the built up area when turning onto their allocated radar heading towards the "Thames Gate".

6.4. The introduction of a speed limit for the initial turn of the SID, together with specified tracks within the SID, will reduce the spread of aircraft tracks around the turn and the initial routing towards the Thames Estuary, thereby reducing the number of people affected by departing aircraft on this route.

6.5. Furthermore, as the roll-out of the turn is towards routing waypoint MCS13, the track lies slightly to the east of the previous track towards "Thames Gate" most aircraft can be expected to have reached 3000ft before the north bank of the Thames.

6.6. Whilst both the SID and the "Thames Gate" routes pass over the Isle of Sheppey, the design of the SID to procedure design criteria together with the RNAV-1 navigation standard and the careful placing of waypoints will substantially reduce the track dispersion of aircraft across Sheppey.

6.7. Furthermore the more structured ATM operation now wholly within controlled airspace will reduce the need for tactical ATC intervention in radar vectoring aircraft away from the SID track at low level.

6.8. Whilst it is not possible to specify higher altitudes within the procedure design it is anticipated that the formalised SID procedure structure, supported by Standing Agreements between LSA ATC and LTC, will enable early climb clearance to be given to departing aircraft once clear of other aircraft inbound to LCY. Moreover it will enable LSA ATC to transfer control of departing aircraft to LTC much earlier than was previously the case. This, in turn, will enable further climb clearance to be given to LSA departures more quickly than previously and thus reduce the environmental impact of LSA traffic over the North Kent area.

6.9. Therefore, whilst the initial climb profile to 3000ft embedded within the SID procedure remains necessary for operational and safety management reasons it is expected that LSA departures via EMKAD would consistently be at approximately 4000ft before Sheppey and generally above 6000ft when passing the Sittingbourne area. LSA will monitor achieved climb profiles of departing aircraft as part of the CAA's Post-Implementation requirements of the ACP.

6.10. Once established in the Airways System and climbing towards their cruising levels under the jurisdiction of LTC Sectors, re-routing of aircraft towards their destinations will continue to take place.

6.11. The SEL Chart at **Appendix F3** shows a change to the alignment of the "far out" extremity of the 80dB(A) SEL contour. This is due to the position of the first flyover waypoint which defines the NAP as a consequence of the PANS-OPS procedure design criteria. It is seen that the initial turn lies further to the east over sparsely populated marshland rather than turning directly towards Shoeburyness.

6.12. **Table F1** below shows the area and population within the 80 and 90 dB(A) SEL footprints for departures by the Airbus A319 on the current route and the proposed SID procedure.

| SEL Value | Runway | Route | Area ($Km^2$) | | Population (thousands) | |
|---|---|---|---|---|---|---|
| | | | Current route | SID | Current route | SID |
| 90 dB(A) | 05 | South | 2.4 | 2.4 | 0.9 | 1.0 |
| 80 dB(A) | | | 12.4 | 12.5 | 8.4 | 8.6 |

**Table F1: SEL Footprints Thames Gate and EKNIV 1G SID**

6.13. The Chart at **Appendix F4** shows the departure swathes against which population counts have been made. The criteria against which the swathe widths and length have been determined are detailed in **Part A** paragraph 9.5 of the consultation document. Whilst the swathe widths reflect the general practice used at other UK airports it should be noted that we expect the day-to-day track-keeping performance for departing aircraft using the RNAV-1 SID procedures to be better than the 2km swathe width used for this analysis.

6.14. **Table F2** below provides a comparative count of the number of people within the respective swathes for the current "Thames Gate" routing and the proposed EMKAD 1G SID.

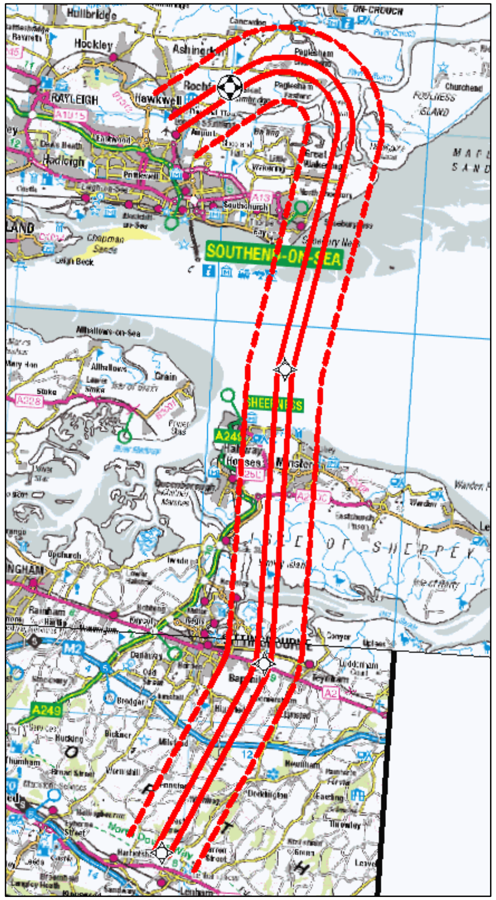
| Runway | Route | Population (thousands) | |
|---|---|---|---|
| | | Current Route (Thames Gate) (nominal 3km width) | SID (nominal 2km width) |
| 05 | South | 30.6 | 4.0 |

**Table F2: Population Count for Thames Gate route and SID**

6.15. The introduction of properly constructed RNAV SIDs with a navigation standard of RNAV-1 will result in improved repeatability of tracks in accordance with CAA policy and DfT guidance. The SID, in conjunction with the recently introduced controlled airspace and the improved airspace efficiency resulting from the recently introduced LAMP Phase 1a airspace arrangements, will enable expeditious climb clearance to be given to departing aircraft above the 3000ft initial limitation of the SID procedure when there are no other conflicting aircraft. Furthermore, it is anticipated that the more efficient airspace arrangements will lead to a reduction in the need for ATC to radar vector aircraft away from the SID route at low altitude in the early stages of departure.

6.16. Therefore we conclude that the impact of changing the PDR and the “Thames Gate” operation to a formal SID procedure brings an overall environmental benefit to communities on the ground and has the potential for improved flight profiles and reduced fuel burn for aircraft operators when there are no other conflicting flights.

# Appendix F1 Diagram of EMKAD 1G SID overlaid on OS topographical map




**EMKAD 1G SID: Diagram showing the anticipated maximum track dispersion (±0.2NM; solid red lines) and the maximum navigation tolerance (± 1.0NM; dashed red lines) overlaid on Ordnance Survey map.**

# Appendix F2 Diagrams of EMKAD 1G SID, and historic tracks of aircraft flying on the current tactical route.

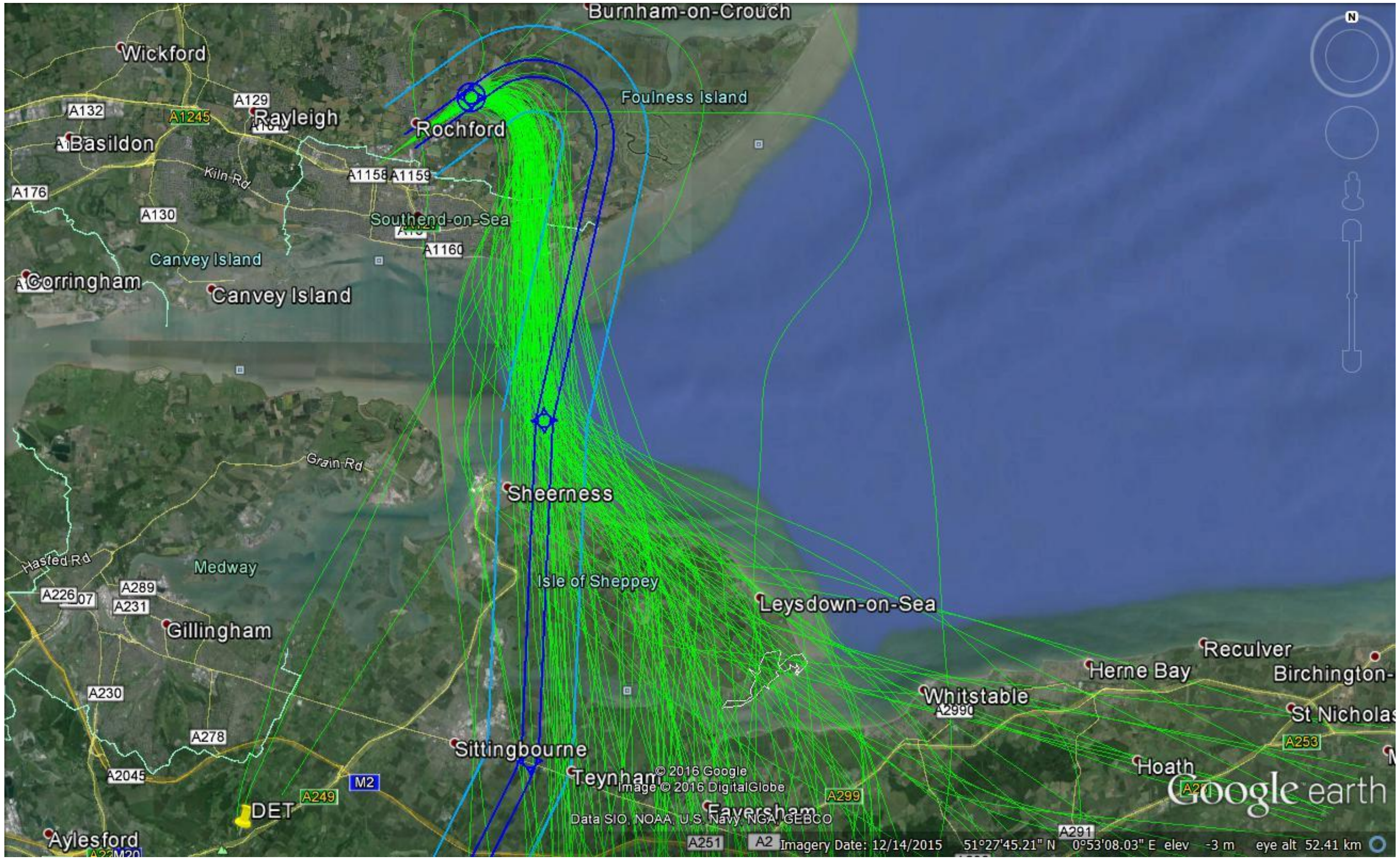



**Diagram showing the anticipated maximum track dispersion (±0.2NM; dark blue) and the maximum navigation tolerance (± 1.0NM; light blue) for the EMKAD 1G SID against historic NTK tracks (green) for departing aircraft July/August 2015**

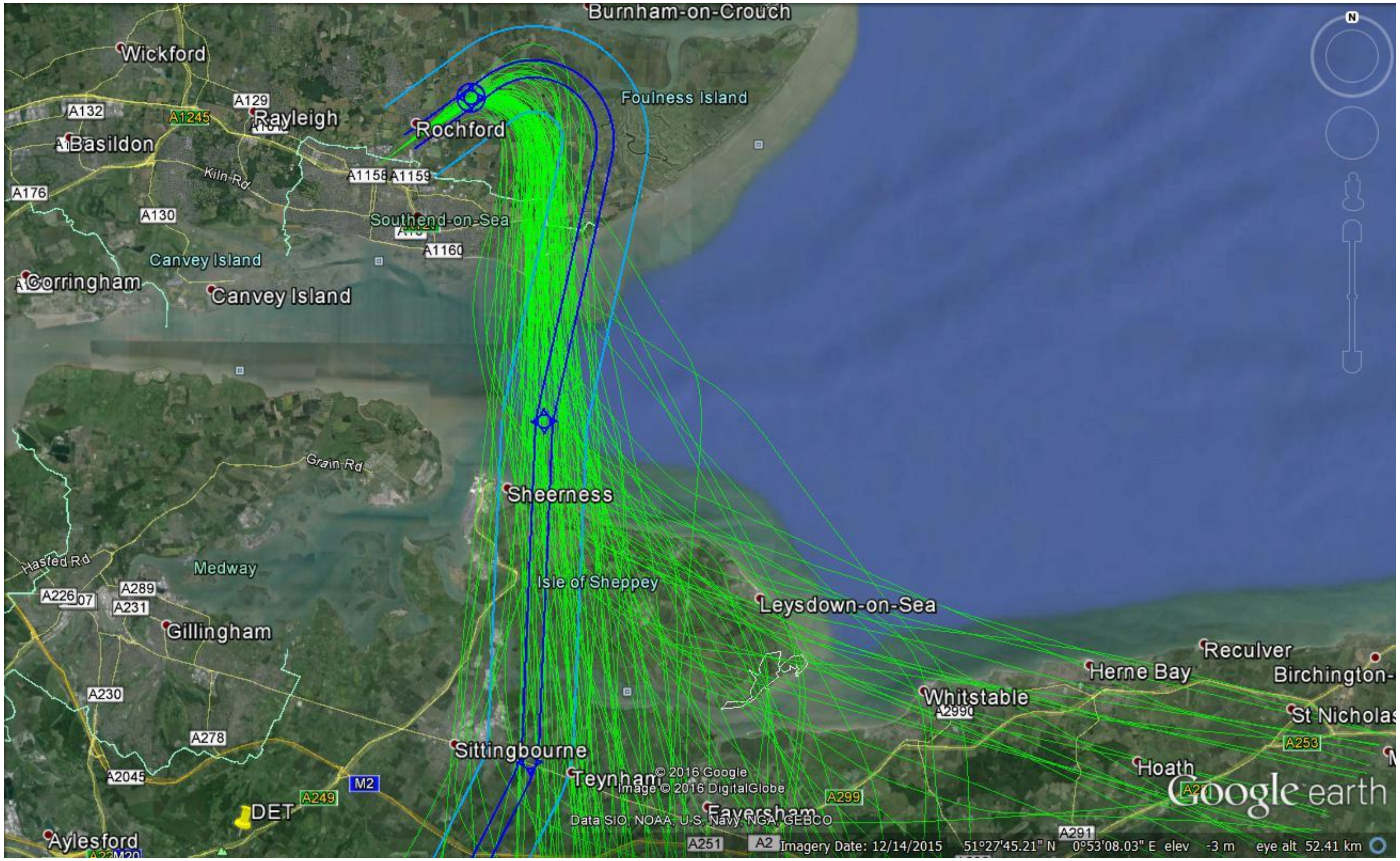
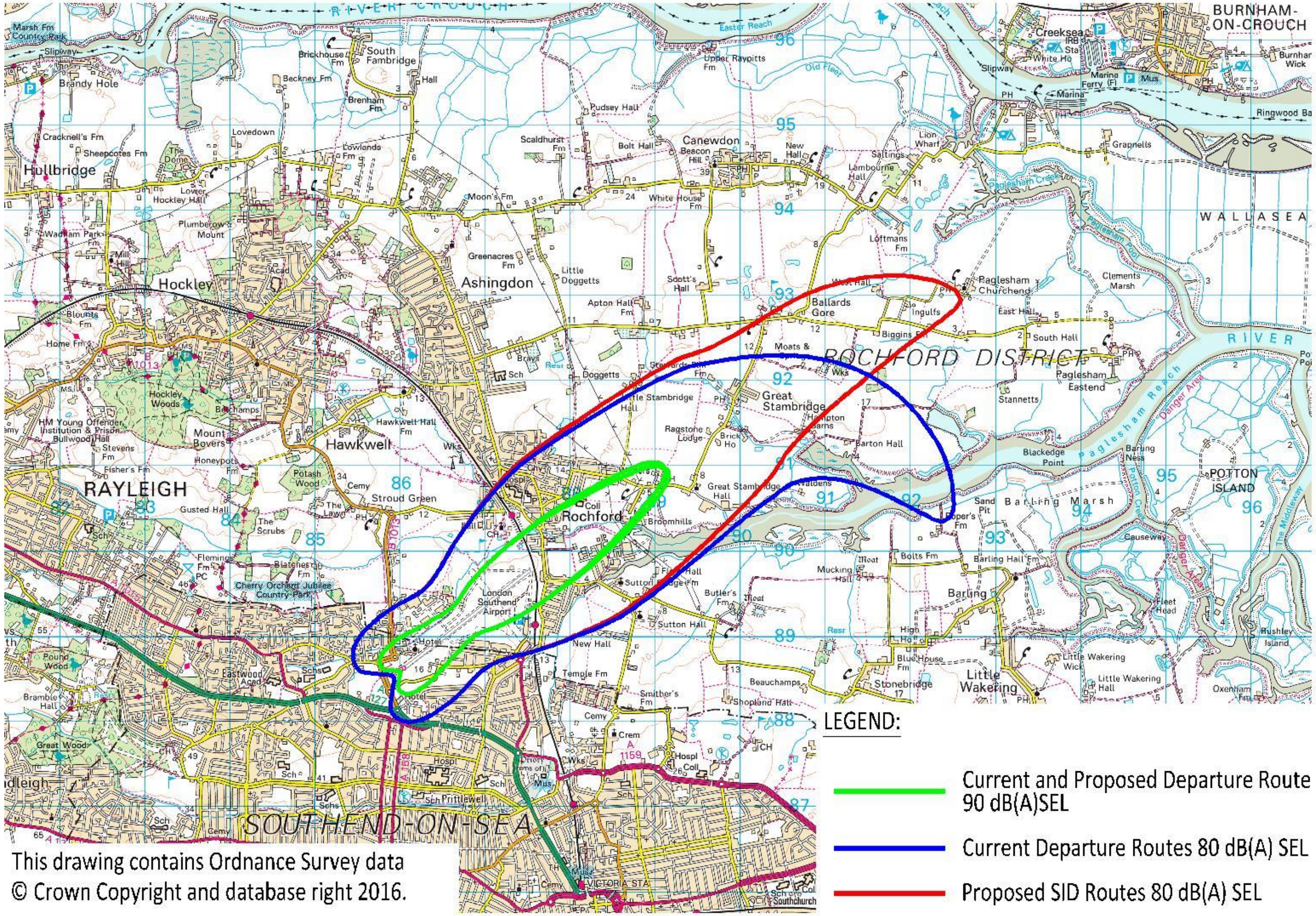
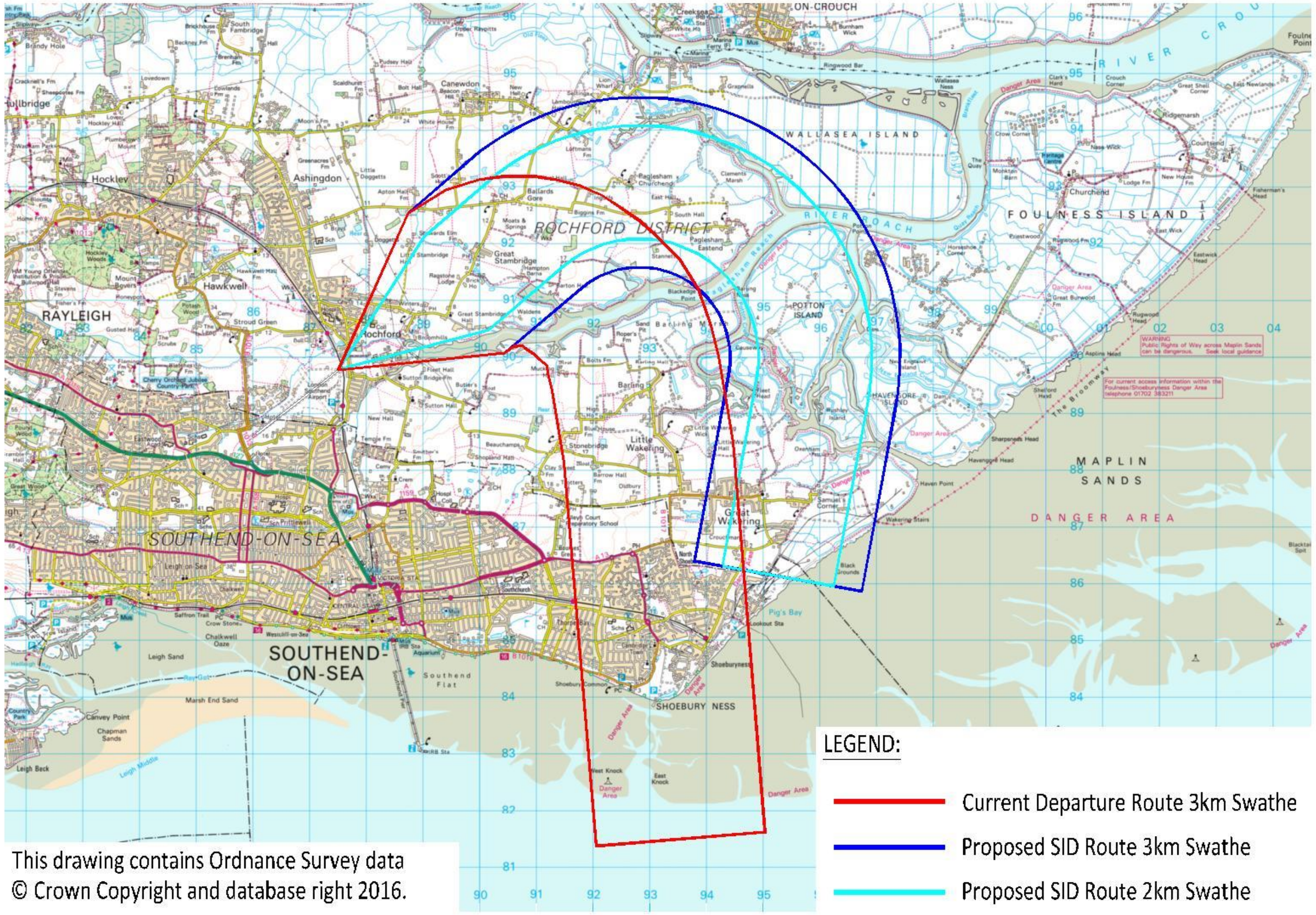



**Diagram showing the anticipated maximum track dispersion (±0.2NM; dark blue) and the maximum navigation tolerance (± 1.0NM; light blue) for the EMKAD 1G SID against historic NTK tracks (green) for departing aircraft July/August 2014**

# Appendix F3 SEL Chart for A319 aircraft .



# Appendix F4 Departure swathes for Thames Gate route and EMKAD 1G SID




**(See Part A paragraph 9.6 for explanation of swathe widths and length.)**