Implementation Plans for Application of
5 Minute Longitudinal Separation on intersecting Tracks
and
42.6 km (23 NM) Lateral Separation
between appropriately equipped aircraft operation in Shanwick CTA

Version 1.0 – November 2017
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IMPLEMENTATION PLAN FOR APPLICATION OF 5 MINUTE LONGITUDINAL SEPARATION BETWEEN PBCS COMPLIANT ADS-C EQUIPPED AIRCRAFT OPERATING ON INTERSECTING TRACKS IN THE SHANWICK CTA

1. Introduction

1.1 Advancements in aircraft avionics and air traffic management flight data processing systems have recently driven analysis of whether the lateral and longitudinal separation standards in the current NAT High Level airspace could be reduced to increase the efficiency of the airspace. As part of this process the NAT approved in 2016 to add in the Application of Separation Minima North Atlantic Region (NAT ASM Doc 008) the following separation minima Appendix A:

5 minutes between aircraft between aircraft cruising, climbing or descending on:

1. The same track; or
2. Crossing tracks provided that the relative angle between the tracks is less than 90 degrees.

<table>
<thead>
<tr>
<th>Separation minima</th>
<th>RNP</th>
<th>RCP</th>
<th>RSP</th>
<th>Maximum ADS-C periodic reporting interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 minutes</td>
<td>2 or 4 or 10</td>
<td>240</td>
<td>180</td>
<td>14 minutes</td>
</tr>
</tbody>
</table>

1.2 The 5 minute separation on intersecting tracks was introduced in PANS-ATM (Doc 4444) 5.4.2.9 Performance-Based Longitudinal Separation in November 2016, and for Shanwick operations represents formalisation of the Reduced Longitudinal Separation which Shanwick implemented as a trial in 2012.

1.3 In practice the transition from the RlongSM Trial application of 5 minutes longitudinal separation between aircraft on same identical or diverging tracks, to 5 minutes longitudinal same direction on intersecting tracks (less than 90 degrees) represents a small change, and has little impact to operational controllers.

1.4 The implementation process is in accordance with NATS Safety Management Manual (SMM) which is in accordance with guidelines provided in SASP Circulars that deal with implementation of separation:

<table>
<thead>
<tr>
<th>SASP Implementation Step</th>
<th>NATS Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Undertake widespread regional consultation with all possible stakeholders and other interested parties.</td>
<td>The following parties are consulted: a) Regulatory authorities. b) NAT SPG Structure. c) Aircraft operators via publication of an AIC. d) Adjacent ANSPs through Letters of Agreements &amp; Interface Control Documents.</td>
</tr>
<tr>
<td>Step 2: Develop an airspace design concept or ensure that the proposed separation minima being implemented will fit the current airspace system and regional or state airspace planning strategy.</td>
<td>The airspace design concept does not need to change for application of 5 minute longitudinal separation.</td>
</tr>
<tr>
<td>Step 3 Review Circular 343 noting specific assumptions, constraints, enablers and system performance requirements.</td>
<td>There are no assumptions, constraints, enablers and system performance requirements documented by ICAO for the application of the 5 minute</td>
</tr>
</tbody>
</table>
### SASP Implementation Step

<table>
<thead>
<tr>
<th>SASP Implementation Step</th>
<th>NATS Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>longitudinal separation.</td>
</tr>
<tr>
<td>Step 4 Compare assumptions, enablers, and system performance requirements in this circular with the regional or State’s operational environment, infrastructure and capability.</td>
<td>There are no assumptions, constraints, enablers and system performance requirements documented by ICAO for the application of the 5 minute longitudinal separation.</td>
</tr>
<tr>
<td>Step 5 If a region or State or ANSP has determined that the change proposal for that region or State is equal to or better than the reference, requirements and system performance in this circular, then the region or State must undertake safety management activities including:</td>
<td>There are no documented reference, requirements and system performance for the application of the 5 minute longitudinal separation.</td>
</tr>
<tr>
<td>Step 5a) formal hazard and consequence(s) identification, and safety risk analysis activities including identification of controls and mitigators;</td>
<td>NATS will conduct hazard identification as well as risk assessment and mitigation in accordance with NATS Safety Management System (SMS) as defined in NATS Safety Management Manual (NATS SMM). These are approved by the UK regulator before the new longitudinal separation standard is implemented. This assurance activity needs to be completed before approval is granted by the UK regulator.</td>
</tr>
<tr>
<td>Step 5b) implementation plan;</td>
<td>This document is the implementation plan.</td>
</tr>
<tr>
<td>Step 5c) techniques for hazard identification/safety risk assessment which may include: 1) the use of data or experience with similar services/changes;</td>
<td>RLongSM 5 minute separation (same identical track or diverging) has been in use for some time in conjunction with Gander. ATC Procedures have been reviewed and subjected to a full ATC Procedures Safety Analysis (APSA) before being accepted as suitable to support transition to the application of 5 minutes longitudinal separation up to 89 degrees as per PANS-ATM (Doc 4444) Chapter 5 Provisions In support of PBCS and the application of performance based separations, NATS provide monitoring data in accordance with ICAO Doc 9869 Performance Based Communication &amp; Surveillance (PBCS) and Global Data Link Document (GOLD) ICAO Doc10337.</td>
</tr>
</tbody>
</table>

### Identification of the Need for Change

2.1 There is general agreement in the NAT to implement reduced separation minima based on advanced aircraft equipage such as ADS-C.
2.2 This separation represents the output of a successful trial of reduced longitudinal separation known as RLongSM, and signifies the operational implementation of existing distance-based separation under the newly amended ICAO provisions.

2.3 Application of 5 minutes longitudinal separation between appropriate aircraft operating on intersecting tracks is expected to result in a reduction in fuel burn and a consequent reduction in greenhouse gas emissions through an increased likelihood of flights being able to operate at their optimum flight levels. This will have the added benefit of allowing return on operator investment in aircraft avionics.

3. **Strategic Lateral Offset Procedure (SLOP)**

3.1 Strategic lateral offsets of one or two miles right of a route or track centreline have been introduced as a means of reducing collision risk and is now standard operating procedure in the entire NAT Region.

3.2 There is no change to application of SLOP within the Shanwick CTA. PANS Chapter 16.

4. **ATC System**

4.1 The air traffic control systems employed in the Shanwick Oceanic Control Centre is known as GAATS+ Flight Data Processing System (FDPS) providing:

- General flight data processing.
- Electronic flight progress strips.
- Automatic internal and external coordination.
- Long term Conflict probing.
- Flight progress calculation based on a weather model.
- FANS1/A ADS-C and CPDLC.
- ARINC 623 Oceanic clearance delivery.
- Lateral- and vertical conformance monitoring against the cleared oceanic flight profile.
- Functionality to graphically display flight profiles, estimates, crossing times, special use airspace etc.
- Voice Communication System (VCS) for both internal and external voice communication.

4.2 The FDPS software updates to meet the separation provisions will primarily be within the conflict algorithms, and will be similar to the application of the 10 minutes (PANS-ATM Chapter 5) intersecting separation currently applied in the Shanwick CTA, whereby procedural conflict probes are updated to apply 5 minutes longitudinal separation between appropriate aircraft under appropriate conditions.

4.3 Application of the 10 minutes intersecting separation is being removed as part of the transition to 5 minutes intersecting separation.

4.4 The system will also be designed to restrict the application of 5 minute intersecting separations within the Shanwick CTA and within adjacent Oceanic CTAs that have agreed their applications through updates to Letters of Agreements and Interfacility Control Documents.

4.5 Adaptation will control the application of the 5 minute intersecting separation to more quickly accommodate changes to adjacent airspace agreements.

4.6 5 minute longitudinal separation between aircraft operating on intersecting tracks will only be applied between aircraft that satisfy the following conditions:
4.6.1 Strategic Application Phase – Pre Boundary Oceanic Clearance Issue (approximately 30 – 90 minutes before entry)

This phase allows planning controllers to issue clearances based on flight plan equipage prior to aircraft being required to establish connections with the Shanwick FDP.

1. MNPS or RNP 2 / 4 / 10 approval has been filed in FPL; and
2. ADS-C equipage has been filed in FPL; and
3. CPDLC equipage has been filed in FPL; and
4. PBCS Item 10a: P2 (RCP240) designator has been filed in FPL;
5. PBCS Item 18: SUR/180 (RSP180) designator has been filed in FPL;
6. Route remains with North Atlantic Region OCAs that apply 5 minutes longitudinal intersecting separation.

4.6.2 Strategic Application Phase – Pre Boundary Phase (approximately 20 minutes before entry)

This phase is a pre-entry check that ensures that the filed FANS1/A equipage filed in FPL is operational.

If no connection is detected at this phase, an alert is output to the planning controller who will attempt to have flight connected, or apply another form of separation.

1. AFN connection been established between aircraft and FDP

4.6.3 Strategic Application Phase – Pre Boundary Phase (approximately 10 - 15 minutes before entry)

This phase allows planning controllers to be able to respond aircraft that cannot meet the connection requirements prior to entry to Shanwick airspace.

1. ADS-C 14 minute Periodic established with FDP
2. CPDLC Next Data Authority (NDA) connection established with FDP

4.6.4 Tactical Application Phase – En-route (approximately 0-5 minutes after entry)

This phase allows the en-route controller to carry out the required actions to ensure a CDA connection is established.

1. CPDLC Current Data Authority (CDA) connection established with FDP

5. Identification of the Method of Safety Assessment

5.1 The ICAO SASP has done collision risk modelling for application of 5 minute longitudinal separation on tracks that intersect up to 89°. The NATS implementation satisfies all conditions for application of the 5 minute separation on intersecting tracks.

5.2 NATS will conduct the appropriate safety assessments including an implementation safety assessment (hazard identification and risk analysis focusing on localized issues) in accordance with NATS safety assessment procedures.
6. **Evaluation of the Risk**

6.1 The ICAO SASP has done collision risk modelling for application of 5 minute longitudinal separation on tracks that intersect up to 89°.

6.2 The NATS implementation satisfies all conditions for application of the 5 minute separation on intersecting tracks as per PANS-ATM (Doc 4444) Chapter 5.

6.3 An implementation safety assessment will be conducted by NATS and needs to be approved by the UK regulator before the separation can be implemented.

7. **Assessment of the SASP Hazard Log**

7.1 NATS has done a preliminary assessment of the SASP hazard logs for implementation of RLatSM and RLongSM and those are considered to also cover the implementation of the 5 minute standard.
IMPLEMENTATION PLAN FOR APPLICATION OF 42.6KM (23 NM) LATERAL SEPARATION BETWEEN PBCS COMPLIANT ADS-C EQUIPPED AIRCRAFT IN THE SHANWICK CTA

1. Introduction

1.1 Advancements in aircraft avionics and air traffic management flight data processing systems have recently driven analysis of whether the lateral- and longitudinal separation standards in the current NAT High Level airspace could be reduced to increase the efficiency of the airspace. As part of this process the NAT approved in 2016 to add in the Application of Separation Minima North Atlantic Region (NAT ASM Doc 008) the following separation minima Appendix A:

42.6km (23 NM) lateral separation between aircraft operating on parallel or non-intersecting tracks or ATS routes in accordance with the following:

1. A navigational performance of RNP4 or RNP 2.
2. Communication system shall satisfy communication performance 240 (RCP 240) and the surveillance system shall satisfy required surveillance performance 180 (RSP 180).

Conformance monitoring shall be ensured by establishing an ADS-C event contract specifying a lateral deviation change event with a maximum of 5 NM threshold and a waypoint change event.

<table>
<thead>
<tr>
<th>Lateral Separation minima</th>
<th>RNP</th>
<th>RCP</th>
<th>RSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.6km (23 NM)</td>
<td>2 or 4</td>
<td>240</td>
<td>180</td>
</tr>
</tbody>
</table>

Note Shanwick implementation sets the lateral deviation contract is set to 3NM.

1.2 The 42.6km (23 NM) lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes was introduced in PANS-ATM (Doc 4444) 5.4.1.2.1.6.b Lateral Separation in November 2016, and for Shanwick operations represents formalisation of the Reduced Lateral Separation (RlatSM) which Shanwick implemented as a trial in November 2015.

1.3 In practise the transition from the RlatSM Trial to the application of 42.6km (23 NM) lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes is a small change, as this is more of an expansion of the application of reduced lateral separation beyond the NAT Organised Tracks (OTS) rather than a new application, and therefore has little impact to operational controllers.

1.4 The implementation process is in accordance with NATS SMS which are in accordance with guidelines provided in SASP Circulars that deal with implementation of separation:

<table>
<thead>
<tr>
<th>SASP Implementation Step</th>
<th>NATS Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 Undertake widespread regional consultation with all possible stakeholders and other interested parties.</td>
<td>The following parties are consulted: a) Regulatory authorities. b) NAT POG and IMG. c) Aircraft operators via publication of an AIC. d) Adjacent ANSPs through Letters of Agreements &amp; Interface Control Documents.</td>
</tr>
<tr>
<td>Step 2: Develop an airspace design concept or ensure that the proposed separation minima being implemented will fit the current airspace system and regional or state airspace planning strategy.</td>
<td>The airspace design concept does not need to change for application of the 23 NM lateral separation.</td>
</tr>
<tr>
<td>SASP Implementation Step</td>
<td>NATS Implementation</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Step 3 Review this circular noting specific assumptions, constraints, enablers and system performance requirements.</td>
<td>There are no assumptions, constraints, enablers and system performance requirements documented by ICAO for the application of the 23 NM lateral separation.</td>
</tr>
<tr>
<td>Step 4 Compare assumptions, enablers, and system performance requirements in this circular with the regional or State’s operational environment, infrastructure and capability.</td>
<td>There are no assumptions, constraints, enablers and system performance requirements documented by ICAO for the application of the 23 NM lateral separation.</td>
</tr>
<tr>
<td>Step 5 If a region or State or ANSP has determined that the change proposal for that region or State is equal to or better than the reference, requirements and system performance in this circular, then the region or State must undertake safety management activities including:</td>
<td>There are no documented reference, requirements and system performance for the application of the 23 NM lateral separation.</td>
</tr>
<tr>
<td>Step 5a) formal hazard and consequence(s) identification, and safety risk analysis activities including identification of controls and mitigators;</td>
<td>NATS has conduct hazard identification as well as risk assessment and mitigation in accordance with NATS Safety Management System as defined in NATS Safety Management Manual (NATS SMM). These are approved by the UK regulator before the new lateral separation standard is implemented. This assurance activity needs to be completed before approval is granted by the UK regulator.</td>
</tr>
<tr>
<td>Step 5b) implementation plan;</td>
<td>This document is the implementation plan.</td>
</tr>
<tr>
<td>Step 5c) techniques for hazard identification/safety risk assessment which may include:</td>
<td>RLatSM has been in use as a single RLatSM Track under trial conditions. This has been subject to monitoring and reporting within NATS Safety Management procedures. Hazards were identified prior to the trial and have been updated as the user experience has matured and as the system has been updated.</td>
</tr>
<tr>
<td>1) the use of data or experience with similar services/changes;</td>
<td></td>
</tr>
</tbody>
</table>

## 2. Identification of the Need for Change

2.1 There is general agreement in the NAT to implement reduced separation minima based on advanced aircraft equipage such as ADS-C and RNP4.

2.2 This separation represents the operational implementation of existing distance-based separation application as a trial, under the newly amended ICAO provisions.

2.3 Application of 42.6km (23 NM) lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes is expected to result in a reduction in fuel burn and a consequent reduction in greenhouse gas emissions through an increased likelihood of flights being able to operate at their optimum flight levels. This will have the added benefit of allowing return on operator investment in aircraft avionics.
3. **Strategic Lateral Offset Procedure (SLOP)**

3.1 Strategic lateral offsets of one or two miles right of a route or track centreline have been introduced as a means of reducing collision risk and is now standard operating procedure in the entire NAT Region.

3.2 There is no change to application of SLOP within the Shanwick CTA. PANS 16.5.2

4. **ATC System**

4.1 The air traffic control systems employed in the Shanwick Oceanic Control Centre is known as GAATS+ Flight Data Processing System (FDPS) providing:

- General flight data processing.
- Electronic flight progress strips.
- Automatic internal and external coordination.
- Long term Conflict probing.
- Flight progress calculation based on a weather model.
- FANS1/A ADS-C and CPDLC.
- ARINC 623 Oceanic clearance delivery.
- Lateral- and vertical conformance monitoring against the cleared oceanic flight profile.
- Functionality to graphically display flight profiles, estimates, crossing times, special use airspace etc.
- Voice Communication System (VCS) for both internal and external voice communication.

4.2 The FDPS software updates to meet the separation provisions will be in the conflict algorithms, and will be similar to the application of the 25NM lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes separation currently applied in the Shanwick CTA within the RlatSM trial, whereby procedural conflict probes are updated to apply 42.6km (23 NM) lateral separation between appropriate aircraft under appropriate conditions.

4.4 The system will also be designed to restrict the application of 23 NM lateral separation within the Shanwick CTA and within adjacent Oceanic CTAs that have agreed their applications through updates to Letters of Agreements and Interfacility Control Documents.

4.5 Adaptation will control the application of the 23NM lateral separation to more quickly accommodate changes to adjacent airspace agreements.

4.6 42.6km (23NM) lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes tracks will only be applied between aircraft that satisfy the following conditions:

4.6.1 **Strategic Application Phase – Pre Boundary Oceanic Clearance Issue (approximately 30 – 90 minutes before entry)**

4.6.1.1 This phase allows planning controllers to issue clearances based on flight plan equipage prior to aircraft being required to establish connections with the Shanwick FDP.

1. RNP 2 or 4 approval has been filed in FPL; and
2. ADS-C equipage has been filed in FPL; and
3. CPDLC equipage has been filed in FPL; and
4. PBCS Item 10a: P2 (RCP240) designator has been filed in FPL;
5. PBCS Item 18: SUR/180 (RSP180) designator has been filed in FPL
6. Route remains with North Atlantic Region OCAs that apply 42.6km (23NM) lateral separation of aircraft on parallel or non-intersecting tracks or ATS routes.
4.6.2 Strategic Application Phase – Pre Boundary Phase (approximately 20 minutes before entry)

4.6.2.1 This phase is a pre-entry check that ensures that the filed FANS1/A equipage filed in FPL is operational.

4.6.2.2 If no connection is detected at this phase, an alert is output to the planning controller who will attempt to have flight connected, or apply another form of separation.

1. AFN connection been established between aircraft and FDP

4.6.3 Strategic Application Phase – Pre Boundary Phase (approximately 10 - 15 minutes before entry)

4.6.3.1 This phase allows planning controllers to be able to respond aircraft that cannot meet the connection requirements prior to entry to Shanwick airspace.

1. ADS-C Waypoint Change Event contract established with FDP
2. ADS-C 14 minute Periodic contract established with FDP
3. ADS-C Lateral Event Contract (specifying a lateral deviation change event with threshold of 23NM)
4. CPDLC Next Data Authority (NDA) connection established with FDP

4.6.4 Tactical Application Phase – En-route (approximately 0-5 minutes after entry)

4.6.4.1 This phase allows the en-route controller to carry out the required actions to ensure a CDA connection is established.

1. CPDLC Current Data Authority (CDA) connection established with FDP

5. Identification of the Method of Safety Assessment

5.2 The ICAO SASP has done collision risk modelling for application of 23 NM lateral separation of aircraft on parallel non-intersecting tracks or ATS routes. The NATS implementation already satisfies all conditions for application of the 23NM lateral separation of aircraft on parallel non-intersecting tracks.

5.3 NATS has conducted the appropriate safety assessments including an implementation safety assessment (hazard identification and risk analysis focusing on localized issues) in accordance with NATS safety assessment procedures.

6. Evaluation of the Risk

6.1 The ICAO SASP has done collision risk modelling for application of (42.6km) 23 NM separation of aircraft on parallel non-intersecting tracks.

6.2 The NATS implementation satisfies all conditions for application of (42.6km) 23 NM lateral separation of aircraft on parallel non-intersecting tracks as per PANS-ATM (Doc 4444) Chapter 5.

6.3 An implementation safety assessment will be conducted by NATS and needs to be approved by the UK regulator before the separation can be implemented.
7. **Assessment of the SASP Hazard Log**

7.1 NATS has done a preliminary assessment of the SASP hazard logs for implementation of RLatSM and RLongSM and those are considered to also cover the implementation of the 23 NM standard.

-END-