



International Civil Aviation Organization

**Fourteenth Meeting of the APANPIRG ATM/AIS/SAR Sub-Group
(ATM/AIS/SAR/SG/14)**

Bangkok, Thailand, 28 June – 2 July 2004

Agenda Item 3: Review and progress the tasks assigned to the ATM/AIS/SAR/SG by APANPIRG

**IMPLEMENTATION OF LATERAL OFFSETS IN THE NON-RADAR OCEANIC
AIRSPACE OF SOUTHEAST ASIA**

(Presented by the Secretariat)

SUMMARY

This paper presents a summary of the development of lateral offset procedures for application in the Asia/Pacific Region.

1. INTRODUCTION

1.1 At APANPIRG/12 (August 2001) consideration was given to the practical application of existing ICAO guidelines on the use of lateral offsets in non-radar, oceanic and remote airspace, especially in areas where RVSM was applied.

1.2 APANPIRG/12 also recognized that the establishment of global lateral offset procedures for application by aircraft navigating using GNSS was becoming a significant safety concern.

1.3 In light of the foregoing, APANPIRG/12 developed the following Decision:

Decision 12/9 – Development of lateral offset procedures for application in the Asia/Pacific Region

That, as a matter of urgency, the ATS/AIS/SAR/SG develop lateral offset procedures for application in the Asia/Pacific Region, and in co-ordination with other regional planning groups and bodies concerned, develop global offset procedures.

2. DISCUSSION

2.1 The use of lateral offsets as a safety measure to reduce the risk of collision in the event of loss of vertical separation was the subject of State letter AN 13/11.6-00/96 dated 3 November 2000. The guidelines allowed for the use of a 1 NM offset where the minimum lateral separation was 50 NM in an RNP 10 non-radar environment. The purpose of these guidelines was to standardize procedures to reduce the likelihood of pilots inadvertently applying procedures different from those specified for the airspace in which they were operating. It was also necessary to ensure that the

application of offsets to reduce the risk of collision as a result of loss of vertical separation would not unduly increase the risk of loss of lateral separation between aircraft on adjacent tracks.

2.2 In its review of the APANPIRG/12 report, the Air Navigation Commission considered Decision 12/9 and noted that further guidance was being developed by the Separation and Airspace Safety Panel (SASP) and that the development of lateral offset procedures for regional implementation should be in accordance with global guidelines to avoid a proliferation of procedures with potentially conflicting requirements.

2.3 The SASP undertook a review of the lateral offset guidelines in late 2001, and these were amended by State letter AN 13/11.6-02/21 (copy attached as Appendix A) dated 31 May 2002 to allow for the application of an offset procedures up to 2 NM provided that a safety analysis for the particular airspace had shown that the proposed procedures would meet appropriate safety criteria.

2.4 An amendment proposal (APAC-S 00/4) to the MID/ASIA/PAC/RAC SUPPs (Doc 7030) was adopted by ICAO on 4 March 2004 to implement the 1 NM offset procedures in designated FIRs in the Asia/Pacific Region where a minimum lateral separation of 50 NM route was being used with RNP 10. The following FIRs were designated to apply the 1 NM offset procedure: Auckland Oceanic, Brisbane, Honiara, Melbourne, Nauru, New Zealand, Port Moresby, Easter Island, Nadi and Tahiti.

2.5 To date, the 2 NM offset procedure is not being used in the Region but it is applied on routes in the western portion of the North Atlantic Region. SASP's work to provide global procedures for the 2 NM procedure is well advanced, and the ICAO guidelines are expected to be revised accordingly in the near term. Following the issue of revised guidelines by ICAO, States would have standardized procedures available to implement a 2 NM offset. These procedures would need to be promulgated in State AIPs for the routes and airspace where offsets had been authorized as required by Annex 2 (Chapter 3, para 3.6.2.1.1 refers).

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the guidelines on the use of lateral offsets and safety benefits (State letter AN 13/11.6-02/21 of 31 May 2002 refers);
- b) note the development by SASP of further revised procedures to allow the use of 2 NM offsets which would provide for additional safety benefit and global application; and
- c) identify airspace and routes where 2 NM offset procedures could be applied and prepare an AIP amendment to implement these procedures when the ICAO guidelines are issued.

ATTACHMENT to State letter AN 13/11.6-02/21 (31 May 2002)

REVISED GUIDELINES ON THE USE OF LATERAL OFFSETS AND THE EFFECT ON AIRSPACE SAFETY

1. INTRODUCTION

1.1 These guidelines are based on studies carried out by the ICAO Separation and Airspace Safety Panel (SASP), formerly known as the Review of the General Concept of Separation Panel (RGCSP), to address airspace safety issues associated with pilots applying lateral offsets when navigating by the Global Navigation Satellite System (GNSS). Information received by ICAO indicates that, when navigating by GNSS, there is a widespread practice among pilots to apply a lateral offset as a safety measure to reduce a perceived increase in the risk of collision due to a loss of planned vertical separation. Furthermore, pilots are using various offset values and applying them in different directions, in some cases without obtaining approval from the appropriate air traffic control (ATC) unit. The impact of the use of lateral offsets on overall airspace safety had not previously been evaluated from a safety perspective, and SASP carried out a technical analysis of safety-related issues. These guidelines are based on the results of this analysis and are provided to assist States and regional planning groups to consider air traffic services (ATS) routes and airspace where the use of lateral offsets could be authorized to obtain a safety benefit, thereby enhancing existing levels of safety. Information is provided for pilots and operators on operational issues concerning the effect of lateral offsets on airspace safety and how a safety benefit could be obtained.

1.2 The SASP studies only took into account the effects of lateral offsets on the safety of ATS routes in oceanic and remote area airspace, i.e. where radar service was not provided.

1.3 In regard to the provisions in Annex 2 - *Rules of the Air* that require aircraft to operate on a route centre line, further detailed studies are required on issues related to precision navigation and the risk of collision in the event of a loss of vertical separation for all aircraft operating environments. This includes high density terminal airspace where radar service is provided, and route systems based on required navigation performance (RNP) types less than RNP 10.

2. BACKGROUND

2.1 In accordance with Annex 2, pilots intending to deviate from the centre line of an ATS route are required to obtain authorization from the appropriate ATC unit. Annex 2, Chapter 3, paragraph 3.6.2.1.1, states:

"Unless otherwise authorized or directed by the appropriate air traffic control unit, controlled flights shall, in so far as practicable:

- a) when on an established ATS route, operate along the defined centre line of that route; or
- b) when on any other route, operate directly between the navigation facilities and/or points defining that route."

It should be noted that ICAO separation minima, including lateral route spacing, are based on the assumption that aircraft operate on the centre line of a route; any unauthorized deviation from this requirement could compromise safety. In view of the potential reduction to the risk of collision due to a loss of planned vertical separation, which may be achieved by the application of lateral offsets, ATS authorities are encouraged to authorize the use of lateral offsets in line with these guidelines.

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3. AIRCRAFT NAVIGATION PERFORMANCE AND AIRSPACE SAFETY

3.1 Aircraft operating navigation systems that use GNSS in the navigation solution achieve significantly better navigation accuracy than those without GNSS, e.g. inertial navigation systems (INS). A recent study of aircraft navigation performance accuracy in the North Pacific area showed that aircraft equipped with the FANS-1 system, which uses the GNSS to obtain the navigation solution, had a standard deviation of cross-track (lateral) deviations of approximately 0.2 km (0.11 NM) whereas aircraft navigating by other means had a standard deviation of 2.2 km (1.17 NM). When an operational error results in a loss of planned vertical separation between aircraft on the same route, a collision may be avoided by virtue of the random, lateral or longitudinal separation between the aircraft. By reducing the magnitude of lateral deviations from the route centre line, the use of GNSS increases the probability of a collision. By using offsets to provide lateral spacing between aircraft, the effect of this reduction in random lateral spacing would be mitigated, thereby reducing the risk of collision.

3.2 In the development of separation minima, aircraft navigation accuracy is taken into account. Therefore, intentional unauthorized deviation by pilots from a route centre line undermines the principles on which airspace and route systems have been designed. In cases where safety analyses have been carried out for route systems, and a minimum safety level has been established, such deviations violate the assumptions on which the analyses were based and may have an adverse effect on the system's actual safety level. However, in some cases a lateral offset could achieve a safety benefit and these guidelines provide information on how this could be obtained.

4. THE EFFECTS ON SAFETY OF LATERAL OFFSETS IN OCEANIC AND REMOTE AREA AIRSPACE

4.1 Lateral offsets should only be applied by aircraft that use GNSS in the navigation solution. The use of lateral offsets by non-GNSS equipped aircraft may in fact increase the risk of collision in some route systems due to the increase in lateral overlap probability of aircraft on adjacent routes.

Application of lateral offsets on bi-directional single routes

4.2 The application of lateral offsets on bi-directional routes by aircraft navigating using GNSS reduces the risk caused by a loss of planned vertical separation, e.g. due to operational errors.

Application of lateral offsets on parallel route systems

4.3 In parallel route systems, the application of lateral offsets does not adversely affect lateral safety under the following circumstances:

- a) the route spacing is 93 km (50 NM) or more;
- b) the magnitude of the lateral offset does not exceed 1.9 km (1 NM); and
- c) the offsets are applied only by aircraft using GNSS navigation systems.

4.4 Offsets applied in parallel route systems under circumstances which differ from those described above could adversely affect the lateral collision risk and are not recommended.

4.5 In the case of aircraft operating in the same direction, a safety benefit would only be attained if aircraft in lateral overlap apply a staggered offset. Procedures would need to be developed for application of such offsets worldwide and further studies are required to provide appropriate procedures.

Application of lateral offsets at track intersections

4.6 Provided that lateral offsets of no more than 1.9 km (1 NM) are applied only to aircraft with GNSS navigation systems, collision risk modelling has shown that the application of lateral offsets on intersecting tracks does not adversely affect system safety at the intersection point.

5. **DIRECTION OF LATERAL OFFSET**

5.1 The offset should be applied to the **right** of the centre line relative to the direction of flight.

6. **MAGNITUDE OF LATERAL OFFSET**

6.1 The analysis carried out by SASP has shown that an offset as small as 0.37 km (0.2 NM) significantly reduces vertical risk by reducing the probability that aircraft are in lateral overlap when operating at adjacent flight levels on the same route. An offset of 1.9 km (1 NM) reduces the probability of lateral overlap by approximately two orders of magnitude as compared to the case of no offset. The reduction depends not only on the magnitude of the offset, but also on the proportion of aircraft navigating by GNSS.

Note. - Notwithstanding the above, ongoing work in some regions may demonstrate that the use of lateral offsets up to 3.8 km (2 NM) may provide specific benefits for a particular route system, e.g. the North Atlantic (NAT).

7. **OTHER CONSIDERATIONS OF THE USE OF LATERAL OFFSETS**

7.1 When planning for the use of lateral offsets, States and regional planning groups should take into account the operational consequences of applying lateral offsets. The arrangements for implementation should take the following points into consideration:

- a) the need to promulgate in aeronautical information publications (AIPs) the routes or airspace where application of lateral offsets has been authorized, including the positions at which offsets are commenced and terminated;
- b) in airspace where the use of lateral offsets has been authorized, pilots would not normally be required to inform ATC that an offset is being applied;
- c) offsets applied during en-route operations at cruising levels should not affect obstacle clearance criteria; in cases where this may be an issue, appropriate restrictions on the use of offsets should be imposed;
- d) offsets should not be used in continental radar-controlled airspace; and
- e) these guidelines do not apply to the use of tactical offsets by ATC, nor to the application of offsets by pilots when following published contingency procedures to avoid wake turbulence.

8. **SUMMARY OF THE USE OF LATERAL OFFSETS**

8.1 When considering the use of lateral offsets to enhance safety, the following conditions should be taken into account:

- a) offsets should only be applied when approved by the appropriate ATS authorities;
- b) offsets are only to be applied in oceanic or remote airspace;
- c) the magnitude of the offset should not be more than 1.9 km (1 NM) from the route centre line;
- d) the offset should be made to the **right** of the centre line relative to the direction of flight;
- e) the offset should be applied only by aircraft using GNSS navigation systems; and

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- f) offsets should not be applied in parallel route systems when the route spacing is less than 93 km (50 NM).

8.2 These guidelines do not preclude the implementation of lateral offset procedures which differ from those described above. However, in such circumstances:

- a) offsets left of track are not to be used; and
- b) a safety analysis of the proposed procedures will be required.

8.3 It is recommended that these offset procedures only be implemented on a regional basis, after coordination between all States involved.

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