



International Civil Aviation Organization

**Thirteenth Meeting of the APANPIRG ATS/AIS/SAR Sub-Group  
(ATS/AIS/SAR/SG/13)**

Bangkok, Thailand, 23 – 27 June 2003

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

**IMPLEMENTATION OF LATERAL OFFSETS**

(Presented by the Secretariat)

**SUMMARY**

This paper presents a summary of developments of lateral offset procedures for consideration in the application in the Asia/Pacific Region, including ongoing work of the Separation and Airspace Safety Panel (SASP).

**1. INTRODUCTION**

**Revised ICAO Guidelines on Use of Lateral Offsets**

1.1 The APANPIRG/13 meeting recalled APANPIRG/12 *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.*

1.2 ICAO guidelines on the use of lateral offsets and the effect on airspace safety were developed by the ICAO Separation and Airspace Safety Panel (SASP) and issued by State letter AN 13/11.6-00/96 dated 3 November 2000. 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 application of offsets to reduce the risk of collision as a result of loss of vertical separation would not increase the lateral risk between aircraft on adjacent tracks due to the magnitude of the offset being used.

1.3 The SASP revised the guidelines to allow for application of offset procedures different from those specified, provided that a safety analysis for the particular airspace had shown that the proposed procedures would meet appropriate safety criteria. The revised guidelines were issued by State letter AN 13/11.6-02/21 dated 31 May 2002. A copy of these guidelines is provided at Appendix A.

1.4 In consideration of the revised guidelines, attention is drawn to wake turbulence procedures in paragraph 7.1 e) of the guidelines, which states:

*“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”.*

1.5 In line with APANPIRG/13 *Conclusion 13/4 ? Survey of State planning to implement lateral offset procedures*, States have been requested to advise the Regional Office of their plans to implement lateral offset procedures. To date there has been little information available on State planning.

1.6 The SASP continues to develop guidelines for global applicability, and is considering an amendment to Annex 2, which is intended to remove any concerns about the authority for pilots to routinely offset from track without an ATC clearance. This Sub-Group in considering offset procedures to be applied in the APAC Region, should be cognizant of the work of SASP in developing global procedures. In this regard, the meeting is reminded of APANPIRG/13 *Conclusion 13/5*:

*Development of lateral offset procedures for application in the Asia/Pacific Region*

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

1.7 A proposed amendment, APAC-S 03/2 to the MID/ASIA and PAC *Regional Supplementary Procedures* (Doc 7030) was circulated to States and international organizations by State letter dated 24 February 2003. This proposal was based on the ICAO guidelines for a 1 NM lateral offset to be applied. Following circulation of the proposal there were no objections and ICAO approval of the amendment is pending.

## **2. DISCUSSION**

### **Update of SASP work on lateral offsets**

2.1 The SASP Project Team 9 had undertaken a detailed review of the Asia/Pacific proposed amendment to Doc 7030. The team at the request of the proposing State, reviewed the proposal to provide expert input to the amendment, and to provide a level of standardisation for other regions wishing to use the Asia/Pacific Doc 7030 amendment as a basis for implementing the 1 NM offset procedure developed by SASP.

2.2 The SASP examined the possibility of developing universal procedures that could be used in any type of airspace structure. As a first step, it developed the 1 NM offset procedure. However, this procedure does not necessarily provide maximum safety benefits in all airspace scenarios. For example, a 1 NM offset applied by GNSS equipped aircraft operating in a unidirectional parallel track system, such as the North Atlantic, does little to address any problem that might result when aircraft on same direction vertically adjacent tracks suddenly change level. Therefore, it is likely that, at least in the short term, different procedures will be developed for different track systems (e.g. the procedures developed for the West Atlantic Air Traffic Route System (WATRS)).

2.3 In this regard, details of different procedures need to be promulgated in relevant regional supplementary procedures (Doc 7030). SASP recognized that it was much easier to put them into effect through the SUPPs rather than making changes to the PANS or Annexes. Therefore, the Annex provides the 'permission' and the regional supplementary procedures the specific details of the offset procedure.

Proposed amendment to Annex 2

2.4 The SASP is developing an amendment proposal to Annex 2, which, when in effect, should remove any concerns about the authority for pilots to routinely offset from track without an air traffic control clearance.

2.5 Annex 2 – *Rules of the Air*, paragraph 3.6.2.1.1 states:

“Unless otherwise authorized by the appropriate ATC 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.”

2.6 The draft proposed amendment to Annex 2 is shown in Appendix B. It links the Annex to 'regional supplementary procedures' that then can be used to describe the lateral offset procedures in detail.

2.7 It should be noted that the guidelines provided by ICAO for application of lateral offsets described above do not provide procedures that suit all operating environments. As in the case of the procedures adopted for the WATRS, consideration needs to be given to the most appropriate offset procedures that are required for a particular airspace. In cases where different procedures are provided, the ICAO guidelines do not preclude the implementation of such lateral offset procedures. However, in such circumstances the guidelines recommend that:

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

2.8 The meeting should consider, as a matter of priority, to adopting the 1 NM offset procedure for the en-route international airspace in the Asia/Pacific Region. Also, a task should be established to identify areas where lateral offset procedures different to those provided in ICAO guidelines need to be developed to meet operational requirements.

**3. ACTION BY THE MEETING**

3.1 The meeting is invited to:

- a) note the lateral offset procedure and associated developments;
- b) update on State planning to introduce lateral offset procedures;

- c) consider the introduction of 1NM lateral offset procedures in accordance with ICAO guidelines for the en-route international airspace of the Asia/Pacific Region; and
- d) establish a task to identify areas and procedures different to those provided in ICAO guidelines which are necessary to meet operational requirements.

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## APPENDIX A

ATTACHMENT to State letter AN 13/11.6-02/21

### 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 (RGCSPP), 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.

### **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
- 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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## APPENDIX B

### SEPARATION AND AISPACE SAFETY PANEL (SASP)

#### DRAFT

#### Proposal for Amendment of Annex 2, Chapter 3, paragraph 3.6.2.1.1

**Proposed Amendment:** Editorial note: Amendments are arranged to show deleted text using strikeout (~~text to be deleted~~), and added text with grey shading (text to be inserted).

**Amend** Annex 2, page 13, paragraph 3.6.2.1.1, dated 5/11/98, as follows:

“Unless otherwise authorised or directed by the appropriate air traffic control unit, or authorised by regional supplementary procedures (Doc 7030), controlled flights shall, as 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.”

#### ALTERNATIVE WORDING

**Amend** Annex 2, page 13, paragraph 3.6.2.1.1, dated 5/11/98, by deleting paragraph 3.6.2.1.1 in total and replacing it with:

“As far as practicable, controlled flights shall operate along the defined centre line of an established ATS route or operate directly between the navigation facilities and/or points defining any route, unless authorised or directed otherwise by an appropriate air traffic control unit or operating in accordance with a procedure specified in regional supplementary procedures (Doc 7030).”

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