



ICAO

International Civil Aviation Organization

**Tenth Meeting of the Surveillance Implementation
Coordination Group (SURICG/10)**

Bangkok, Thailand, 21 - 23 April 2025

Agenda Item 8: Update on surveillance activities and explore potential cooperation opportunity

ASSESSING A NEW SURVEILLANCE SYSTEM FOR OPERATIONAL USE

(Presented by New Zealand)

SUMMARY

This paper looks at Airways use of the EUROCONTROL Specification for ATM Surveillance System Performance (ESASSP) document to assess a new surveillance system for use within the Air Traffic Management System (ATMS).

1. INTRODUCTION

1.1 In 2024 Airways began the process of assessing a new non-cooperative radar (PSR) for use within the ATMS. The scope of this testing was to ensure the validity of the data for non-cooperative target detection and assist with issues such as a transponder failure. In addition, ATC management wished to assess the capability of the PSR for 5NM surveillance separation in instances where no other surveillance source was available. To carry out the assessment Airways used ESASSP document ED 1.1 Sept 2015, as agreed with the PSR vendor.

1.2 The following will provide a brief outline of the issues encountered during this process.

#Note: in NZ, ADSB is the primary surveillance source, with MSSR providing a contingency back-up in the case of a GNSS localized or systemwide failure. PSR is used to provide detection of non-cooperative targets and targets with equipment issues such as transponder failure, but could it also be used for a separation service if no other surveillance was available.

2. Discussion

2.1 ESASSP Edition 1.1 Sept 2015 lays out a set of requirements to provide an assessment of the ability of a PSR to provide 5NM surveillance separation. These identified requirements are:

- Service or Function specific – define requirements for each supported air traffic service or function.
- Independent of the environment – i.e., applicable everywhere but can be adapted for environment needs.
- Easily verifiable/measurable on a regular basis
- Represent a minimum baseline, supplemented by additional requirements dictated by the local environment and a local safety assessment. i.e., it is a minimum level of performance the system shall provide.

- Allow maximum design flexibility, providing an end-to-end assessment i.e., it is not just the surveillance sensor but from the surveillance sensor to the controller's screens.

2.2 Required data items for 5NM horizontal separation provided by ATCO using non-cooperative surveillance systems include:

- Positional data (horizontal 2d)
- Surveillance data status (coasted/not coasted, and time of applicability)
- Track velocity vector should also be provided.

2.3 ESASSP Table 6: Mandatory and recommended performance for 5NM horizontal separation provided by ATCO using non-cooperative surveillance system.

3.5.3 Mandatory and recommended performance requirements for 5 NM horizontal separation provided by ATCO using non-cooperative surveillance system					
Req. #	Quality of service	Mandatory performance	Recommended performance	Ref. Justif.	Conf. method
5N_N-R1	Measurement interval for probability of update assessment (R2)	Less than or equal to 8 seconds	Less than or equal to 6 seconds	2.1.1 2.1.2	4.2.1
5N_N-R2	Probability of update of horizontal position in accordance with selected measurement interval	Greater than 90 % global	Greater than or equal to 97 % for 100% of the flights, any flight below 97% shall be investigated as defined in R10	2.1.3 2.1.4	4.2.2.1
5N_N-R3	Ratio of missed horizontal position involved in long gaps (larger than 26.4 s $\pm$ 3 x 8s + 10%)	Less than or equal to 0.5 %		2.1.4	4.2.3
5N_N-R4	Horizontal position RMS error	Less than or equal to 500 m global	Less than or equal to 350 m global	2.1.5 2.1.6	4.2.4
5N_N-R5	Ratio of target reports involved in series of at least 3 consecutive horizontal position correlated errors larger than 926 m - 0.5 NM		Less than or equal to 0.03 %	2.1.7	4.2.5
5N_N-R6	Relative time of applicability of horizontal position for aircraft in close proximity (less than 18520 m – 10 NM)		Less than or equal to 0.3 second RMS for relative data age	2.1.9	4.2.6
5N_N-R7	Track velocity RMS error		Less than or equal to 4 m/s for straight line and less than or equal to 8 m/s for turn	2.1.22	4.2.14
5N_N-R8	Track velocity angle RMS error		Less than or equal to 10° for straight line and less than or equal to 25° for turn	2.1.22	4.2.14
5N_N-R9	Continuity (probability of critical failure)		Less than or equal to 2.5 10 ⁻⁵ per hour of operation	2.1.25	4.2.17
5N_N-R10	Investigations		Flights for which requirement R2 is not achieved shall be investigated and an impact assessment conducted and appropriate risk mitigation/reduction measures introduced if necessary.	NA	

Table 6: Non-cooperative surveillance system requirements for supporting 5 NM horizontal separation (5N_N)

2.4 In using ESASSP, Airways aim is to assess the PSR to the same quality standard we would do for MSSR, ADS- B and Multilateration, which is to use the Recommended values due to their higher quality standard and only use the Mandatory where there are no recommended requirements. We have used this method since 2013 for the introduction of new surveillance systems. It is also consistent with the newer version of the ESASSAP document, V1.3, Section 3.2.1, This section states ***"For pure non-cooperative surveillance system used to support 3/5 NM separation applications in the same environment, the same performance requirements as those applicable to cooperative surveillance system are applicable except the performance criteria applicable to pressure altitude and aircraft identity data items, which are not provided by non-cooperative surveillance system."***

2.5 Initial test results showed that the PSR was failing the mandatory requirement 5N_N-R3 (long gaps) and the recommended requirements 5N_N-R2 (probability of update), 5N_N-R7 (track velocity RMS error) and 5N_N-R8 (track velocity angle RMS error). Continued improvement made by the vendor reduced the error values, but the results were still failing some of the requirements. Changes were also made by the Airways software team to the ATMS Surveillance Data Processor (SDP) to help

improve the track velocity. After these improvements, the data continued to fail both 5N_N-R3 and 5N_N-R7.

2.6 As a result of this assessment Airways has decided not to use this radar for surveillance separation and will employ it solely for situational awareness - that is to assist with our prime purpose for the radar for the detection of non-cooperative targets and those targets with issues such as a transponder failure. Both of the remaining new PSR's will undergo the same assessment process when ready.

NOTE: Airways remaining 1990 PSR was assessed to the required standards in 1990 and complied with the requirements then for 5NM surveillance separation. It remains in service on that basis until such time as the new PSR at Auckland enters service. Its prime use remains to detect non-cooperative targets and assist those targets with issues such as a transponder failure.

2.7 Other issues encountered during the final acceptance tests include:

- a. Airways ATC requirement was to see VFR traffic operating low level close to the control zone (CTR) boundary to ensure non-compliant traffic remained clear of the CTR. This meant that in tuning the radar to see these targets, excessive false targets were occurring in close proximity to the airport. While the PSR was only producing 2 or less false targets a radar scan, up to 70 false targets over the airport per hour were being detected, which was considered excessive. In reducing the number of false targets, the number of low-level VFR traffic detected was subsequently reduced.
- b. A number of PSR reflections and split tracks are occurring, which have increased in the last few months. Airways engineers believe this is associated with a large warehouse recently built in the Airport industrial area. Airways is currently working with the vendor to resolve this issue.

Conclusion

2.8 In assessing the new PSR against the same standard as that for other more accurate surveillance equipment such as MSSR, ADS-B and Multilateration, the assessment has shown that the PSR in our environment, is not capable of meeting **all** the required mandatory and recommended standards required for 5NM surveillance separation.

2.9 Airways has chosen not to assess the PSR against the old non-cooperative standards for 5NM surveillance separation, on the basis that the results would not be robust enough in today's environment. For example:

- a. The mandatory requirement for a PSR Probability of Update (POU) is 90% over the whole airspace covered by the system. This method allows for a significant route or areas of coverage to fall under the 90% requirement, with the POU for all of the radar's coverage still meeting the required standard. Placing the POU requirement on each aircraft, would mean individual flights under 90% would need to be investigated and issues resolved. Using 97%, as for other sensors, would provide a more robust, but possibly more difficult result to meet.
- b. Although the Eurocontrol Surveillance Standard for Radar Surveillance in En-Route and Major Terminal Areas, ED1.0 March 1997, section 6.4.2.2, allows for ≤ 20 false targets per radar scan, operationally Airways considers this figure excessive.
 - o For example, for a 5 second update radar that is ≤ 240 false tracks a minute or $\leq 14,400$ false tracks an hour.

- Constant false targets, especially in and around a control zone or approach fan, can make it difficult for a controller to pick a real target out from all the clutter and can result in a genuine non-cooperative target being ignored or worst-case scenario the PSR data being totally ignored.
- ICAO and EUROCONTROL should review the use of POU, especially in regard to:
 - The difference between the mandatory PSR POU rate of 90% versus the recommended rate of 97%, and
 - The difference in allowing for a global assessment for the mandatory rate versus a per aircraft rate for the recommended value.

2.9.1 In New Zealand, controllers have been provided with a 1 second screen refresh update rate for the last 7 years, together with the accuracy of data provided by ADSB, Multilateration and MSSRs DAPs data to enhance tracking. Based on the assessed PSR data, it was felt that from an HMI perspective, it would be difficult for controllers to suddenly be asked to adapt to the intricacies of a PSR, to provide a 5NM surveillance separation service.

2.9.2 PSR generated issues include:

- A slower update rate
- Jumpy tracks and velocity leader lines
- Speed inaccuracies.
- Coasting tracks
- Having to manually identify and correlate tracks.
- An overly generous false target rate per scan.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper;
- b) discuss the proposed recommendations; and
- c) discuss any relevant matter as appropriate
