NATS

Performance through Innovation

PBCS Impact
OATS Simulation Results – Westbound Oceanic Service Delivery (using IATA PBCS compliance data)

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Analytics

Background

- Performance Based Communication and Surveillance (PBCS) is due to be implemented in the North Atlantic (NAT) on 29th March 2018.
- Analytics was asked to assess the impact on service performance of aircraft readiness/non-compliance to PBCS.
- The Analytics Oceanic Air Traffic Simulator (OATS) tool has been used to undertake this analysis. It simulates traffic over the NAT airspace and assigns each flight a cleared route.
- This report outlines the service performance (i.e. requested vs. cleared routes) for Westbound Oceanic traffic.
- Further details of the simulated separation standards, configuration and traffic are discussed on later slides.
- **This is an updated version of this analysis (following on from report A17200 version 2 published in Jan 18)– this new version has been based on IATA PBCS readiness survey data.** Note that in Reference to report A17200 Version 2, separation standards B have been used in the analysis in this slide pack.

Simulation Configuration

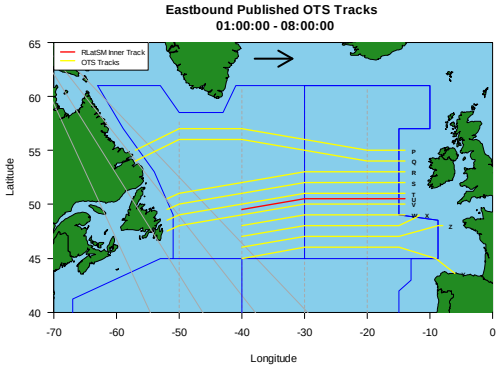
- **01/09/2017** has been selected as the sample day with the busiest oceanic traffic levels to date and is therefore assumed to be representative of March 2018 traffic. Note only one sample day was simulated, however, this is deemed acceptable to provide a snapshot of likely service performance within the timescales.
- The requested routes for Organised Track Structure (OTS) flights were determined by OATS based on simulated tracks (see slide 4). For each flight, the route with the lowest total fuel burn (i.e. total estimated fuel burn from origin to destination) was selected as the preferred route and therefore the requested route. Where it was not possible to generate the requested route in OATS, the actual requested route from the SAATS AUDIT data in the Business Intelligence Data Warehouse (BI DW) was used. **Note that for the date simulated approximately 50% of flights were OTS flights**.
- For Non OTS flights, their actual requested clearance was determined from the SAATS AUDIT data in BI DW. The final Requested Clearance (RCL) message prior to Shanwick entry was used as a requested route for all Westbound traffic. The final Oceanic Clearance message (OCM) prior to Shanwick entry was used as a requested route for all Eastbound traffic (since RCL messages for these flights are not contained in the SAATS AUDIT data).
- The simulations were then run with the demand for one day **and the service performance received within the simulations by the Westbound traffic was assessed**. Service performance received by the Eastbound traffic within the simulations has not been considered; these flights are only included for conflict detection against the Westbound traffic. When referring to Westbound traffic this means anything where NATS provides the first oceanic clearance (these include Southbound Tango flights, Northbound Icelandic flights and some other Southbound flights).

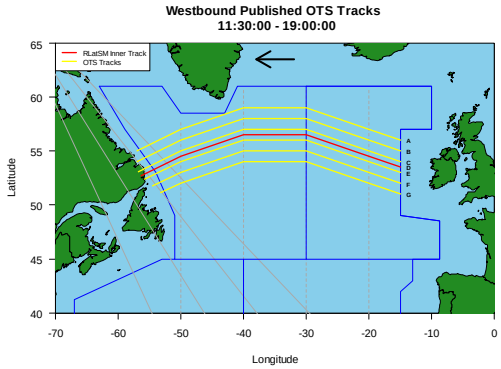
Simulated Tracks

- As the simulation date selected is 01/09/2017, the requested routes on this day are based on RLatSM Phase 1 demand**. In order to simulate demand in an RLatSM Phase 2 environment, tracks were generated in the simulation**. See below illustrations for the actual tracks published on 01/09/2017 and the subsequent RLatSM Phase 2 tracks generated for the purpose of this simulation.

Actual (RLatSM Phase 1)

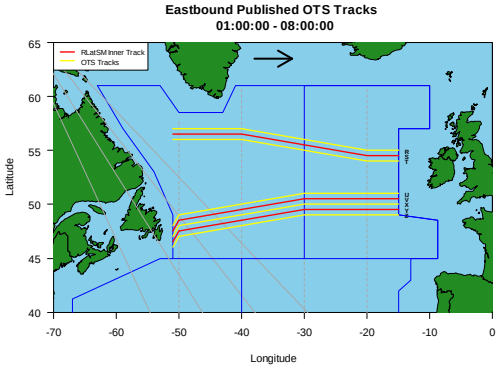
01/09/2017

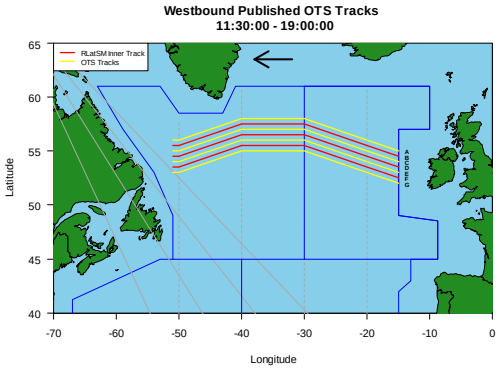




Simulated (RLatSM Phase 2)

01/09/2017





East

West

- Note that only the service performance of the Westbound traffic has been assessed, the Eastbound traffic is only included for conflict detection against the Westbound traffic.

PBCS Compliant Scenarios

- In Dec 17 IATA has published the results of a PBCS readiness survey covering the top 80+% of NAT Operators.
- This IATA data was used to derive a PBCS scenario based on the number of each aircraft type for each operator currently without a Statement of Compliance (SOC) from either Boeing or Airbus, or State Approval. This data was then applied to the traffic on 01/09/2017 to determine for this sample day which flights would be simulated as PBCS Compliant.
- Note that in this PBCS scenario constructed, 32% of all aircraft were simulated as PBCS compliant and 41% of OTS traffic were simulated as PBCS compliant. This is in comparison to report A17200 Version 2 which assessed three scenarios 25%, 50% and 75% PBCS compliant.
- Aircraft for all other Operators and Aircraft types not covered in the IATA survey are assumed here to be not PBCS compliant.
- Note that in the baseline scenario 83% were Datalink (i.e. ADS-C & CPDLC) equipped and therefore eligible for the reduced separation standards.

Simulated Scenarios and Separation Standards

- The simulated scenarios and corresponding separation standards applied are listed in the following tables. Note that RLatSM Phase 2 has been used as the baseline as RLatSM Phase 2 will be in place prior to PBCS in March 2018.

1. Baseline (RLatSM Phase 2)

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

2. PBCS Scenario

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

Note: step-climbs are not considered within the simulations and hence there is not the opportunity for flights to enter Shanwick with a planned separation of 10 minutes before climbing into a smaller RLongSM separation with a flight at a higher level.

Results – (OTS and non OTS)

- The following table lists the Westbound service performance for each of the scenarios modelled, note that this also includes current day Westbound Service Performance figures for reference:

	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%

- The service performance achieved for aircraft on 01/09/2017 in the Baseline scenario was 67%, i.e. 67% of aircraft received the exact route they requested.
- The service performance that *would have* been achieved, using the IATA survey to simulate which aircraft would be PBCS compliant, would be 55% - i.e. 55% of these aircraft would have been cleared on exactly the route they had requested.
- Note that in the PBCS Scenario 32% of aircraft were assumed to be PBCS Compliant.

*Current day Westbound Service performance is based on SAATS AUDIT data in BI DW and summarised in the dashboard here

Results – OTS only

- The following table lists the Westbound service performance for each of the scenarios modelled, just considering those aircraft **requesting an OTS route**:

	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%

- The service performance achieved for aircraft on 01/09/2017 in the Baseline scenario for flights requesting a Westbound OTS route was 66%.
- The service performance that *would have* been achieved, using the IATA survey to simulate which aircraft would be PBCS compliant, would be 49% - i.e. 49% of these aircraft would have been cleared on exactly the route they had requested.
- Note that in the PBCS Scenario 41% of aircraft requesting an OTS route were simulated as PBCS Compliant.
- Based on this sample day (849 Westbound Flights) this PBCS scenario would result in:
  - 69 more OTS flights shifted in 1 Dimension (compared with RLatSM Phase 2).
  - 8 more OTS flights shifted in 2 Dimensions (compared with RLatSM Phase 2).

Results – non OTS only

- The following table lists the Westbound service performance for each of the scenarios modelled, just considering those aircraft **requesting a non OTS route**:

	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)	68.6%	31.4%	0.0%	0.0%
PBCS Scenario	61.8%	36.7%	1.0%	0.5%

- The service performance achieved for aircraft on 01/09/2017 in the Baseline scenario for non OTS traffic was 69%.
- The service performance that *would have* been achieved, using the IATA survey to simulate which aircraft would be PBCS compliant, would be 62% - i.e. 62% of these aircraft would have been cleared on exactly the route they had requested.
- Note that in the PBCS Scenario 22% of aircraft requesting a non OTS route were simulated as PBCS Compliant.
- Based on this sample day (849 Westbound Flights) this PBCS scenario would result in :
  - 21 more non OTS flights shifted in 1 Dimension (compared with RLatSM Phase 2)
  - 4 more non OTS flights shifted in 2 Dimensions (compared with RLatSM Phase 2)
  - 2 more non OTS flights shifted in 3 Dimensions (compared with RLatSM Phase 2)

Conclusions

- Performance Based Communication and Surveillance (PBCS) is due to be implemented in the North Atlantic (NAT) on 29th March 2018.
- In Dec 17 IATA has published the results of a PBCS readiness survey covering the top 80+% of NAT Operators - this data has been used to derive a PBCS scenario. Hence this report supersedes report A17200 version 2 published in Jan 18.
- The Analytics Oceanic Air Traffic Simulator (OATS) tool has been used to undertake this analysis, by simulating traffic over the NAT and assigning each flight a cleared route. 01/09/2017 has been used as the sample day.
- The service performance achieved for aircraft in the Baseline RLatSM Phase 2 scenario was 67% cleared on exactly their requested route.
- In the PBCS scenario 55% of Westbound aircraft were cleared on exactly their requested route.
  - For the OTS traffic 49% were cleared on exactly their requested route.
  - For non OTS traffic 62% were cleared on exactly their requested route.
- These results suggest, based on current knowledge of PBCS readiness, the level of service performance in a PBCS scenario would be slightly lower than the service performance levels as seen at the end of 2017, there would also be a reduction in service performance compared with RLatSM Phase 2.
- Compared with the RLatSM Phase 2 scenario (and based on the 849 Westbound flights on this day) the PBCS scenario modelled would result in:
  - 69 more OTS flights and 21 more non OTS flights shifted in 1 Dimension.
  - 8 more OTS flights and 4 more non OTS flights shifted in 2 Dimensions.
  - 2 more non OTS flights shifted in 3 Dimensions.
- It should be noted that this analysis is based on a small sample (only 1 day has been simulated).
- In the previous analysis (report A17200 Version 2) in the 25% PBCS compliant scenario 53% of aircraft were cleared on exactly their requested route and in the 50% PBCS compliant scenario 56% of aircraft were cleared on exactly their requested route.