Implementation Plan

for Application of 10 Minute Longitudinal Separation between ADS-C equipped Aircraft operating on Intersecting Tracks in the Reykjavik CTA

Version 1.0
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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 2013 to add in the Application of Separation Minima North Atlantic Region (NAT ASM Doc 008) the following separation minima in paragraph 3.4.2 E:

10 minutes between turbojet aircraft with assigned Mach Numbers on intersecting tracks, whether in level, climbing or descending flight, provided the aircraft have ADS-C periodic contracts with a maximum reporting interval of 20 minutes.

Note: this application satisfies the PANS-ATM 5.4.2.2.1 b) requirement that GNSS permits frequent determination of position and speed.

1.2 This change formally established the NAT interpretation of the term “frequent determination of position and speed” that has been used in the old traditional PANS-ATM longitudinal standard that is documented in PANS-ATM section 5.4.2.2.1.b):

b) 10 minutes while vertical separation does not exist, provided that such separation is authorized only where ground-based navigation aids or GNSS permit frequent determination of position and speed (see Figures 5-17A and 5-17B); or

1.3 This Implementation plan therefore covers implementation of one of the old traditional PANS-ATM separation standards that has now been enabled by introduction of the ADS-C functionality that can provide the frequent position updates that are required in the 10 minute standard. This separation minima has already been implemented by Gander, New York, Santa Maria and Shanwick in the NAT.

1.4 In practice this implementation is a stepping stone towards implementation of 5 minute separation on intersecting tracks in accordance with the new 5 minute separation standard that will be introduced in the PANS-ATM in November 2016.

1.5 Implementation of the 10 minute standard is not covered in any ICAO Circular. However since the 5 minute separation (RLongSM) is being introduced in the Reykjavik CTA at the same time, the implementation of the 10 minute standard benefits from all the safety work that is associated with implementation of RLongSM and the guidance provided in draft Circular 343, Guidelines for the Implementation of Performance Based Longitudinal Separation Minima.

1.5 The implementation process is conducted in the following manner in accordance with the guidelines provided in SASP Circulars that deal with implementation of separation:

<table>
<thead>
<tr>
<th>SASP Implementation Step</th>
<th>Isavia implementation</th>
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<tbody>
<tr>
<td>Step 1 Undertake widespread regional consultation with all possible stakeholders and other interested parties.</td>
<td>The following parties are consulted:</td>
</tr>
<tr>
<td></td>
<td>a) Regulatory authorities.</td>
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<tr>
<td></td>
<td>b) NAT POG and IMG.</td>
</tr>
<tr>
<td></td>
<td>c) Aircraft operators via publication of an AIC.</td>
</tr>
<tr>
<td></td>
<td>d) Iceland Radio.</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 10 minute longitudinal separation.</td>
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<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 10 minute 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 10 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 10 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>Isavia will conduct hazard identification as well as risk assessment and mitigation in accordance with Isavia’s safety assessment procedures (which are approved by the Icelandic regulator) before the new longitudinal separation standard is implemented. This activity needs to be completed before approval is granted by the Icelandic 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>1) The 10 minute longitudinal separation is currently being applied to aircraft within the Iceland domestic airspace. Isavia does not have experience with application of the 10 minute separation to high level aircraft but experience is being built by Gander and Shanwick. The separation will not be implemented in Reykjavik unless application of the separation by Gander and Shanwick has been successful. 2) Quantitative modeling is not required for</td>
</tr>
</tbody>
</table>
2) quantitative modeling based on sufficient data, a validated model of the change, and analyzed assumptions;

3) the application and documentation of expert knowledge, experience and objective judgment by specialist staff; and

4) a formal analysis in accordance with appropriate safety risk management techniques as set out in the Safety Management Manual (Doc 9859);

Step 5d) identification and analysis of human factors issues identified with the implementation including those associated with Human Machine Interface matters;

Identical methods of separation using different separation minima are already in use in the Reykjavik centre using the same air traffic control systems which are:

a) Flight Data Processing System (FDPS).

b) Integrated Situation Display System (ISDS).

c) Voice Communication System.

The use of ADS-C in application of this standard is also covered in the implementation of RLongSM. This item will nevertheless be covered in the safety assessment activities, especially in relation to system changes that are done to enable application of the new separation minima and in relation to mixed mode separation because some aircraft in the NAT High Level Airspace do not qualify for this separation.

Step 5e) simulation where appropriate;

Simulation will be run during controller training.

Step 5f) operational training; and

Controllers will receive both classroom and simulator training.

Step 5g) regulatory approvals

Approval from the Icelandic regulator is required before implementation.

Step 6 If a region or State has determined that the change proposal for that region or State is not equal to the requirements and quantitative modeling is not required for the application of separation standards published in the PANS-ATM. The 10
system performance in this circular, then the region or State must:
i) consider alternative safety risk controls to achieve the technical and safety performance that matches the reference in this circular; or,
ii) conduct appropriate quantitative risk analysis for the development of a local standard in accordance with the *Manual on Airspace Planning Methodology for the Determination of Separation Minima* Doc 9689.

<table>
<thead>
<tr>
<th>Step 7: Develop suitable safety assessment documentation including a safety plan and associated safety cases.</th>
<th>minute longitudinal separation is a very old standard and any assumptions made when the standard was originally devised are no longer known. ICAO has made it clear to the SASP that the old traditional separation standards are not to be revisited.</th>
</tr>
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<tbody>
<tr>
<td>Step 8 Implementation activities should include:</td>
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<tr>
<td>Step 8 i) trial under appropriate conditions;</td>
<td>A trial application of the 10 minute separation between non-turbojet aircraft is not considered necessary because the standard has already been implemented in Gander, New York, Santa Maria and Shanwick.</td>
</tr>
<tr>
<td>Step 8 ii) expert panel to undertake scrutiny of proposals and development of identified improvements to the implementation plan;</td>
<td>An expert panel will be formed to manage the project.</td>
</tr>
<tr>
<td>Step 8 iii) develop an appropriate backup plan to enable reversion if necessary; and</td>
<td>The backup plan is reversion to the current separation standards.</td>
</tr>
<tr>
<td>Step 8 iv) continuous reporting and monitoring results of incidents, events, observations.</td>
<td>Incident and occurrence reporting, investigation and lesson dissemination to relevant staff members is a part of Isavia’s Safety Management System and applies to all operations in the Reykjavik centre.</td>
</tr>
<tr>
<td>Step 9: Develop a suitable post-implementation monitoring and review processes.</td>
<td>Post-implementation monitoring and review will be through the incident and occurrence reporting and investigation process that is in place in Reykjavik centre.</td>
</tr>
</tbody>
</table>
2 Identification of the Need for Change

2.1 The following issues are the main drivers behind the proposal to apply 10 minute longitudinal separation between appropriate aircraft operating on intersecting tracks in the Reykjavik CTA:

- There is general agreement in the NAT to implement reduced separation minima based on advanced aircraft equipage such as ADS-C. There is also a need to harmonize the application of the 10 minute separation between Reykjavik, Shanwick and Gander.

- Application of the 10 minute standard 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 without requiring a change from current NAT MNPS certification.
3 Description of the Current Airspace

3.1 Airspace Structure

3.1.1 The responsibility for air traffic control services within the North Atlantic (NAT) Region is delegated by the International Civil Aviation Organization (ICAO) to seven states: the United Kingdom, Iceland, Canada, Norway, USA, Denmark and Portugal.

3.1.2 The Icelandic Air Navigation Service Provider, Isavia, is responsible for Air Traffic Management Services above flight level 195 in the BGGL FIR north of 63°30’N as well as the entire BIRD FIR (Figure 1).

3.1.3 The airspace managed by Isavia is divided into four geographic sectors, namely the East; South; West and North Sectors (Figure 2). The first two are characterized by extensive radar and ADS-B coverage (Figure 3), the West sector is currently mostly procedural but ADS-B services are gradually being implemented (Figure 4), the North sector is procedural.

3.1.4 The four base sectors are split vertically according to the amount of traffic; the smallest definition of a sector being a single base sector with one flight level.
Figure 2: Reykjavik CTA

Figure 3: Current radar coverage
Figure 4: Current ADS-B and DCPC VHF coverage at jet levels

3.1.5 The Reykjavik CTA abuts the following control areas: Scottish, Shanwick and Gander to the south, Edmonton to the west, Murmansk, Bodø and Stavanger to the East.

3.1.6 The airspace beneath the Reykjavík CTA West - and North Sectors consists for the most part of the BGGL FIR where Flight Information Service is provided by Sondrestrøm FIC below F195, Sondrestrøm TMA when Air Traffic Control service is provided by Sondrestrøm Approach and Thule TMA where Air Traffic Control service is provided by Thule Terminal Radar Approach Control Cab (TRACAB). A small part of the West - and North sectors does however extend to sea level in the Reykjavik FIR, the lower boundary of controlled airspace in that portion is Flight Level 055.

3.1.7 The Reykjavik CTA is Class A airspace at and above F055 in which instrument flight rules (IFR) apply at all times. An exception to this is the domestic airspace over Iceland where the airspace below F195 is Class E for the most part. The oceanic airspace below F055 is Class G airspace.

3.1.8 The major airports in the area served by MNPS approved aircraft are Keflavík, Reykjavík and Akureyri airports in Iceland, Vagar in the Faroe Islands, Sondrestrøm and Thule airports in Greenland. In addition there are a number of regional airports in Iceland and Greenland which are mainly served by regional aircraft.

3.1.9 The NAT traffic is predominantly commercial. International General Aviation (IGA) Business aircraft comprise a high proportion of the higher altitude airspace operations while regional commercial aircraft and private aircraft operate below the NAT High Level Airspace (HLA).
3.2 **Strategic Lateral Offset Procedure (SLOP)**

3.2.1 Strategic lateral offsets of one or two miles right of a route or track centerline have been introduced as a means of reducing collision risk and is now standard operating procedure in the entire NAT Region. SLOP is however not allowed below F285 in the Reykjavik CTA due to the application of GNSS lateral separation.

3.3 **Airborne Collision Avoidance Systems (ACAS)**

3.3.1 In addition to the requirements of Annex 6, (Part I, paragraph 6.16 and Part II, paragraph 6.14) ACAS II shall be carried and operated in the NAT Region by all turbine-engine aircraft having a maximum certificated take-off mass exceeding 5 700 kg or authorized to carry more than 19 passengers.
4 Traffic Patterns and Procedural Separation

4.1 General

4.1.1 The traffic is dominated by five major traffic flows:

- First is the traffic linking Iceland with Europe and North America.
- Second is the traffic linking Europe to North America. The volume of this traffic flow varies from day-to-day depending on the high altitude winds and the corresponding location of the NAT organized track system (OTS).
- Third is the traffic linking the Middle East, India and Pakistan to North America.
- Fourth is the traffic linking North America with the Far East.
- Fifth is the low level traffic below the MNPS airspace which is mostly comprised of:
  - Icelandic domestic traffic.
  - Greenland domestic traffic.
  - Traffic between Iceland and Greenland and the Faroes
  - International general aviation traffic transiting the NAT.

4.1.2 The major traffic flow between Europe and North America takes place in two distinct traffic flows during each 24-hour period due to passenger preference, time zone differences and the imposition of night-time noise curfews at the major airports. The majority of the Westbound flow leaves European airports in the late morning to early afternoon and arrives at Eastern North American coastal airports typically some 2 hours later - local time - given the time difference. The majority of the Eastbound flow leaves North American airports in mid/late evening and arriving in Europe early to mid-morning local time. Consequently, the diurnal distribution of this traffic has a distinctive tidal pattern characterized by two peaks passing 30° W, the Eastbound centered on 0400 Universal Coordinated Time (UTC) and the Westbound centered on 1500 UTC.

4.1.3 Following are a few key figures concerning the international traffic within the Reykjavik CTA in the last few years (excluding the Icelandic domestic traffic):

<table>
<thead>
<tr>
<th>Month</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>Diff.% 14/15</th>
<th>Average per 24 hours</th>
</tr>
</thead>
</table>

Total 90.970 97.747 105.434 110.366 101.503 102.275 111.489 107.998 116.326 130.856 145.891 11.5% 400

Figure 5: Number of international flights in the Reykjavik CTA.
Average flight time of aircraft within the Reykjavik CTA is 1 hour 42 minutes. Average flight distance is 775 NM.

Figure 6: Yearly traffic increase in the Reykjavik CTA 2004-2015.

Figure 7: Division between Westbound and Eastbound flights.

Figure 8: Division between overflights and flights to/from Iceland.
Figure 9: Division between Commercial, General aviation and Military

Figure 10: Westbound vs. Eastbound and Total per month in 2015.

Figure 11: Division between Random traffic and OTS traffic in 2015.
Figure 12: Use of high level flight levels in the Reykjavik CTA in 2015.

Figure 13: Arrival time of aircraft into the Reykjavik CTA in 2014 and 2015.

Figure 14: Arrival time of aircraft into the Reykjavik CTA in 2015 divided between westbound and eastbound aircraft.
Figure 15: Largest aircraft operators in the Reykjavik CTA in 2015.

Figure 16: Most common aircraft types in 2015.

Figure 17: Most common city pairs in 2015.
4.2 North Atlantic Organized Track System (NAT OTS)

4.2.1 As is the norm in most of the NAT Region the Reykjavik CTA is free of fixed routes, the only constrains on routing being the use of anchor points at whole degrees of latitude at every whole decades of longitude for tracks trending West/East and at 5° intervals of latitude for North/South oriented tracks.

4.2.2 A significant portion of the NAT traffic operates on tracks, which vary from day to day dependent on meteorological conditions. The variability of the wind patterns would make a fixed track system unnecessarily penalizing in terms of flight time and consequent fuel usage. Nevertheless, the volume of traffic along the core routes is such that a complete absence of any designated tracks (i.e. a free flow system) would currently be unworkable given the need to maintain procedural separation standards in airspace largely without radar and ADS-B surveillance.

4.2.3 As a result, an OTS is set up on a diurnal basis for each of the Westbound and Eastbound flows. Each core OTS is comprised of a set, typically 4 to 7, of parallel or nearly parallel tracks, positioned in the light of the prevailing winds to suit the traffic flying between Europe and North America.

4.2.4 The designation of an OTS facilitates a high throughput of traffic by ensuring that aircraft on adjacent tracks are separated for the entire oceanic crossing - at the expense of some restriction in the operator's choice of track. In effect, where the preferred track lies within the geographical limits of the OTS, the operator is obliged to choose an OTS track or fly above or below the system. Where the preferred track lies clear of the OTS, the operator is free to fly it by nominating a random track. Trans-Atlantic tracks, therefore, fall into three categories: OTS, Random or Fixed.

4.2.5 The location of the NAT tracks depends on the meteorological conditions and varies from day to day. In 2015 96% of the traffic in the Reykjavik CTA was on random tracks and 4% was on the NAT tracks. During 2015 the westbound NAT tracks entered the Reykjavik CTA 107 days while the eastbound NAT tracks entered the Reykjavik CTA only 3 days.

4.2.6 With implementation of NAT Data link mandate phase 2a on 5 February 2015 FANS compatible data link is required to fly at F350-390 inclusive on the NAT tracks.

4.3 Navigation Performance Specifications

4.3.1 The NAT High Level Airspace (HLA) is established between FL285 and FL420 and superseded the NAT MNPS airspace on 4 February 2016. To ensure the safe application of separation between aircraft in the NAT HLA airspace, aircraft normally need to have a MNPS approval or a NAT HLA MNPS approval to operate within this part of the NAT airspace. An exception to this is that non-approved aircraft are allowed to enter the NAT HLA airspace if the following conditions are satisfied:

✓ The aircraft is provided with an ATS Surveillance service; and
✓ The aircraft is in Direct controller pilot communications on VHF; and
✓ The aircraft is equipped with a long range navigation system.

4.3.2 The NAT HLA was established to ensure that the risk of collision as a consequence of a loss of horizontal separation would be contained within an agreed Target Level of Safety (TLS). The navigation component of the MNPS approval is based on the Annex 6 MNPS requirements and the navigation component of the NAT HLA MNPS approval is based on the RNAV 10 or RNP 4 requirements.
4.3.3 The lateral separation applied between any combination MNPS approved and NAT HLA MNPS approved aircraft in the Reykjavík CTA is currently 50 NM. For the most part, aircraft tracks are separated using the earth’s coordinate system to define tracks and effect separation laterally by 50 NM or 1 degree provided a portion of the route is within, above, or below the NAT HLA airspace. Isavia is planning to implement RLatSM on the NAT OTS at the same time as RLongSM will be implemented.

4.3.4 The longitudinal separation minima applied in the airspace vary greatly depending on aircraft class (jet, prop) among other criteria but for the target population the values are 15 minutes for crossing tracks and 10 minutes for aircraft that have reported a common point and follow the same track or continuously diverging tracks. One other implementation plan that is being prepared concurrently with this plan proposes the following change to longitudinal separation:

- 10 minutes between aircraft on intersecting tracks provided the aircraft have ADS-C contracts with at least a 20 minute periodic report contract.

4.4 Reduced Vertical Separation Minimum (RVSM)

4.4.1 RVSM airspace has been established within the confines of the NAT HLA airspace and associated transition areas. In RVSM airspace, 1000 feet vertical separation is applied between approved aircraft. Currently, RVSM is only applied between FL 290 and FL 410 inclusive. To ensure the safe application of the separation minimum, only RVSM approved aircraft are allowed to operate within RVSM airspace. Aircraft are monitored to ensure that the TLS is being met.

4.5 Special Use Airspace

4.5.1 There is no permanent special use airspace in the Reykjavík CTA high level airspace. Temporary special use airspace is however on occasions established to cater for military exercises.
5 Communication, Navigation, Surveillance

5.1 Communication

5.1.1 Air/Ground Communication
5.1.1.1 The following air/ground communication possibilities are available in the Reykjavik sectors:

- South, East and West sectors:
  - Direct controller pilot VHF voice communications.
  - General purpose VHF voice communications via Iceland radio.
  - HF voice communications via Iceland radio.
  - FANS1/A CPDLC.
  - SATCOM voice via Iceland radio and direct to the controller.
  - Oceanic clearance delivery via ARINC 623 data link.

- North sector:
  - HF voice communications via Iceland radio.
  - FANS1/A CPDLC. Due to satellite coverage limitations this service is only available south of 82N for aircraft equipped with Inmarsat data link.
  - SATCOM voice via Iceland radio and direct to the controller.
  - Oceanic clearance delivery via ARINC 623 data link. Due to satellite coverage limitations this service is only available south of 82N for aircraft equipped with Inmarsat data link.

5.1.1.2 All aircraft operating within the Reykjavík FIR/CTA shall maintain continuous watch on the appropriate frequency of Iceland Radio unless engaged in direct controller pilot communications with Reykjavik Control. HF RTF communication equipment with appropriate frequencies available is mandatory outside VHF coverage. When operating outside VHF coverage aircraft are required to be equipped with dual long range voice communications system (HF or SATCOM). 62% of MNPS approved and NAT HLA approved aircraft operating in the Reykjavik CTA is also FANS1/A equipped. This low equipage number is mainly explained by the large number of non-FANS equipped B757 and A320 aircraft that operate in and out of Iceland.

5.1.2 Ground/Ground Communication
5.1.2.1 Communication between sectors within the Reykjavik center is primarily effected through interactions with the Flight Data Processing System (FDPS) though voice intercom is of course available.

5.1.2.2 An On-Line Data link Interface exists with Gander, Edmonton, Shanwick, Scottish, Stavanger, Bodö and the Faxi TMA serving Reykjavik and Keflavik airports. This is used for initial coordination of flights crossing the common boundary. Any subsequent negotiation is effected via leased line voice connections. All coordination with Murmansk, Sondrestrøm FIC, Sondrestöm APP, Thule APP and Vagar is effected via leased line voice connections.

5.1.2.3 Communication between Reykjavik OACC and Iceland radio is via AFTN and dedicated phone lines.
5.2 Navigation

5.2.1 The required navigation performance of aircraft operating in the NAT HLA is specified in the NAT section of DOC 7030. The required performance is:

- MNPS with standard deviation of lateral track errors less than 11.7 km (6.3 NM); or
- RNAV 10 as specified in the PBN Manual (ICAO Doc 9613); or
- RNP 4 as specified in the PBN Manual.

5.2.2 Except when operating on the special “Blue Spruce Routes” or under the exemption described in section 4.3.1 above aircraft operating in the NAT HLA are required to carry two independent long range navigation systems.

5.2.3 MNPS aircraft navigate mostly using GNSS and IRS/INS. Several ground based navigations aids such as VOR, NDB and DME are available in Iceland, Faroe Islands and Greenland but those aids are scarce and far between and do therefore not significantly contribute towards the navigation performance.

5.2.4 The navigation equipage in the Reykjavik CTA in the year 2015 was as follows. The traffic sample is all flights in the Reykjavik CTA excluding Iceland domestic flights:

a) GNSS equipage is 93.7%.

b) MNPS equipage is 94.2%.

c) Of all MNPS flights 51.1% are RNP 4 approved.

d) Of all MNPS flights 70.1% are RNAV 10 approved.

5.3 Surveillance

5.3.1 ATS Surveillance service is currently provided with radar and ADS-B as follows:

a) There are seven SSR radar stations; five stations in Iceland, one station in the Faroe Islands and one station in the Shetland Islands (see figure 18 below).

b) There are eight ADS-B stations in eight different locations in Iceland.

c) There are four ADS-B stations in two locations in the Faroe Islands.

d) There are ten ADS-B stations in five locations in Greenland.

(see ADS-B coverage in figure 19 below).
5.3.2 The ATS surveillance system (radar and ADS-B) allows the ATC system to provide more economical flight profiles to flights in the South-East and West sectors than could be provided in a procedural system. The ATS surveillance system also provides lateral- and vertical conformance monitoring against the cleared oceanic flight profile.
5.3.3 Surveillance data is otherwise provided to the Reykjavik ATC system by:

- Voice position reports via HF and general purpose VHF via Iceland radio and other radio stations.
- Position reports via FANS1/A ADS-C.

5.3.4 Surveillance data is presented to the controller on an Integrated Situation Display System (ISDS) displaying ATS surveillance tracks and FDPS generated CPL tracks where no radar data is available. Distinction between radar, ADS-B, combined radar/ADS-B- and CPL tracks is done using symbology and color coding (see figure below).

![Integrated Situation Display System (ISDS)](image)

**Figure 20: Integrated Situation Display System (ISDS).**

5.4 **ATC System**

5.4.1 The air traffic control systems employed in the Reykjavik control center are:

- **Flight Data Processing System (FDPS) providing:**
  - General flight data processing.
  - Electronic flight progress strips.
  - Automatic internal and external coordination.
  - Long term and medium term Conflict probing.
  - Flight progress calculation based on a weather model.
  - FANS1/A ADS-C and CPDLC.
  - ARINC 623 Oceanic clearance delivery.

- **Integrated Situation Display System (ISDS) and radar data processing system providing:**
  - Multi Radar data processing.
  - Air situation picture showing both radar and CPL tracks.
  - Short Term Conflict Alerting (STCA).
- Arrival Manager (AMAN).
- 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.
6 Determination of the Proposed System and Operational Application

6.1 10 minute longitudinal separation between aircraft operating on intersecting tracks will only be applied between aircraft that satisfy the following conditions:

- MNPS approval has been filed in the FPL; and
- ADS-C flag is set to “1” which indicates that the status of ADS-C contracts with the aircraft in relation to the location of the aircraft is appropriate for application of the separation and that a position report is not overdue by more than 6 minutes.
- Periodic ADS-C position reporting interval is 14 minutes.¹

6.2 Application of the separation will be aligned with Gander and Shanwick by applying the same conditions for separation. “Normal” longitudinal separation will be provided to Edmonton (when not applying ADS-B), Murmansk and Bodø. There are no restrictions at the BIRD/Stavanger and BIRD/Scottish boundaries since those boundaries are covered by ATS surveillance.

6.3 RSP 180 approval will not be required. The performance of the ADS-C system is however monitored against RSP 180 in accordance with NAT SPG conclusions.

6.4 The following changes are done to the Reykjavik ATC system to support application of the 10 minute longitudinal separation:

a) The procedural conflict probe is changed to apply the 10 minute longitudinal separation under appropriate conditions.

b) The FDPS position report overdue monitoring is modified to satisfy the requirements in the following PANS-ATM provision that is associated with application of the 5 minute separation:

5.4.2.9.7 When an ADS-C periodic or waypoint change event report is not received within 3 minutes of the time it should have been sent, the report is considered overdue and the controller shall take action to obtain the report as quickly as possible, normally by ADS-C or CPDLC. If a report is not received within 6 minutes of the time the original report should have been sent, and there is a possibility of loss of separation with other aircraft, the controller shall take action to resolve any potential conflict(s) as soon as possible. The communication means provided shall be such that the conflict is resolved within a further 7 1/2 minutes.

If a report is overdue by 3 minutes the FDPS will automatically send a demand ADS-C contract. If a report is overdue by 6 minutes the 10 minute separation is not considered to exist anymore.

c) Electronic flight progress strips are amended to show ADS-C status for application of the 10 minute separation.

d) A new “Aircraft equipment and capabilities” window is introduced into the FDPS to make it easier for controllers to view and modify the aircraft equipment and capabilities filed in Items 10 and 18 of the flight plan.

¹ The 10 minute separation only requires a 20 minute periodic reporting interval but the Isavia implementation will utilize the 14 minute interval in accordance with the ICAO 5 minute standard.
c) Medium Term Conflict Detection (MTCD) is introduced. This warns the controller if distance between aircraft is expected to fall below a certain defined value (f.ex. 12 NM TBD).

d) Adapted “black hole” airspace volumes are introduced in the South and East sectors in which pairs of ATS surveillance identified aircraft are not conflict probed for procedural separation but only for MTCD and STCA.

6.5 The planned implementation date is in November 2016. Details of the implementation will be published in an AIC.
7 Identification of the Method of Safety Assessment

7.1 The 10 minute longitudinal separation is a very old standard and any assumptions made when the standard was originally devised are no longer known. ICAO has made it clear to the SASP that the old traditional separation standards are not to be revisited. Quantitative modeling is not required for the application of separation standards published in the PANS-ATM.

7.2 The ICAO SASP has however done collision risk modelling for application of 5 minute longitudinal separation on tracks that intersect up to 89°. The Isavia implementation already satisfies all conditions for application of the 5 minute separation on intersecting tracks except that RCP 240 and RSP 180 approval is not required pending the outcome of the NAT PBCS transition strategy. Since almost all aircraft using ADS-C are also equipped with and using CPDLC it can be argued that any requirements for application of the 10 minute standard are met by meeting the criteria for application of the 5 minute standard.

7.3 Isavia will conduct the appropriate safety assessments including an implementation safety assessment (hazard identification and risk analysis focusing on localized issues) in accordance with Isavia’s safety assessment procedures.
8 Evaluation of the Risk

8.1 General

8.1.1 The 10 minute longitudinal separation published in the PANS-ATM is a long standing separation standard. Apart from the NAT ASM condition for using ADS-C at a minimum 20 minute reporting rate, there are no documented conditions for the application of the standard and any assumptions made when the standard was originally devised are no longer known.

8.1.2 The standard is being applied in the Gander, New York, Santa Maria and Shanwick areas and Isavia is not aware of any problems with application of the standard within those areas.

8.1.3 The ICAO SASP has done collision risk modelling for application of 5 minute longitudinal separation on tracks that intersect up to 89°. The Isavia implementation already satisfies all conditions for application of the 5 minute separation on intersecting tracks except that RCP 240 and RSP 180 approval is not required pending the outcome of the NAT PBCS transition strategy. Since almost all aircraft using ADS-C are also equipped with and using CPDLC it can be argued that any requirements for application of the 10 minute standard are met by meeting the criteria for application of the 5 minute standard. The 10 minute standard can in practice be viewed as a temporary transition to application of 5 minute separation between aircraft operating on intersecting tracks.

8.1.4 An implementation safety assessment will be conducted by Isavia and needs to be approved by the Icelandic regulator before the separation can be implemented.
9 Assessment of the SASP Hazard Log

9.1 Isavia 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 10 minute standard.

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