

PBCS Airspace impact Simulation

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NATS

Planned -v- Predicted Service Impacts



- **Planned Service impact**

- NATS simulation estimated that transitioning from trial application of RLongSM (same identical or diverging routes) and RLatSM (Phase 2; OTS) to PBCS longitudinal of 5 minutes (same direction), and 23nm lateral separation between pairs of PBCS authorised flights, would provide more opportunities for aircraft to be allocated their requested trajectories, thereby reducing fuel burn, the number of re-routes issued and controller workload alike.
- NATS Baseline assumes 83% of all NAT traffic (~96% OTS) was Datalink (ADS-C / CPDLC) equipped.

- **Predicted Service Impact**

- NATS completed two short simulation assessments of service impact
 1. In December 2017, to estimate the likely impact on service performance if 25%, 50% or 75% of customers secured a PBCS “certification” (i.e. regulatory certification / approval to achieve RCP240 / RSP180), and in January 2018, to estimate impact using PBCS “certification” estimates from an IATA airline survey*
 2. **Using IATA Survey data**, 32% of all aircraft were simulated as PBCS compliant, with 41% of OTS traffic simulated as PBCS compliant ... all other Operators and Aircraft types not covered in the IATA survey were assumed to not be PBCS compliant.

Analysis of Service Performance Impact



- NATS Oceanic Air Traffic Simulator (OATS) tool was used to simulate traffic over NAT airspace and to assign each flight a cleared route based upon the baseline and predicted separation standards.
- Results describe service performance (i.e. requested vs. cleared routes) for Westbound Oceanic traffic.
- Key features of this analysis were :
 - It was based on a one-day traffic sample from September 1st, 2017*; using simulated tracks based around the OTS design that day; RLongSM and RLatSM trials separations were not available.
 - Aircraft would be provided the smallest separation for which they were equipped / certified
 - PBCS Compliance, data from the IATA PBCS Readiness Survey data was used to determine which flights would be allocated PBCS separations, based on operator and aircraft type.
 - Service performance for Eastbound traffic has not been considered; these flights were included for conflict detection against the Westbound traffic.
 - Results for Westbound traffic include all traffic where NATS provides the first oceanic clearance (e.g. Southbound Tango flights, Northbound Icelandic flights and some other Southbound flights).

ATC Separation Standards

- Baseline Option
 - RLongSM, plus
 - RLatSM Phase 2
 - DLM compliant separations used.
- PBCS Option
 - If compliant, smaller separations than RLongSM & RLatSM are used
 - If non-compliant, larger separations than RLongSM & RLatSM are used

The loss of RLongSM provides the greatest impact on ATC Capacity

RLatSM	Separation Standards Simulated		
	Standard	Datalink (i.e. ADS-C & CPDLC)	Non-Datalink
Following		5 Minutes	10 Minutes
Crossing		10 Minutes	15 Minutes
Lateral		23NM	50.5NM
Vertical		1000ft	1000ft
Planned		10 Minutes	10 Minutes

PBCS	Separation Standards Simulated		
	Standard	PBCS Compliant	Not PBCS compliant
Following		5 Minutes	10 Minutes
Crossing		5 Minutes	15 Minutes
Lateral		23NM	50.5NM
Vertical		1000ft	1000ft
Planned		10 Minutes	10 Minutes

- Results, include
 - All westbound traffic
 - OTS & non-OTS

	Service Performance			
	% of Flights Cleared on Requested Route (i.e. Same Entry Point, FL and Speed)	% of Flights Cleared with a 1 Dimensional shift	% of Flights Cleared with a 2 Dimensional shift	% of Flights Cleared with a 3 Dimensional shift
Current Day Q3 2017 (RLatSM Phase 1) WESTBOUND ONLY	59.0%	35.0%	5.7%	0.2%
Baseline (RLatSM Phase 2)	67.0%	33.0%	0.0%	0.0%
PBCS Scenario	54.8%	43.6%	1.4%	0.2%

- 32% of aircraft were simulated as PBCS compliant, which is loosely in line with the IATA Optimistic case figures.

- Results, include
 - All westbound traffic
 - OTS Traffic only (c. 50% of total flights)

	Westbound Service Performance			
	% of Flights Cleared on Requested Route (i.e. Same Entry Point, FL and Speed)	% of Flights Cleared with a 1 Dimensional shift	% of Flights Cleared with a 2 Dimensional shift	% of Flights Cleared with a 3 Dimensional shift
Baseline (RLatSM Phase 2)	65.6%	34.4%	0.0%	0.0%
PBCS Scenario	48.6%	49.7%	1.8%	0.0%

- 41% of OTS flights were simulated as PBCS compliant which is loosely in line with the IATA Optimistic case figures.
- Based upon this sample day of 849 westbound flights, the application of PBCS separations would result in
 - 69 more OTS flights shifted in 1 dimension per day (compared with RLongSM / RLatSM Phase 2), and
 - 8 more OTS flights shifted in 2 dimensions per day (compared with RLongSM / RLatSM Phase 2)

- Results, include
 - All westbound traffic
 - Non-OTS Traffic only (c. 50% of total flights)

	Westbound Service Performance			
	% of Flights Cleared on Requested Route <small>(i.e. Same Entry Point, FL and Speed)</small>	% of Flights Cleared with a 1 Dimensional shift	% of Flights Cleared with a 2 Dimensional shift	% of Flights Cleared with a 3 Dimensional shift
Baseline (RLatSM Phase 2)	68.6%	31.4%	0.0%	0.0%
PBCS Scenario	61.8%	36.7%	1.0%	0.5%

- 22% of OTS flights were simulated as PBCS compliant which is loosely in line with the IATA Optimistic case figures.
- Based upon this sample day of 849 westbound flights, the application of PBCS separations would result in
 - 21 more OTS flights shifted in 1 dimension per day (compared with RLongSM / RLatSM Phase 2),
 - 4 more OTS flights shifted in 2 dimensions per day (compared with RLongSM / RLatSM Phase 2), and
 - 2 more OTS flights shifted in 3 dimensions per day (compared with RLongSM / RLatSM Phase 2)
- n.b. for non-OTS flights, a 1 dimensional change may include a level change of >1000'

Service Performance Analysis - Summary



- Notwithstanding the wider benefits that PBCS can bring to NAT operations, based on the analysis conducted by NATS using the PBCS readiness data compiled by IATA, it is likely that there will be a service impact until fleet compliance increases, that is estimated within this analysis to be :
 - 69 more OTS and 21 more non-OTS flights per day shifted in 1 dimension (compared with RLongSM / RLatSM Phase 2),
 - 8 more OTS and 4 more non-OTS flights per day shifted in 2 dimensions (compared with RLongSM / RLatSM Phase 2), and
 - 2 more non-OTS flights per day shifted in 3 dimensions (compared with RLongSM / RLatSM Phase 2)
 - n.b. for non-OTS flights, a 1 dimensional change may include a level change of >1000'

Service Impact

Service impact (Shanwick)



- Primary service impact is expected to be an increase to controller workload (caused by controllers taking time to find clearances for those aircraft being shifted), that's estimated at ~4 hours of additional sector opening every day.
- NATS will make every effort to absorb this additional workload through existing resource. However, it is estimated that mitigations and workload controls will need to be applied on average for ~10 days/month when this existing resource cannot be guaranteed.
- Based on 2017 historical workload and delay data, the use of Airspace Capacity Management Measures to reduce traffic demand during peak westbound flow may be necessary, with an estimated ~1500 mins of delay for each day applied, or ~15,000 mins per month.