International Civil Aviation Organization

The Ninth Meeting of the APANPIRG ATM Sub-Group (ATM/SG/9)

Video Teleconference, 01 – 05 November 2021

Agenda Item 6: ATM Coordination (Meetings, Route Development, Contingency Planning)

INFORMAL PACIFIC AIR TRAFFIC CONTROL (ATC) COORDINATING GROUP (IPACG) NOPAC ROUTE SYSTEM REDESIGN UPDATE

(Presented by United States of America and Japan)

SUMMARY

This paper presents details on the planned revision of the NOPAC Route System between Japan and Alaska. The redesign will take advantage of the 23 NM lateral separation minima to optimize the movement of aircraft through the NOPAC Route System. The NOPAC routes will be compressed into a smaller volume of airspace, providing more efficient NOPAC route flight planning and increased opportunity for optimized routes south of the NOPAC Routes. The NOPAC redesign Phases will require aircraft to have RNP4, RSP180 and RCP240 approvals when operating from FL340 through FL400 on specified NOPAC routes.

1. INTRODUCTION

1.1. When the NOPAC route system was created, standard oceanic separation was 100 NM lateral, 20 minutes longitudinal and 2000 feet vertical. The NOPAC route system was designed as 5 parallel routes that were spaced by at least 50 NM between the routes. Composite separation (½ lateral and ½ vertical) was applied between the aircraft. This allowed for the efficient movement of the NOPAC aircraft through a compressed amount of airspace. Subsequent improvements in aircraft capabilities (RNP10/RNAV10 and RVSM) allowed standard oceanic separation to be reduced to 50 NM laterally and 1000 feet vertically. These changes greatly increased the capacity of the NOPAC Route System. Currently the NOPAC Route System remains basically the same as originally published, a series of 5 parallel routes that cross the Fukuoka/Anchorage Oceanic common FIR boundary (see Figure 1).

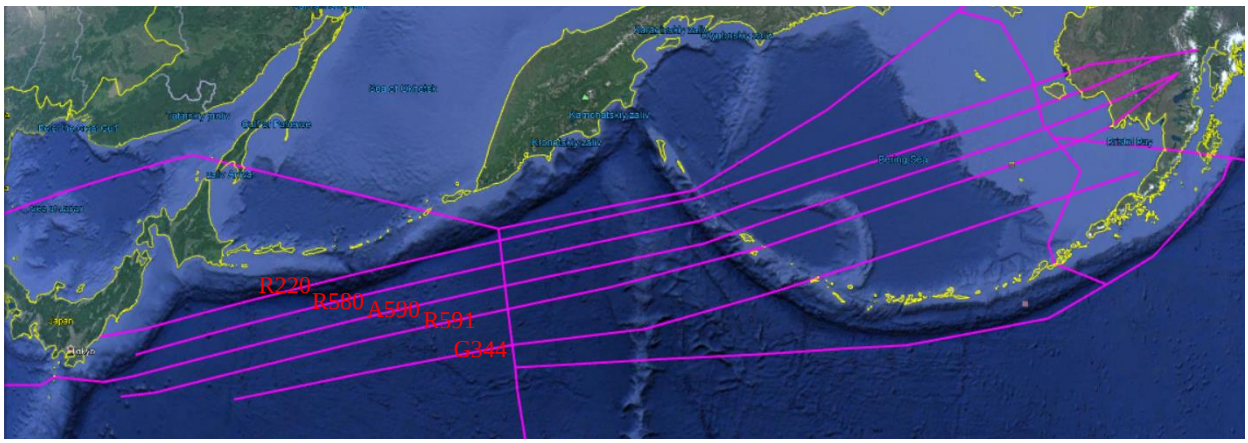

Figure 1. Current NOPAC State

1.2. The NOPAC routes are spaced at least 50 NM apart. In some cases like G344, there is significant extra spacing between the routes. There are also several other ATS routes that connect to the NOPAC routes that are not shown in Figure 1.

1.3. In November 2016, ICAO published a new 23 NM lateral separation minimum which requires RNP4, RSP180 and RCP240. The NOPAC Route System has a high level of FANS 1/A equipped aircraft which could be capable of supporting the 23 NM PBCS lateral minima. Some of these NOPAC FANS 1/A aircraft have not yet obtained their approvals for RNP4 or RCP240/RSP180 which are required to apply the 23 NM PBCS lateral minima. For the purposes of this paper, "PBCS approved" means the aircraft is RCP240 and RSP180 approved.

1.4. JCAB and the FAA have been working with IATA and the operators through IPACG to develop a Phased Implementation plan for 23 NM laterally spaced NOPAC routes. The following paragraphs provide details on the different NOPAC redesign implementation phases.

1.5. The COVID pandemic has caused Phase 1 to be broken into 2 parts, Phase 1a and Phase 1b. The need for this change will be discussed later in more detail in Section 2 of this paper. The details of Phase 1a are provided in paragraph 1.6 below. The details of Phase 1b are provided in paragraph 1.7. The implementation of 23 NM lateral separation minimum in NOPAC will require PBCS/RNP4 restrictions at defined altitude stratums in NOPAC. Phase 1a and Phase 1b will introduce the initial PBCS/RNP4 restrictions on ATS Route R220.

1.6. Phase 1a will begin on December 2, 2021. In Phase 1a of the NOPAC redesign, ATS Route R220 will require RNP4, RSP180 and RCP240 PBCS approvals from FL340 to FL400. Aircraft without RNP4, RSP180 and RCP240 approvals will be able to fly R220 at FL330 and below or FL410 and above or on ATS route R580. The initial R220 PBCS restrictions will get operators familiar with flight planning through NOPAC when their aircraft are not PBCS/RNP4 approved. The adjacent routes remain spaced 50 NM apart in Phase 1a, so if a Non-PBCS aircraft flight plans via R220 and it cannot comply with the PBCS altitude restrictions, it will still be possible to accommodate the aircraft. This will provide for operator education and prevent unnecessary diversions for fuel. The FAA and JCAB will conduct post flight evaluation to identify operators that did not comply with the R220 PBCS/RNP4 requirements. The non-compliant operators will be contacted to make sure the operator understands the PBCS/RNP4 requirements and flight plans correctly in the future. In Phase 1a there is no penalty for failing to meet the PBCS requirements. The goal of Phase 1a is to educate non PBCS approved operators of the PBCS requirements that will be enforced after Phase 1b begins and to increase the percentage of PBCS approved aircraft operating in NOPAC. In Phase 1a none of the NOPAC Routes will be removed and there are no changes to the directions that the NOPAC routes are currently flown.

1.7. In Phase 1b ATS Route G344 will be deleted, and R591 will be shortened to between ADNAP and ADGOR for adopting 15 degrees diverging separation. But Fixes on deleted G344 and R591 within Fukuoka FIR, AGEDI, AKISU, KALIG and CUTEE, will be retained as a significant point for PACOTS and UPRs. Controllers will begin to enforce the R220 PBCS/RNP4 requirements. Non PBCS/RNP4 aircraft on R220 will be required to fly at FL330 and below or FL410 and above. The other routing alternative for Non PBCS/RNP4 approved westbound aircraft in NOPAC is to flight plan via R580. Phase 1b does not have a start date at this time, but it will be November 2022 or later due to FAA ATOP software changes that are required to begin enforcing the R220 PBCS requirements. Additionally before Phase 1b can begin, the post flight monitoring must indicate a high level of compliance of the R220 PBCS/RNP4 requirements. If too many aircraft are not complying with the R220 restrictions, controller workload may become too high, with controllers changing altitudes and issuing reroutes to R580.

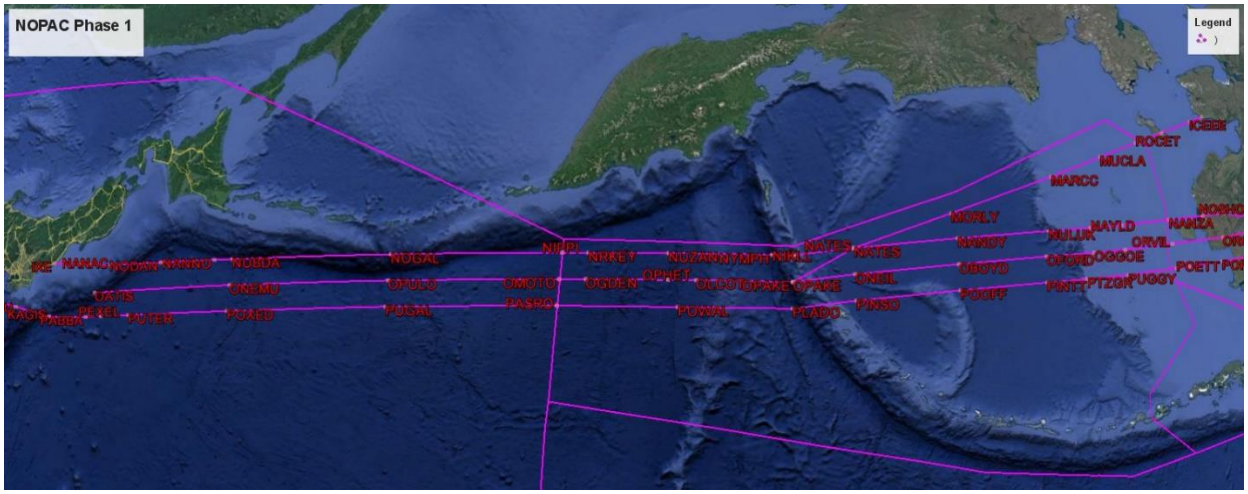

Figure 2-1. NOPAC Redesign Phase 1b

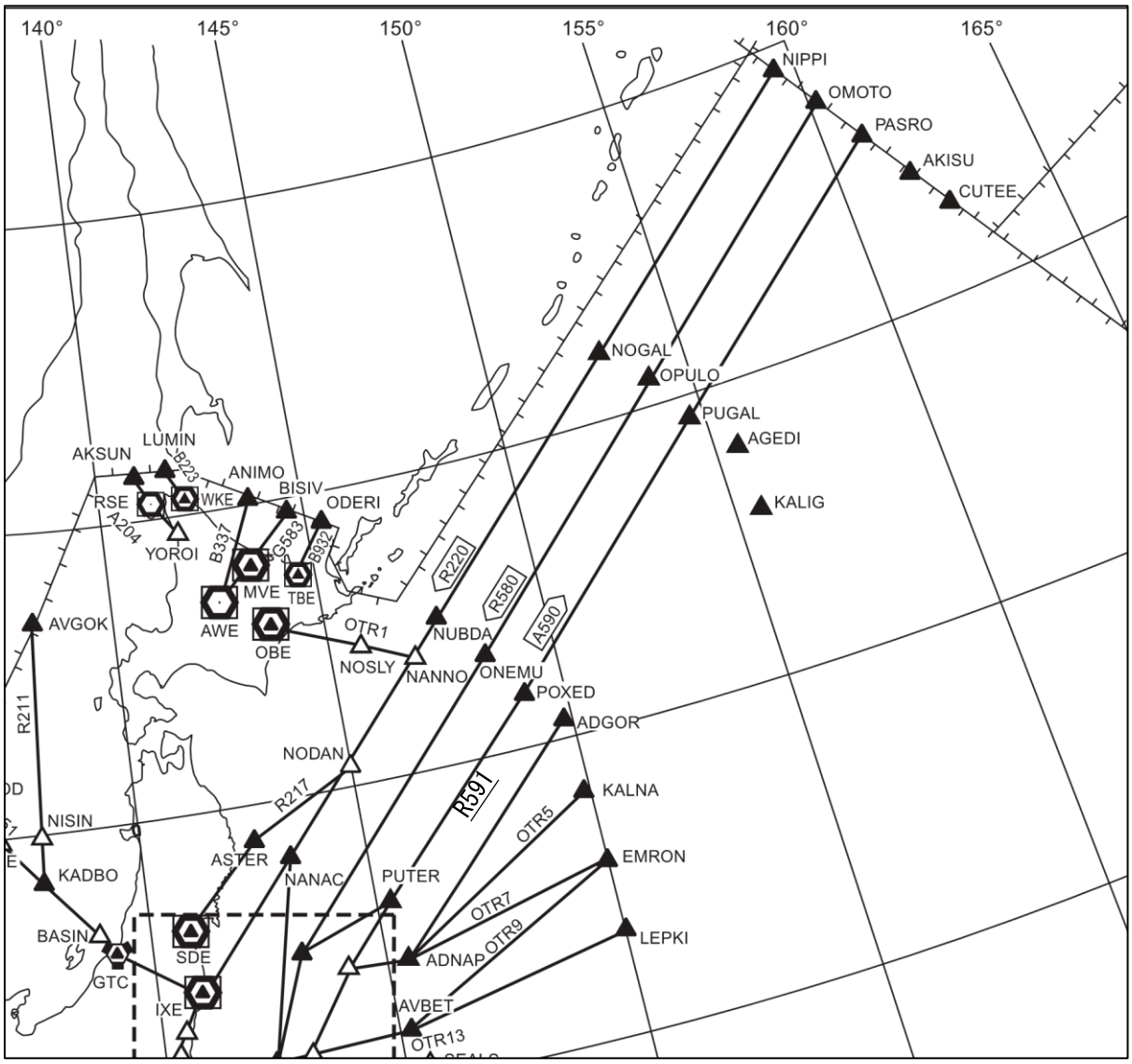

Figure 2-2. NOPAC Redesign Phase 1b within Fukuoka FIR

1.7.1 In Phase 1b, JCAB will conduct post flight evaluation of eastbound aircraft in NOPAC to identify operators that did not comply with the PBCS/RNP4 requirements. The non-compliant operators

will be contacted to make sure the operator understands the PBCS/RNP4 requirements of the future R580 changing to an eastbound route. Besides, the PBCS/RNP4 approved eastbound aircraft which could not maintain FL340 or above altitude at the west gateway of NOPAC due to heavy weight or aircraft performance will be identified by JCAB.

1.7.2 In Phase 1b, westbound PACOTS Tracks would be published via R220, R580 and 50 NM south of A590.

1.7.3 Eastbound PACOTS Tracks would be published via A590 and 50 NM south of A590.

1.7.4 UPRs would be allowed via the 3 remaining NOPAC routes and 50 NM south of A590.

1.7.4 The criteria to proceed to Phase 2 would include:

- No adverse impacts were discovered during Phase 1 that were not able to be safely mitigated.
- Operators are correctly complying with the R220 PBCS restrictions.
- The JCAB TOPS and FAA ATOP computer systems have been successfully modified to support 23 NM lateral separation.
- Aircraft PBCS approval level is high enough to proceed to Phase 2. At this time that level is expected to be 90 percent or higher.

1.8 Phase 2 will utilize a new westbound ATS Route, named M523, which will be evenly spaced between R220 and R580.

1.8.1 R220 remains a westbound route with PBCS/RNP4 approval required from FL340 to FL400.

1.8.2 M523 is a new westbound route open to PBCS/RNP4 aircraft from FL340 to FL400. M523 is closed to aircraft FL330 and below and FL410 and above. The reason for the closure to traffic at or below FL330 and at or above FL410 because there may be non-PBCS/RNP4 approved traffic on the adjacent tracks R220 and R580 at those altitudes.

1.8.3 R580 changes to an eastbound route with PBCS/RNP4 approval required from FL340 to FL400.

1.8.4 A590 remains unchanged with no PBCS restrictions.

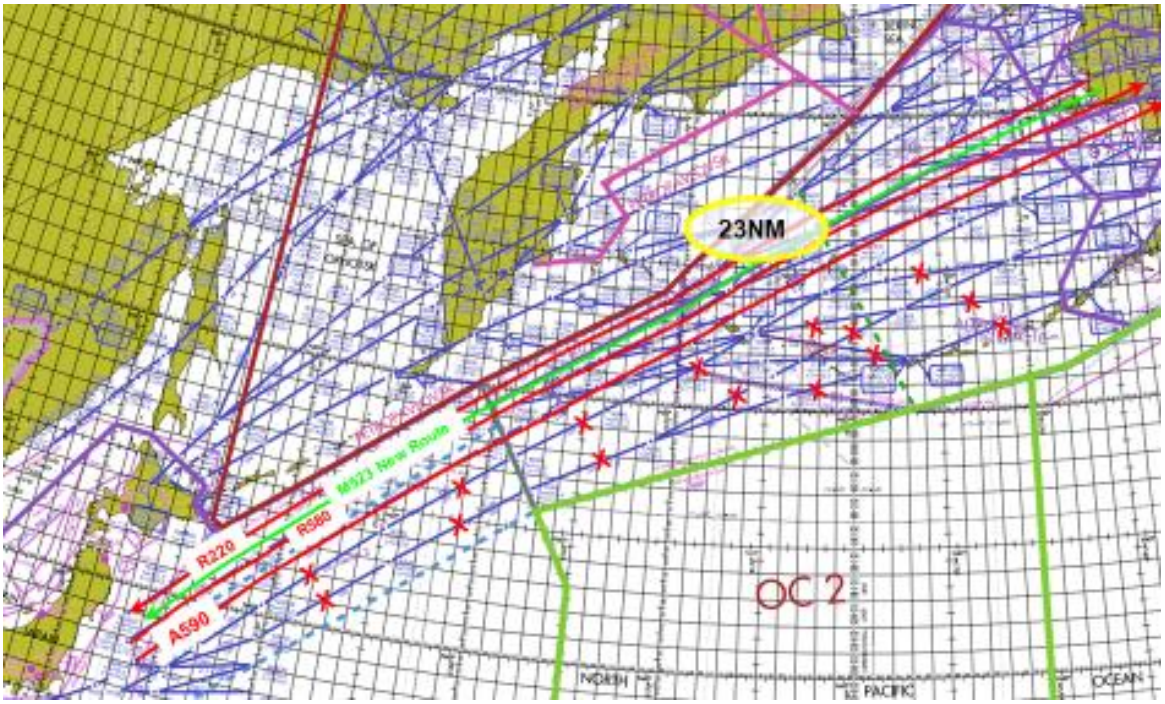

Figure 3. NOPAC Redesign Phase 2

1.8.5 Westbound PACOTS Tracks would be published via R220, "M523" and 50 NM south of A590.

1.8.6 Eastbound PACOTS Tracks would be published via R580, A590 and 50 NM south of A590.

1.8.7 UPRs would be allowed via the 4 NOPAC routes and 50 NM south of A590.

1.8.8 The criteria to proceed to Phase 3 would include:

- Successful implementation of Phase 2 with no adverse impacts that were not safely mitigated.
- Operators are correctly complying with the Phase 2 ATS Route PBCS restrictions.

1.9 Phase 3 will create a new eastbound ATS Route, named N507, which will be at least 25 NM south of R580.

1.9.1 R220 remains a westbound route with PBCS/RNP4 approval required from FL340 to FL400.

1.9.2 M523 remains westbound route open to PBCS/RNP4 aircraft from FL340 to FL400. M523 is closed to aircraft FL330 and below and FL410 and above.

1.9.3 R580 remains an eastbound route with PBCS/RNP4 approval required from FL340 to FL400.

1.9.4 N507 is a new eastbound route open to PBCS/RNP4 aircraft from FL340 to FL400. N507 is closed to aircraft FL330 and below and FL410 and above.

1.9.5 A590 will be removed but the waypoints that define A590 will be retained. Aircraft flying the waypoints of A590 will be required to have PBCS/RNP4 approval required from FL340 to FL400.

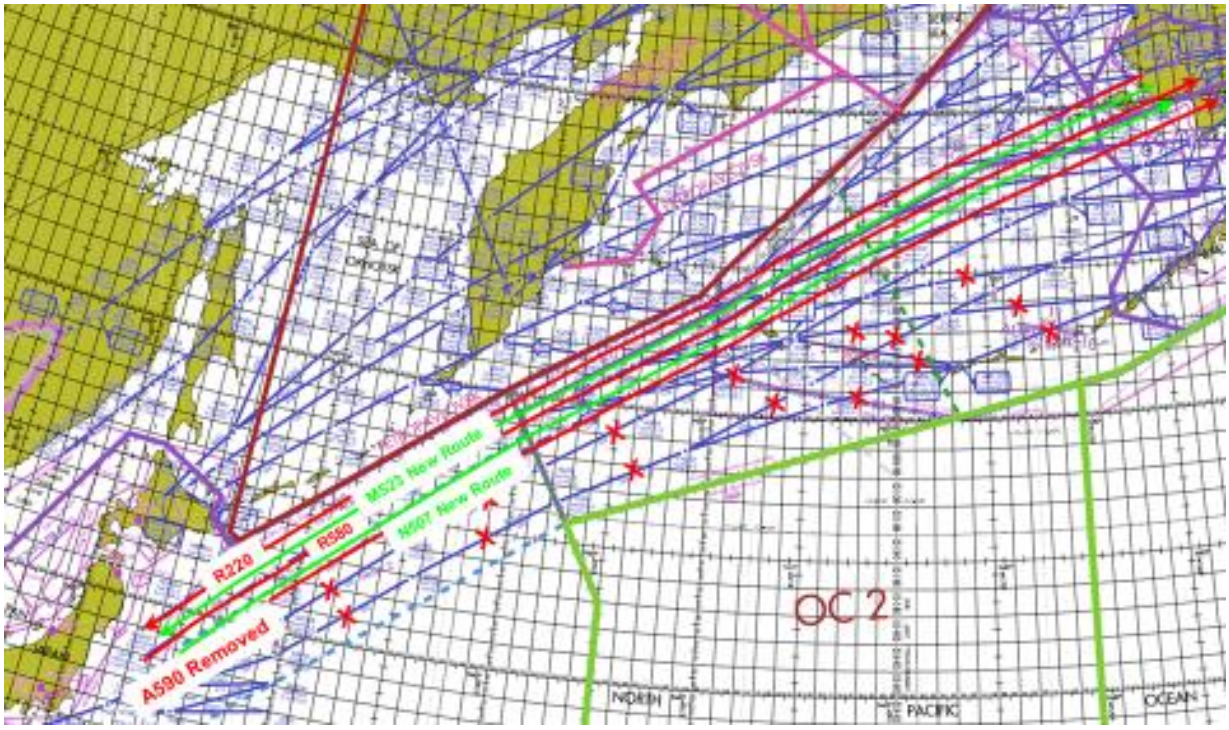

Figure 4. NOPAC Redesign Phase 3

1.9.6 Westbound PACOTS Tracks would be published via R220, M523, 25 NM south of N507 via the waypoints of the deleted A590 or 75 NM south of N507 via the waypoints of the deleted R591.

1.9.7 Eastbound PACOTS Tracks would be published via R580, N507, 25 NM south of N507 via the waypoints of the deleted A590 or 75 NM south of N507 via the waypoints of the deleted R591.

1.9.8 UPRs would be allowed via the 4 NOPAC routes, 25 NM south of N507 via the waypoints of the deleted A590 or 75 NM south of N507 via the waypoints of the deleted R591.

1.9.9 When a PACOTS Track or UPRs utilize R220, M523, R580, N507 or the waypoints of the deleted A590, 25 NM south of N507, PBCS approvals are required from FL340 to FL400. Figure 5 shows a cross section of the Phase 3 NOPAC routes to illustrate the PBCS requirements and available altitudes on each of the Phase 3 routes.

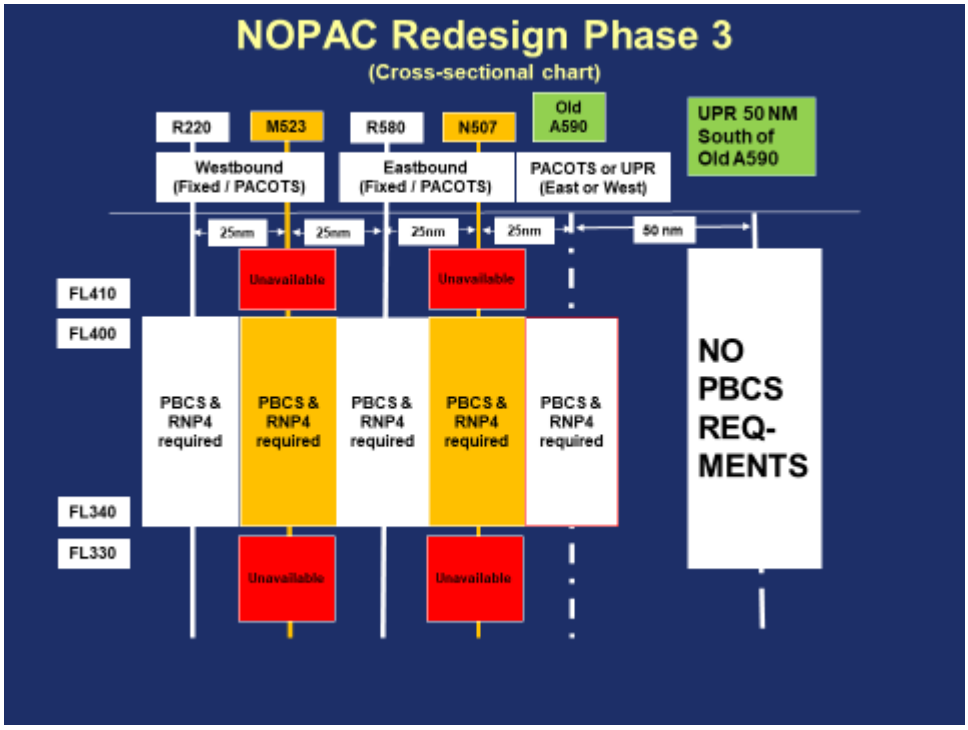

Figure 5. NOPAC Redesign Phase 3 Cross Sectional Chart

1.10 Rules for joining the NOPAC route system will be very similar to the rules used today.

1.11 After implementation of Phase 3, the 4 NOPAC routes will have been compressed into less airspace than 3 routes previously occupied. The Phase 3 PBCS routes will allow for the efficient movement of large volumes of traffic through the NOPAC routes. A significant volume of airspace south of the Phase 3 NOPAC routes previously occupied by A590, R591 and G344 will be available for more efficient flexible PACOTS routes and UPRs. After implementation of Phase 3, the airspace will be monitored for any issues and procedural adjustments may be made when required. As the percentage of PBCS approved aircraft increases, adjustments may be made to increase the PBCS altitude stratums to improve efficiency

2. DISCUSSION

2.1 The COVID-19 pandemic has caused many changes to the aircraft capabilities in NOPAC. After COVID the number of PBCS approved aircraft dropped and there was a large increase in Non-PBCS approved Cargo aircraft. Prior to COVID-19, IATA had projected that most of their member's aircraft in NOPAC would have their PBCS approvals by the end of 2022. However COVID caused the percentage of PBCS approved aircraft to fall from around 76% to 54% in the first few months of 2019. After the pandemic began, we have continued to work with IATA and the operators on the NOPAC redesign. The pandemic has placed most operators in great financial crisis and they are looking for any operational efficiencies that they can utilize. While the NOPAC redesign is not a short-term project, the proposed changes will help provide the efficiency gains the operators are looking for. Recognizing these benefits, many of the operators have obtained new PBCS approvals for their aircraft and the percentage of PBCS aircraft has rebounded.

2.2 The 23 NM laterally spaced NOPAC Route Structure is not being considered exclusionary routes/airspace. Non-PBCS approved aircraft will be accommodated at or below FL330 and at or above FL410 or south of the four NOPAC Phase 3 routes. IATA expressed support for the proposed plan at the IPACG 45 Meeting, but IATA does not represent all NOPAC users. The FAA collected

data from the first half of 2019 and coordinated the NOPAC redesign plan with Non PBCS approved aircraft operators that were not IATA members. Most of these Non-IATA operators responded and have either obtained PBCS approvals or have plans to obtain the approvals for their aircraft.

2.3 While the percentage of PBCS approved operators in NOPAC fell to 54% in April 2019, that number has rebounded. Figure 6 shows the percentage of PBCS approved aircraft in NOPAC at FL300 and above for the first 7 months of 2021.

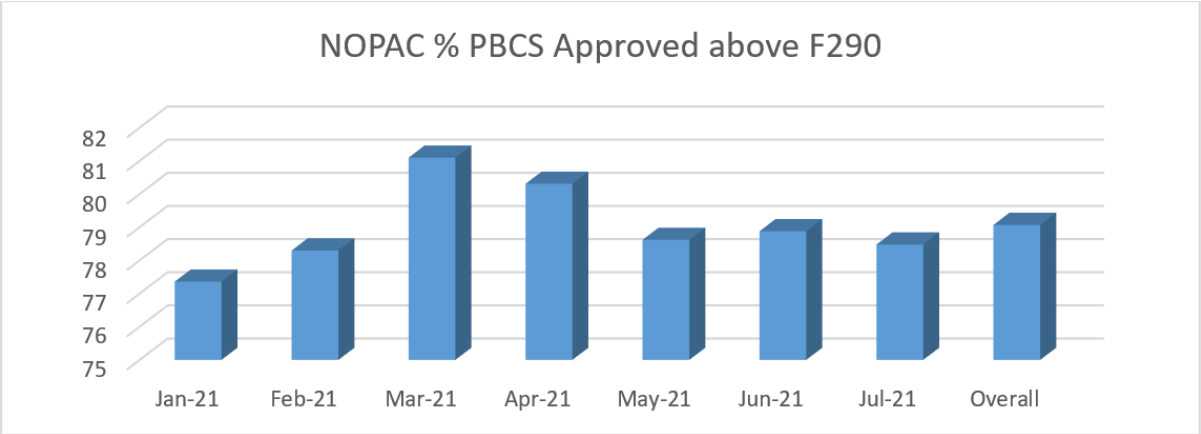

Figure 6. Percentage of PBCS Approved flights above FL290 in NOPAC

2.4 The percentage of PBCS approved aircraft fluctuates about 4% month to month, but the overall percentage for PBCS aircraft in 2021 has rebounded to over pre-COVID approval levels.

2.5 Starting in Phase 1a of the NOPAC redesign, there will be PBCS and RNP4 requirements from FL340 to FL400 on different NOPAC routes. The number of routes with PBCS requirements will increase as the Phases progress. Figure 7 shows a breakdown of NOPAC AIDC CPL aircraft altitudes crossing the Fukuoka/Anchorage FIR boundary in July 2021 at FL300 and above. The blue columns are the total number of aircraft at the altitude. The red columns are the number of Non-PBCS approved aircraft at each altitude.

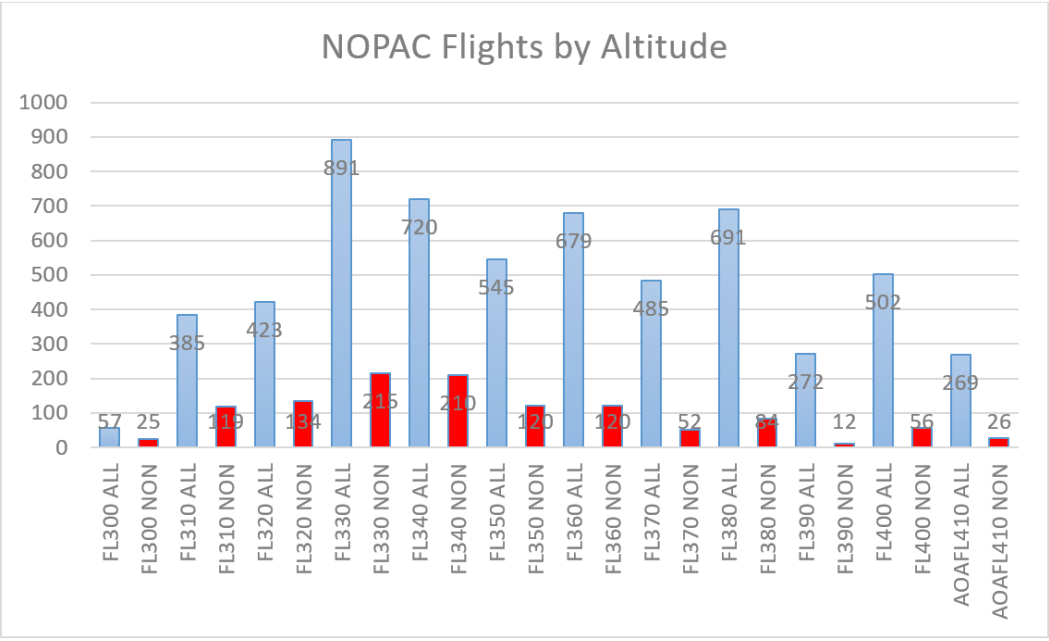

Figure 7. NOPAC Traffic CPL FIR altitude breakdown July 2021

2.6 Aircraft at FL330 and below or aircraft at FL410 and above are not within the PBCS requirements. It can be seen that in July there were a significant number of Non-PBCS approved aircraft operating in the planned PBCS altitude stratum.

2.7 IATA provided results from an updated 2021 survey of their Non-PBCS approved operators which detailed their plans for obtaining PBCS approval. We have also obtained information from Non-IATA members on their plans to obtain PBCS approval. Figure 8 provides a de-identified list of Non-PBCS operators and the altitude stratums they operate at. The table also indicates if the operator has plans to be prepared for Phase 1b PBCS requirements.

Operator	Type AC	No Flights of 1236	FL340-400	FL340	PBCS Cert. Plans to be prepared for Phase 1b
"A"	B744	321	187	72	NO
"B"	B744	151	98	44	NO
"C"	B77L	99	27	9	NO
"D"	B744	95	40	34	YES
"E"	MOSTLY MD11	84	42	4	YES
"F"	B748	81	46	20	UNKNOWN
"G"	B789	61	61	1	YES
"H"	B77L	41	0	0	NO
"I"	B77L	39	18	16	YES
"J"	ASST	25	18	5	UNKNOWN
"K"	MD11/B744	22	12	1	UNKNOWN
"F"	B77W	16	12	2	UNKNOWN
"M"	B744	16	9	7	YES
"N"	B744	14	7	4	YES
"O"	ASST	8	8	0	YES
"P"	A343	7	2	1	UNKNOWN
"Q"	ASST	7	1	0	UNKNOWN
"R"	B744	6	4	2	NO

Operator	Type AC	No Flights of 1236	FL340-400	FL340	PBCS Cert. Plans to be prepared for Phase 1b
"S"	B789	3	3	0	UNKNOWN

Figure 8. July 2021 Non-PBCS De-Identified NOPAC Operators

2.8 The Figure 8 table is sorted by the operators with the most non PBCS approved flights. The top 3 Non-PBCS operators account for over half of the Non-PBCS flights. These 3 IATA operators advised that they have no plans to obtain PBCS approval for their aircraft. We are in the process of coordinating with IATA to ensure those 3 operators and their other members understand the implications of not having PBCS approval when Phase 1b starts.

2.9 JCAB and the FAA previously discussed that the percentage of PBCS/RNP4 approved flights in NOPAC needed to be 90 percent or higher to move forward to Phase 1b. In 2021 the NOPAC overall PBCS approval was at 79.07 percent. The impact of the COVID-19 pandemic has delayed the implementation of NOPAC Redesign Phase 1b and later. Until the PBCS approval rate reaches the 90 percent implementation goal it is not possible to move forward to Phase 1b due to controller workload.

2.10 In the Anchorage Oceanic FIR, ATS Route R220 is too close to the Magadan FIR boundary. On December 2, 2021, as part of the NOPAC redesign, the FAA will move R220, R580, A590 and R591 within the Anchorage Oceanic FIR about 8NM south near 170E (NIKLL) to correct that problem. Also on December 2, 2021 the FAA will establish the two new PBCS/PBN routes M523 and N507 within the Anchorage Oceanic FIR in preparation for Phase 2 of the NOPAC redesign project. M523 and N507 will be NOTAMed as unavailable until Phase 2 begins. All the waypoints of M523 will start with the letter "H" and all the waypoints of N507 will start with the letter "R".

2.11 Phase 1a of the NOPAC redesign will be implemented on December 2, 2021. Phase 1a will help to raise the level of PBCS approved operators to help reach the 90% PBCS approval level without causing undue burden on the operators. When Phase 3 is completed it will open more airspace for UPRs and flexible routes. The newly opened airspace south of the NOPAC routes will not have any PBCS requirements. The NOPAC redesign will increase airspace efficiency.

2.12 A tentative date of November 2022 has been set to begin Phase 1b. The November 2022 date is dependent on ANSP software changes and the PBCS/RNP4 approval levels.

2.13 Japan and the FAA have continued their efforts to improve operational efficiency between the IPACG Plenary meetings. The next IPACG/47 Plenary Meeting will be held virtually on February 1/2 and 2/3, 2022 depending which time zone the participant is in. Updates from the IPACG/47 meeting will be provided to the next ATM/SG meeting.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) support the NOPAC redesign project.

…….