International Civil Aviation Organization

FIFTEENTH MEETING OF THE ASIA/PACIFIC AIR NAVIGATION PLANNING AND IMPLEMENTATION REGIONAL GROUP (APANPIRG/15)
Bangkok, Thailand, 23 to 27 August 2004

Agenda Item 3 : CNS/ATM Implementation and Related Activities

SURVEILLANCE IMPLEMENTATION PROGRAMME FOR THE TAHITI FIR

(Presented by France)

SUMMARY

This information paper presents the different steps of improving surveillance capability in the Tahiti FIR. Tahiti ACC is responsible for the provision of en route oceanic, en route domestic, terminal and airport air traffic control. Tahiti has already moved from a fully procedural ATC to ADS/CPDLC based ATC for en route oceanic traffic. The programme for the implementation of a radar for the terminal airspace has been launched in June 2004 with the objective of improving safety. Studies have also been launched for the implementation of ADS-B to provide an extended automated surveillance area covering most of the domestic en route traffic in a very large area. Although ADS-B is considered as a major enabler for this purpose, preliminary studies have shown that considerable efforts are still required on regulatory aspects such as aircraft equipage mandate and definition of separation minima.

1. The Tahiti FIR context

1.1. Tahiti FIR is a large airspace of approximately 2000 Nm x 2000 Nm from ground up to unlimited altitude with a class A airspace between FL195 and FL660 and a class D airspace for Tahiti CTR (35 Nm around Tahiti Faa Airport up to FL 095). It is surrounded by Oakland, Chile, New Zealand FIR and a no FIR airspace. Tahiti ACC is responsible for the provision of en route oceanic, en route domestic, terminal and airport air traffic control.

1.2. The air traffic in the Tahiti FIR is made of different kinds:

- long haul transpacific aircraft between USA and Australia or New Zealand over flying at high altitude usually on User Preferred Route (UPR) to optimise flight time and fuel. These flights are operated by large aircraft such as B747 or A340;

- flights to (or from) Tahiti Faa'a airport from (or to) far destination such as Japan, USA, New Zealand concerned by oceanic en route, domestic en route, terminal area and airport ATC;

- flights between the different islands of the very large Polynesian archipelago. The flights between Tahiti and the nearest islands (Moorea, Iles sous le vent) have a specific route network based on current navigation infrastructure and other flights to remote islands are using predefined free routes. These flights are operated by regional aircraft such as ATR42/72 and also by general aviation aircraft;

- other flights are also to be considered such as military flights, sanitary flights with aircraft or helicopters or other general aviation activity (helicopters, VFR, etc).

1.3. The 2003 traffic statistic is showing that 67 000 IFR flights and 35 000 VFR have been controlled by Tahiti ACC. A significant increase in 2003 compared to 2002 of 4.9 % for IFR traffic is mainly due to the increase of flight to or from Tahiti Faa'a airport. This is reinforcing the need for improving surveillance capabilities especially in the CTR where most of the traffic are converging.

2. ADS-C for oceanic en route traffic

2.1. The VIVO system is an Air Traffic Control system using mainly satellite datalink to communicate with FANS/A/1 equipped aircraft operating oceanic flights. It has been in operation since March 1995 and represents one of the first applications of the CNS/ATM concept defined by ICAO. This system is the result of a regional approach, initiated within the informal group ISPACG (Informal South Pacific ATS Controlling Group) to address the classical restrictions of an oceanic environment : a network of ATS fixed routes that does not take into consideration the actual real time meteorological situation, a poor HF voice communication capability, no means of surveillance (radar implementation is not technically and economically feasible for such a large oceanic airspace). Air Traffic Control is carried out through procedures. The pilot has to report his position and intentions over predetermined waypoints.

2.2. The VIVO system was deployed in several steps: with step 1 in 1995, the controller had a flight plan position display. With step 2 in 1996: CPDLC using FANS/1/A ACARS technology was introduced and improved surveillance by adding automatic update of aircraft position based on pilot CPDLC report in addition to the major improvement of controller pilot communication. Step 3 was deployed in 1999 and is a major modernization step for surveillance with the introduction of ADS-C. The establishment of automatic contract between the VIVO system and the avionics has considerably increased the realism of the air situation display without any increase of controller or pilot workload.

2.3. Modernization of the VIVO system has been launched and a new Linux based version will be operational in 2005. It will have additional functionalities such as the CLAM (Conformance Level Adherence Monitoring) and improvement of ADS. In parallel safety studies are conducted in accordance with Eurocontrol ESARR4 (European Safety Regulatory Requirement) and ICAO Doc 4444 and other relevant ICAO documentation to enable the use of RNP10 based separation minima in the Tahiti FIR.

3. A radar for terminal airspace

3.1. The next surveillance modernization step will address the airspace surrounding Tahiti Island and especially the terminal airspace of Tahiti Faa'a airport. The increase of traffic (cf. 1.3) and the need to increase safety (90% of incidents over the last 10 years have been in a range of 180 Nm from Tahiti) are the main drivers for the French DNA (Directorate for Air Navigation) decision to implement a secondary radar on Tahiti Island. This radar will provide a coverage of the main traffic flows and especially of the standard departure and arrival procedures. Efficiency of Search and Rescue operations can also be significantly improved with the help of a surveillance tool.

3.2. Preliminary studies for a radar installation have started in 2002. A site survey has led to the choice of the Mont Marau Site which is considered as the best trade-off between coverage and accessibility for maintenance and installation in this mountainous area. The studies also assessed the need for radar data processing and controller display system. PC based display systems called IRMA that are already deployed in many regional French airports will be installed in the tower and in the ATC room.

3.3. With the emergence of ADS-B technology, a comparison study between ADS-B and radar was performed in 2003 and the beginning of 2004. The conclusions were that ADS-B could provide a very interesting extension of surveillance coverage but radar control regulatory framework is more mature especially for terminal airspace. The transponders are mandatory for all IFR flights in Tahiti FIR since 1st of January 2003 and extension of the regulation to VFR flights is achievable and is expected with radar operational service.

3.4. A program has been launched in June 2004 to implement one of the secondary monopulse radar stations that was previously installed in France and that is now under replacement by a new Mode S station. Radar operations in Tahiti are expected by end of 2007.

4. ADS-B implementation plan

4.1. The ADS-B study mentioned in 3.3 has assessed 2 scenarios : an ADS-B only surveillance in Polynesia and an extension of the radar coverage with ADS-B. Due to terrain, radar cannot cover 360° at very low altitude around the Tahiti Island and cannot also fully cover the main domestic en route traffic flow between Tahiti and Iles sous le vent when approaching Bora Bora airport. Therefore the implementation of 3 ADS-B ground stations collocated with existing VHF voice ground stations would provide a full surveillance capability in the surrounding area of Tahiti, improving ATS and Search and Rescue operations for a limited and affordable cost.

4.2. In a later stage extension of the coverage with the installation of additional ADS-B ground station collocated with future VHF stations connected to Tahiti by VSAT could provide full surveillance of the domestic traffic flow at en route altitude and during the approach on remote small airports of the Polynesian archipelago. With the development of ADS-B surveillance, exchange of data with adjacent FIRs could be envisaged.

4.3. The study has also assessed in detail the impact of mandating 1090 MHz Extended Squitter capability onboard all involved aircraft. For the most advanced “digital” aircraft, Service Bulletin already exists, thus the cost of equipment should be affordable. For other aircraft especially light aircraft and helicopters, 1090 MHz ES transponders and also appropriate GNSS receivers are available, but Supplemental Type of Certificate have to be developed leading to a higher cost for these types of aircraft. Work is still needed to validate that the broadcast data are usable for ADS-B specific separation standard that are under definition by ICAO.

4.4. In addition to ICAO panels activities on ADS-B such as OPLINK and SAS panels, requirements for radar like application are under development by the Requirement Focus Group (EUROCAE, RTCA, EUROCONTROL, FAA) and are essential for certification of aircraft and for a full operational use of ADS-B with radar-like procedures. These requirements are also concerning navigation requirements and especially satellite navigation precision and integrity. French DNA experts are actively contributing to this RFG.

4.5. The aircraft equipment policy is one of the essential items that needs to be investigated considering the cost, the schedule and the availability of the certification material in a regional coordinated process. The extension of surveillance coverage with ADS-B could be envisaged just after the radar implementation. In that case, an aircraft ADS-B equipage mandate should be necessary before the end of the decade in Tahiti

4.6. Definition of separation minima is the other issue that is essential for an operational use of ADS-B as a surveillance means. Criteria have to be defined by ICAO taking into account ADS-B performances and failure modes as assessed by safety studies. It is planned to evaluate in Toulouse ADS-B 1090 MHz ES performances to support this definition and then, when criteria are available, to assess their application to the Tahiti environment for both the radar and ADS-B overlap area and for the ADS-B only areas.

5. Conclusion

The Meeting is invited to:

a) take note of the information provided in this paper;

b) continue cooperation effort on ADS-B regulatory matters regarding aircraft equipment and definition of separation minima.

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