THE FORTY-NINTH MEETING OF THE INFORMAL PACIFIC ATC COORDINATING GROUP (IPACG/49)

NOPAC Redesign Future Considerations

(Presented by FAA)

SUMMARY

This paper provides discussion on the planned phasing structure of the NOPAC Redesign Project, incorporating lessons learned from contingency events, emerging data regarding VHF Data Link to SATCOM transitions, and confidence issues with the stability and redundancy of the oceanic data link network.

1. Introduction

1.1. The multi-phased redesign of the North Pacific (NOPAC) route structure in the Anchorage and Fukuoka Oceanic FIRs has been underway since January 2023. NOPAC redesign utilizes the 23NM lateral Performance-Based Communication and Surveillance (PBCS) separation standard for a 25NM laterally spaced ATS route structure.

1.2. Phase 1 and 2 of the NOPAC Redesign removed ATS routes R591 and G344, published the 25NM lateral spaced westbound ATS route M523, established R580 as an eastbound ATS route, and established User Preferred Route (UPR) airspace south of the NOPAC route structure. Phase 3, originally planned for mid-year 2025, intends to publish the 25NM laterally spaced eastbound ATS route N507.

1.3. The basis for the NOPAC redesign route structure is the reduced lateral separation standard provided by RNP4, RSP180, and RCP240 PBCS separation minima. The significant data link network outages experienced in 2024 have necessitated more reliance than anticipated on the contingency procedures outlined in the NOPAC MOU between Fukuoka ACC and Anchorage ARTCC. In addition, Anchorage has experienced frequent network connectivity issues experienced by aircraft transitioning between VHF datalink and Satellite datalink. This has further complicated the reliable use of the 23NM lateral minimum.

2. Discussion

2.1. The FAA shared updated information on observed impacts to oceanic air traffic related to data link network outages at IPACG PM/31. As discussed in that paper, the observed network unavailability in 2024, as measured by duration of outage, for some data link services was significantly higher than the safety target of 520 total minutes. Figure 1 illustrates the duration of observed service outages against the safety target.

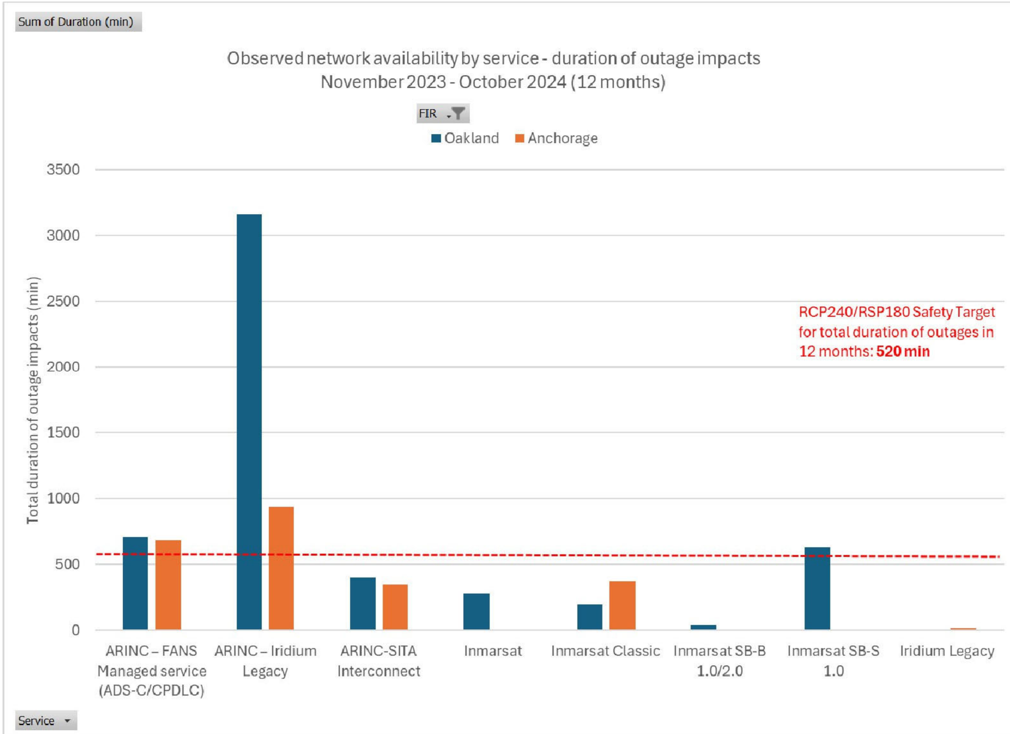

Figure 1.

2.2. Figure 2 illustrates a breakdown of each outage observed, including duration, service impacted, and number of data link flights impacted. The number of flights impacted refers only to aircraft which directly lost service, it does not account for flights that may have retained connectivity but were subjected to an unrequested altitude or routing change to accommodate the application of a larger separation standard with directly impacted aircraft.

Start of Outage	End of Outage	Duration(Min)	Impacted Service	Impacted Data Link-equipped Flights
2024-01-05 00:01	2024-01-05 01:13	72	ARINC	55
2024-01-19 02:25	2024-01-19 04:08	103	Iridium/ARINC	6
2024-01-26 02:29	2024-01-26 03:27	58	Iridium/ARINC	6
2024-02-02 02:21	2024-02-02 02:55	34	Iridium/ARINC	6
2024-02-04 14:47	2024-02-04 15:04	17	Iridium/ARINC	5
2024-02-05 02:39	2024-02-05 03:02	23	Iridium/ARINC	4
2024-02-06 06:21	2024-02-06 08:55	154	Iridium/ARINC	3
2024-02-09 02:28	2024-02-09 03:49	81	Iridium/ARINC	4
2024-02-12 02:33	2024-02-12 03:02	29	Iridium/ARINC	5
2024-02-12 18:02	2024-02-12 18:27	25	Iridium/ARINC	5
2024-02-13 18:38	2024-02-13 20:00	82	ARINC	23
2024-02-16 02:36	2024-02-16 03:15	39	Iridium/ARINC	5
2024-02-21 05:13	2024-02-21 07:52	159	Iridium/ARINC	6
2024-02-21 08:59	2024-02-21 09:58	59	Iridium/ARINC	3
2024-03-06 17:36	2024-03-06 17:53	17	Iridium(Planned)	4
2024-03-11 02:33	2024-03-11 03:04	31	Iridium/ARINC	10
2024-03-13 15:02	2024-03-13 16:00	58	Irdiium/ARINC(Planned)	4
2024-03-13 17:15	2024-03-13 17:29	14	Irdiium/ARINC(Planned)	4
2024-03-19 03:25	2024-03-19 04:03	42	Inmarsat	14
2024-03-21 11:36	2024-03-21 13:19	103	Inmarsat(APAC/AMER)	41
2024-03-27 17:35	2024-03-27 17:54	19	Iridium/ARINC	3
2024-04-12 15:31	2024-04-12 18:12	161	ARINC-SITA Interconnect(?)	35
2024-04-14 16:09	2024-04-14 18:56	167	ARINC-SITA Interconnect	38
2024-04-15 14:29	2024-04-15 14:50	21	ARINC-SITA Interconnect	14
2024-07-31 01:55	2024-07-31 02:42	48	Inmarsat	33
2024-07-31 02:46	2024-07-31 04:05	49	Inmarsat	30
2024-07-31 06:06	2024-07-31 06:45	40	Inmarsat	39
2024-07-31 11:31	2024-07-31 12:38	67	Inmarsat	33
2024-08-01 11:04	2024-08-01 11:25	21	Inmarsat	21
2024-10-07 14:56	2024-10-07 15:22	26	ARINC	37

Figure 2. Data Link Outages Observed in Anchorage FIR in CY2024

2.3. Another cause of connectivity issues in Anchorage Oceanic airspace is VHF Data Link (VDL) to Satellite (SAT) transitions. Anchorage has multiple VDL sites which provide significant coverage in their oceanic FIR.VDL to SAT transition is a known contributor to poor datalink performance and connectivity issues. Figure 3 illustrates Anchorage Center's approximate VDL coverage as well as the areas with the most significant performance issues observed. The white circles represent the Shemya and Saint Paul VDL sites. ADS-C reports from January through May 2024 are plotted, with green squares indicating reports which were received in a timely manner. The yellow squares indicate ADS-C reports which were received significantly late. Red squares represent ADS-C reports which were so late that the aircraft lost eligibility for PBCS. Where the two most northerly westbound routes exit the Saint Paul and Shemya VDL volumes there is a cluster of red ADS-C reports. The eastbound routes have a similar cluster of red reports where they exit the Shemya VDL volume.

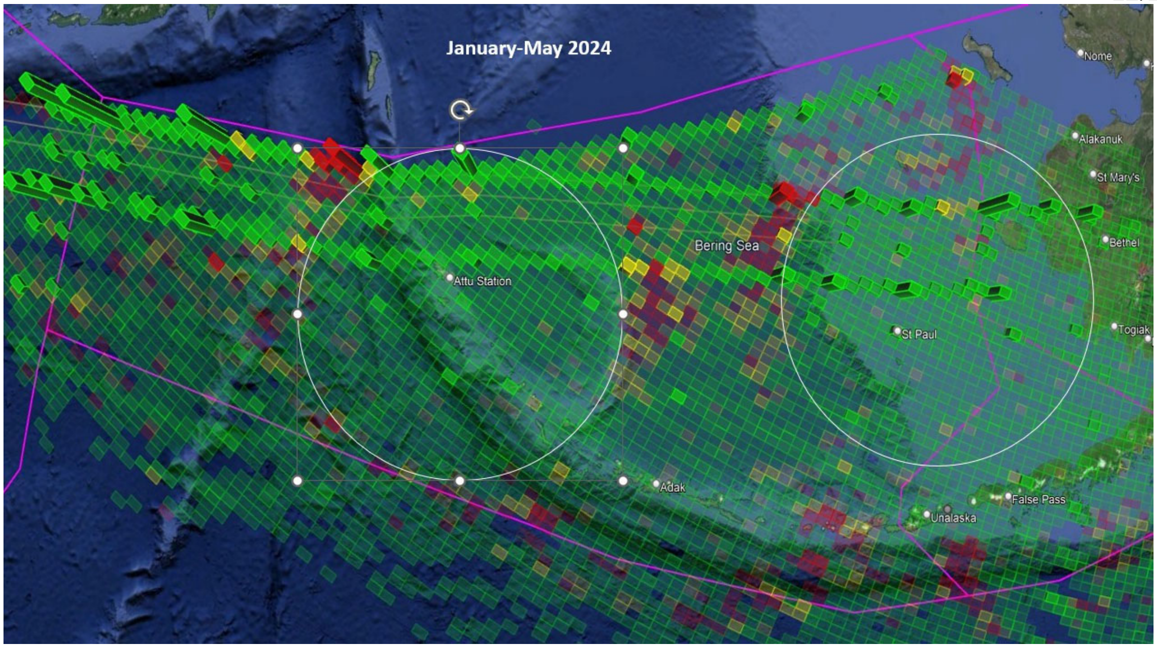

Figure 3. Shemya and Saint Paul VDL Site coverages

2.4. A proposed mitigation for this issue is for operators to upgrade ACARS router avionics to include the RAT1 timer. This timer is intended to improve performance during VDL-to-SAT transitions by attempting to send a duplicate message via SAT when attempts to send the message via VDL have not been successful for 60 seconds. While the FAA and operators remain hopeful that the RAT1 timer will alleviate some of these transition issues, a representative from Boeing informed the FAA on 29 October 2024, that the Boeing 747 800 series already has the RAT1 timer as a part of the software in their CMU. There is, however, an additional known issue with SAT, wherein a flight simply will not connect to SATCOM at all. It has been observed since the airframe went into service in 2012. While Boeing does not currently have a root cause or a schedule for fixes, they have recreated the issue in their lab, and are optimistic for a fix at some point in the future. Still, this promises that near-term, RAT1 timer implementation will not fix all connectivity issues for all airframes.

2.5. There are nearly 70 RNP4/PBCS compliant B747 400 series aircraft that operate in the NOPAC which do not have hardware or software capable of enabling RAT1. It is understood that these airframes will not be upgraded to allow RAT1 functionality. Therefore, these airframes do not have any potential resolution for VDL-SAT transition and will continue to experience connectivity issues leading to suspension of reduced separation by ATOP.

2.6. After the start of NOPAC Redesign Phase 2, the winter of 2023 in to early 2024 saw extreme crowding on R220. Average traffic on R220 is around 3,000 flights a month. Figure 4 shows the spike in utilization in February 2024 with traffic levels more than doubled to almost 7,000 flights in the month. Traffic levels remained significantly above average through June 2024.

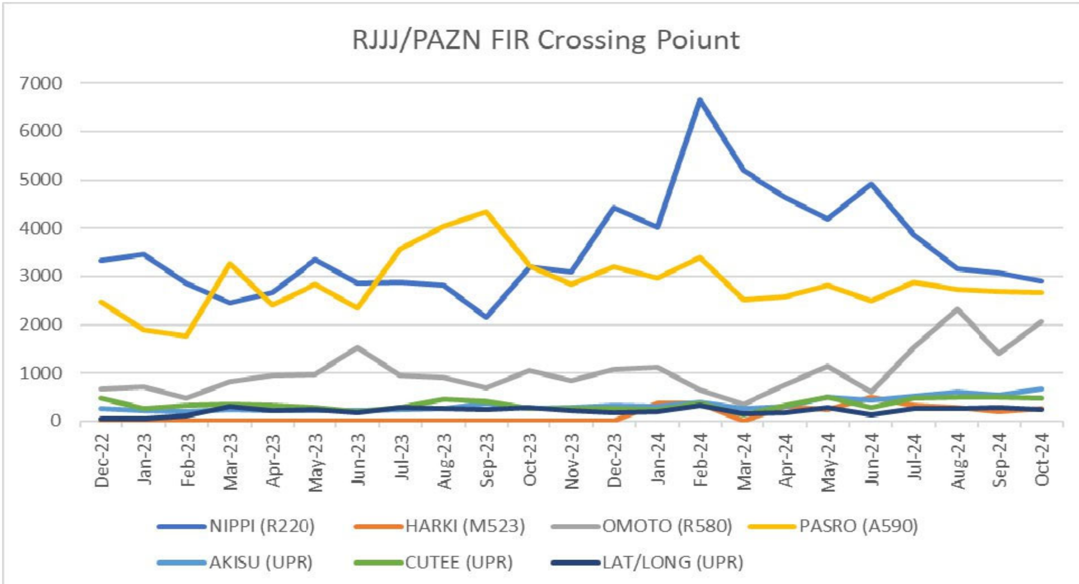

Figure 4. RJJJ/PAZN FIR Crossing Point Traffic

2.7. One known factor for the higher level of traffic on R220 is the closure of the Russian Airspace to most operators. Aircraft which would typically utilize the Russian airspace are limited to the NOPAC structure and choose R220 as the most northerly routing available to them. Unfortunately, it appears the Ukrainian war will continue through the coming winter so the Russian airspace will likely remain closed.

2.8. The FAA studied flight plan data to ascertain whether other factors contributed to the overloading on R220. Figure 5 shows traffic on R220 graphed by departure region. Most R220 departure regions remain fairly stable throughout the data collection. Several regions did experience a small rise in February 2024, but the increase in departures from California was significant.

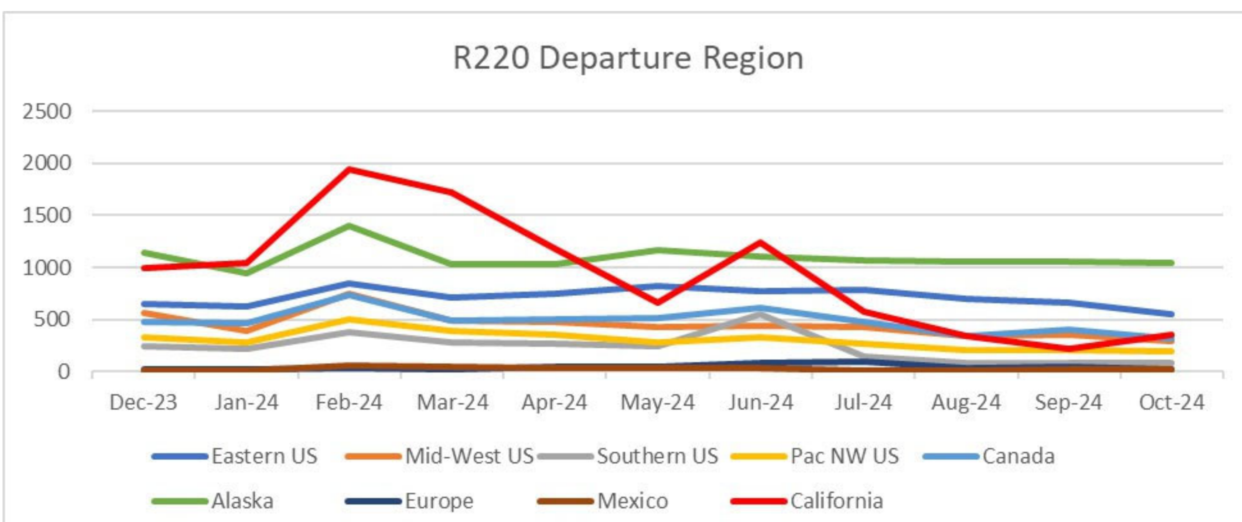

Figure 5. R220 Departure Regions

2.9. Given the high congestion of westbound traffic in the NOPAC and the frequency with which data link connectivity issues continue to be encountered, robust contingency procedures are especially important. The positioning of R220 and M523 make it very challenging to manage an urgent shift to non-PBCS separation minima during datalink outages, as there is no immediate option to establish 50NM lateral separation by issuing reroutes on to an adjacent airway. The FAA has renewed interest in exploring measures to improve the NOPAC redesign routes to account for traffic congestion and contingency preparedness.

2.10. The FAA would like to propose some options for discussion that could potentially lead to improved operations and safety.

Proposal 1: Return R580 to a westbound ATS route. In the event of a data link outage Anchorage and Fukuoka controllers will easily be able to balance westbound traffic on two routes with 50NM spacing. This could also have potential to open more altitudes for aircraft that are not PBCS equipped. In addition, it could be considered to allow westbound PACOTS to be published on R220 and R580 simultaneously. N507 could still be published along its planned route, or consideration could be made to instead publish it 25NM south of A590.Utilizing 50NM spacing between the westbound and eastbound NOPAC routes would eliminate opposite direction traffic conflictions during a data link outage.

Proposal 2: Change R580 to a vertically split route. When problems were encountered with multiple data link outages after the start of Phase 2, a temporary agreement was reached between Anchorage and Fukuoka to split the use of R580. Flight level 340 and above was used for westbound aircraft and flight level 330 and below was used for eastbound aircraft. With this proposal when a data link outage occurred, traffic on M523 could be rerouted to R580, FL340 and above or merged with the traffic on R220. This gives controllers more options to manage data link network outages.

Proposal 3: Revert back to Phase 1b. Eliminating the use of M523 removes the lateral separation impact of data link outages, but it is a step backward with the NOPAC Redesign Project.

2.11. Due to the data link connectivity problems and inability to continue use of reduced lateral separation during an outage FAA is not ready to move forward with NOPAC Redesign Phase 3 as it is currently designed. Until these issues are resolved the FAA considers that it would not be wise to introduce more routes separated by the 23 NM lateral minimum without better contingency options.

3. Action by the meeting

3.1. The meeting is requested to:

3.1.1. Discuss the NOPAC Redesign Project’s progress so far.

3.1.2. Discuss the proposals in 2.10 and explore possible longer-term options that could reduce the impacts of data link outages on the controllers and aircraft operating on the NOPAC Redesign routes.