International Civil Aviation Organization

Fourth Meeting of the Bay of Bengal Traffic Flow Review Group (BOBTFRG/4)

Video Teleconference, 6 – 8 December 2022

Agenda Item 6: Any Other Business

REVIEW OF BOBTFRG PRIORITY AREAS IMPLEMENTATION TIMELINES

(Presented by the Secretariat)

SUMMARY

This paper presents the proposed implementation timelines for BOBTFRG Priority Areas for review and update to firm up the feasible implementation timelines of PBCS for the performance-based longitudinal separation over the Bay of Bengal airspace.

1. INTRODUCTION

1.1 The BOBTFRG Priority Areas 1 and 2 were developed and agreed at the Second Meeting of the Bay of Bengal Traffic Flow Review Group (BOBTFRG/2, Bangkok, Thailand, 08 – 10 October 2019). The BOBTFRG/3 (VTC, 14 -15 December 2021) agreed to update the implementation timeline for each priority area to reflect the changed factors by COVID-19.

1.2 This paper aims to facilitate the discussion to firm up the feasible implementation timelines of Performance-Based Communications and Surveillance (PBCS) for performance-based longitudinal separation with the key enabler of ADS-C/CPDLC mandate over the Bay of Bengal area to optimise the airspace capacity. The suggested update of the implementation timeline for each priority area is contained in **Attachment A**.

2. DISCUSSION

Performance Expectations in the *Asia/Pacific Seamless ANS Plan*

2.1 Within Category R airspace, ADS-C surveillance and CPDLC should be enabled to support PBN-based separation in the concept of '*best equipped or capable, best served*' and '*most capable, best served*', which advocates that in each case where any aircraft that does not meet specified requirements, it should receive a lower priority, except where prescribed (such as for State aircraft). Transition to RNP 4 or RNP 2 oceanic specifications is recommended at the earliest opportunity.

2.2 All ATC units should authorise the use of horizontal separation minima stated in ICAO Doc 4444 (PANS-ATM), or as close to the separation minima as practicable, taking into account such factors as:

a) the automation of the ATM system, including automated hand-off between sectors;

b) the capability of the ATC communications systems;

c) the performance of the ATS surveillance system, including data-sharing or overlapping coverage a TOC points; and

d) ensuring the competency of air traffic controllers to apply the full tactical capability of ATA surveillance systems.

2.3 The delivery of ATC services should be based primarily on the CNS/ATM capability. When using Annx11 compliant ATS surveillance, 5NM (enroute) or 3NM (terminal) surveillance-based separations should be authorised within ATC sectors. At the TOC points in such environment, 5-10NM should be authorised with auto hand-off and surveillance data-sharing or overlapping coverage at the TOC point, and 5-20NM without auto hand-off, as determined by an appropriate safety assessment.

2.4 The efficacy, continuity and availability of ATM services should be supported by adherence with regional planning and guidance material regarding ATM automation and ATM contingency systems (regarding ATM contingency operations, refer to the Regional ATM Contingency Plan).

2.5 As far as practicable, all new ATS Routes should be PBN Routes in accordance with the following specifications;

APAC Seamless ANS Plan	**Category R airspace**	**Category S airspace**
PARS Phase II with expected implementation by 07 Nov 2019	RNP 4, RNP 10 (RNAV 10) (other acceptable specifications – RNP 2 oceanic)	RNAV 2 or RNP 2
To support ASBU	APTA-B0/1 – 8, APTA-B1/1 – 5	
PARS Phase III with expected implementation by 03 Nov 2022	RNP 2 Oceanic (requires dual independent installations) (other acceptable specifications – RNP 4)	RNAV 2 or RNP 2
To support ASBU	COMS-B0/1 – 2, COMS-B1/1 – 3, APTA B0/1 – 8, APTA B1/1 – 5	

2.6 It is important to note that the ATS route navigation performance specification selected should be harmonised and utilise the least stringent requirement needed to support the intended operation unless obstacle clearance or ATC separation requirements demand.

PBCS Implementation

2.7 Highlighting the expected implementation of PBCS provisions of ICAO Annexes 6 and 11, Doc 4444 PANS-ATM and Guidance Material by not later than 29 March 2018, the meeting is invited to note summarised information below:

- **By Air Navigation Service Providers** applying the following commonly used performance-based separation minima[1] were supported by ADS-C/CPDLC:
  - 23 NM lateral separation (RNP 4 or RNP 2);
  - 50 NM longitudinal separation (RNAV 10/RNP 10 or RNP 4); and
  - 30 NM longitudinal separation (RNP 4 or RNP 2).
- **By Regulatory Authorities**:
  - For safety oversight of ANSP PBCS operations; and
  - To approve, and monitor the performance of, PBCS operations by aircraft and aircraft operators of the State of Registry.

[1] ICAO Doc 4444 Procedures of Air Navigation Services – Air Traffic management (PANS-ATM) sections 5.4.1.2.1.6 and 5.4.2.9.2 detail the communications and surveillance performance requirements for tall performance-based separation minima that are supported by ADS-C/CPDLC. 50NM longitudinal separation minimum in 5.4.2.6.3 does not require the use of ADS-C, but does require direct controller pilot communications (DCPC) and distance reports at frequent intervals (at least every 24 seconds).

2.8 The meeting should also recall that the implementation of performance-based separations in the airspace over the high seas requires supporting procedures in ICAO Doc 7030 – *Regional Supplementary Procedures*, particularly including:

- 50NM lateral separation – RNAV 10 (RNP 10);
- 50NM longitudinal separation – RNAV 10 (RNP 10) RCP240, RSP180;
- 30NM longitudinal separation – RNP 4 or RNP 2, RCP240, RSP180;
- 23 NM lateral separation – RNP 4 or RNP 2, RCP240, RSP180.

2.9 In the BOB area, majority of the ATS routes are specified as RNAV 10 (RNP 10) and so far there were not so much progress being made in terms of the implementation of RNP 2 (or RNP 4) routes and PBCS (refer to **Attachment B** for the separation application by BOB States). More efficient application of performance-based separation should not be further deferred to cope with the traffic that are returning after a big halt by the COVID-19.

ADS-C/CPDLC Equipage and ATM Automation system Readiness

2.10 ADS-C and CDPLC were identified as the most needed to support performance-based separations and enhance the efficiency in the Bay of Bengal.

2.11 As ADS-C/CPDLC mandate being deferred from the planned date, 1 January 2023 due to huge impact by COVID-19 as per IATA's request, it was agreed at the SAIOSEACG/1 that States and concerned and IATA would report the analysis result on their readiness in such as fleet equipage in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2, ATM automation system including the expected timelines of PBCS implementation following the long discussion at the BOBTFRG/3 meeting in 2021.

2.12 To allow operational priority for PBN and PBCS approved aircraft by designation as non-exclusive PBN and PBCS airspace, NOPAC Route System was suggested as the benchmark for the BOB airspace to expedite the readiness including a reasonable transitional period, still giving non-equipped aircraft the opportunity to fly supposedly on selective route segment at a certain band of levels during a time band. So that the tangible benefits in terms of capacity, optimal flight profiles for operators who are equipped and also significant reduction in carbon emission.

2.13 More details on NOPAC Route System can be found in the ATM/SG/9 − IP/06, jointly submitted by USA and Japan, which introduced a non-exclusive mandate in the North Pacific (NOPAC) Route Systems included a transition period, where non-capable aircraft could still plan up to an intermediate/higher level, but capable aircraft would be accorded a priority in a specified level band. See more details at:

https://www.icao.int/APAC/Meetings/2021%20ATM%20SG%209/IP06%20IPACG%20NOPAC%20Route%20System%20Redesign%20Update.pdf.

2.14 The important considerations when planning for airspace equipage mandate can be found in the paragraph 5.34 of the *Asia/Pacific Seamless ANS Plan* Version 3.0 for your reference.

3. CONCLUSION

3.1 Given the urgent need to ensure the most efficient ATM systems to support the recovery of the aviation industry after severe financial losses during the COVID-19 and the benefits that performance-based separation would bring, ICAO urges all BOB States and IATA to step forward firming up a timeline for mandating ADS-C/CPDLC including the affordable transitional period for un-equipped aircraft.

3.2 Considering the analysis results by IATA on fleet equipage of traffic over the Category R airspace in BOB area, below are suggested:

a) **Phase 1**– 50 NM / 5 min longitudinal separation to be applied based on the current capability RNAV 10 (RNP 10) available as soon as possible;

b) **Phase 2** – trail implementation of 30 NM longitudinal / 23 NM lateral separation with harmonized ADS-C/CPDLC equipage mandate for RNP 4, RCP 240, RSP 180 requirements allowing non-equipped aircraft, taking account into;

- 70% of fleet equipage rate to start trial implementation with the target mandate date on **1 March 2024;** or
- 90% of fleet equipage rate for exclusive mandate, whichever comes first;
- with at least **1 year-transitional period** in between the trial and exclusive mandate of ADS-C/CPDLC to give operational priority to equipped aircraft allowing non-equipped aircraft **at a certain flight level band**.

c) **Phase 3** – Exclusive implementation of 30 NM longitudinal / 23 NM lateral separation with PBCS supports as of **1 March 2024**.

3.3 To ensure both Air Navigation Service Providers (ANSPs) and airspace users are ready and capable of PBCS and to develop a more detailed plan with feasible implementation timelines for all concerned Stakeholders including flight level band, forming a task force consisting of experts and participants from States concerned and IATA would be a good way to progress more effectively.

BOB Route Network Task Force Team		
State	**Point of Contact**	**Remarks**
Afghanistan		
Bangladesh		
India		Lead
Indonesia		
Malaysia		
Myanmar		
Pakistan		
Thailand		
Singapore		
Sri Lanka		
Thailand		
IATA		

3.4 Once the detailed plan is drafted by the task force team, the plan is to be reported to the next South Asia, Indian Ocean and Southeast Asia ATM Coordination Group (SAIOSEACG/2) to recommend ADS-C/CPDLC equipage mandate date, tentatively by **1 March 2024** for implementation of performance-based separation with PBCS requirements over the BOB area with the transition period to allow non-equipped aircraft at a certain flight level band to facilitate the equipage rate.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper;

b) urge States concerned and IATA to report the results of the fleet equipage analysis in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2 as soon as practicable;

c) agree with the forming of the task force team to draft the implementation plan of Bay of Bengal Route Network as suggested in the section 3 of this paper;

d) review and provide feedback on the *Implementation Timelines for BOBTFRG Priority Areas* in **Attachment A**; and

e) discuss any relevant matters as appropriate.

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IMPLEMENTATION TIMELINES FOR BOBTFRG PRIORITY AREAS V3.0

BOBTFRG Priority Area 1: Conduct a review of the air traffic flows in **Category S airspace** through Thailand, Myanmar, Bangladesh, India, Pakistan and Afghanistan. The objective is to develop a plan to implement improved and harmonised longitudinal spacing on affected ATS route(s) (targeting **20 NM longitudinal spacing**, or as close to the separation minima as practicable).

		Activity	Completion Date	Remarks
Phase 1	1	Identify current spacing implemented by States.	~~BOBTFRG/4~~ Completed	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Bangladesh, India, Indonesia, Malaysia, Myanmar, Pakistan and Thailand had submitted data to ICAO. Re: ATM/SG/9 WP/7, ICAO APAC Regional Office would circulate a new survey form, requesting APAC Administrations to provide information about the authorised ATC separation minimums and separation minimums at each FIR TOC point.
	2	Identify impediments to implementation of improved spacing (staffing and ATC sectorisation constraints).	Completed at BOBTFRG/3	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Reasons provided by States: communication and surveillance coverage limitations; ATM system capability related to PBCS; and low level of ADS-C/CPDLC equipage.
	3	Identify the ATS surveillance and communication gaps and actions taken to fill the gaps.	Closed at BOBTFRG/3	Ref CNS SG/23 WP/22. Updated at BOBTFRG/3: ATS Surveillance and DCPC VHF Coverage Charts was included in the *Asia/Pacific Seamless ANS Plan V3.0*.

		Activity	Completion Date	Remarks
	4	Identify ATS Inter-Facility Data Communication (AIDC) and/or direct speech circuits' capabilities.	Closed at BOBTFRG/3	States to provide update to the Secretariat latest by 30 November 2019. Updated at BOBTFRG/3: Updated AIDC implementation status in the APAC Region was provided in Appendix B to the APA TF/7 Report.
	5	Investigate whether appropriate handoff procedures are implemented between controllers providing ATS surveillance in adjacent airspace – review ATS Letter of Agreement (LOA).	~~31 January 2022~~ Completed at BOBTFRG/4	Updated at BOBTFRG/3: Bangkok – Kuala Lumpur ACCs: Yes Bangkok – Yangon ACCs: Yes Jakarta – Kuala Lumpur ACCs: Yes Dhaka – Kolkata ACCs: expected in 2025. Dhaka – Yangon ACCs: expected in 2025. Yangon – Kolkata ACCs (ATS route A201)? Delhi – Lahore ACCs? Delhi – Karachi ACCs? Mumbai – Karachi ACCs? Lahore – Kabul ACCs? Karachi – Kabul ACCs? Colombo ACC – Chennai OCC?
	6	~~Review the existing Flight Level Allocation Scheme (FLAS) operating within the concerned airspace, with a view to improve efficiencies.~~ Review and plan improved and efficient FLAS operating within the BOB airspace.	~~31 January 2022~~ BOBTFRG/5	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Reason for FLAS: multiple crossing of higher density routes over Category R airspace. States to confirm the accuracy of the information in the Bay of Bengal FLAS Chart (BOBTFRG/3 Report re: WP/07).

		Activity	Completion Date	Remarks
	7	~~States to identify routes along which reliable surveillance and communication are available to look at the possibility of reduced longitudinal spacing.~~ Confirm the coverage of Surveillance and Communication over the BOB airspace (to be tasked to TF to draft the Plan of the BOB Route Network)	~~31 January 2022~~ States (TF) report to SAIOSEACG/2	Updated at BOBTFRG/3: India and Pakistan: 50 NM longitudinal spacing implemented at the TOC points of following FIR boundaries: Delhi – Karachi FIRs; Delhi – Lahore FIRs; and Mumbai – Karachi FIRs. Indonesia and Malaysia: 20 NM longitudinal spacing implemented at the following TOC points: GOTLA, PUGER and SALAX. Malaysia and Thailand: 30 NM longitudinal spacing implemented at the TOC points between Bangkok and Kuala Lumpur FIRs. Myanmar and Thailand? India and Myanmar (ATS route A201)? India and Sri Lanka?
Phase 2	8	Complete the agreement between States to implement 20 NM longitudinal spacing (or as close to the separation minima as practicable) in Category S airspace through Thailand, Myanmar, Bangladesh, India, Pakistan and Afghanistan. Bangladesh regularly keeps the meeting updated the progress of CNS-ATM Modernization Project.	2025	Updated at BOBTFRG/3: Traffic operating north of Bay of Bengal airspace will traverse through Dhaka FIR, and currently no en-route ATS surveillance service provided in Dhaka FIR. To be reviewed in tandem with the Modernization Project of CNS-ATM System of Bangladesh.

BOBTFRG Priority Area 2: Conduct a review of the air traffic flows in **Category R airspace** within Bay of Bengal. The objective is to develop a plan to implement improved and harmonised **30 NM longitudinal spacing** on affected ATS routes.

		Activity	Completion Date	Remarks
Phase 1	1	Agreement between States to implement 50 NM longitudinal spacing between applicable aircraft on affected ATS routes. The application of performance-based separation minima and distance-based separation minima (RNP 10, with procedural position reports not less than 24 minutes apart) in airspace over the high seas requires supporting procedures in ICAO Doc 7030 – *Regional Supplementary Procedures*.	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	Chennai and Kuala Lumpur ACC to signed revised LoA by 31 January 2020. Jakarta and Colombo had implemented 50 NM longitudinal spacing. Yangon and Kolkata, and Chennai had implemented 50 NM longitudinal spacing. Updated at BOBTFRG/3: Chennai OCC and Kuala Lumpur ACC had signed a new LoA, effected on 01 June 2021. 50 NM longitudinal spacing implemented. No update at the SAIOSEACG/1
	2	Facilitate potential modernization of Bangladesh CNS/ATM system (meeting tentatively planned for 23 October 2019).	Closed	ICAO RO to provide feedback during SAIOACG/10. Updated at BOBTFRG/3: The Modernization Project of CNS-ATM System of Bangladesh expected to be completed in 2024.
	3	Research and development project conducted by India, Singapore and any other interested States to look at technology capability and benefits, including the business case for enhanced surveillance and communication.	Closed	Subject to the approval from the competent agencies of each State. India and Singapore (ATMRI) would examine the proposal and submit their comments at the BOBTFRG/3. Updated at BOBTFRG/3: On 25 November 2019, Airport Authority of India had an informal meeting with ATMRI Singapore on the ICAO request in BOBTFRG/2 for a joint research and development. In the meeting, ATMRI informed that communications and surveillance was not in their domain of research, and they would not be able to

		Activity	Completion Date	Remarks
				participate.
	4	Implementation of 50 NM longitudinal separation (RNAV 10/ RNP 10) with PBCS in the BOB airspace, at or above a level to be determined.	~~To be discussed at SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	ADS-C/CPDLC non-exclusive mandate? PfA to ICAO Doc 7030 – *Regional Supplementary Procedures*. Current fleet equipage is less than 70%. Most of the non-equip aircraft are narrow-body aircraft and low cost airlines. Updated at BOBTFRG/3: ~~States to issue AIC after SAIOACG/10.~~ For better clarity, the ADS-C/CPDLC non-exclusive mandate should be referred to as *"designation as non-exclusive PBN and PBCS airspace to allow operational priority for PBN and PBCS approved aircraft"*. Due to the COVID-19 pandemic, which has caused severe impact on airlines and ANSPs resources and revenue, the discussion on the plan designation as non-exclusive PBN and PBCS airspace to allow operational priority for PBN and PBCS approved aircraft.has been postponed.
		a. States ~~and IATA~~ to conduct analysis on fleet equipage in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2 (continental and oceanic).	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	BOBTFRG/3 Report re: WP/08. IATA presented its analysis results at the SAIOSEACG/1 and ATM SG/10.
		b. States requiring PBCS support to implement performance-based separation to develop its PBCS implementation plan, including expected date of implementation.	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	BOBTFRG/3 Report re: WP/08. No update at the SIOSEACG/1

		Activity	Completion Date	Remarks
	5	Develop Performance-based Communication and Surveillance (PBCS) Implementation Plan to support 30 NM longitudinal spacing on RNP 4 (or RNP 2) routes within Category R airspace.	~~To be determined~~ States (TF) report to SAIOSEACG/2	States that require PBCS to support 30 NM longitudinal spacing: Bangladesh: To be determined. Sri Lanka: No information. India: Expected to be implemented in Chennai FIR in 2020; Mumbai FIR in 2023; and Kolkata FIR to be determined. Indonesia: Expected in 2023 as part of the new Jakarta ACC ATM system project. Malaysia: Expected in second quarter of 2022. Myanmar: To be determined.
	6	Implementation of RNP 4 (or RNP 2) routes within BOB airspace.	~~To be determined~~ States (TF) report to SAIOSEACG/2	Subject to the implementation of PBCS.
	7	Agreement between States to implement 30 NM longitudinal spacing (or as close to the separation minima as practicable) on affected ATS routes.	~~To be determined~~ **1 March 2024**	Updated at BOBTFRG/3: Subject to the implementation of PBCS.
Phase 2	8	Review the demand and capacity on the affected ATS routes.	~~To be determined~~ 2025 (SAIOSEACG/4)	Subject to the implementation of PBCS.
	9	Identify solutions to integrate departing traffic from New Delhi with the BOBCAT traffic.	~~To be determined~~ 2025 (SAIOSEACG/4)	
	10	Review the requirement to retain BOBCAT tool based on the increase in capacity utilising improved longitudinal spacing, taking into account forecast growth in air traffic.	~~To be determined~~ 2025 (SAIOSEACG/4)	
	11	Make recommendations to SAIOACG on the future status of the BOBCAT tool.	~~To be determined~~ 2025 (SAIOSEACG/4)	

DATA RELATED TO ATS ROUTES WITHIN THE BAY OF BENGAL AIRSPACE

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
1	Bangladesh	Dhaka	N/A	50NM/10mins	No (At present there is No ATM Automation)	Yangon	APAGO	B465	S-S	10 Min		National Airline 47.6% of all ACFT. *(B787 & B777 fleet of National airline is 100% ADS-C & CPDLC equipped). One Private Airline 87.5% another Nil	National Airline 76.2% One Private Airline 57% another Nil	National Airline 47.6% One Private Airline 87.5% another N/A	National Airline 90.5% Private Airline 93.75%	Not applicable, since ATM Automation Readiness for PBCS Implementation not yet planned
							AVLED	G463	S-S	10 Min						
							CHILA	A599	S-S	10 Min						
						Kolkata	ATOGA	R472	S-S	50 NM						
							AAT	A201	S-S	10 Min						
							AGODA	R472	S-S	50 NM						
							AVNAK	B209	S-S	10 Min						
							AVPOP	L507	S-S	10 Min	ATC service is provided by Kolkata ACC					
							BEMAK	A462	S-S	50NM						
							BIPUL	R472	S-S	10 Min						
							CML	B593	S-S	10 Min						
							ESDOT	L507	R-S	10 Min	ATC service is provided by Kolkata ACC					
							IBAPA	B593	S-S	10 Min						
							MIGOP	R598	S-S	10 Min						
							NOKAT	B593	S-S	10 Min						
							REDAP	R344	S-S	10 Min						
							SUMAG	B465	S-S	10 Min						
							TEBID	G463	S-S	10 Min						
							VANTU	R598	S-S	10 Min						
							VINAD	R598	S-S	10 Min						

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
						KOLKATA	TMA Boundary	Z2, J1(CDR-2	S-S	50 NM						
							LKN	J20 (CDR-2 route)	S-S	50NM						
							LKN/80°E*	Q18	S-S	20 NM**/ 40NM	* Subject to conditions and aircraft					
							LKN/80°E*	B345	S-S	40NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							LKN	W85	S-S	40NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							TMA Boundary	L509, M875, L759, L333	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							LKN/80°E*	A201	S-S	20 NM**/ 40NM* / 10MINUTES	* Subject to conditions and aircraft					
							LKN	R460, R594	S-S	20 NM**/ 40NM* / 50NM*/ 10MINUTES	* Subject to conditions and aircraft					
							TMA Boundary	W33, (J37, J48, J58, J98 (CDR-2	S-S	10 MINUTES						
							LKN	J39, J47 (CDR-2 Routes)	S-S	10 MINUTES						

		Delhi	50NM	5-10NM		**MUMBAI**	BUKLO	Q24	S-S	20 NM						
							FIR Boundary	Q3	S-S	50 NM						
							TMA Boundary	Z1 (CDR-2 route)	S-S	50 NM						
							RUPEN	Q1	S-S	20NM* / 50 NM	* Subject to conditions and aircraft equipage					
							BUKLO/253 0N*	W20	S-S	40NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							30 NM West of IBANI	P628	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							FIR Boundary	A347, W13N	S-S	80 NM /10 MINUTES						
							EPDAD	W122N	S-S	10 MINUTES						
							BILAN	W10	S-S	10 MINUTES						
							UUD	W58	S-S	10 MINUTES						
							TMA Boundary	J37, J50, J60, J62, Z9 (CDR-	S-S	10 MINUTES						
							POVOS	J51, Z8 (CDR-	S-S	10 MINUTES						
							IBANI	J52 (CDR-2 Route)	S-S	10 MINUTES						
							SEKDO	Z15(CDR-2 Route)	S-S	20 NM						
						LAHORE	VIKIT	P628	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							MERUN	L333, G452	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							GUGAL	M875	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							SULOM	L509, M890	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage					
							SULOM	A466	S-S	50NM * / 5 MINUTES * / 10	* Subject to conditions and aircraft equipage					
							RABAN	A456	S-S	10 MINUTES						
						CHENNAI	LAROB	Q24	S-S	20NM						
							AGELA	Q8	S-S	30NM* / 50NM	* Subject to conditions and aircraft equipage					
							OKILA	Q12	S-S	30NM* / 50NM	* Subject to conditions and aircraft equipage					
							DUKOD	Z5	S-S	20NM*/ 50NM	* Subject to conditions and aircraft equipage					
							LUTGU	L518	S-S	50NM* /10 MINUTES	* Subject to conditions and aircraft equipage					
							OMDEV	T9	S-S	50NM* / 10MINUTES	* Subject to conditions and aircraft equipage					
							AGELA	W56, N571	S-S	30NM* / 50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							EPKOS	W67	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							BBM	R458	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							OKILA	P574, R461,	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage					
							GODEP	W28	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							LUTGU	W19	S-S	10 MINUTES						
							BUSBO	W20, W27,	S-S	10 MINUTES						
							SUDUM	W38	S-S	10 MINUTES						
							AGELA	B466	S-S	10 MINUTES						
							MELAX	W18, W218	S-S	10MINUTES						
							FIR Boundary	W136, J89	S-S	10 MINUTES						
							KEVIB	J36	S-S	10 MINUTES						
							TANGE	J67	S-S	10 MINUTES						
							IBANI	Q23	S-S	20 NM						
							TMA Boundary	Z1(CDR-2 routes)	S-S	50 NM						

		Mumbai	50NM	5-10NM		**DELHI**	ADBUK	Q2	S-S	20NM* / 50NM	* Subject to conditions and aircraft equipage				
							IBANI / 2530N*	W19	S-S	40NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							30NM West of IBANI	P628, L510	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							BILAN	W10	S-S	10 MINUTES					
							IDOLA	A474	S-S	10 MINUTES					
							UUD	W58, R462	S-S	10 MINUTES					
							MIBOG	J50, J62	S-S	10 MINUTES					
							POVOS	J51, Z8	S-S	10 MINUTES					
							SEKDO	Z15	S-S	20 NM					
							FIR Boundary	J37, J52	S-S	10 MINUTES					
						KOLKATA	FIR Boundary	Q20	S-S	20NM					
							FIR Boundary	V39	S-S	30NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							ODUMI	T1	S-S	30NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							VEMPI	W140	S-S	30NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							TEGIG	G450, V38	S-S	30NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							ASOPO	P628	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							TEGIG	L510	S-S	50 NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							FIR Boundary	N895, L524,	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							Common Boundary	N877, L301	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							ASOPO	A791	S-S	30NM* / 50NM* /10	* Subject to conditions and aircraft equipage				
							JJB	W99	S-S	10 MINUTES					
							FIR Boundary	G472, G590, W40, W68, W139,	S-S	10 MINUTES					
						KARACHI	TELEM	A791, G210	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							RAMSA	R462	S-S	10 MINUTES					
							SAPNA	M638, N519	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
						CHENNAI	ANODA	UL425	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							KAKIB	N563	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							OSUPI	T5	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							BEDIL	L875	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							VASTU	M300	R/S-R	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
							POMAN	P570	R/S-R	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
2	**India**					**DELHI**	LKN/80°E *	Q18	S-S	20NM** / 40NM	* Subject to conditions and aircraft				
							TMA Boundary	Z2 (CDR-2 route)	S-S	50NM					
							TMA Boundary	L759, M875, L509, L333,	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage				
							LKN/80°E *	A201	S-S	20NM** / 40NM*/ 10 MINUTES	* Subject to conditions and aircraft				
							LKN/80°E *	R460	S-S	20NM**/ 40NM*/ 50NM*/	* Subject to conditions and aircraft				
							TMA Boundary	W33	S-S	10 MINUTES					
							FIR Boundary	J1, J71, J56, J48, J37, J47,	S-S	10 MINUTES					
							FIR Boundary	Q19	S-S	20 NM					
							TEGIG	G450 , V38	S-S	30 NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				

		Kolkata	50NM	5-10M		**MUMBAI**	ODUMI	T1	S-S	30 NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							VEMPI	W140	S-S	30 NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							FIR Boundary	V39	S-S	30 NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							Common Boundary	N877, L301	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							FIR Boundary	L524, N895	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							TEGIG	L510	S-S	50NM* / 10 MINUTES	* Subject to conditions and aircraft equipage							
							ASOPO	A791	S-S	30 NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage							
							FIR Boundary	V75, W136, J4, V75, G590, W40	S-S	10 MINUTES								
							JJB	W99	S-S	10 MINUTES								
						CHENNAI	SUPLU	Q10	S-S	20NM*/ 50NM	* Subject to conditions and aircraft equipage							
							AKSAN	W29	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							SAPNU	W41	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							BITEM (above FL255)	W47	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							XOPOX (above FL255)	A465	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							MEPIP	W136, J4	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							MANPU	N877	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage							
							VIPAT (above	V9	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
						YANGON	ANSOS	A201	S-S	10 MINUTES								
							CHILA	A599	S-S	10 MINUTES								
							APAGO	B465	S-S	10 MINUTES								
							IBITA	P646	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							TEBOV	L507	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							MIPAK	L759	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							RINDA	L301	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							MEPEL	M770	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							BORBU	L524	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							SAGOD	N895	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							SAGOD	G472	R/S-R	10 MINUTES								
						CHENNAI	VATLA	P628	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							VATLA	W111	R/S-R	10 MINUTES								
							KIBUD	W112	R/S-R	10 MINUTES								
							NUSRU	Q23	S-S	20NM								
							VIKAS	Q9	S-S	30NM*/ 50NM	* Subject to conditions and aircraft equipage							
							GULUP	Q13	S-S	30NM*/ 50NM	* Subject to conditions and aircraft equipage							
							AGELA	N571	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							LUTGU	L518	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							OMDEV	T9	S-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage							
							OKILA	P574 , W17	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage							
							AGELA	W56	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage							
							EPKOS	W67	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage							

		Chennai	50NM	5-10NM		**MUMBAI**	BBM	R458	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
							GODEP	W28	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
							VIKAS	B211	S-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
							MEPIP	W136	S-S	10 MINUTES					
							LUTGU	W19	S-S	10 MINUTES					
							BUSBO	W20	S-S	10 MINUTES					
							PEDMA	W27	S-S	10 MINUTES					
							SUDUM	W38	S-S	10 MINUTES					
							MELAX	W218	S-S	10 MINUTES					
							MELAX/COMMON BOUNDARY	Q27/J42	S-S	10 MINUTES					
							GUROG	J64	S-S	10 MINUTES					
							COMMON BOUNDARY	J89, J41, J36, J3	S-S	10 MINUTES					
							BUSBO	Q28	S-S	10 MINUTES					
							TANGE	J67	S-S	10 MINUTES					
							COMMON BOUNDARY	J28, J29 (CDR 3 Routes)	S-S	10 MINUTES					
							AGELA	J104	S-S	10 MINUTES					
							UXOGO	J65	S-S	10 MINUTES					
							PEGBO	J5	S-S	50NM*/10 MINUTES	* Subject to conditions and aircraft equipage				
						KOLKATA	NODAX	Q11	S-S	20NM**	**Trial operations				
							MEPIP	W136 , J4	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							SAPNU	W41	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							AKSAN	W29	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							BITEM (above FL255)	W47	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							VIPAT (above FL255)	V009	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							XOPOX (above FL255)	A465	S-S	30NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							MANPU	N877	S-S	30 NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
						COLOMBO	BASUR	P570	S-S	50NM*/ 80NM*/ 10	* Subject to conditions and aircraft equipage				
							ATETA	M300	S-S	50NM*/ 80NM*/ 10	* Subject to conditions and aircraft equipage				
							IDIBI	G325	S-S	10 MINUTES					
							SAGOR	A465	S-S	10 MINUTES					
							DEMON	R461	S-S	10 MINUTES					
						MUMBAI	ANODA	UL425	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							OSUPI	T5	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							BEDIL	L875	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							KAKIB	N563	R-S	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage				
							POMAN	P570	R-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
							VASTU	M300	R-S	30NM*/ 50NM*/ 10	* Subject to conditions and aircraft equipage				
						YANGON	LULDA	P762	R-S	50NM*/ 80NM*/ 10	* Subject to conditions and aircraft equipage				
						KOLKATA	VATLA	W111	R-S	10 MINUTES					
							KIBUD	W112	R-S	10 MINUTES					

						JAKARTA	MEMAK	N563	R/S-R	50NM*/ 80NM*/ 10	* Subject to conditions and aircraft equipage					
						COLOMBO	DUGOS	P762	R/S-R	50NM*/ 80NM*/ 10	* Subject to conditions and aircraft equipage					
							SULTO	L645	R/S-R	10 MINUTES						
							DUGOS	L896, N564	R/S-R	10 MINUTES						
						KUALALUMPUR	IGOGU	N571	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							IGREX	P628	R/S-R	50NM*/ 10 MINUTES	* Subject to conditions and aircraft equipage					
							NOPEK	P574	R/S-R	10 MINUTES						
							ANOKO	B466	R/S-R	10 MINUTES						

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
3	Indonesia	Jakarta	50NM	5NM	No Status: Trail Operation	Chennai	MEMAK	N563	R-S	50 NM	Base on RNP10 Operations	0%	97.1%	45%	83.1%	2025
						Kuala Lumpur	POVUS	P627	R-S	10 Minutes MNT						
							ANSAX	P574	R-S	50 NM	Base on RNP10 Operations					
							TASEK/TOSOK	B466	S-S	10 Minutes MNT						
							GOTLA	G468	S-S	20 NM						
							PUGER	P574	S-S	20 NM						
							SALAX	M300/N563	S-S	20 NM						
						Colombo	KETIV	L897/L774/N628	R/S-R	10 Minutes MNT						
							SELSU	M766	R/S-R	10 Minutes MNT						
							NISOK	L896/P756	R-S	10 Minutes MNT						
							NIXUL	P570	R-S	50 NM	Base on RNP10 Operations					
							NIXUL	P627	R-S	10 Minutes MNT						
							TOPIN	M300	R-S	50 NM	Base on RNP10 Operations					

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
4	Malaysia	Kuala Lumpur	50NM	5NM		CHENNAI OCC	NOPEK	P574	R/S-R	50NM						
							ANOKO	B466	R/S-R	50NM						
							IGOGU	N571	R/S-R	50NM						
							SAMAK	L645	R/S-R	50NM						
							EMRAN	L510	R/S-R	50NM	EASTBOUND ONLY					
						BANGKOK ACC	DALAN	B579	S-S	30NM	EASTBOUND ONLY					
							TAMOS	A457	S-S	30NM						
							KARMI	M757	S-S	30NM	EASTBOUND ONLY					
							PASVA	Y514	S-S	30NM	EASTBOUND ONLY					
						JAKARTA ACC	SALAX	N633	S-S	20NM						
							PUGER	R461	S-S	20NM						
							GOTLA	G468	S-S	20NM						

			Separation Minimums Within the FIR		ATM Automation Readiness for PBCS	Current Horizontal Separation Minimums at Inbound FIR TOC points	Fleet Equipage (PBCS) of National Airliners	Target Date of PBCS Implementation

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
5	Myanmar	Yangon	50NM/10mins	50NM/10mins		Dhaka	APAGO	B465								
							AVLED	G463								
							CHILA	A599								
						Chennai	LULDA	P762								
						Kolkata	ANSOS	A201								
							CHILA	A599								
							APAGO	B465								
							IBITA	P646								
							TEBOV	L507								
							MIPAK	L759								
							RINDA	L301								
							MEPEL	M770								
							BORBU	L524								
							SAGOD	N895								
							SAGOD	G472								
						Bangkok	SISUK	R207								
							BOMAS	A581								
							MAKAS	G473								
							BETNO	G463								
							PADET	G331								
							LUDVI	L507								
							BETNO	P646								
							NURDA	L524								
							PUMOR	L877								
							TANEK	L301								
							AKATO	M502								
							EKAVO	M626								
							TAVUN	L759								
							IKULA	L515								
							PADET	M770								
6	Pakistan	Lahore	50NM	15NM		Delhi	GUGAL	M875	S-S	50NM	Based on RNP10 Operation					
							SULOM	A466/L509	S-S	50NM	Based on RNP10 Operation on Route					
							RABAN	A456	S-S	10 minutes						
						Kabul	MOTMO	P500	S-S	50NM	Based on RNP10 operation					
							DUGIN	G206	S-S	10 Minutes	From TOC DUGIN on route G206 124NM Category S					
							LAJAK	L509/M881	S-S	50NM	Based on RNP10 Operation					
							SITAX	M875/A466	S-S	50NM	Based on RNP10 Operation on route					
							DOBAT	N644	S-S	50NM	Based on RNP10 Operation					
							BIROS	L750	S-S	50NM	Based on RNP10 Operation					
							RIMPA	G202	S-S	10 minutes						
							ASLUM	P628	S-S	50NM	Based on RNP10 Operation					
						Mumbai	KABIM	P518	S-S	50NM	Based on RNP10 Operation					
							SAPNA	M638/N519	S-S	50NM	Based on RNP10 Operation					
							PARTY	G208	S-S	50NM						

		Karachi	50NM	15NM			TASOP	A325/B210	S-S	50NM									
						Delhi	RAMSA	R462	S-S	50NM									
							VIKIT	P628	S-S	50NM	Based on RNP10 Operation								
							MERUN	G202/R471 / G452/L750	S-S	50NM	Based on RNP10 Operation on Route L750								
						Kabul	SERKA	N636/B466	S-S	50NM	Based on RNP10 Operation on route N636								
							GADER	A453	R/S-R	10 minutes									

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
7	Sri Lanka	Colombo	50NM	5NM	No	Jakarta	KETIV	L897/L774/ N628	R/S-R	50NM	Based on RNP10 Operation & MNT, subject to aircraft equipped with CPDLC	A332/3 - 100% & A320/21 50%	A320 /21 & A332/3 - 100%	A320/21 & A332/3- 100%	A320/21 & A332/3 -100%	01/2024
							SELSU	M766	R/S-R	50NM	Based on RNP10 Operation & MNT subject					
							NISOK	L896/P756	R/S-R	50NM	Based on RNP10 Operation & MNT,subject aircraft equipped with CPDLC					
							NIXUL	P570	S-R	50NM	Based on RNP10 Operation & MNT subject					
							NIXUL	P627	S-R	50NM	Based on RNP10 Operation & MNT subject					
							TOPIN	M300	S-R	50NM	Based on RNP10 Operation & MNT subject					
						Chennai	DUGOS	P762	R-S	50NM	Based on RNP10 Operation & MNT subject					
							SULTO	L645	R-R	50NM	Based on RNP10 Operation & MNT subject					
							DUGOS	L896, N564	R-S	50NM	Based on RNP10 Operation & MNT, subject aircraft equipped with CPDLC					
							BASUR	P570	S-S	50NM	Surveillance spacing 30NM for ARR/DEP					
							ATETA	M300	S-S	50NM	Surveillance spacing 30NM for ARR/DEP					
							IDIBI	G325	S-S	50NM	Surveillance spacing 30NM for ARR/DEP					
							SAGOR	A465	S-S	50NM	Surveillance spacing 30NM for ARR/DEP					
							DEMON	R461	S-S	50NM	Surveillance spacing 30NM for ARR/DEP					

S/No.	BOB States	FIRS	Separation Minimums Within the FIR		ATM Automation Readiness for PBCS Implementation Yes/No	Current Horizontal Separation Minimums at Inbound FIR TOC points						Fleet Equipage (PBCS) of National Airliners				Target Date of PBCS Implementation
			Category R	Category S		Inbound Transferring FIR	TOC s	ATS Routes	Category of Airspace to FIR TOC (Inbound only)	Minimum horizontal separation standard	Remarks/Route Restrictions	ADS-C/CPDLC (%)	RNP10 (%)	RNP4 (%)	RNP2 (%)	MM/YY
8	Thailand	Bangkok	N/A	5nm		Kuala Lumpur FIR	DUBAX	R325	S-S	30 NM	Surveillance spacing					
							TAMOS	A457	S-S	30 NM	Surveillance spacing					
							KARMI	A464	S-S	30 NM	Surveillance spacing					
							RIGTO	M769	S-S	30 NM	Surveillance spacing					
							SAPAM	L645	R-S	10 Mins						
							RUSET	P627	R-S	10 Mins						
							ABTOK	M644	S-S	30 NM	Surveillance spacing					
							KADAX	M626	S-S	30 NM	Surveillance spacing					
							PASVA	A334	S-S	30 NM	Surveillance spacing					
							GOLUD	M751	S-S	30 NM	Surveillance spacing					
							TIDAR	M904	R-S	10 Mins						
							SISUK	R207	R-S	10 Mins						
							BOMAS	A581	S-S	30NM, 20 NM*	Surveillance spacing					
							MAKAS	G473	S-S	30NM, 20 NM*	Surveillance spacing					

						Yangon FIR	BETNO	G463	S-S	30NM, 20 NM*	Surveillance spacing								
							PADET	G331	S-S	10 Mins, 7 Mins	7 Mins applied for DEST. VTSP								
							LUDVI	L507	S-S	30NM, 20 NM*									
							BETNO	P646	S-S	30NM, 20 NM*									
							NURDA	L524	S-S	30NM, 20 NM*									
							PUMOR	L877	S-S	30NM, 20 NM*									
							TANEK	L301	S-S	30NM, 20 NM*									
							AKATO	M502	S-S	30NM,20 NM*									
							EKAVO	M626	R-S	10 Mins, 7 Mins	7 Mins applied for DEST. VTSP								
							TAVUN	L759	R-S	10 Mins, 7 Mins	7 Mins applied for DEST. VTSP								
							IKULA	L515	R-S	10 Mins, 7 Mins	7 Mins applied for DEST. VTSP								
							PADET	M770	R-S	10 Mins									

International Civil Aviation Organization

Fourth Meeting of the Bay of Bengal Traffic Flow Review Group (BOBTFRG/4)

Video Teleconference, 6 – 8 December 2022

Agenda Item 6: Any Other Business

REVIEW OF BOBTFRG PRIORITY AREAS IMPLEMENTATION TIMELINES

(Presented by the Secretariat)

SUMMARY

This paper presents the proposed implementation timelines for BOBTFRG Priority Areas for review and update to firm up the feasible implementation timelines of PBCS for the performance-based longitudinal separation over the Bay of Bengal airspace.

1. INTRODUCTION

1.1 The BOBTFRG Priority Areas 1 and 2 were developed and agreed at the Second Meeting of the Bay of Bengal Traffic Flow Review Group (BOBTFRG/2, Bangkok, Thailand, 08 – 10 October 2019). The BOBTFRG/3 (VTC, 14 -15 December 2021) agreed to update the implementation timeline for each priority area to reflect the changed factors by COVID-19.

1.2 This paper aims to facilitate the discussion to firm up the feasible implementation timelines of Performance-Based Communications and Surveillance (PBCS) for performance-based longitudinal separation with the key enabler of ADS-C/CPDLC mandate over the Bay of Bengal area to optimise the airspace capacity. The suggested update of the implementation timeline for each priority area is contained in **Attachment A**.

2. DISCUSSION

Performance Expectations in the *Asia/Pacific Seamless ANS Plan*

2.1 Within Category R airspace, ADS-C surveillance and CPDLC should be enabled to support PBN-based separation in the concept of '*best equipped or capable, best served*' and '*most capable, best served*', which advocates that in each case where any aircraft that does not meet specified requirements, it should receive a lower priority, except where prescribed (such as for State aircraft). Transition to RNP 4 or RNP 2 oceanic specifications is recommended at the earliest opportunity.

2.2 All ATC units should authorise the use of horizontal separation minima stated in ICAO Doc 4444 (PANS-ATM), or as close to the separation minima as practicable, taking into account such factors as:

a) the automation of the ATM system, including automated hand-off between sectors;

b) the capability of the ATC communications systems;

c) the performance of the ATS surveillance system, including data-sharing or overlapping coverage at TOC points; and

d) ensuring the competency of air traffic controllers to apply the full tactical capability of ATS surveillance systems.

2.3 The delivery of ATC services should be based primarily on the CNS/ATM capability. When using Annx11 compliant ATS surveillance, 5NM (enroute) or 3NM (terminal) surveillance-based separations should be authorised within ATC sectors. At the TOC points in such environment, 5-10NM should be authorised with auto hand-off and surveillance data-sharing or overlapping coverage at the TOC point, and 5-20NM without auto hand-off, as determined by an appropriate safety assessment.

2.4 The efficacy, continuity and availability of ATM services should be supported by adherence with regional planning and guidance material regarding ATM automation and ATM contingency systems (regarding ATM contingency operations, refer to the Regional ATM Contingency Plan).

2.5 As far as practicable, all new ATS Routes should be PBN Routes in accordance with the following specifications;

APAC Seamless ANS Plan	**Category R airspace**	**Category S airspace**
PARS Phase II with expected implementation by 07 Nov 2019	RNP 4, RNP 10 (RNAV 10) (other acceptable specifications – RNP 2 oceanic)	RNAV 2 or RNP 2
To support ASBU	APTA-B0/1 – 8, APTA-B1/1 – 5	
PARS Phase III with expected implementation by 03 Nov 2022	RNP 2 Oceanic (requires dual independent installations) (other acceptable specifications – RNP 4)	RNAV 2 or RNP 2
To support ASBU	COMS-B0/1 – 2, COMS-B1/1 – 3, APTA B0/1 – 8, APTA B1/1 – 5	

2.6 It is important to note that the ATS route navigation performance specification selected should be harmonised and utilise the least stringent requirement needed to support the intended operation unless obstacle clearance or ATC separation requirements demand.

PBCS Implementation

2.7 Highlighting the expected implementation of PBCS provisions of ICAO Annexes 6 and 11, Doc 4444 PANS-ATM and Guidance Material by not later than 29 March 2018, the meeting is invited to note summarised information below:

- **By Air Navigation Service Providers** applying the following commonly used performance-based separation minima[1] were supported by ADS-C/CPDLC:
  - 23 NM lateral separation (RNP 4 or RNP 2);
  - 50 NM longitudinal separation (RNAV 10/RNP 10 or RNP 4); and
  - 30 NM longitudinal separation (RNP 4 or RNP 2).
- **By Regulatory Authorities**:
  - For safety oversight of ANSP PBCS operations; and
  - To approve, and monitor the performance of, PBCS operations by aircraft and aircraft operators of the State of Registry.

[1] ICAO Doc 4444 Procedures of Air Navigation Services – Air Traffic management (PANS-ATM) sections 5.4.1.2.1.6 and 5.4.2.9.2 detail the communications and surveillance performance requirements for tall performance-based separation minima that are supported by ADS-C/CPDLC. 50NM longitudinal separation minimum in 5.4.2.6.3 does not require the use of ADS-C, but does require direct controller pilot communications (DCPC) and distance reports at frequent intervals (at least every 24 seconds).

2.8 The meeting should also recall that the implementation of performance-based separations in the airspace over the high seas requires supporting procedures in ICAO Doc 7030 – *Regional Supplementary Procedures*, particularly including:

- 50NM lateral separation – RNAV 10 (RNP 10);
- 50NM longitudinal separation – RNAV 10 (RNP 10) RCP240, RSP180;
- 30NM longitudinal separation – RNP 4 or RNP 2, RCP240, RSP180;
- 23 NM lateral separation – RNP 4 or RNP 2, RCP240, RSP180.

2.9 In the BOB area, majority of the ATS routes are specified as RNAV 10 (RNP 10) and so far there were not so much progress being made in terms of the implementation of RNP 2 (or RNP 4) routes and PBCS (refer to **Attachment B** for the separation application by BOB States). More efficient application of performance-based separation should not be further deferred to cope with the traffic that are returning after a big halt by the COVID-19.

ADS-C/CPDLC Equipage and ATM Automation system Readiness

2.10 ADS-C and CDPLC were identified as the most needed to support performance-based separations and enhance the efficiency in the Bay of Bengal.

2.11 As ADS-C/CPDLC mandate being deferred from the planned date, 1 January 2023 due to huge impact by COVID-19 as per IATA's request, it was agreed at the SAIOSEACG/1 that States concerned and IATA would report the analysis result on their readiness in such as fleet equipage in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2, ATM automation system including the expected timelines of PBCS implementation following the long discussion at the BOBTFRG/3 meeting in 2021.

2.12 To allow operational priority for PBN and PBCS approved aircraft by designation as non-exclusive PBN and PBCS airspace, NOPAC Route System was suggested as the benchmark for the BOB airspace to expedite the readiness including a reasonable transitional period, still giving non-equipped aircraft the opportunity to fly supposedly on selective route segment at a certain band of levels during a time band. So that the tangible benefits can be acquired in terms of capacity, optimal flight profiles for operators who are equipped and also significant reduction in carbon emission.

2.13 More details on NOPAC Route System can be found in the ATM/SG/9 − IP/06, jointly submitted by USA and Japan, which introduced a non-exclusive mandate in the North Pacific (NOPAC) Route Systems including a transition period, where non-capable aircraft could still plan up to an intermediate/higher level, but capable aircraft would be accorded a priority in a specified level band. See more details at:

https://www.icao.int/APAC/Meetings/2021%20ATM%20SG%209/IP06%20IPACG%20NOPAC%20Route%20System%20Redesign%20Update.pdf.

2.14 The important considerations from an operators' perspective when planning for airspace equipage mandate can be found in the paragraph 5.34 of the *Asia/Pacific Seamless ANS Plan* Version 3.0 for your reference.

3. CONCLUSION

3.1 Given the urgent need to ensure the most efficient ATM systems to support the recovery of the aviation industry after severe financial losses during the COVID-19 and the benefits that performance-based separation would bring, ICAO urges all BOB States and IATA to step forward firming up a timeline for mandating ADS-C/CPDLC including the affordable transitional period for non-equipped aircraft.

3.2 Considering the analysis results by IATA on fleet equipage of traffic over the Category R airspace in BOB area, below are suggested:

a) **Phase 1**– 50 NM / 5 min longitudinal separation to be applied based on the current capability RNAV 10 (RNP 10) available as soon as possible;

b) **Phase 2** – trail implementation of 30 NM longitudinal / 23 NM lateral separation with harmonized ADS-C/CPDLC equipage mandate for RNP 4, RCP 240, RSP 180 requirements allowing non-equipped aircraft, taking account into;

- 70% of fleet equipage rate to start trial implementation with the target mandate date on **1 March 2024;** or
- 90% of fleet equipage rate for exclusive mandate, whichever comes first;
- with at least **1 year-transitional period** in between the trial and exclusive mandate of ADS-C/CPDLC to give operational priority to equipped aircraft allowing non-equipped aircraft **at a certain flight level band**.

c) **Phase 3** – Exclusive implementation of 30 NM longitudinal / 23 NM lateral separation with PBCS supports as of **1 March 2024**.

3.3 To ensure both Air Navigation Service Providers (ANSPs) and airspace users are ready and capable of PBCS and to develop a more detailed plan with feasible implementation timelines for all concerned Stakeholders including flight level band, forming a task force consisting of experts and participants from States concerned and IATA would be a good way to progress more effectively.

BOB Route Network Task Force Team		
State	**Point of Contact**	**Remarks**
Afghanistan		
Bangladesh		
India		Lead
Indonesia		
Malaysia		
Myanmar		
Pakistan		
Thailand		
Singapore		
Sri Lanka		
Thailand		
IATA		

3.4 Once the detailed plan is drafted by the task force team, the plan is to be reported to the next South Asia, Indian Ocean and Southeast Asia ATM Coordination Group (SAIOSEACG/2) to recommend ADS-C/CPDLC equipage mandate date, tentatively by **1 March 2024** for implementation of performance-based separation with PBCS requirements over the BOB area with the transition period to allow non-equipped aircraft at a certain flight level band to facilitate the equipage rate.

4. ACTION BY THE MEETING

4.1 The meeting is invited to:

a) note the information contained in this paper;

b) urge States concerned and IATA to report the results of the fleet equipage analysis in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2 as soon as practicable;

c) agree with the forming of the task force team to draft the implementation plan of Bay of Bengal Route Network as suggested in the section 3 of this paper;

d) review and provide feedback on the *Implementation Timelines for BOBTFRG Priority Areas* in **Attachment A**; and

e) discuss any relevant matters as appropriate.

…….

IMPLEMENTATION TIMELINES FOR BOBTFRG PRIORITY AREAS V3.0

BOBTFRG Priority Area 1: Conduct a review of the air traffic flows in **Category S airspace** through Thailand, Myanmar, Bangladesh, India, Pakistan and Afghanistan. The objective is to develop a plan to implement improved and harmonised longitudinal spacing on affected ATS route(s) (targeting **20 NM longitudinal spacing**, or as close to the separation minima as practicable).

		Activity	Completion Date	Remarks
Phase 1	1	Identify current spacing implemented by States.	~~BOBTFRG/4~~ Completed	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Bangladesh, India, Indonesia, Malaysia, Myanmar, Pakistan and Thailand had submitted data to ICAO. Re: ATM/SG/9 WP/7, ICAO APAC Regional Office would circulate a new survey form, requesting APAC Administrations to provide information about the authorised ATC separation minimums and separation minimums at each FIR TOC point.
	2	Identify impediments to implementation of improved spacing (staffing and ATC sectorisation constraints).	Completed at BOBTFRG/3	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Reasons provided by States: communication and surveillance coverage limitations; ATM system capability related to PBCS; and low level of ADS-C/CPDLC equipage.
	3	Identify the ATS surveillance and communication gaps and actions taken to fill the gaps.	Closed at BOBTFRG/3	Ref CNS SG/23 WP/22. Updated at BOBTFRG/3: ATS Surveillance and DCPC VHF Coverage Charts was included in the *Asia/Pacific Seamless ANS Plan V3.0*.

		Activity	Completion Date	Remarks
	4	Identify ATS Inter-Facility Data Communication (AIDC) and/or direct speech circuits' capabilities.	Closed at BOBTFRG/3	States to provide update to the Secretariat latest by 30 November 2019. Updated at BOBTFRG/3: Updated AIDC implementation status in the APAC Region was provided in Appendix B to the APA TF/7 Report.
	5	Investigate whether appropriate handoff procedures are implemented between controllers providing ATS surveillance in adjacent airspace – review ATS Letter of Agreement (LOA).	~~31 January 2022~~ Completed at BOBTFRG/4	Updated at BOBTFRG/3: Bangkok – Kuala Lumpur ACCs: Yes Bangkok – Yangon ACCs: Yes Jakarta – Kuala Lumpur ACCs: Yes Dhaka – Kolkata ACCs: expected in 2025. Dhaka – Yangon ACCs: expected in 2025. Yangon – Kolkata ACCs (ATS route A201)? Delhi – Lahore ACCs? Delhi – Karachi ACCs? Mumbai – Karachi ACCs? Lahore – Kabul ACCs? Karachi – Kabul ACCs? Colombo ACC – Chennai OCC?
	6	~~Review the existing Flight Level Allocation Scheme (FLAS) operating within the concerned airspace, with a view to improve efficiencies.~~ Review and plan improved and efficient FLAS operating within the BOB airspace.	~~31 January 2022~~ BOBTFRG/5	States to fill and submit the Attachment D to BOBTFRG/2 State Letter by 31 October 2019. Updated at BOBTFRG/3: Reason for FLAS: multiple crossing of higher density routes over Category R airspace. States to confirm the accuracy of the information in the Bay of Bengal FLAS Chart (BOBTFRG/3 Report re: WP/07).

		Activity	Completion Date	Remarks
	7	~~States to identify routes along which reliable surveillance and communication are available to look at the possibility of reduced longitudinal spacing.~~ Confirm the coverage of Surveillance and Communication over the BOB airspace (to be tasked to TF to draft the Plan of the BOB Route Network)	~~31 January 2022~~ States (TF) report to SAIOSEACG/2	Updated at BOBTFRG/3: India and Pakistan: 50 NM longitudinal spacing implemented at the TOC points of following FIR boundaries: Delhi – Karachi FIRs; Delhi – Lahore FIRs; and Mumbai – Karachi FIRs. Indonesia and Malaysia: 20 NM longitudinal spacing implemented at the following TOC points: GOTLA, PUGER and SALAX. Malaysia and Thailand: 30 NM longitudinal spacing implemented at the TOC points between Bangkok and Kuala Lumpur FIRs. Myanmar and Thailand? India and Myanmar (ATS route A201)? India and Sri Lanka?
Phase 2	8	Complete the agreement between States to implement 20 NM longitudinal spacing (or as close to the separation minima as practicable) in Category S airspace through Thailand, Myanmar, Bangladesh, India, Pakistan and Afghanistan. Bangladesh regularly keeps the meeting updated the progress of CNS-ATM Modernization Project.	2025	Updated at BOBTFRG/3: Traffic operating north of Bay of Bengal airspace will traverse through Dhaka FIR, and currently no en-route ATS surveillance service provided in Dhaka FIR. To be reviewed in tandem with the Modernization Project of CNS-ATM System of Bangladesh.

BOBTFRG Priority Area 2: Conduct a review of the air traffic flows in **Category R airspace** within Bay of Bengal. The objective is to develop a plan to implement improved and harmonised **30 NM longitudinal spacing** on affected ATS routes.

		Activity	Completion Date	Remarks
Phase 1	1	Agreement between States to implement 50 NM longitudinal spacing between applicable aircraft on affected ATS routes. The application of performance-based separation minima and distance-based separation minima (RNP 10, with procedural position reports not less than 24 minutes apart) in airspace over the high seas requires supporting procedures in ICAO Doc 7030 – *Regional Supplementary Procedures*.	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	Chennai and Kuala Lumpur ACC to signed revised LoA by 31 January 2020. Jakarta and Colombo had implemented 50 NM longitudinal spacing. Yangon and Kolkata, and Chennai had implemented 50 NM longitudinal spacing. Updated at BOBTFRG/3: Chennai OCC and Kuala Lumpur ACC had signed a new LoA, effected on 01 June 2021. 50 NM longitudinal spacing implemented. No update at the SAIOSEACG/1
	2	Facilitate potential modernization of Bangladesh CNS/ATM system (meeting tentatively planned for 23 October 2019).	Closed	ICAO RO to provide feedback during SAIOACG/10. Updated at BOBTFRG/3: The Modernization Project of CNS-ATM System of Bangladesh expected to be completed in 2024.
	3	Research and development project conducted by India, Singapore and any other interested States to look at technology capability and benefits, including the business case for enhanced surveillance and communication.	Closed	Subject to the approval from the competent agencies of each State. India and Singapore (ATMRI) would examine the proposal and submit their comments at the BOBTFRG/3. Updated at BOBTFRG/3: On 25 November 2019, Airport Authority of India had an informal meeting with ATMRI Singapore on the ICAO request in BOBTFRG/2 for a joint research and development. In the meeting, ATMRI informed that communications and surveillance was not in their domain of research, and they would not be able to

		Activity	Completion Date	Remarks
				participate.
	4	Implementation of 50 NM longitudinal separation (RNAV 10/ RNP 10) with PBCS in the BOB airspace, at or above a level to be determined.	~~To be discussed at SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	ADS-C/CPDLC non-exclusive mandate? PfA to ICAO Doc 7030 – *Regional Supplementary Procedures*. Current fleet equipage is less than 70%. Most of the non-equip aircraft are narrow-body aircraft and low cost airlines. Updated at BOBTFRG/3: ~~States to issue AIC after SAIOACG/10.~~ For better clarity, the ADS-C/CPDLC non-exclusive mandate should be referred to as *"designation as non-exclusive PBN and PBCS airspace to allow operational priority for PBN and PBCS approved aircraft"*. Due to the COVID-19 pandemic, which has caused severe impact on airlines and ANSPs resources and revenue, the discussion on the plan designation as non-exclusive PBN and PBCS airspace to allow operational priority for PBN and PBCS approved aircraft.has been postponed.
		a. States ~~and IATA~~ to conduct analysis on fleet equipage in ADS-C/CPDLC, RNP 10, RNP 4 and RNP 2 (continental and oceanic).	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	BOBTFRG/3 Report re: WP/08. IATA presented its analysis results at the SAIOSEACG/1 and ATM SG/10.
		b. States requiring PBCS support to implement performance-based separation to develop its PBCS implementation plan, including expected date of implementation.	~~SAIOSEACG/1~~ States (TF) report to SAIOSEACG/2	BOBTFRG/3 Report re: WP/08. No update at the SIOSEACG/1

		Activity	Completion Date	Remarks
	5	Develop Performance-based Communication and Surveillance (PBCS) Implementation Plan to support 30 NM longitudinal spacing on RNP 4 (or RNP 2) routes within Category R airspace.	~~To be determined~~ States (TF) report to SAIOSEACG/2	States that require PBCS to support 30 NM longitudinal spacing: Bangladesh: To be determined. Sri Lanka: No information. India: Expected to be implemented in Chennai FIR in 2020; Mumbai FIR in 2023; and Kolkata FIR to be determined. Indonesia: Expected in 2023 as part of the new Jakarta ACC ATM system project. Malaysia: Expected in second quarter of 2022. Myanmar: To be determined.
	6	Implementation of RNP 4 (or RNP 2) routes within BOB airspace.	~~To be determined~~ States (TF) report to SAIOSEACG/2	Subject to the implementation of PBCS.
	7	Agreement between States to implement 30 NM longitudinal spacing (or as close to the separation minima as practicable) on affected ATS routes.	~~To be determined~~ **1 March 2024**	Updated at BOBTFRG/3: Subject to the implementation of PBCS.
Phase 2	8	Review the demand and capacity on the affected ATS routes.	~~To be determined~~ 2025 (SAIOSEACG/4)	Subject to the implementation of PBCS.
	9	Identify solutions to integrate departing traffic from New Delhi with the BOBCAT traffic.	~~To be determined~~ 2025 (SAIOSEACG/4)	
	10	Review the requirement to retain BOBCAT tool based on the increase in capacity utilising improved longitudinal spacing, taking into account forecast growth in air traffic.	~~To be determined~~ 2025 (SAIOSEACG/4)	
	11	Make recommendations to SAIOACG on the future status of the BOBCAT tool.	~~To be determined~~ 2025 (SAIOSEACG/4)	