

ELEVENTH AIR NAVIGATION CONFERENCE

Montreal, 22 September to 3 October 2003

**Agenda Item 4: Capacity-enhancement
measures**

4.2 Regional measures

:

CAPACITY ENHANCEMENT OVER THE NORTH/CENTRAL PACIFIC AREAS

(Presented by Japan)

SUMMARY

This paper presents the current oceanic ATS operation, its progress and future implementation plan for capacity enhancement over the North/Central Pacific Areas. The IPACG, established by JCAB and FAA provides a forum for air traffic service providers and users to informally meet and explore solutions to near term ATC problems that limit the capacity or efficiency within the Anchorage, Oakland, and Tokyo Oceanic flight information regions. IPACG has achieved implementation of 50 NM lateral separation minimum based on RNP 10, and RVSM over the North/Central Pacific. The IPACG also discusses further reductions of lateral and longitudinal separations by introducing ADS/CPDLC capabilities based on the AMSS.

Action by the conference is in paragraph 6.

1. INTRODUCTION

1.1 There exist several major international flight routes over the Pacific Ocean connecting Asian countries and North America. As to the international flight routes over the North/Central Pacific (NOPAC/CENPAC), Japan and the United States have a responsibility to provide oceanic air traffic services (ATS). The Japan Civil Aviation Bureau (JCAB) is responsible for two flight information regions (FIRs), Tokyo FIR and Naha FIR, whereas the Federal Aviation Administration (FAA) is responsible for two FIRs, Anchorage Oceanic FIR and Oakland Oceanic FIR. The layout of FIRs in the Pacific Ocean is shown in Figure 1 in the appendix.

1.2 In providing oceanic ATS, HF voice communication is widely used because VHF communication cannot be reached due to the line of sight and limited VHF power. JCAB has implemented two HF communication centers in Tokyo and Naha. Tokyo Radio is in charge of HF voice communication in the North Pacific Region (NP) and Central West Pacific Region (CWP), and Naha Radio is only in charge of CWP.

1.3 An air traffic controller who is in charge of providing oceanic ATS cannot communicate directly with pilot in the current oceanic operations. An air traffic controller communicates with the intermediary called HF communication specialist through teletype or voice line. Then, the HF communication specialist conveys controllers' messages such as ATC instructions to the pilot through HF radio. In the opposite direction, the pilot communicates with the HF communication specialist to convey messages such as position reports and ATC requests through HF radio. Then, those received messages will be sent to the air traffic controller through teletype or voice line by the HF communication specialist. Currently, position report in oceanic flight is made at every 10 degrees longitude, which is equivalent to about one hour reporting interval in NOPAC/CENPAC.

1.4 In the oceanic airspace, time-based longitudinal separation minimum, that is, 15 minutes or 10 minutes with Mach Number Technique is applied at this moment. There are a number of reasons why this separation minimum cannot be reduced further with the current operations. One of the major reasons is that ATC communications using HF voice requires an HF communication specialist and it is not direct communication between the ATC and the pilot. Since HF voice communication is not stable due to the propagation problems caused by the ionospheric irregularity, it is not feasible to further improve communication and surveillance requirements using HF voice.

2. OPERATION TOWARD CAPACITY ENHANCEMENT

2.1 The international air traffic between Asian countries and North America has been increasing very sharply with the growing aviation market in Asia. The major international traffic flow and its amount are shown in Figure 2 in the appendix. In order to cope with the sharp increase of the international air traffic over the Pacific Ocean, it was thought necessary to transition from HF voice communication to aeronautical mobile satellite service (AMSS) communication. The Informal Pacific ATC Coordination Group (IPACG), established by JCAB and FAA provides a forum for ATS providers and users to informally meet and explore solutions to near term ATC problems that limit the capacity or efficiency within the Anchorage, Oakland, and Tokyo Oceanic FIRs. Taking into consideration the technological developments as well as the consequent reform of operational procedures, the IPACG decided to discuss improving the oceanic ATS operation over the Pacific Ocean.

2.2 The IPACG initiated trials with the limited airlines participation by utilizing the future air navigation systems (FANS)/1 package of B747-400 in the early 1990's. With the increase of FANS/1 and FANS/A-equipped aircraft, ATC data link operations commenced in 1997 over NOPAC/CENPAC through AMSS system operated by International Maritime Satellite Organization (INMARSAT). Some 20 aircraft operators participate in the operation and 30 to 50 per cent of aircraft operating in the area, depending on the tracks, are currently data link capable aircraft. Currently, controller-pilot data link communications (CPDLC) is used as a primary means of communications for NOPAC/CENPAC with HF as a backup. The ADS system has been implemented at Tokyo ACC and will be used for ATC with the introduction of 50 NM longitudinal separation minimum discussed later.

2.3 The IPACG established the FANS Interoperability Team (FIT) in order to monitor and enhance the data link operations in NOPAC/CENPAC in 1999. The FIT is composed of ATS service providers, aircraft operators, data link service providers, aircraft and avionics manufacturers, international organizations, and regulatory authorities. JCAB and FAA have established a Central Reporting Agency (CRA) for jurisdictional oceanic airspace to collect the technical and operational problems associated with data link operations, and develop recommendations for improving the system and operational procedures.

3. STRATEGY OF SEPARATION REDUCTION WITH THE USE OF AMSS

3.1 50 NM lateral separation minimum with RNP 10 was implemented in NOPAC/CENPAC in 1998. The introduction of lateral separation minimum from 100 NM to 50 NM reduced ATC complexity, specifically crossing traffic complexity in NOPAC. With the introduction of 50 NM lateral separation minimum, NOPAC was modified from a composite route system (CRS) to a simple parallel route system with 50 NM track spacing.

3.2 NOPAC is a fixed parallel route system with five published routes connecting between Japan and the Alaska Peninsula, while Pacific Organized Track System (PACOTS) is a flexible route system, connecting between Japan and the United States west coast and Hawaii, generated daily closer to favorable winds to maximize operational benefits, taking account of weather forecasts. The major oceanic routes in the Pacific Ocean are shown in Figure 1. The air traffic flow management centre (ATFMC) in Fukuoka usually generates seven eastbound tracks, whereas Oakland ARTCC generates six westbound tracks. The introduction of 50 NM lateral separation has enabled for two centres to establish more efficient tracks with minimum time and fuel consumption.

3.3 Establishing additional tracks with 50 NM track spacing is not feasible due to the limitation of entry/exit gates for the oceanic airspace. In order to further improve operations in NOPAC/CENPAC coping with the increasing traffic in the future, further separation reduction is required. JCAB and FAA have agreed at IPACG to implement 50 NM longitudinal separation minimum using ADS/CPDLC in NOPAC/CENPAC. Due to strong easterly winds, it is expected that the introduction of 50 NM longitudinal separation minimum for the eastbound flights will significantly improve operation in NOPAC compared with the current time-based longitudinal separation using HF voice. JCAB and FAA plan to introduce 30 NM longitudinal and 30 NM lateral separation minima in future using ADS/CPDLC. Once the 30 NM lateral separation is introduced, each track could be established closer to favorable winds.

3.4 As stated above, in order to cope with the rapid increase of international traffic in NOPAC/CENPAC, it is inevitable for JCAB to introduce ADS/CPDLC through the AMSS for the reduction of aircraft separation minima. When data link is lost and it is considered that there is a possibility of loss of separation and action is required to resolve potential conflict, alternate means of separation using HF shall be applied. However, it is not always possible to appropriately apply the alternate means of separations using HF. That is why the dependable AMSS system with high reliability and integrity is needed to support oceanic ATS in a very congested traffic environment.

3.5 Therefore, JCAB decided to develop a new aeronautical satellite system, called Multi-functional Transport Satellite (MTSAT) in 1994. There will be two aeronautical satellites, MTSAT-1R and MTSAT-2 available for the Asia and Pacific Region. There are also two aeronautical satellite centres where two ground earth stations (GES)s are implemented in each center. The instantaneous switchover

between two satellites and four GESs is fully assured in the MTSAT. The technical details of the MTSAT and high redundant system can be found in AN-Conf/11-IP/34. The redundant architecture will provide highly reliable AMSS to users, which will strongly support the reduction of the lateral and longitudinal separations over NOPAC/CENPAC.

3.6 With the MTSAT-1R scheduled for launch in early 2004, JCAB intends to apply 50 NM longitudinal separation minimum using ADS/CPDLC for appropriately equipped aircraft. With the MTSAT-2 scheduled for launch in early 2005 and obtaining operational experiences, JCAB will further reduce the longitudinal separation minimum to 30 NM. JCAB closely coordinates with FAA and aircraft operators through IPACG meetings for the introduction of these separation minima.

4. ESTABLISHMENT OF AIR TRAFFIC MANAGEMENT (ATM) CENTER

4.1 In parallel with the implementation of MTSAT system, JCAB is now implementing the ATM centre in Fukuoka where the ATFM is located. While the ATFM is now providing only the domestic flow management function, such new functions as the airspace management (ASM), the oceanic ATS and international flow management will be added in the ATM centre.

4.2 As to the oceanic ATS function, there are two ACCs — Tokyo ACC and Naha ACC in Japan — who are responsible for the provision of oceanic ATS within the Tokyo and Naha FIRs respectively. JCAB plans to consolidate the two FIRs into a single FIR. With the consolidation of FIR, the oceanic ATS operation will be integrated accordingly from Tokyo ACC and Naha ACC into the ATM centre in Fukuoka. The operation of HF voice communication presently provided by Tokyo Radio and Naha Radio will also be combined into a single unit. The operation of the ATM centre is expected to commence in 2005.

4.3 Since reduced vertical separation minima (RVSM) implementation in 2000 in NOPAC/CENPAC, operators are able to fly at levels closer to preferred level. It is reported however that some 40 per cent of international flights departing from Japan bound for the North America are not able to obtain preferred levels from departure airports due to over-flying traffic from other Asian cities. On the other hand, it is also reported that due to departing traffic from Japan, the over-flying aircraft are often not able to climb to optimum levels within the Japanese FIRs. It is considered that, in addition to separation reduction, measures for harmonizing operations for flights both departing from and over-flying Japan are needed. When the function of international flow management coordinating with the neighboring ACCs is provided in the ATM centre, it is expected to significantly improve operations in the northeast Asia and NOPAC/CENPAC.

5. COORDINATION WITH ADJACENT FIRS

5.1 In parallel with the establishment of the ATM centre in Fukuoka, JCAB is assisting the Philippines in implementing the CNS/ATM systems. The Philippines Air Transportation Office (ATO) is responsible for the provision of oceanic ATS within the Manila FIR, adjacent to Naha FIR. Traffic departing from Japan bound for South East Asian destinations, i.e. Jakarta, Kuala Lumpur and Singapore, over-fly the South China Sea airspace. Manila ACC is responsible for a part of the South China Sea airspace where radar surveillance is not available.

5.2 The Japanese Government concluded the 25th Japanese Yen Loan with the Philippine Government in March 2002. The Yen Loan has included implementation of the CNS/ATM Systems for the Philippines, i.e. data link system and ATM center. The ATM center in Manila is expected to commence its operation in 2009. The seamless international air traffic flow will be assured between ATM center in Fukuoka and ATM center in Manila in the near future. Data link operation for the oceanic control airspace within the Manila FIR will contribute to the possible reduction of longitudinal separation minima in the area.

6. ACTION BY THE CONFERENCE

6.1 The Eleventh Air Navigation Conference is invited to recommend that:

- a) ICAO should continue to assist States for the transition to AMSS and to encourage the use of AMSS for ATS in oceanic and remote airspace;
- b) ICAO should continue to encourage States to conduct ADS/CPDLC trial operations, so that the technical and operational problems be identified to ensure the smooth transition to AMSS; and
- c) ICAO should continue to promote coordination between States and between Regions through PIRGs in order to ensure the provision of global and seamless services when one ATM provider intends to introduce ADS/CPDLC through the AMSS in its FIR.

— — — — —

APPENDIX

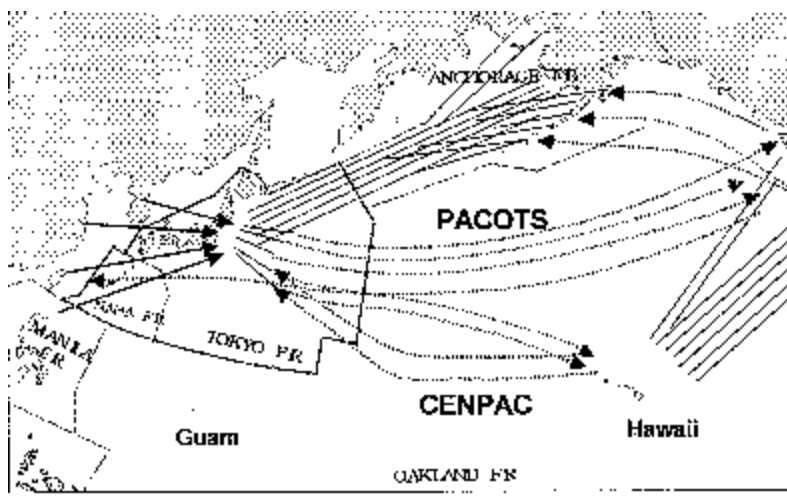


Figure 1. Layout of FIRs and major oceanic routes in the Pacific Ocean

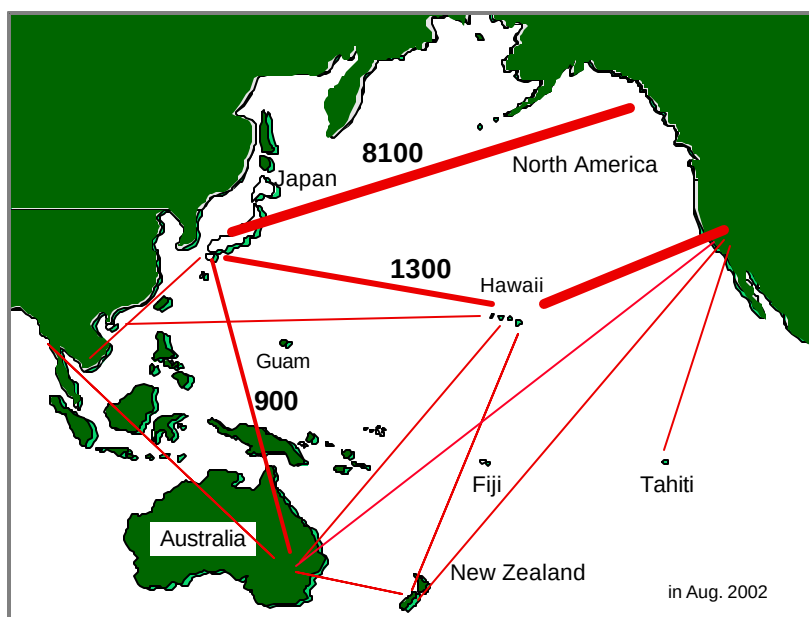


Figure 2. Major international traffic flow and its amount

— END —