International Civil Aviation Organization

ELEVENTH MEETING OF THE SURVEILLANCE IMPLEMENTATION COORDINATION GROUP (SURICG/11)

Bangkok, Thailand, 25 - 27 March 2026

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

USE OF ADS-B ONLY DATA FOR SURFACE SITUATIONAL AWARENESS TO REDUCE THE RISK OF RUNWAY INCURSIONS AND PROVIDE A MORE EFFICIENT ATC SERVICE

(Presented by New Zealand)

SUMMARY

This paper looks at Airways use of ADS-B data only to provide Surface Situational Awareness for use within the Air Traffic Management Automation System (ATMAS), achieving a safe, viable economic solution where the use of an "Advanced Surface Movement Guidance and Control System" (A-SMGCS) is not justified.

1. INTRODUCTION

1.1 Since 2010 Airways New Zealand (New Zealand's Air Navigation Service Provider (ANSP)), has been using a Multilateration (MLAT) system at Auckland (NZAA) to surveil surface movements. MLAT was initially approved for Low Visibility Operations (LVO) due to fog between the months of April and Oct each year but has subsequently been adopted by ATC for everyday surface situational awareness, enhancing safety and reducing the risk of runway incursions.

1.2 MLAT is backed up by ADS-B around NZAA's international terminal for gap coverage and over the whole airfield as a contingency in the event of MLAT failure. Both MLAT and ADS-B systems track aircraft, while only ADS-B is used to track vehicles. A Surface Movement Radar (SMR) is not used for the services provided.

1.3 The system in use provides an A-SMGCS Level 1 Surveillance service which could be upgraded to a higher level as required.

1.4 The introduction of ADS-B as New Zealand's primary surveillance system on Dec 31, 2022, allowed Airways to provide a similar ground surveillance service at other International or Domestic airports within the New Zealand NZZC FIR, but using ADS-B data only. The ability to use ADS-B data for this purpose is enabled by the regulatory requirement for all aircraft to be ADS-B equipped to enter any controlled airspace.

1.5 Airways referenced international regulatory guidance documents and worked closely with the local Regulator (NZCAA) in designing surface surveillance capability. Particularly Airways referenced:

- ICAO DOC 4444 (10/11/16) PANS-ATM, section 8.10.2.2
- ICAO DOC 9830 (1/1/2004) Advanced Surface Movements Guidance (A-SMGCS)
- Eurocontrol Specification for A-SMGCS Services ED: 2.0 (22/4/2020)

- EUROCAE ED-163/RTCA DO-321 (Safety, performance and interoperability requirement document for ADS-B airport surface surveillance application (ADS-B APT)

1.6 Using ADS-B's one second updates provide high-precision, real-time data from both vehicles and aircraft, allowing for faster detection of movement issues. The added capability of ADSB-IN allows both ground and onboard systems to also detect such issues.

1.7 The use of ground surveillance is further enhanced by use of Electronic Strips in towers to provide additional layers of safety, allowing strips representing aircraft or airport vehicles to be placed in runway or taxiway bays, providing a visual cue to the controller that the runway is safe or not safe for departures or arrivals.

1.8 ADS-B-based ground surveillance provides an effective solution in the New Zealand environment that can support greater levels of A-SMGCS equivalency as need arises.

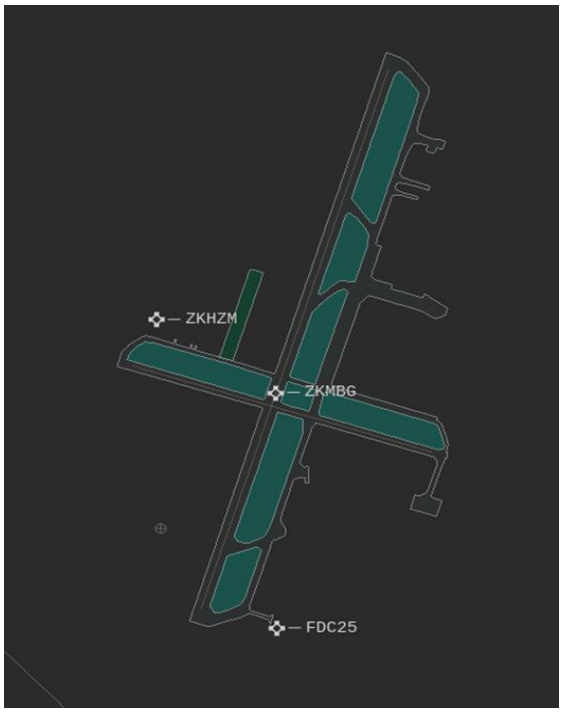

FIG 1- NZCH SURFACE MOVEMENTS - SHOWING AIRCRAFT TARGETS ONLY

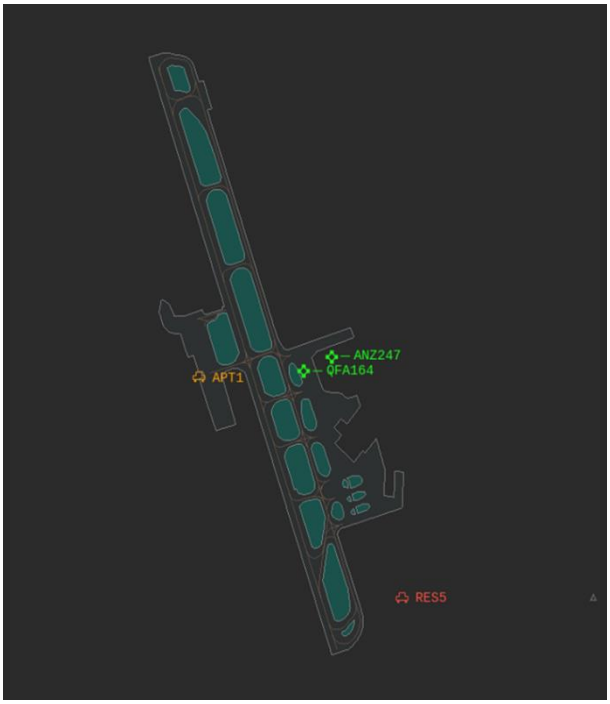

FIG 2 - NZWN SURFACE MOVEMENTS - SHOWING BOTH AIRCRAFT AND VEHICLE TARGETS.

2. DISCUSSION

2.1 As seen by New Zealand's example, the use of ADS-B surveillance data can provide effective surface situational awareness at airports without the cost and complexity of employing more expensive surveillance systems, or A-SMGCS. States considering ground surveillance capability may wish to consider the following learnings:

2.2. **Regulatory guidance:** For New Zealand, the ANSP considered the following when confirming the use of ADS-B only data for ground surveillance:

- *ICAO DOC 4444 ED 16 2016, section 8.10.2.2* allows for the use of SMR to augment visual observation of traffic and to provide surveillance of traffic on those parts of the maneuvering area which cannot be observed visually. In achieving 8.10.2.2 ADS-B

adds additional capability in allowing faster identification of aircraft and easier differentiation of vehicle types – see FIG 2 (NZWN).

- *DOC 9830 ED 2004, section 2.2.1 a) Surveillance and 2.5.1*. In achieving 2.2.1 a) and 2.5.1, ADS-B provides additional capability through ADS-B In to allow aircraft to identify other targets on the maneuvering area which may be in conflict.
- *Eurocontrol Specification for Advanced-Surface Movement Guidance and Control System, section 2.2 Surveillance Service.* The ICAO definition of A-SMGCS (Level 1) Surveillance has been redefined by Eurocontrol as a "Surveillance Service" providing airport traffic situational awareness through the identification, position, and tracking of aircraft and vehicles within a predefined coverage volume via a Human Machine Interface (HMI)". In achieving 2.2, ADS-B provides additional capability through ADS-B IN to allow aircraft to identify other targets on the maneuvering area which may be in conflict.
- *EUROCAE ED-163/RTCA DO-321 (Safety, performance and interoperability requirement document for ADS-B airport surface surveillance application (ADS-B APT)* – "The surveillance data is intended to augment the controller's situational awareness and help the controller to manage the traffic in a more efficient time".

Note# Information in various international documents on the requirements for vehicle equipage and compliance is not clear – see FSMP-WG/9 WP/16 9th Meeting 22 to 30 August 2019. If your regulatory authority has no rules for the use of Vehicles on the airport maneuvering areas, the local airport operator may be required to set the necessary rules for operations of vehicle ADSB equipage as part of the airport operating certificate.

2.3. Regulatory support: For ADS-B-only ground surveillance in New Zealand, an equipage mandate for airspace/airport operations was required.

- Airways capability to use ADS-B only for surface surveillance is covered by the mandate for ADS-B equipage for operation in all NZZC FIR controlled airspace effective on Dec 31, 2022.
- For other States to use only ADS-B data for surface surveillance, all aircraft and vehicles using the aerodrome will be required to be ADS-B equipped. If not already mandated, States will need to consider how to achieve this.

2.4. Safety case: For New Zealand, a full safety case/assessment was required.

- To comply with NZCAA Part 171/172 requirements, a safety case was carried out to ensure that the systems and processes were safe to use, provided an enhancement to the controllers' ability to control traffic, and met with regulatory procedures such as those required by ICAO and/or Eurocontrol.

2.5. **Cost:** New Zealand's use of ADS-B only surveillance required careful assessment of cost.

- Use was made of any national network ADS-B ground station sites which already have coverage over the airfield.
- Depending on existing ADS-B infrastructure and the airfield size and complexity, additional on-airfield ADS-B installations may be minimal. In New Zealand this was limited to one ADSB ground station at most controlled airfields.
- If the correct regulatory and technical environment is available, there is no requirement for other surveillance systems such as SMR or MLAT. The simplicity of the design reduces standup timeframes and cost compared to SMR/MLAT alternatives that can be expensive and complex to install, especially if multiple or large systems are required to provide full airport coverage.

- Using an ADS-B-only surveillance system provides a single simple system to maintain, reducing workload for technicians, and costs for extensive inventories of spare parts for multiple systems and associated service contracts.
- The cost involved in the enhancement of systems that ingest ADS-B data is dependent on state capability – see Section 2.6.

2.6. **ATMAS modification:** Effective display and functionality within the ATMAS is required to ensure ATS staff can effectively use ADS-B only surveillance data.

- New Zealand's application required specific enhancement of the ATMAS HMI:
  - Airport surface maps were adapted to display an airport outline with runway, holding points, taxiways, as well as the apron area if required – see Fig 1&2.
  - Tracking functionality was enhanced to accommodate correct display of operations on the aerodrome such as ground vehicles or aircraft ground mode.
- Airways' in-house capability to modify the ATMAS software helped reduce costs and provides a pathway for future enhancement.
  - Other ANSP's without such capability may incur additional costs if their ATMAS vendor is required to add surface tracking capability or provide an A-SMGCS to meet the need. Such cost should be weighed against alternative options.
  - States without in-house capability could consider non-A-SMGCS options such as a standalone HMI for surface movements. Vendors can fulfil this requirement and allow for further system enhancement if required in the future.

2.7. **Training:** Air Traffic Services (ATS) and Technical training was required for New Zealand.

- In New Zealand, training for affected ATS staff (Tower controller/Flight Information Officers) in the use of surveillance for situational awareness is required. Use of surveillance for situational awareness, either on the surface or for airborne targets, is provided with simulator training using Airways in-house tower simulator. Cyclical training on a yearly basis reinforces these requirements.
- Training for Technicians in New Zealand on surveillance equipment and the ATMAS is provided as part of a technician's initial training and then followed up by local site training.
- The Airways' Manual of Air Traffic Services was updated to include the provision for situational awareness using surface surveillance.
- The appropriate technical training documents were also updated as required to reflect the surveillance system and new features within the ATMS.

2.8. **Regulatory sign off:** States may require full regulatory sign off.

- The NZ regulatory authority required the ADS-B surveillance system to be included in the NZCAA Part 171/172 exposition held by the ANSP.
- As Airways is contracted by Auckland International Airport Ltd (AIAL) the Airport Owner at NZAA, to provide an ATC service, the associated NZCAA Part 139 certificate was also updated approving the use of ground surveillance to support LVO ops based on the complexity of traffic, along with other LVO mitigations such as stop-bar and simplified taxi routes etc.

CONCLUSION

2.9 The use of ADS-B only surveillance data has been proven in New Zealand to be a cost effective and simple way of providing a Surface Situational Awareness service equivalent to that of a Level 1 A-SMGCS Surveillance system.

2.10 Depending on airport needs and accompanying business/safety assessment(s), the capability shown in New Zealand indicates that a current ATMAS can be updated as required locally to fulfil A-SMGCS guidance Levels 1- 4 without the need of additional support systems.

2.11 International documentation around airport vehicle equipment and regulatory standards is lacking and should be reviewed.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) discuss any relevant matter as appropriate

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