



Twenty Second Meeting of the Africa-Indian Ocean Planning and Implementation Regional Group (APIRG/22)

(Accra, Ghana, 29 July – 02 August 2019)

Agenda Item 2.2: Update on Air Traffic Management & Search and Rescue Matters

**STATUS OF STRATEGIC LATERAL OFFSET PROCEDURES (SLOP)
IMPLEMENTATION IN THE AFI REGION**

(Presented by ARMA)

SUMMARY
<p>This working paper provides the results of the survey that was conducted to establish the number of FIR's that have officially implemented the SLOP which is required for the annual Collision Risk Assessment in order to reduce the vertical collision risk.</p> <p>Action by the meeting is at paragraph 3.</p>
<p>REFERENCE(S):</p> <ul style="list-style-type: none"> • <i>ICAO Circular 331-AN/192</i> • <i>SASP/2</i> • <i>PANS-ATM, Doc 4444</i>
<p>Related ICAO Strategic Objective(s): A, B, C and E</p>

1. INTRODUCTION

1.1 When reduced vertical separation minimum (RVSM) was implemented and the uptake of global navigation satellite system (GNSS) became apparent, Air Navigation Service Providers (ANSPs) became aware that the risk of mid-air collision was increasing exponentially. RVSM altimetry puts an aircraft within an average of 10 m (33 ft.) vertically and GNSS puts that same aircraft within approximately 9 m laterally of where they are supposed to be. The obvious solution to reduce the vertical overlap risk in the system to meet the Target Level of Safety was to reduce the vertical overlap probability by recreating the randomness that RVSM and GNSS had removed from aircraft distribution. The result was the implementation of a lateral offset in increments of one nautical mile (NM) up to 3.7 km to the right of centreline. This has been used in the oceans for a decade. One additional benefit is that it provides a wake turbulence avoidance capability.

1.2 The risk of mid-air collisions in continental airspace prompted several organizations to request ICAO to adapt the strategic lateral offset procedure (SLOP) to a surveillance environment. Utilizing the extreme accuracy of GNSS and newer aircraft's ability to offset in tenths of a mile, multiple offsets up to one half mile (0.5 NM) may be applied safely within route separations as low as

11.1 km (6 NM). The mitigation of risk that this creates in the air traffic system will allow ANSPs to continue to meet the established target levels of safety.

2. DISCUSSION

2.1 In 2019 Proposal 8 was formulated to make changes to Circular 331 which will be amended to be Circular 354 when the changes have been implemented as follows:

- a) **where the lateral separation minima or spacing between route centre lines is 42.6 km (23 NM) 28 km (15 NM) or more, offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 3.7 km (2 NM);**
- b) **where the lateral separation minima or spacing between route centre lines is 19 km (10 NM) or more and less than 28 km (15 NM), while one aircraft climbs/descends through the level of another aircraft, offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 3.7 km (2 NM); and**
- c) **where the lateral separation minima or spacing between route centre lines is 11.1 km (6 NM) or more and less than 42.6 km (23 NM) 28 km (15 NM), offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 0.9 km (0.5 NM).**

2.2 The collision risk modelling for the reduced lateral separation Standards below 23 NM to facilitate climb and descent through the level of another aircraft included the allowance for full (up to 2 NM) strategic lateral offset procedures (SLOP) application, as defined under Section 16.5 of the Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM, Doc 4444). These separations were previously circulated via State letter 17/85; however, it was noted that Section 16.5 prohibited full SLOP below 23 NM and, consequently, the Standards were not published. Initial Proposal 8 amends Section 16.5, reducing the 23 NM lateral limitation to 15 NM, and again further to 10 NM, where one aircraft climbs through the level of another. This allows the reduced lateral separation minima to be “re-proposed” for amendment as a consequence of amending the SLOP provisions

2.3 The routes or airspace where application of strategic lateral offsets is authorized, and the procedures to be followed by pilots, shall be promulgated in aeronautical information publications (AIPs). In some instances, it may be necessary to impose restrictions on the use of strategic lateral offsets, e.g. where their application may be inappropriate for reasons related to obstacle clearance. Route conformance monitoring systems shall account for the application of SLOP. ICAO Circular 331-AN/192 The decision to apply a strategic lateral offset shall be the responsibility of the flight crew. The flight crew shall only apply strategic lateral offsets in airspace where such offsets have been authorized by the appropriate ATS authority and when the aircraft is equipped with automatic offset tracking capability.

2.4 The higher the usage of SLOP the greater the resulting collision risk reduction. But even a small uptake of SLOP, has a significant effect. For example, a single offsetting aircraft flying the North Atlantic in a direction opposite to the main traffic flow may be passing a considerable number of opposite direction aircraft. This single aircraft applying SLOP provides a reduced risk, not only for itself, but also for all the other encountered aircraft, even though they were not participating in any form of offset.

2.5 The vertical collision risk results can be reduced by SLOP implementation and application. With SLOP, the collision risk can be reduced to an estimate of up to 30%. The safety benefit increases slightly with the remaining vertical deviation times limited to 5 minutes before being intervened. When SLOP is considered, the vertical collision risk estimate falls to below the Target Level of Service (TLS) of 5×10^{-9} fatal accidents per flight hour.

2.6 It would be recalled that APIRG 17 adopted Conclusion 17/43:

Conclusion 17/43: Implementation of Strategic Lateral Offsets (SLOP) in the AFI Region

That, AFI States implement SLOP within their areas of responsibility, by the AIRAC effective date of 30th November 2010, in line with provisions in PANS-ATM Doc 4444 Chapter 16 and the following guidance:

- a) SLOP will be applied in those oceanic FIRs where fixed routes are established;***
- b) SLOP will be applied in all areas of the continental AFI Region except in those areas where ATC separation is provided by surveillance, unless approved by the State; and***
- c) SLOP will be applied in oceanic random routing areas (AORRA and IORRA) with effect from the target date of AIRAC date of 2 June 2011.***

2.7 However, there has been varied interpretation and implementation of Conclusion 17/43 by States and ATS providers.

2.6. Strategic Lateral Offset Procedures (SLOP) Provisions in Doc 4444

Note 1. — SLOP are approved procedures that allow aircraft to fly on a parallel track to the right of the centre line relative to the direction of flight to mitigate the lateral overlap probability due to increased navigation accuracy and wake turbulence encounters. Unless specified in the separation standard, an aircraft's use of these procedures does not affect the application of prescribed separation standards.

Note 2. — Annex 2, 3.6.2.1.1, requires authorization for the application of strategic lateral offsets from the appropriate ATS authority responsible for the airspace concerned.

2.6.1 Implementation of strategic lateral offset procedures shall be coordinated among the States involved.

Note. — Information concerning the implementation of strategic lateral offset procedures is contained in the Implementation of Strategic Lateral Offset Procedures (Circular 331).

2.6.2 Strategic lateral offsets shall be authorized only in en-route airspace as follows:

- a) where the lateral separation minima or spacing between route centre lines is 42.6 km (23 NM) or more, offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 3.7 km (2 NM); and
- b) where the lateral separation minima or spacing between route centre lines is 11.1 km (6 NM) or more and less than 42.6 km (23 NM), offsets to the right of the centre line relative to the direction of flight in tenths of a nautical mile up to a maximum of 0.9 km (0.5 NM).

2.6.3 The routes or airspace where application of strategic lateral offsets is authorized, and the procedures to be followed by pilots, shall be promulgated in aeronautical information publications (AIPs). In some instances, it may be necessary to impose restrictions on the use of strategic lateral offsets, e.g. where their application may be inappropriate for reasons related to obstacle clearance. Route conformance monitoring systems shall account for the application of SLOP.

2.6.4 The decision to apply a strategic lateral offset shall be the responsibility of the flight crew. The flight crew shall only apply strategic lateral offsets in airspace where such offsets have been authorized by the appropriate ATS authority and when the aircraft is equipped with automatic offset tracking capability.

Note 1. — Pilots may contact other aircraft on the inter-pilot air-to-air frequency 123.45 MHz to coordinate offsets.

Note 2. — The strategic lateral offset procedure has been designed to include offsets to mitigate the effects of wake turbulence of preceding aircraft. If wake turbulence needs to be avoided, an offset to the right and within the limits specified in 16.5.2 may be used.

Note 3. — Pilots are not required to inform ATC that a strategic lateral offset is being applied.

2.7 Although originally developed for use in oceanic environments where procedural rules for lateral track separation are normally in place, the risk of mid-air collisions in continental airspace prompted several organizations to request ICAO to adapt SLOP to an ATS surveillance environment. Utilizing the accuracy of GNSS and aircraft capability to offset in tenths of a mile, multiple offsets of up to one half mile were determined to be safely applicable for operations on published tracks or ATS Routes with separations as low as 11.1 km (6 NM). A new draft for the revised Circular 331 is anticipated to include the aforementioned.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) Take note of the content
- b) Encourage States to implement SLOP.

APPENDIX A

FIR	Implemented SLOP (Yes/No)
Accra	Yes
Addis Ababa	No
Antananarivo	Yes
Asmara	No
Beira	Yes
Brazzaville	Yes
Cape Town	No
Dakar Terrestrial	Yes
Dar Es Salaam	No
Entebbe	Pending
Gaborone	No
Harare	Yes
Johannesburg	No
Johannesburg Oceanic	No
Kano	Yes
Kinshasha	Yes
Lilongwe	No
Luanda	Yes
Lusaka	Pending
Mauritius	No
Mogadishu	Yes
Nairobi	No
N'djamena	Yes
Niamey	Yes
Roberts	Yes
Seychelles	Yes
Windhoek	No

Total Implemented	14
Total Not Implemented	11
Pending Decision to Implement Awaiting Evidence	2
Total FIRs	27