


Report of the CAA's Post Implementation Review of the London Airspace Management Programme (LAMP) Phase 1A Airspace Change Proposal – Modules A to E

CAP 1692

A large, abstract graphic composed of overlapping, semi-transparent blue shapes in various shades, ranging from light cyan to deep navy blue, creating a dynamic, layered effect that fills the bottom two-thirds of the page.

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Executive Summary

1. The CAA's airspace change process is a seven-stage mechanism that is set out in detail in CAP 725. Although the CAA introduced a new airspace change process (CAP 1616) on 2 January 2018 for making a decision whether or not to approve proposals to change airspace design, this Airspace Change Proposal (ACP) was fully implemented prior to the introduction of that document, and analysis on Post Implementation Review (PIR) data received by the Civil Aviation Authority (CAA) commenced prior to its introduction. This PIR has therefore been undertaken in accordance with CAP 725 and the Department for Transport's Guidance to the Civil Aviation Authority on Environmental Objectives Relating to the Exercise of its Air Navigation Functions (2014).
2. Under the CAP725 process, in February 2015, NATS submitted an ACP titled the London Airspace Management Programme (LAMP) Phase 1A proposal to the CAA, to propose changes to airspace in the south-east of England including proposals to change a number of arrival and departure procedures at a number of aerodromes. LAMP Phase 1A was a major airspace change designed to deliver modifications to airspace arrangements affecting a broad swathe of south-east England from Stansted to the Isle of Wight in order to provide, primarily, capacity and efficiency benefits.
3. The CAA decision made on 13 October 2015 to approve the changes was originally published on the CAA website in CAP1366 on 22 December 2015. Whilst the changes to flightpaths have been in operation since 4 February 2016, the final stage of the airspace change process - Stage 7 - is for a PIR to be conducted one year after implementation of an airspace change.
4. The sponsor provided PIR data to the CAA in June 2017; on 18 October 2017, the CAA commenced the PIR of the impact of its decision and the implemented change. The content and outcome of this review process by the CAA is discussed in detail in each of the respective LAMP Phase 1A Module PIR reports which are detailed in CAP 1692/A to CAP 1692/E.
5. As a result of our analysis, the CAA has concluded that the LAMP 1A PIR does show that the proposal has been implemented and operated as expected, although in four locations, there was some variance in London City traffic patterns compared with what was predicted in consultation on the departure and arrival routes. In addition, there was a considerable variance with the

overall fuel and CO₂ benefits as forecast by the sponsors which has resulted in less savings than were predicted.

6. The CAA confirms that no modification of the RNAV-1¹ arrival and departure designs are required by NATS except for some minor modifications to chart naming and data base coding changes which are detailed in Module B and C reports.
7. The CAA's airspace change process for the LAMP Phase 1A airspace change request dated 16 February 2015 has now concluded. However, we recommend that the sponsor:
 - 1) Investigate why there are some discrepancies with traffic patterns with some of the London City procedures and advise the CAA accordingly. These are detailed in Modules B and C.
 - 2) Investigate why the change proposal has not achieved the expected fuel and CO₂ benefits and advise the CAA accordingly.
8. This report, summarises the individual Module conclusions. All the information the CAA has taken into account is published on our website/interim portal.

¹ Performance-based navigation (of which RNAV-1 is a type) is satellite aviation guidance; in comparison to ground-based navigation aids (such as those used by conventional SIDs) performance based navigational technology will allow aircraft to fly much more accurate and flexible tracks. Satellite guidance will also allow the UK's complicated and busy airspace to be redesigned, increasing capacity and efficiency while maintaining or enhancing safety performance. A route structure optimised for satellite guidance with aircraft flying a pre-programmed trajectory will also reduce the need for tactical intervention by air traffic controllers to instruct pilots to change direction, bringing down the cost of air traffic control, and optimise the climb and departure profiles of aircraft (which is the most expeditious routeing of aircraft so far as airlines are concerned, and which also burns the least fuel and overall causes the least noise).

Scope and Background of the PIR

What is a Post Implementation Review

9. The CAA's approach to decision-making in relation to proposals to approve changes to airspace is explained in its Guidance on the Application of the Airspace Change Process, CAP 725. This detailed Guidance provides that the seventh and last stage of the process is a review of the implementation of the decision, particularly from an operational perspective, known as a Post Implementation Review (PIR).
10. The Guidance states that the purpose of a PIR is to determine whether the anticipated impacts and benefits in the original proposal and published decision are as expected, and where there are differences, what steps (if any) are required to be taken.
11. If the impacts are not as predicted, the CAA will require the change sponsor to investigate why, and consider possible mitigations or modifications for impacts that vary from those which were anticipated to meet the terms of the original decision.
12. A PIR is therefore focused on the effects of a particular airspace change proposal. It is not a review of the decision on the airspace change proposal, and neither is it a re-run of the original decision process.

Background to our conclusions in this PIR Decision

13. On 13 October 2015, the CAA approved LAMP Phase 1A change proposals to change traffic patterns for Stansted and Luton Standard Instrument Departures (SIDs), London City arrival and departure routes, route network changes for London City, Gatwick, Farnborough, Southampton and Bournemouth; these changes involved a variety of changes which included RNAV-1 procedures for London City arrivals and departures and a number of new ATS routes providing connectivity to the route network in adjacent States' airspace. The changes for the London City network changes were proposed as Module C which is the subject of this report. In our Decision document dated 22 December 2015, we provided information and background to the change. We recommend readers of this report read that decision in conjunction with this document.

Conditions attached to the CAA's decision to approve the change

14. A number of conditions were placed on the sponsor as a result of our decision to implement the changes proposed in the LAMP Phase 1A ACP. These are detailed in each of the Module PIR reports together with the outcomes of those requirements.
15. Whilst one of the outcomes resulted in a NATMAC consultation to revise some of the lower limits of controlled airspace in the Thames Estuary area and the vicinity of the Kent coast, whilst more time was requested by some NATMAC members following NATMAC 80, no further feedback was received from NATMAC members. Therefore, the CAA has decided to re-examine this initiative once the outcome of the TAG Farnborough ACP is determined and will notify NATMAC members in due course.

Data collected for the purpose of the PIR

Sources of Information

16. Information was provided by the change sponsor as requested by the CAA; the evidence provided is published on the CAA website. Feedback from aircraft operators and airlines was also received and reviewed during the PIR process.
17. The CAA and change sponsor also received feedback from groups and residents much of which was directly related to the issues that the CAA required to be considered under the terms, scope and objective of this PIR. Groups and residents close to Stansted and London City airports raised complaints on aircraft noise and overflight, and concentration of the new RNAV-1 arrival and departure flight paths at London City.
18. All feedback is discussed in each of the PIR Module reports.

Objectives and Anticipated Impacts

The original proposal and its objectives

19. The original change proposal proposed changes to airspace arrangements which were covered by five individual elements (referred to as Modules) of LAMP Phase 1A comprising changes at the following aerodromes:
 - 1) Module A: London Stansted - a Standard Instrument Departure (SID) switch (switching aircraft departure routeing from the Detling SID onto the extant Clacton SID at implementation).
 - 2) Module B: London City and Biggin Hill (using a shared procedure with London City).
 - 3) Module C: Southend, London City and Biggin Hill (using a shared procedure with London City) and Gatwick.
 - 4) Module D: London Luton and Northolt – a SID switch (switching aircraft departure routeing from the Detling SID onto the extant MATCH SID at implementation).
20. Module E: South Coast changes with revised procedures and flight plan routeings from the southeast for Bournemouth, Southampton and from the southeast and south for Farnborough.
21. To support these changes there were some changes to lower limits of controlled airspace, and a number of new Air Traffic Services (ATS) Routes.
22. The justifications presented by NATS for the LAMP Phase 1A proposals were that it would modernise airspace structure, improve the operational efficiency of the airspace providing capacity for the future, minimise future delay, improve the environmental performance of the airspace, reduce average CO₂ per flight and reduce the incidence of low level overflight of populated areas. It was acknowledged that of themselves, none of the Modules would increase the capacity of the airspace at time of implementation, but each of the Modules would collectively contribute to a modernisation of the airspace that enabled further systemisation, as and when further phases of airspace change were developed for the south-east of England and were put forward for consideration by the CAA.

23. NATS' stated aim for LAMP as a whole is to redesign the airspace network over the whole of London and the south-east. Initial plans were to consult on a complete package of network changes and 'swathes' and then follow this up with airport specific consultations prior to a phased implementation at single or groups of airports. However initial design work and programming issues meant that this plan was revised so that LAMP design and consultation was to be addressed in two main phases. The first centred around London City and Gatwick (referred to as LAMP Phase 1A) and the second around Luton, Stansted and Heathrow (referred to as Phase 2).
24. LAMP Phase 1A (the subject of these airspace change proposals) was progressed on this revised basis but almost all of the changes (apart from one, high level arrival route to the TIMBA Hold) for Gatwick were subsequently removed from scope. It was noted that it was still NATS' and the airports' intention to progress subsequent phases of LAMP to realise greater improvement in the future and meet European requirements to modernise the airspace system. However, as of the date of this decision, future plans were suspended by Gatwick Airport Limited and NATS pending the outcome of a decision on a future runway at either Heathrow or Gatwick, and Department for Transport plans to revise the Air Navigation Guidance² to the CAA.
25. It was stated that a successful implementation of LAMP Phase 1A, taking into account the legal and policy context, would constitute progress towards the CAA's overall Future Airspace Strategy (FAS) policy objective. It is a condition of NERL's Licence (Condition 10a) that "the Licensee shall use reasonable endeavours to further implement the major air traffic management ("ATM") modernisation programmes set out in the UK FAS Deployment Plan of December 2012. These programmes are: the raising of the United Kingdom Transition Altitude ("TA"); the terminal airspace redesign under the London Airspace Modernisation Programme ("LAMP"); and the implementation of the [Single European Sky Air Traffic Management Research (SESAR)] Pilot Common Project."
26. In CAP1366, the CAA formally recorded that the aims and objectives of LAMP Phase 1A were objectives which it endorsed and, subject to the terms of the regulatory and policy framework in force at that time, the CAA would seek to approve changes to the UK airspace structure that meet the aims and objectives of LAMP or its revised branding under airspace development for the

² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/269527/air-navigation-guidance.pdf.

south-east of England under the Future Airspace Strategy Implementation (FASI) South projects.

Anticipated Impacts

27. In each of our PIR reports, we highlighted what impact the changes proposed in each of the LAMP 1A Modules would have.

CAA Assessment

Operational Assessment

28. The CAA examined the track data plots of PIR data and reviewed the evidence provided by the sponsor with regard to the set of PIR reporting requirements as highlighted in each of the individual Modules. We completed a detailed analysis of all the new procedures flown and compiled reports which accompanied each Module. We also took account of feedback from operators and engagement with database coding houses. We summarised our conclusions in each of the reports under Safety, Operational Feedback, Air Navigation Service Provision, Utilisation and Track Keeping, and Traffic.

Environmental Assessment

29. The sponsor provided its analysis of the environmental impacts for the airspace change post implementation review. The CAA has assessed that data and the details of that assessment were described in each of the Modules PIR reports. We described the impacts of: aircraft noise, overflights on existing or new areas overflown, overflight of Areas of Outstanding Natural Beauty and National Parks and CO₂ Emissions. We summarised our conclusions in each of the reports and whether our conclusion on the environmental impacts consequential on the implementation were as expected and were consistent with the impacts we took into consideration in making our original decision. We also highlighted whether there were any impacts which were not anticipated.

Community Stakeholder observations

30. As part of the data collection process, the change sponsor was required to accept, process and collate noise enquiries/complaints and feedback relating to the implementation of this airspace change.
31. We analysed complaints received by the change sponsor and the CAA as part of this Review. As a result of our analysis, we concluded in our reports whether or not the themes were consistent with the traffic patterns that we were expecting to see.

Ministry of Defence Operations

32. We examined whether operations by the Ministry of Defence were affected by the proposals in each of the Modules and concluded that the change had had no impact on military operations.

Conclusion

32. As a result of our analysis we have reached the following conclusions for each of the proposed Modules of LAMP Phase 1A:

Module A Conclusions

33. The change has resulted in both the negative and positive impacts which were expected, with a significant increase in traffic on to the Clacton departure route and a significant reduction on the Detling route. This has resulted in the expected associated noise impacts on the Clacton departure.
34. This change has delivered positive benefits in terms of Fuel Burn and CO₂ emissions, primarily derived from better climb profiles. There has also been an associated reduction in complexity in the very busy airspace to the southeast of Lambourne by removing the Stansted Detling departures from daytime operations, although a very small number of departures still use the Detling SID during the day as expected by NATS.
35. Based on the information provided by the sponsor, in the first year of operation we are content that the Module A airspace arrangement has operated successfully as the change sponsor intended which is in line with our airspace change decision outlined in CAP1366/A. We note that there are no ATC or airspace operational issues arising since the introduction of the change.

Module B Conclusions

36. The airspace change has resulted in both negative and positive impacts. In terms of noise, these are as expected but there is an unexpected negative impact which is an increase in CO₂ (when combining Module B & C impacts together given their interdependency). However, the increase in CO₂ emissions of 11,709 tonnes in Module C is offset by the savings under Modules A and D, therefore as a package, LAMP 1A has still delivered a CO₂ benefit although this is much reduced.

37. Fewer people are overflowed but those that are still overflowed are overflowed more often as a result of the implementation of RNAV-1 procedures. Some people who may have expected a reduction in overflight may still have similar overflight due to the three differences below:
- 1) **Runway 09 CLN Departures, Segment 3.** The departure flightpath runs slightly north of where the expected flightpath was portrayed in consultation – at the A1112 this was approximately 500m. In our Module B Report Annex B, we stated a displacement was up to 1,000m from what was expected, but departures are still flying within the swathe of airspace that was overflowed before the change. This is outside the area of the 57dB LA_{eq} noise contour, so this is not deemed to be significant by the Air Navigation Guidance noise metrics terms, and there are fewer aircraft in the location than before the change in 2016. Noise impacts, as assessed in terms of noise metrics, are therefore unchanged; this is highlighted in the Module B Annex B at page 77.
 - 2) **Runway 09 DVR/EKNIV Departures, Segment 3.** The departure flightpath runs approximately 500m south of where the expected flightpath was portrayed in consultation. This will have no discernible effect on noise impacts as this occurs where departures are within the 3,000ft to 4,000ft altitude band where this largely occurs.
 - 3) **Runway 27 BPK/CLN/EKNIV Departures, Segment 2.** The concentrated traffic pattern of departures is slightly wider than expected (See Module B Report Annex B) but is still within the swathe of airspace that was overflowed before the change. It is still narrower than the pre-2016 concentration just not as much as consulted on. This is occurring within the 2,000ft to 3,000ft altitude band, however, where this largely occurs, this will have no discernible effect on noise impacts as this is outside the area of the 57dB LA_{eq} noise contour, and is not deemed to be significant by the Air Navigation Guidance noise metrics terms.
38. In respect of the above observations on the variance of flight paths compared to what was portrayed in consultation, we recommend that the sponsor

investigate why there is a discrepancy between the forecast and actual flightpath and determine what, if any, action should be taken.

39. Overall safety is much improved.
40. Based on the information provided by the sponsor, whilst noting the three variations to departure tracks highlighted above, in the first year of operation we are content that the Module B airspace arrangement has operated successfully, as the change sponsor intended, which is in line with our decision as highlighted in CAP1366/B. We note that there is one minor change to the arrival chart and database coding for Runway 09, but other than that, there are no operational issues arising since the introduction of the change.

Module C Conclusions

41. This module's track keeping is very much in line with what was expected. Importantly the reduction in tactical vectoring over Kent and Essex has reduced the numbers overflown quite markedly and the departures towards the south using the new EKNIV SIDs, are climbing more quickly. Importantly, this has reduced ATC complexity significantly, with a subsequent improvement in safety.
42. Regarding the forecast fuel savings and reduction in CO₂ emissions, the outcome in the first year of operation has resulted in a disbenefit of additional fuel and an increase in CO₂ emissions. There is a CO₂ disbenefit of 11,709 tonnes compared to the expected benefit of 10,099-20,199 tonnes of forecast CO₂ savings which is not insignificant. However, overall, the five modules of LAMP 1A still provide a net benefit of 1,294 tonnes in CO₂ emissions, despite the forecast range on CO₂ savings of 17,445-34,890 tonnes of CO₂. We therefore recommend NATS investigate why there is this variation between the forecast benefits and the actual fuel and CO₂ disbenefit and report on the reasons more fully.
43. We also noted that arrivals to London City Runway 09 are being vectored south of the track and that is not wholly in line with what was portrayed in the consultation feedback report. In this area - over the Hoo peninsular - the aircraft are all above 4,000ft where the area is sparsely populated. This was always an area that could be tactically flown over where ATC vector aircraft for sequencing arrivals, and the impact of this overflight does not meet the applicable definition of 'significant environmental impact'. However, we

recommend that the sponsor examine why the unpredicted overflight of the Hoo peninsular has occurred and propose further action, if any.

44. Based on the information provided by the sponsor, whilst there has been a fuel and CO₂ disbenefit arising from the changes in this Module, it is offset by the fuel and CO₂ benefits realised with Modules A and D during the first year of operation, thus we are content that the Module C airspace arrangement has operated successfully as the change sponsor intended; this is in line with our decision as highlighted in CAP1366/C. We noted the operational issues with chart naming in the early phase of operation, and the issue with the Biggin Hill chart naming convention and are content that action is in hand to address and resolve the issue. As a result of the review, we are content that there are no other operational issues arising since the introduction of the change, and that there has been a significant improvement in safety and a reduction in the Thames Radar risk safety index.

Module D Conclusions.

45. The implementation of Module D with the switching of the departures from the Luton and Northolt Detling SIDs onto the routing of the MATCH SID has, as expected, seen aircraft climb sooner than was the case when flying the Detling SID before the change; the track keeping is largely as expected. The benefits of the reduced complexity and the improved climb performance been even better than expected. The extra 2NM track miles being flown instead of the forecast 8NM is noteworthy and has therefore resulted in a less of a disbenefit than forecast. Overall, there was a net improvement to fuel and CO₂ emissions.
46. Based on the information provided by the sponsor, during the first year of operation, we are content that the Module D airspace arrangement has operated successfully as the change sponsor intended; this is in line with our decision as highlighted in CAP1366/D. There have been no operational issues arising since the introduction of the change.

Module E Conclusions

47. The change to airspace arrangements along the south coast introduced with Module E has improved the ATC interactions around the Goodwood area reducing complexity; consequently, this has resulted in improvements from a safety perspective.

48. The tracking further north of the arrivals near the Isle of Wight may be because they are higher but it does not appear to have had any consequential impact.
49. We remain committed to re-examine the options for the rationalisation of controlled airspace along the south coast. This will have to be considered in light of the outcome of the TAG Farnborough Airport airspace change proposal and further airspace developments undertaken by NATS. As soon as it is practical to do so, the CAA will engage NATS to review options identified so far, evaluate the impacts of the TAG Farnborough Airport changes and further enhancements undertaken by NATS in order that a consolidated position can be established to facilitate engagement with NATMAC stakeholders.
50. Based on the information provided by the sponsor, during the first year of operation, we are content that the Module E airspace arrangement has operated successfully as the change sponsor intended; this is in line with our decision as highlighted in CAP1366/E. There have been no operational issues arising since the introduction of the change.

Overall Conclusion

51. As a result of our analysis, the CAA has concluded that the LAMP 1A PIR does show that the proposal has been implemented and operated as expected, although there was some small variance in forecast traffic patterns for three of the London City departure routes and one arrival route, and a small variance in traffic patterns over the Isle of Wight relating to traffic inbound to Southampton although the frequency of daily flights inbound to Southampton from the southeast is extremely low.
52. There was a considerable variance with the overall fuel and CO₂ benefits as forecast by the sponsors which have resulted in less savings than were predicted.
53. In respect of all LAMP Phase 1A Modules, the CAA confirms that no modification of the RNAV-1 arrival and departure designs are required by NATS except for some minor modifications to chart naming and data base coding changes which are detailed in Module B and C reports.

Confirmation of LAMP Phase 1A Implementation

54. The CAA's airspace change process for the LAMP Phase 1A airspace change request dated 16 February 2015 has now concluded. We now recommend that the sponsor:
- 1) Investigate why there are some discrepancies with traffic patterns with some of the London City procedures and determine what, if any action should be taken. These are detailed in Modules B and C.
 - 2) Investigate why there is a variation between the forecast benefits and the actual fuel and CO₂ disbenefit achieved from the implementation of Module C and report on the reasons more fully in order to determine what, if any action is appropriate.

Note on plain language

55. The CAA has attempted to write this report as clearly as possible. Our approach has been to include all the relevant technical material but also to provide a summary and of the conclusions the CAA has reached in reliance on it in as understandable a way as possible. Nevertheless, when summarising a technical subject there is always a risk that explaining it in more accessible terms can alter the meaning. For that reason, the definitive version of our assessment and conclusions are in the attached technical reports.

Annex A – Glossary

	2001 Directions	Civil Aviation Authority (Air Navigation) Directions 2001
	2002 Guidance	The Secretary of State's Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions published in 2002
	2014 Guidance	The Secretary of State's Guidance to the CAA on Environmental Objectives Relating to the Exercise of its Air Navigation Functions published in 2014
A	A330	Airbus 330 Aircraft
	A380	Airbus 380 Aircraft
	a/c	Aircraft
	AAL	Above Aerodrome Level
	ACP	Airspace Change Proposal
	AIC	Aeronautical Information Circular
	AIP	Aeronautical Information Publication
	Alt	Altitude (see AMSL)
	AMSL	Above Mean Sea Level (see Alt)
	ANO	Air Navigation Order
	ANSP	Air Navigation Service Provider
	AONB	Area of Outstanding Natural Beauty
	APD	Approved Procedure Designer
	APF	Aviation Policy Framework
	ARINC 424	Airlines Electronic Engineering Committee - Navigation System Data Base
	ATC	Air Traffic Control
	ATM	Air Traffic Management
	ATS	Air Traffic Service
B	B747-400	Boeing 747-400 Aircraft
	B777	Boeing 777 Aircraft
C	CAA	Civil Aviation Authority

	CF leg	Course To Fix leg
D	dB	Decibel units
	dBA	Decibel units measured on an A-weighted scale
	DfT	Department for Transport
	DEM	Digital Elevation Model
	DER	Departure End of Runway
	DET	Detling D/VOR
	DME	Distance Measuring Equipment
	DVOF	Digital Vertical Obstruction File
	DVOR	DME/VOR Navigational Aid D DVR – Dover D/VOR (plus a number D21) = 21 nautical miles from the VOR
	DVR	Dover D/VOR
	D (plus 2 or 3 digit no.)	DME range from a navigational aid (eg DVR D21 = 21 nms from the specified beacon, in this case the Dover D/VOR)
E	EGGW	ICAO Location Indicator for London Luton Airport
	EGHH	ICAO Location Indicator for Bournemouth Airport
	EGHI	ICAO Location Indicator for Southampton Airport
	EGKK	ICAO Location Indicator for London Gatwick Airport
	EGLC	ICAO Location Indicator for London City Airport
	EGLF	ICAO Location Indicator for Farnborough Airport
	EGLL	ICAO Location Indicator for London Heathrow Airport
	EGMC	ICAO Location Indicator for Southend Airport
	EGSS	ICAO Location Indicator for London Stansted Airport
	EGWU	ICAO Location Indicator for Northolt Airport
F	FAS	Future Airspace Strategy
	FB WP	Fly-by waypoint
	FDR	Flight Data Recorder
	FIR	Flight Information Regions
	FL	Flight Level
	FMC	Flight Management Computer

	FMGC	Flight Management Guidance Computer
	FMS	Flight Management System
	FO WP	Fly-over waypoint
	FTE	Flight Technical Error
G	GNSS	Global Navigation Satellite System
	GPS	US DoD Global Positioning System
H	HDGs	Headings
	hPa	Hectopascal – 1 hectopascal is equivalent to 1 millibar
I	ICAO	International Civil Aviation Organisation
	IFP	Instrument Flight Procedure
	ILS	Instrument Landing System
	IRS	Inertial Reference System
J	JAA	Joint Aviation Authorities
K	KIAS	Indicated Air-speed in Knots
	Kts	Knots
L	Leq	Equivalent continuous sound level
	LAMP	London Airspace Management Programme
	LHR	London Heathrow
M	M	Magnetic
	Mag Var	Magnetic Variation
	MID	Midhurst D/VOR
	MSD	Minimum Stabilisation Distance
	MSL	Minimum Segment Length
N	NADP	Noise Abatement Departure Procedures
	NATS	The group of companies that includes NERL and NATS Services Limited
	NERL	NATS (En Route) plc
	ND	Navigation Display
	NOTAM	Notice to Airmen
	NPR	Noise Preferential Route
	NMS or nms	Nautical Miles
	NSE	Navigation System Error

P	PANS OPS	Procedures for Air Navigation Services Operations
	PBN	Performance-based Navigation
	PDE	Path Definition Error
	PF	Pilot Flying
	PIR	Post Implementation Review
	PIRG	PIR Group
	PM	Pilot Monitoring
	PNF	Pilot Not Flying
	PRNAV	Precision Area Navigation
	PT	Path Terminator
R	R plus 3 digit number	Radial (No:) from a VOR (eg. R260 = 260 degree radial from a specified point)
	RF Turns	Radius to Fix Turns
	RNAV-1	Area Navigation
	RNP	Required Navigation Performance
	RNP APCH	PBN approach procedure
S	SAM	Southampton D/VOR
	SEL	Sound Exposure Level
	SFD	Seaford D/VOR
	SID	Standard Instrument Departure
	STAR	Standard Terminal Arrival Route
	SW	South West
T	TF leg	Track to Fix leg
	TSE	Total System Error
V	VI leg	Vector to Intercept leg
	VOR	Very High Frequency Omnidirectional Radio Range
W	WP	Waypoint