

Notice of Proposed Rule Making

NPRM 18-02

18 September 2017

Part 91 General Operating and Flight Rules

Docket 16/CAR/12

NSS Surveillance ADS-B above FL245

Consequential Amendments

**Part 1
Part 43
Part 66
Part 101
Part 103
Part 172**

Background to the Civil Aviation Rules

The Civil Aviation Rules (the Rules) establish the minimum regulatory safety boundary for participants to gain entry into, operate within, and exit the New Zealand civil aviation system. The Rules are structured in a manner similar to the Federal Aviation Regulations of the USA.

Rules are divided into Parts and each Part contains a series of individual rules which relate to a particular set of aviation activities. Some rules empower the use of a CAA Notice. Notices contain specific mandatory requirements including detail about the approvals, standards, conditions, procedures and technical specifications that have been approved or determined by the Director to be appropriate in accordance with a corresponding enabling rule.

Advisory Circulars accompany many rule Parts and contain information about standards, practices and procedures that the Director has established to be an acceptable means of compliance with the associated rule. An Advisory Circular may also contain guidance material to facilitate compliance with the rule requirements.

The objective of the Civil Aviation Rules system is to strike a balance of responsibility between, on the one hand, the Crown and regulatory authority (CAA) and, on the other hand, those who provide services and exercise privileges in the civil aviation system. This balance must enable the Crown and regulatory authority to set standards for, and monitor performance of, aviation participants whilst providing the maximum flexibility for the participants to develop their own means of compliance within the safety boundary.

Section 12 of the Civil Aviation Act 1990 prescribes general requirements for participants in the civil aviation system and requires, amongst other things, participants to carry out their activities safely and in accordance with the relevant prescribed safety standards and practices.

Section 28 of the Act allows the Minister to make ordinary rules for any of the following purposes:

- the implementation of New Zealand's obligations under the Convention
- to allow for the mutual recognition of safety certifications in accordance with the ANZA mutual recognition agreements
- the provision of aviation meteorological services, search and rescue services and civil aviation security programmes and services
- assisting aviation safety and security, including but not limited to personal security
- assisting economic development
- improving access and mobility
- protecting and promoting public health
- ensuring environmental sustainability
- any matter related or reasonably incidental to any of the following:
 - i. The Minister's objectives under section 14 of the Act;
 - ii. The Minister's functions under section 14A of the Act;
 - iii. The Authority's objectives under section 72AA of the Act;
 - iv. The Authority's functions and duties under section 72B of the Act; and
 - v. The Director's functions and powers under section 72I of the Act
- any other matter contemplated by any provision of the Act.

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1. Purpose of this NPRM

The purpose of this rule-making proposal is to update the Civil Aviation Rules to provide for the transition from secondary surveillance radar to Automatic Dependent Surveillance Broadcast (ADS-B) Out as the primary source of data for surveillance in New Zealand. This proposal primarily relates to changes to Part 91 and includes proposed amendments to other parts to ensure they remain fit for purpose in an ADS-B surveillance environment.

2. Background to the Proposal

2.1 General Summary

New Southern Sky

The National Airspace and Air Navigation Plan (NAANP) sets out a ten year, three stage plan for modernising New Zealand's aviation system. The NAANP is being implemented through the New Southern Sky (NSS) programme. Cabinet agreed to the NAANP in June 2014.

A key change signalled in the NAANP is the modernisation of the surveillance system – information about where aircraft are located that is fed into the air traffic management system (ATM) and used to keep aircraft separated in controlled airspace. Surveillance is a critical part of the aviation system and is central to safety.

The NAANP proposes that the current secondary surveillance radar will be replaced with an ADS-B Out surveillance system. ADS-B Out is the International Civil Aviation Organization's (ICAO) recommended system for modern surveillance and that delivers safety and operational benefits.

The NAANP proposal suggests that the transition to ADS-B Out occur in two phases:

- firstly, in respect of aircraft that fly within controlled airspace designated under Part 71 within the New Zealand Flight Information Region above flight level 245 from 31 December 2018; and
- secondly, in respect of aircraft that fly within transponder mandatory airspace designated under Part 71 within the New Zealand Flight Information Region below flight level 245 from 31 December 2021.

This NPRM concerns the rule changes required to implement the first of those two phases.

The rationale for moving to ADS-B

New Zealand is currently served by three primary surveillance radars¹ at Auckland, Wellington and Christchurch airports. Six secondary surveillance radars² provide additional coverage and information to air traffic control (ATC). A multilateration system provides surveillance information to the air traffic management system in the lower South Island.

The current secondary surveillance radar reaches the end of its operational life in 2021, hence the need to replace the surveillance infrastructure.

The benefits of ADS-B OUT include:

- 45 % improved surveillance coverage of airspace compared to existing radar systems, particularly at low altitudes,

¹Primary surveillance radar measure only the range and bearing of targets by detecting reflected radio signals (uncooperative targets).

²Secondary surveillance radar relies on targets equipped with a radar transponder that replies to each interrogation signal by transmitting a response containing encoded data.

- improved safety, particularly in airspace with more traffic, as ADS-B Out provides more precise position information on a more frequent basis. It refreshes up to twice every second compared to every 5 seconds for radar;
- ATC may be able to provide improved levels of support in unusual or emergency situations, including search and rescue, through more accurate position reporting which may help locate a distressed or downed aircraft;
- Alignment of New Zealand's surveillance system with recommendations for system modernisation from ICAO and with the requirements from other States such as the United States and Australia.

ADS-B Out does involve cost to operators as it requires specific equipment:

- A 1090 Mode S extended squitter (ES) transponder; and
- A GNSS position source that is compatible with the transponder.

The policy objectives of the proposed amendments are to:

- Enable the replacement of New Zealand's current aviation secondary surveillance radar infrastructure with Automatic Dependent Surveillance – Broadcast (ADS-B) Out as the primary source of data for air traffic control;
- Mandate fitment and operation of ADS-B Out on all aircraft operating in controlled airspace above flight level 245 designated under Part 71 within the New Zealand Flight Information Region from 31 December 2018;
- Ensure the integrity of the surveillance system during the transition to ADS-B Out;
- Set the required performance standards and level of aircraft equipage compatible with the ADS-B surveillance system;
- Ensure that New Zealand's new surveillance system aligns with the ICAO Global Air Navigation Plan (GANP) and ICAO Asia Pacific Surveillance Strategy, both of which include surveillance system modernisation based on the 1090 MHz Mode S ES ADS-B system;
- Provide for standards for the installation, testing, performance, and use of ADS-B systems on aircraft.

Proposed approach

Aircraft with ADS-B systems already fitted

Many aircraft in New Zealand are fitted with ADS-B systems that include transponders certified against TSO-C166 initial issue. Provided they are operating properly, those systems will meet the minimum performance requirements proposed in this NPRM. The proposed rules would allow operators to continue to operate using that equipment, or equipment already fitted that can demonstrate the same level of performance.

Aircraft being brought into New Zealand that are already equipped with an ADS-B system that meets the minimum performance standard will also be able to retain that system under the proposal.

New or replacement ADS-B systems fitted from the date of commencement will need to be, or demonstrate the same level of performance as, the most recent standard for Mode ES transponders: TSO-C166(b), and a compatible GNSS position source that meet the performance requirements set out in this proposal.

This requirement would also apply to aircraft being brought into New Zealand and being fitted with an ADS-B Out system before importation, or as soon as possible after importation, so that the aircraft can be operated in controlled airspace above flight level 245.

Relevance to operators who only fly in controlled airspace below flight level 245

Readers should note that this proposal does not compel operators in controlled airspace below flight level 245 to equip with ADS-B (the proposed mandate for this airspace would come into force on 31 December 2021); however, if they do choose to equip, the ADS-B system would need to meet the standards specified in Part 91.

The notice would provide standards that operators in controlled airspace below flight level 245 can use to ensure that ADS-B equipment that they install and use would be compatible with the ATM system, and meet the requirements of the proposed 2021 mandate for all aircraft in controlled airspace.

Operators in controlled airspace should note that, as part of the policy development process for the proposed mandate for ADS-B in all controlled airspace from the end of 2021, the CAA will be considering whether other equipage options could be safely integrated into the air traffic management (ATM) system and operators may wish to wait for the outcomes of this process.

Applicability of proposed ADS-B mandate for all controlled airspace above flight level 245 is set out in the table below:

Scenario	Date of requirement to fit ADS-B Out	Equipment standard
<p>New ADS-B system for an aircraft to be operated above flight level 245</p> <p>Replacement of existing surveillance transponder system in an aircraft to be operated above flight level 245</p>	Date of commencement of ADS-B rules	ADS-B system must meet performance requirements in Notice NTC 91.258.
An aircraft that is already fitted with an ADS-B system	Fit requirement not applicable System must be in use from 31 December 2018	ADS-B system must meet performance requirements in Notice NTC 91.258. If ADS-B system does not meet requirements, then must be upgraded or replaced in order to meet requirements
New installation of an ADS-B system in an aircraft that is to be used in controlled airspace below flight level 245	Not applicable – no mandate to fit ADS-B in aircraft operating below flight level 245 in this proposal. Note: A proposal to mandate ADS-B in all controlled airspace is under development	If an operator chooses to fit ADS-B in aircraft that is to be operated in controlled airspace below flight level 245, the ADS-B system must meet requirements of AS-B rules and Notice NTC 91.258
Aircraft being imported into New Zealand for use in controlled airspace above flight level 245	For new installations – from commencement date of this rule	If ADS-B system is already fitted, it must meet performance requirements in Notice NTC 91.258

Aircraft registered overseas and operated within the New Zealand flight information region	Must comply with this 31 December 2018	Must meet the performance requirements in Notice NTC 91.258
Aircraft being operated in controlled airspace and transponder mandatory airspace below flight level 245	Not required by this rule Note: A proposal to mandate ADS-B in all controlled airspace is under development	Aircraft must continue to comply with the requirements of CAR 91.247 and 91.541
Aircraft operating in uncontrolled airspace only	Not applicable	

2.2 Problem definition

The current rules do not support the transition to ADS-B Out as New Zealand's main source of surveillance data.

Rule 43.63 requires that secondary surveillance radar (SSR) transponders have to be tested in accordance with Appendix E. This NPRM proposes that new ADS-B testing procedures will be required by the rules under Appendix E as part of the transition towards ADS-B.

Rule Part 66 does not provide for ADS-B Out systems as the subject of a rating in Appendix B.1 – Group Types and Ratings.

There is no current requirement for aircraft that operate in controlled airspace above flight level 245 to be fitted with an ADS-B Out system. Rule 91.541 currently requires operators to fit Mode A/C transponders to their aircraft when flying in transponder mandatory airspace. These transponders are the minimum required to operate with the present SSR system. However, the Mode A/C transponders are not compatible with the ADS-B Out surveillance system.

The current rules do not define an ADS-B Out system or ADS-B as a source of information for air traffic management purposes. This NPRM proposes consequential amendments to Parts 101, 103 and 172 as a result of these proposed changes.

2.3 NPRM Development

Technical experts from the operational groups within the CAA contributed to the development of the policy and this NPRM. Airways contributed to the development of this proposal from a surveillance infrastructure perspective. The development of the NPRM reflects comments and feedback received from industry in response to targeted engagement that took place in early 2016.

In September 2016, Cabinet approved the Minister of Transport's proposal to mandate ADS-B in controlled airspace above flight level 245 proceed into the rule-making process.

2.4 Proposed rule structure

The proposed rule changes are intended to update the existing rule set to reflect the technical and operational requirements for a transition to ADS-B Out. The primary changes will occur in civil aviation rule Part 91, with consequential amendments to Parts 1, 43, 66, 101, 103 and 172.

CAA Notices

This NPRM includes the proposed use of a CAA notice. The aim of CAA notices is to better support risk-based regulation, and improve the flexibility and responsiveness of the rules.

The authority for such notices is section 28(5) of the Civil Aviation Act 1990. This section permits the Minister of Transport to make rules on any terms and conditions specified in the rule to –

- require a matter to be determined or undertaken or approved by the Authority, the Director or another person; or
- empower the Authority, Director or another person to impose requirements or conditions as to the performance of any aviation activity including (but not limited to) any procedures to be followed.

These requirements must be in writing and will be set out in CAA notices, which in this case can only be issued by the Director. Before notices may be issued there must be a corresponding enabling rule in the Civil Aviation Rules. That also means that not complying with the notice results in a breach of the enabling rule.

CAA notices will generally apply in circumstances where the rules may not adequately or appropriately capture technical or procedural requirements.

Notices will be used where there are benefits to taking a performance-based approach, for example in circumstances where new technological changes or innovations require more flexibility than prescriptive approach and rules may become quickly out-dated, or where there is a need to respond to safety issues which the rules cannot adequately deal with.

The use of CAA notices reflects international trends that adopt risk-based regulation, and some comparable overseas aviation regulators use similar instruments. For example, the Australian regulator CASA, uses Civil Aviation Orders made by the Director of Aviation Safety for a wide variety of activities. These Orders contain detailed technical requirements and generally supplement Civil Aviation Regulations, the Australian equivalent of the New Zealand Civil Aviation Rules. CASA also issues Manuals of Standards, which include detailed technical requirements which support the implementation of the Civil Aviation Safety Regulations.

The draft CAA notice proposed in this NPRM provides the technical requirements that would need to be met by operators. These requirements are legally enforceable as they are part of the rules. The benefits of this approach are that operators can choose the equipment they wish to use so long as it meets the requirements set out in the notice. As technology advances, this means that the rules will remain relevant while enabling the safe introduction of new technologies.

Other existing rules, regulatory tools and guidance, such as Airworthiness Directives and Advisory Circulars (ACs) will continue to be used as appropriate.

An AC will provide guidance on acceptable means of compliance, and the fitting, testing, certifying, and using of ADS-B Out systems. The draft notice and draft advisory circular are included as part of this NPRM for comment.

2.5 Key Stakeholders

The Civil Aviation Authority acknowledges the following as key stakeholders in the proposed rule amendments contained in this NPRM:

- The Civil Aviation Authority;
- The Minister of Transport;
- The Ministry of Transport;
- Airways Corporation of New Zealand (Airways);
- The New Zealand Defence Force;
- Domestic and foreign air transport operators;
- All other operators who have or plan to have aircraft operating above flight level 245;
- All other operators who plan to install ADS-B equipment in their aircraft prior to a rule mandating ADS-B for all controlled airspace;
- Aircraft maintenance organisations operating under a Part 145 certificate;

- Aircraft design organisations operating under a Part 146 certificate;
- Licensed aviation maintenance engineers;
- Avionics suppliers.

3. Issues Addressed during Development

The main issues in developing the policy for ADS-B Out in controlled airspace above flight level 245 included an economic analysis of the benefits and costs, the international context, the policy objectives and the policy options as follows:

3.1 Economic analysis - Benefits

- 3.1.1 The direct benefits of ADS-B Out implementation relate primarily to capital and operating savings for Airways. These benefits to be accrued by Airways could possibly be passed onto operators and the public as reduced costs through greater operational efficiency. Other indirect benefits relate to operational safety, efficiency, interoperability and reputational benefits from the increased surveillance coverage and alignment with the global air navigation plan.
- 3.1.2 ADS-B Out will support realisation of the PBN benefits. More accurate surveillance information and greater coverage will allow more precise management of aircraft resulting in improvements in airspace capacity and safety improvements.
- 3.1.3 ADS-B Out implementation will be the subject of ongoing cost benefit analysis.

3.2 Economic analysis - Costs

- 3.2.1 It is technologically possible to provide the same surveillance coverage as ADS-B Out using additional radars, however the ongoing support cost would be significantly more compared to the ADS-B Out surveillance network.
- 3.2.2 Airways have advised that the new ground infrastructure is estimated to cost Airways \$44m (\$32m has been committed for the 2017-2019 pricing round and \$12m is proposed in the following pricing round). This investment is expected to provide \$31m of new customer benefits and avoid \$21m of costs to maintain the radar current system.
- 3.2.3 There are costs associated with the introduction of ADS-B Out, most notably the cost of equipping aircraft and certification of the modification.
- 3.2.4 Operators that currently operate in controlled airspace above flight level 245 who have not yet equipped their aircraft with ADS-B Out will incur costs for the equipment purchase, installation, certification and testing, and regular tests during the life of the equipment.
- 3.2.5 For further information on costs, refer to section 3.6 below.

3.3 International Context

- 3.3.1 The NAANP proposes that New Zealand follows the ICAO Global Air Navigation Plan (GANP) and the ICAO Asia Pacific Surveillance Strategy and the Asia Pacific Seamless ATM Plan which includes surveillance system modernisation based on the 1090 MHz ES ADS-B system.
- 3.3.2 The GANP does not place requirements on ICAO States. It is a planning tool to be used by individual States where they determine a need for modernisation of their airspace and air navigation systems. The end of operational life of New Zealand's surveillance radar provides an opportunity to ensure that the replacement system improves aviation system safety and efficiency, and in consideration of the guidance in the GANP.
- 3.3.3 The proposed transition towards a mandatory ADS-B Out environment is consistent with developments in other jurisdictions including the US and Australia. This proposal takes into account the need to harmonise New Zealand's requirements with those in the States our operators fly to, and vice versa.

3.4 Aim and objectives

- 3.4.1 The aim of the proposal is to provide a regulatory framework for the safe and effective introduction of ADS-B in controlled airspace above flight level 245 in the New Zealand Flight Information Region.

3.4.2 The primary objectives are to:

- provide an effective regulatory mechanism to facilitate the ADS-B transition,
- ensure the integrity of the surveillance system during the transition to ADS-B,
- set the required performance level of aircraft equipage compatible with the ADS-B surveillance system,
- minimise costs and unnecessary regulatory impost on industry.

3.5 Options

3.5.1 In determining the approach to address the objectives, the CAA considered a number of regulatory approaches.

3.5.2 These options were:

- 1) status quo;
- 2) regulations to set the standards for ADS-B Out equipage;
- 3) a rule providing for designation of ADS-B Out mandatory airspace using a phased approach, with the first phase requiring ADS-B Out equipage on aircraft in controlled airspace above flight level 245 from 31 December 2018 (A rule requiring ADS-B Out equipage on aircraft in all controlled airspace from 31 December 2021 only).

3.5.3 The preferred solution is a combination of options 2, and 3 a performance-based rule with an associated service package (training, education and information for operators, crew, design and maintenance organisations) to facilitate a safe transition to an ADS-B Out environment.

3.6 Compliance Costs

There are costs associated with the introduction of ADS-B Out most notably the cost of equipping aircraft and certification of the modification. Airways data indicates that approximately 99 % of flights in controlled airspace above flight level 245 are undertaken by aircraft already equipped with operational ADS-B Out.

Operators who have not yet equipped will need to do by the 31 December 2018 mandate signalled in the proposal. Operators bringing new aircraft into the country or fitting aircraft ahead of bringing them into the country, will need to install an approved ADS-B system before the new aircraft will be certified for flight in controlled airspace above flight level 245.

ADS-B Out requires two pieces of equipment to be fitted on an aircraft:

- A 1090 MHz Mode S extended squitter transponder and
- A GNSS position source compatible with the transponder.

The cost of equipping aircraft with ADS-B Out is highly variable. Some aircraft will require significant modifications in order to install ADS-B Out. Operators may choose to include ADS-B Out as part of a comprehensive update of aircraft avionics, including, for example, upgrading the aircraft's navigation system at the same time.

Installation and certification costs will depend on the specific requirements for each aircraft, the type of equipment installed and whether it is covered by a supplemental type certificate, the operation the aircraft conducts, and operator preferences.

Airways, as the owner and operator of the surveillance infrastructure, is responsible for the procurement, installation, and operational costs of the ADS-B Out system. There are costs to Airways for the installation of a network of ADS-B ground stations and contingency radar network. The costs of this solution will be borne by Airways as the owner of this infrastructure and by participants through Airways' fees and charges.

4. Legislative Analysis

4.1 Power to Make Rules

The Minister may make ordinary rules under sections 28, 29, 29A, 29B and 30 of the Civil Aviation Act 1990, for various purposes including implementing New Zealand's obligations under the Convention, assisting aviation safety and security, and any matter contemplated under the Act.

These proposed rules are made pursuant to:

(a) Section 28(1)(a) which allows the Minister to make rules for the purpose of the implementation of New Zealand's obligations under the Convention:

(b) Section 28(1)(c) which allows the Minister to make rules for the purpose of assisting aviation safety and security, including (but not limited to) personal security:

(c) Section 28(5) which allows the Minister to empower the Authority, the Director or another person to make requirements or conditions in relation to any aviation activity including procedures:

(d) Section 29 (c) which allows the Minister to make rules providing for general operating rules, air traffic rules, and flight rules, including but not limited to the following:

(i) the conditions under which aircraft may be used or operated, or under which any act may be performed in or from an aircraft:

(ii) the prevention of aircraft endangering persons or property:

(e) Section 29A which allows the Minister to make rules providing for the classification, designation, special use, prohibition, and the restriction of airspace and things affecting navigable airspace, including airspace used by aircraft used by the New Zealand Defence Force or a visiting force:

(f) Section 30(a) which allows the Minister to make rules for the designation, classification, and certification of all or any of the following:

- i. aircraft:
- ii. aircraft pilots:
- iii. flight crew members:
- iv. air traffic service personnel:
- v. aviation security service personnel:
- vi. aircraft maintenance personnel:
- vii. aviation examiners or medical examiners:
- viii. air services:
- ix. air traffic services:
- x. aerodromes and aerodrome operators:
- xi. navigation installation providers:
- xii. aviation training organisations:
- xiii. aircraft design, manufacture, and maintenance organisations:
- xiv. aeronautical procedures:
- xv. aviation security services:

- xvi. aviation meteorological services:
- xvii. aviation communication services:
- xviii. any other person who provides services in the civil aviation system, and any aircraft, aeronautical products, aviation related services, facilities, and equipment operated in support of the civil aviation system, or classes of such persons, aircraft, aeronautical products, aviation related services, facilities, and equipment operated in support of the civil aviation system:

(g) Section 30(b) which allows the Minister to make rules for the setting of standards, specifications, restrictions, and licensing requirements for all or any of those persons or things specified in paragraph 30(a) including the specifications of standards of design, construction, manufacture, processing, testing, supply, approval, and identification of aircraft and aeronautical products;

(h) Section 30(d) which allows the Minister to make rules for the definitions, abbreviations, and units of measurement to apply within the civil aviation system.

4.2 Matters to be taken into account

The development of this NPRM and the proposed rule changes take into account the matters under section 33 of the Act that the Minister must take into account when making ordinary rules including the following:

ICAO Standards and Recommended Practices

The proposed rule amendments comply with applicable sections of the following ICAO Annexes:

- Annex 2 – Rules of the Air
- Annex 6 – Operation of Aircraft Annex 8 – Airworthiness of Aircraft
- Annex 8 – Airworthiness of Aircraft
- Annex 10 – Aeronautical Telecommunications
- Annex 11 – Air Traffic Services

Assisting Economic Development

The proposed rule amendments will assist economic development by reducing the capital and operating costs of the surveillance system.

ADS-B will support realisation of the PBN benefits, helping to reduce track miles and fuel burn. More accurate surveillance information will allow more precise management of aircraft, resulting in the greatest possible safety and efficiency gains and resulting benefits.

Assisting Safety and Personal Security

The proposed rule amendments will improve aviation safety by ensuring that the equipment on board aircraft aligns with the ground-based surveillance infrastructure. The phased implementation of ADS-B will facilitate the safe transition to an ADS-B environment by introducing the new technology to part of the fleet first, while the legacy system remains in place as a back-up.

These changes, including the introduction of performance-based rules, promote safety by future-proofing the rules framework to allow integration of new, more advanced technology provided it meets the set minimum standards.

The amendments will align the rules with the appropriate ICAO standards and recommended practices.

Improving Access and Mobility

The proposed rule amendments will have no impact on access and mobility.

Protecting and Promoting Public Health

The proposed rule amendments will have no impact on protecting and promoting public health.

Ensuring Environmental Sustainability

The proposed rule amendments will contribute to the overall benefits of system modernisation on environmental sustainability through reducing fuel burn and corresponding carbon emissions.

4.3 Incorporation by reference

Requirements determined by the Director regarding an ADS-B system to be specified in a notice, will incorporate material by reference (see Notice NTC 91.258).

4.4 Civil Aviation (Offences) Regulations

Schedule 1 of the Civil Aviation (Offences) Regulations is made by the Governor General pursuant to section 100 of the Civil Aviation Act 1990 and contains a list of summary and infringement penalties associated with offences against various civil aviation rules.

The proposed rule will require amendments to the Civil Aviation (Offences) Regulations 2006 by creating new offences regarding

- the operation of aircraft without using an operational ADS-B system (rule 91.255);
- the broadcasting of non-compliant ADS-B data (rule 91.257A(1));
- the use of 978 MHz Universal Access Transceiver to transmit data (rule 91.257A(a)(2)).

5. Submissions on the NPRM

5.1 Submissions are invited

This proposal has been developed by the CAA. Interested persons are invited to participate in the making of the proposed rules by submitting written data, views, or comments. All submissions will be considered before final action on the proposed rulemaking is taken. If there is a need to make any significant change to the rule requirements in this proposal as a result of the submissions received, then interested persons may be invited to make further submissions.

5.2 Examination of Submissions

All submissions will be available for examination by interested persons both before and after the closing date for submissions. A consultation summary will be published on the CAA web site and provided to each person who submits a written submission on this NPRM.

Submissions may be examined by application to the Docket Clerk at the Civil Aviation Authority Level 15, Asteron Centre, 55 Featherston Street, Wellington 6011 between 8:30 am and 4:30 pm on weekdays, except statutory holidays.

5.3 Official Information Act

Submitters should note that subject to the Official Information Act 1982 any information attached to submissions will become part of the docket file and will be available to the public for examination.

Submitters should state clearly if there is any information in their submission that is commercially sensitive or for some other reason the submitter does not want the information to be released to other interested parties. The CAA will consider this in making a decision in respect of any Official Information Act requests. It should be noted that the CAA cannot guarantee confidentiality in respect of any specific submissions.

5.4 How to make a submission

A pre-prepared response sheet is available on the CAA web site at <https://www.caa.govt.nz/rules/nprms-2/> to assist with submissions.

Submissions may be sent by the following methods:

by mail: Docket Clerk (NPRM 18-02)
Civil Aviation Authority
PO Box 3555
Wellington 6140
New Zealand

delivered: Docket Clerk (NPRM 18-02)
Civil Aviation Authority
Asteron House
Level 15
55 Featherston Street
Wellington 6011

e-mail: docket@caa.govt.nz and marked NPRM 18-02

5.5 Final date for submissions

Comments must be received by 27 October 2017.

5.6 Availability of the NPRM:

Any person may obtain a copy of this NPRM from–

CAA web site: www.caa.govt.nz;

or from:

Docket Clerk
Civil Aviation Authority
Asteron House
Level 15
55 Featherston Street
Wellington 6011
Phone: 64–4–560 9640 (quoting NPRM 18-02)

5.7 Further information

For further information, contact:

Brigid Borlase
Principal Policy Advisor
Email: Brigid.borlase@caa.govt.nz
Telephone: (04) 460 4721

6. Proposed Rule Amendments: structure of this document

The changes comprise additions of new rules to existing rule parts and amendments of existing rules.

Proposed deletions from existing rule wordings are highlighted in grey and struck through: ~~example~~.

New wording proposed for the rules is highlighted in grey: example

Part 1 Definitions and Abbreviations

ADS-B means Automatic Dependent Surveillance –Broadcast:

ADS-B Out means a function on an aircraft that periodically broadcasts its state vector (position and velocity) and other information derived from on-board systems in a format suitable for ADS-B receivers:

ADS-B system means a GNSS position source and a compatible Mode S Extended Squitter 1090Mhz ADS-B Out transponder:

CAA means the Civil Aviation Authority of New Zealand established by section 72A of the Act:

Extended Squitter –means the additional data transmitted by an extended squitter transponder, which includes the standard Mode S transmission and the data required for ADS-B Out:

NM means nautical mile:

Part 43 General Maintenance Rules

Subpart B – Maintenance

43.63 Surveillance transponder tests and inspections

~~Each~~ A person performing an inspection of the ~~SSR surveillance~~ transponder required by Part 91 ~~shall~~ must perform the tests and inspections listed in Appendix E.

Appendix E—ATC Transponder Tests and Inspections

[NOTE - The only change to Appendix E is the addition of paragraph E.12]

This appendix applies to a person referred to in rule 43.63.

E.1 General

- (a) The ATC transponder tests may be conducted using a bench check or portable test equipment.
- (b) If portable test equipment with appropriate coupling to the aircraft antenna system is used, operate the test equipment for ATCRBS transponders at a nominal rate of 235 interrogations per second to avoid possible ATCRBS interference.
- (c) For Mode S, operate the test equipment at a nominal rate of 50 Mode S interrogations per second.
- (d) An additional 3 dB loss is allowed to compensate for antenna coupling errors during receiver sensitivity measurements conducted under paragraph E.4 (a)(3) below when using portable test equipment.

E.2 Radio reply frequency test

- (a) For all classes of ATCRBS transponders, interrogate the transponder and verify that the reply frequency is 1090 ± 3 MHz.
- (b) For classes 1B, 2B, and 3B Mode S transponders, interrogate the transponder and verify that the reply frequency is 1090 ± 3 MHz.
- (c) For classes 1B, 2B, and 3B Mode S transponders that incorporate the optional 1090 ± 1 MHz reply frequency, interrogate the transponder and verify that the reply frequency is correct.
- (d) For classes 1A, 2A, 3A, and 4 Mode S transponders, interrogate the transponder and verify that the reply frequency is 1090 ± 1 MHz.

E.3 Suppression test

- (a) When classes 1B and 2B ATCRBS Transponders, or Classes 1B, 2B, and 3B Mode S transponders are interrogated at a rate between 230 and 1000 Mode 3/A interrogations per second or when Classes 1A and 2A ATCRBS Transponders, or Classes 1B, 2A, 3A, and 4 Mode S transponders are interrogated at a rate between 230 and 1200 Mode 3/A interrogations per second—
 - (1) verify that the transponder does not respond to more than 1 % of ATCRBS interrogations when the amplitude of P2 pulse is equal to the P1 pulse; and
 - (2) verify that the transponder replies to at least 90 % of ATCRBS interrogations when the amplitude of the P2 pulse is 9 dB less than the P1 pulse.
- (b) If the test is conducted with a radiated test signal, the interrogation rate shall be 235 ± 5 interrogations per second unless a higher rate has been approved for the test equipment used at that location.

E.4 Receiver sensitivity test

- (a) Verify that, for any class of ATCRBS Transponder, the minimum triggering level of the receiver for the system is -73 ± 4 dBm, or that for any class of Mode S transponder, the minimum triggering level of the receiver for Mode S format (P6 type) interrogations is 74 ± 3 dBm by use of a test set—

- (1) connected to the antenna end of the transmission line; or
 - (2) connected to the antenna terminal of the transponder with a correction for transmission line loss; or
 - (3) utilising radiated signals.
- (b) Verify that the difference in Mode 3/A and Mode C receiver sensitivity does not exceed 1 dBm for either any class of ATCRBS transponder or any class of Mode S transponder.

E.5 RF peak output power test

Verify that the transponder RF output power is within the following specifications for the class of transponder using the conditions prescribed in paragraph E.4 (a):

- (a) For class 1A and 2A ATCRBS transponders, the minimum RF peak output power is at least 21.0 dbw (125 watts):
- (b) For class 1B and 2B ATCRBS transponders, the minimum RF peak output power is at least 18.5 dbw (70 watts):
- (c) For class 1A, 2A, 3A, and 4 and those Class 1B, 2B, and 3B Mode S transponders that include the optional high RF peak output power, the minimum RF peak output power is at least 21.0 dbw (125 watts):
- (d) For class 1B, 2B, and 3B Mode S transponders, the minimum RF peak output power is at least 18.5 dbw (70 watts):
- (e) For any class of ATCRBS or any class of Mode S transponders, the maximum RF peak output power does not exceed 27.0 dbw (500 watts).

E.6 Mode S diversity transmission channel isolation test

For any class of Mode S transponder that incorporates diversity operation, verify that the RF peak output power transmitted from the selected antenna exceeds the power transmitted from the non-selected antenna by at least 20 dB.

E.7 Mode S address test

Interrogate the Mode S transponder using the correct address and at least 2 incorrect addresses and making the interrogations at a nominal rate of 50 interrogations per second and verify that it replies only to its assigned address.

E.8 Mode S formats test

- (a) Interrogate the Mode S transponder with UF for which it is equipped and verify that the replies are made in the correct format using the surveillance formats UF=4 and 5.
- (b) Verify that the altitude reported in the replies to UF=4 are the same as that reported in a valid ATCRBS Mode C reply.
- (c) Verify that the identity reported in the replies to UF=5 are the same as that reported in a valid ATCRBS Mode 3/A reply, if the transponder is so equipped, using the communication formats UF=20, 21, and 24.

E.9 Mode S all-call interrogations test

Interrogate the Mode S transponder with the Mode S-only all-call format UF=11, and the ATCRBS/Mode S all-call formats (1.6 microsecond P4 pulse) and verify that the correct address and capability are reported in the replies (downlink format DF=11).

E.10 Mode S ATCRBS-only all-call interrogation test

Interrogate the Mode S transponder with the ATCRBS-only all-call interrogation (0.8 microsecond P4 pulse) and verify that no reply is generated.

E.11 Mode S Squitter test

E.12 ADS-B (Mode S Extender Squitter)

- (a) Verify that the ADS-B system meets the transponder performance requirements specified in a notice required by rule 91.258, demonstrated using an appropriate transponder test set.
- (b) Test reports must be retained in the aircraft maintenance records.

Part 66 Aircraft Maintenance Personnel Licensing

[NOTE – The only change to Appendix B.1 is in paragraph (f). There is no change to Appendix B.2]

Appendix B — Group and Type Ratings**B.1 Groups**

Ratings may be issued in the following Groups:

(a) Aeroplane

Group 1: Metal stressed skin unpressurised aeroplanes with fixed landing gear not exceeding 5700 kg:

Group 2: Metal stressed skin unpressurised aeroplanes other than Group 1:

Group 3: Aeroplanes with principally wooden or tubular structure, fabric covered:

Group 4: Aeroplanes constructed principally of fibre reinforced plastic (FRP) or similar material:

(b) Rotorcraft

Group 1: Piston engined rotorcraft:

Group 2: Turbine engined rotorcraft:

(c) Powerplant

Group 1: Normally aspirated piston engines:

Group 2: Turbocharged, supercharged, or radial piston engines:

(d) Electrical

Group 1: Electrical systems in pressurised aeroplanes with an MCTOW of 5700 kg or less and unpressurised aircraft which have as their primary source of power:

(i) DC generators; or

(ii) Starter generators; or

(iii) Alternators with self-contained rectifiers:

Group 2: Electrical systems which have as their primary source of power:

(i) DC generators, or starter generators, and have frequency wild alternators installed for secondary services; or

(ii) constant frequency AC from alternators driven by constant speed drive units:

(e) Instrument

Group 1: General aircraft instrument systems; basic flight instrument systems; oxygen systems, cabin pressurisation and air conditioning systems other than those fitted to pressurised aeroplanes with an MCTOW of 5700 kg or more:

Group 2: Autoflight and navigation systems including air data computer systems, servo driven instruments, remote gyro systems including remote reading compasses, automatic flight control systems and inertial navigation systems other than those fitted to pressurised aeroplanes with an MCTOW of 5700 kg or more:

(f) Radio

Group 1: Airborne communication systems including VHF, HF, CVR, audio and ELT:

Group 2: Airborne navigation systems including ADF, VOR, ILS, VLF, Omega, marker beacon, GPS and GNSS:

Group 3: Airborne ~~primary and secondary~~ surveillance systems including weather radar, doppler, radio altimeter, DME, transponder, ADS-B systems and TCAS:

(g) Lighter than air aircraft

Group 1: Hot air free balloons and hot air airships in their entirety:

Group 2: Gas filled airships and their components excluding the engine and propeller or fan, or both.

Part 91 General Operating and Flight Rules

Subpart A – General

[NOTE – The major changes to Part 91 relevant to this proposal are in rules 91.247; 91.253; 91.255; 91.257; 91.258 and 91.541.]

[NOTE – There are also minor editorial changes proposed, also highlighted in grey.]

91.1 Purpose

- (a) This Part prescribes general operating and flight rules for the operation of civil aircraft.
- (b) Subject to paragraphs (c)(1) and (d), the following rules also apply to members of the New Zealand Defence Force and any aircraft operated by the New Zealand Defence Force within the territorial limits of New Zealand:
- (1) rule 91.129:
 - (2) rules 91.223 to 91.225, when operating in the vicinity of civil aircraft:
 - (3) rule 91.229, when operating in the vicinity of civil aircraft:
 - (4) rule 91.233:
 - (5) rule 91.241:
 - (6) rules 91.245 to 91.247:
 - (7) rule 91.309:
 - (8) rule 91.313:
 - (9) rules 91.407 to 91.411:
 - (10) rules 91.425 to 91.427:
 - (11) rule 91.431:
 - (12) rule 91.541:
 - (13) rule 91.255.
- (c) This Part does not apply to—
- (1) any member of the New Zealand Defence Force or any aircraft operated by the New Zealand Defence Force acting in connection with—
 - (i) any war or other like emergency; or
 - (ii) the defence of New Zealand and other New Zealand interests; or
 - (iii) aid to the civil power in time of emergency; or
 - (iv) the provision of any public service; or
 - (v) any operation performed within a restricted, danger, or military operating area designated under rule 71.201 for military purposes; and
 - (2) persons operating aircraft to which Part 101 applies; and
 - (2A) a person operating an aircraft under the authority of an unmanned aircraft operator certificate granted under the Act and in accordance with Part 102 unless compliance with any of the requirements in this Part is required as a condition of operation; and

(3) persons and equipment to which Part 105 applies.

(d) The following rules do not apply to any member of the New Zealand Defence Force or any aircraft operated by the New Zealand Defence Force performing training for an operation specified in paragraph (c)(1) if that training cannot be performed in accordance with the rule:

(1) rule 91.225(b):

(2) rule 91.233:

(3) rule 91.313, if training outside controlled airspace:

(4) rule 91.407, if training outside controlled airspace:

(5) rule 91.427, if training outside controlled airspace.

(e) The following rules do not apply in the case of air operations conducted in New Zealand under an Australian AOC with ANZA privileges:

(1) 91.111(1):

(2) 91.112:

(3) 91.115:

(4) 91.121:

(5) 91.123:

(6) 91.201(1)(i):

(7) 91.201(3):

(8) 91.205:

(9) 91.207:

(10) 91.209:

(11) 91.211:

(12) 91.213:

(13) 91.215:

(14) 91.221:

(15) 91.401:

(16) 91.501:

(17) 91.503:

(18) 91.505:

(19) 91.507:

(20) 91.509:

(21) 91.511:

(22) 91.513:

(23) 91.515:

- (24) 91.517:
- (25) 91.519:
- (26) 91.521:
- (27) 91.523:
- (28) 91.525:
- (29) 91.527:
- (30) 91.529:
- (31) 91.531:
- (32) 91.533:
- (33) 91.537:
- (34) 91.539:
- (35) 91.543:
- (36) 91.545:
- (37) 91.707.

91.247 Use of SSR transponder and altitude reporting equipment

(a) Except as provided in paragraph (g), a pilot-in-command of an aircraft operating in transponder mandatory special use airspace or transponder mandatory controlled airspace below flight level 245 designated under Part 71 within the New Zealand FIR must, unless otherwise authorised or instructed by ATC, operate the transponder —

- (1) in Mode A and Mode C; or
- (2) in Mode S if the aircraft is equipped with Mode S equipment and allocated a unique Mode S code referred to in paragraph (d); or
- (3) in ADS-B Out.

(b) Except as provided in paragraph (g), a pilot-in-command of an aircraft operating in transponder mandatory controlled airspace above flight level 245 designated under Part 71 within the New Zealand FIR must, unless otherwise authorised or instructed by ATC, operate the transponder in ADS-B Out.

(c) Except if paragraph (3) applies or if operating Mode S equipment, the pilot-in-command must set the transponder SSR code—

- (1) to the code assigned by ATC for the flight; or
- (2) if not assigned a code by ATC, in accordance with Table 2; and
- (3) in the event of an in-flight emergency, loss of radio communications, or an act of unlawful interference, set the transponder to the appropriate code in accordance with Table 3.

(d) A person pilot-in-command of an aircraft must not operate Mode S transponder equipment unless the aircraft is transmitting a unique Mode S code assigned by the State of registry.

(e) A pilot-in-command intending to operate an aircraft without an operable transponder in transponder mandatory airspace that is within controlled airspace must obtain specific authorisation from the ATC unit having jurisdiction over the relevant airspace as part of the ATC clearance to enter that airspace.

(f) A pilot-in-command of an aircraft operating in transponder mandatory airspace must immediately advise the ATC unit having jurisdiction over the relevant airspace of any failure or partial failure of the transponder equipment.

(g) Unless otherwise required by ATC, only one of the aircraft in a formation flight is required to operate a transponder in accordance with paragraph (a) or paragraph (b).

Table 2. Airspace SSR Codes

Flight rules	Type of aircraft operation	SSR Code
VFR	For aircraft involved in fire fighting and reconnaissance duties	0111
IFR	All	2000
VFR	All - in Auckland Oceanic FIR only	2000
VFR	All - when operating in the aerodrome traffic circuit at a controlled aerodrome	2200
VFR	Aeroplanes other than Defence aeroplanes	1200
VFR	Gliders or balloons	1300
VFR	Powered aircraft in designated general aviation areas	1400
VFR	Helicopters other than Defence helicopters	1500
VFR	Defence aeroplanes	6000
VFR	Defence helicopters	6500

Table 3. Emergency SSR Codes

Occurrence	SSR Code
Unlawful interference	7500
Loss of radio communication	7600
In flight emergency when no code has been allocated by ATC	7700

91.253 Transition Provision – ADS-B Out

Rules 91.247(b) and 91.255 do not apply until 31 December 2018.

91.255 Mandatory operation of ADS-B Out in controlled airspace above flight level 245

(a) A person must not operate an aircraft in controlled airspace above flight level 245 within transponder mandatory airspace designated under Part 71 in the New Zealand FIR unless the aircraft is equipped with an ADS-B system which meets the minimum performance standards and requirements under rule 91.257.

(b) Paragraph (a) does not apply to an aircraft operating in any portion of the airspace within the Auckland Oceanic FIR.

91.257 ADS-B system equipment performance standards and requirements

An ADS-B system must meet the following minimum requirements -

- (1) include a 1090 MHz Mode S Extended Squitter transponder;

- (2) include a GNSS position source that is compatible with the 1090 MHz Mode S Extended Squitter transponder referred to in paragraph (1);
- (3) transmit an ADS-B Out message set determined by the Director as specified in a notice referred to in rule 91.258;
- (4) meet performance standards regarding ADS-B systems determined by the Director as specified in a notice referred to in rule 91.258;
- (5) meet the aircraft accuracy parameters of the data for ADS-B transmission determined by the Director as specified in a notice referred to in rule 91.258; and
- (6) meet the testing and power requirements determined by the Director as specified in a notice referred to in rule 91.258.

91.257A Prohibited use of certain transceivers and transmission of non-compliant data

(a) A person operating an aircraft in controlled airspace within transponder mandatory airspace designated under Part 71 in the New Zealand FIR must not –

- (1) allow the transmission of non-compliant data or misleading data; or
- (2) use a 978 MHz Universal Access Transceiver to transmit data.

91.258 Director may determine certain requirements regarding ADS-B as specified in a notice

(a) The Director may determine the following requirements as specified in a notice under rule 91.258A –

- (1) the requirements for an ADS-B Out message set;
- (2) the performance standards for ADS-B systems;
- (3) aircraft accuracy parameters of the data for ADS-B transmission; and
- (4) the testing and power requirements regarding an ADS-B system.

(b) A person must comply with any requirement specified in a notice referred to in paragraph (a) if the requirement applies to the person.

91.258A Process prior to issuing or amending a notice

(a) Before issuing or amending a notice to specify the requirements referred to in rule 91.258, the Director must –

- (1) conduct a safety review to assess the risk to aviation safety of the matter giving rise to particular safety concerns by taking into account –
 - (i) the requirements of the ATC surveillance system;
 - (ii) the integrity and compatibility of equipment, systems, performance standards and procedures for an ADS-B system required by rule 91.257;
 - (iii) how ICAO or other ICAO Contracting States are dealing with the risk;
 - (iv) any other information that the Director considers may be relevant; and
- (2) consult publicly by publishing the initial or amended notice on the CAA website; and
- (3) consider the following:
 - (i) ICAO's annexes to the Convention or legislation by ICAO Contracting States in relation to surveillance systems and ADS-B systems, including equipment;

- (ii) International standards of the ICAO or ICAO Contracting States and recommended practices and guidance as set out in any document, plan, strategy or manual relating to surveillance systems and ADS-B systems, including equipage; and
- (4) determine, after conducting the safety review, whether or not it is necessary to impose requirements to eliminate or mitigate any risk to aviation safety.

(b) Before amending a notice, the Director must consult publicly by publishing on the CAA website any proposed amendment or intention to amend a notice.

91.258B Notice to be published

(a) The Director must, as soon as practicable after issuing, amending or revoking a notice, publish on the CAA website—

- (1) the notice; and
- (2) the date the notice comes into effect; and
- (3) the reasons for the notice.

91.258C Effective date of notice

(a) A notice made under rule 91.258 comes into force on the date specified by the Director.

(b) In determining the date under paragraph (a), the Director must provide reasonable time for affected parties to be made aware of the notice before it comes into force.

91.258D Amendment of notice

(a) The Director may amend a notice made under rule 91.258 at any time and rules 91.258A and 91.258B, with the necessary modifications, apply to any amendment.

(b) Despite paragraph (a), rules 91.258A and 91.258C(b) do not apply to any amendment or correction that is minor and non-controversial.

91.258E Revocation of notice

(a) The Director may revoke a notice made under rule 91.258 at any time if the Director is satisfied that the notice is no longer necessary after having consulted publicly on the CAA website.

(b) A revocation takes effect from the date specified by the Director.

Subpart F Instrument and Equipment Requirements

91.541 Transponder and altitude reporting equipment

(a) Where an aircraft is equipped with ATRCBS transponder equipment, the transponder must have—

- (1) Mode 3/A 4096 code capability replying to Mode 3/A interrogations with the code specified by ATC; and
- (2) Mode C capability that automatically replies to Mode C interrogations by transmitting pressure altitude information in 100 foot increments.

(b) Where an aircraft is equipped with Mode S transponder equipment, the transponder must be capable of replying to—

- (1) Mode 3/A interrogations with the code specified by ATC; and

- (2) intermode; and
- (3) Mode S interrogations.

(c) Where an aircraft is equipped with an ADS-B system, the system must meet the minimum performance standards and requirements under rule 91.257.

Subpart G — Operator Maintenance Requirements

[NOTE – The only changes proposed in Subpart G are minimal, editorial ones to change references from “SSR transponders” to “surveillance transponders” in rules 91.601(b), 91.605 (e)(2) and (3)]

91.601 Purpose

(a) This subpart prescribes the requirements to maintain New Zealand registered aircraft operating within or outside of New Zealand.

(b) Except for the following rules, this subpart does not apply to a microlight aircraft that is maintained under Part 103:

- (1) rule 91.605(e)(2) (test and inspection of automatic pressure altitude reporting system if the microlight aircraft is equipped with a ~~SSR~~ surveillance transponder):
- (2) rule 91.605(e)(3) (~~SSR~~ surveillance transponder):
- (3) rule 91.605(e)(8) (flotation equipment):
- (4) rule 91.616 (maintenance logbook - Class 2 microlight aircraft):
- (5) rule 91.617 (maintenance records - Class 2 microlight aircraft):
- (6) rule 91.621 (transfer of maintenance records):
- (7) rule 91.623 (retention of records).

(c) Except for the following rules, this subpart does not apply to a glider that is maintained under Part 104:

- (1) rule 91.605(e) (maintenance of instruments and equipment):
- (2) rule 91.613 (operational flight check):
- (3) rule 91.615 (annual review of airworthiness):
- (4) rule 91.616 (maintenance logbook):
- (5) rule 91.617 (maintenance records):
- (6) rule 91.621 (transfer of maintenance records):
- (7) rule 91.623 (retention of records).

91.605 Maintenance programmes and schedules

(a) Subject to paragraphs (b), (c), and (d), the operator of an aircraft must maintain the aircraft under—

- (1) a maintenance programme approved under Part 115; or
- (2) a maintenance programme approved under Part 119; or
- (3) a maintenance programme approved under rule 91.607; or
- (4) the manufacturer’s maintenance schedule; or

-
- (5) if the aircraft is powered by a piston engine and has a MCTOW of 2730 kg or less, a maintenance programme that is acceptable to the Director and includes at least the following:
- (i) details of the responsibilities and standards for maintenance of the aircraft in accordance with the applicable rule requirements;
 - (ii) details of pre-flight checks;
 - (iii) details of scheduled maintenance checks and inspections.
- (b) The operator of an aircraft that is—
- (1) used for air operations under the authority of an air operator certificate issued by the Director under the Act and Part 119 must maintain the aircraft under the maintenance programme that is required by Part 119; or
 - (2) used for adventure aviation operations under the authority of an adventure aviation operator certificate issued by the Director under the Act and Part 115 must maintain the aircraft under the maintenance programme that is required by Part 115; or
 - (3) issued with a special category airworthiness certificate must maintain the aircraft under a valid maintenance programme approved under rule 91.607 for the holder of the certificate of registration for the aircraft.
- (c) If the manufacturer's maintenance schedule referred to in paragraph (a)(4) does not provide for an aircraft that operates for less than 100 hours of time in service per year, the operator must ensure that the manufacturer's 100-hour inspection or an equivalent inspection is completed within the preceding 12 months.
- (d) If the Director determines that a manufacturer's maintenance schedule referred to in paragraph (a)(4) is deficient, the Director may require the operator to submit a maintenance programme for approval under rule 91.607.
- (e) Except as provided in paragraph (f) and rule 91.611, the operator of an aircraft must not operate the aircraft unless—
- (1) every aircraft radio station that is required to be installed in the aircraft under Subpart F for operations under IFR has been tested and inspected under Part 43, Appendix B within the preceding 24 months; and
 - (2) every static pressure system, altimeter instrument, or automatic pressure altitude reporting system that is required to be installed in the aircraft under Subpart F, or required for ~~an SSR~~ a surveillance transponder installed in the aircraft, has been tested and inspected under Part 43, Appendix D—
 - (i) within the preceding 24 months; and
 - (ii) following any opening and closing of the static pressure system, except for the use of system drain and alternate static pressure valves, or where self-sealing disconnect coupling is provided; and
 - (iii) following installation of, or maintenance on, the automatic pressure altitude reporting system where data correspondence error could be introduced; and
 - (3) every ~~SSR~~ surveillance transponder that is required to be installed in the aircraft under Subpart F has been tested and inspected, under Part 43, Appendix E within the preceding 24 months; and
 - (4) every ELT that is required to be installed in the aircraft under Subpart F—
 - (i) has been tested and inspected under—
 - (A) Appendix F of Part 43 within the previous 12 months or 100 hours of aircraft time in service, whichever is the sooner, or

- (B) for an aircraft maintained under a maintenance programme required by rule 119.63, the scheduled intervals, which must not be more than 12 months, as described in the approved maintenance programme; and
- (ii) has been tested in accordance with the manufacturer's instructions within the previous 24 months; and
 - (iii) has the battery replaced in accordance with the manufacturer's instructions, when the life of the battery, as established by the manufacturer, has expired; and
- (5) every compass that is required to be installed in the aircraft under Subpart F has been calibrated—
- (i) within the preceding 24 months; and
 - (ii) following any out of phase event that may affect the calibration of the compass unless the aircraft manufacturer specifies otherwise; and
- (6) every first aid kit that is required to be installed in the aircraft under Subpart F has been inspected—
- (i) within the preceding 12 months to ensure that appropriate quantities of items are included and time-expired items are replaced; and
 - (ii) after every reported use to ensure that appropriate quantities of items are included; and
- (7) every portable fire extinguisher that is required to be installed in the aircraft under Subpart F has been inspected for condition and tested in accordance with the manufacturer's instructions or other equivalent instructions acceptable to the Director within the preceding 12 months; and
- (8) all flotation equipment that is required to be installed in the aircraft under Subpart F has been inspected for condition and tested in accordance with the manufacturer's instructions or other equivalent instructions acceptable to the Director within the preceding 12 months; and
- (9) the aircraft's empty weight and centre of gravity is re-established if—
- (i) changes have been made to the aircraft that could affect the empty weight and centre of gravity; or
 - (ii) the operator has any reason to suspect that the information in the aircraft's flight manual is no longer accurate; and
- (10) for a powered aircraft with a maximum certificated seating capacity of 4 or more seats, the aircraft has been weighed within the preceding 10 years.
- (f) The operator of an aircraft that is maintained under a maintenance programme referred to in paragraphs (a)(1) or (a)(2) is not required to comply with any particular requirement in paragraph (e) if the maintenance programme for the aircraft includes a test, inspection, or other action that is equivalent to the particular requirement in paragraph (e).
- (g) The operator of an aircraft must—
- (1) identify in the maintenance logbook for the aircraft which maintenance option under paragraph (a) is to be used for the aircraft; and
 - (2) if the maintenance programme is one that is approved under Part 119 or approved under rule 91.607, identify in the maintenance programme the person who is responsible for scheduling the maintenance that is required in the programme; and
 - (3) if changing from the maintenance programme or option identified under paragraph (1) to another programme or option under paragraph (a), schedule the inspections required by the new programme or schedule, to provide for the continued airworthy condition of the aircraft; and

- (4) provide a copy of the applicable maintenance programme or schedule to the person who performs maintenance on the aircraft, and upon request to the Director.
- (h) The tests and inspections required by paragraphs (e)(1), (e)(2)(i), (e)(3), and the 12 month test and inspection requirement in paragraph (e)(4)(i)(A) do not need to be performed if—
- (1) the aircraft has been inspected for the grant of an airworthiness certificate under section 9 of the Act and Part 21 within the preceding 12 months; and
 - (2) the applicable equipment was installed in the aircraft when the inspection specified in paragraph (1) was performed.

Part 101 Gyrogliders and Parasails, Unmanned Aircraft (including Balloons), Kites, and Rockets – Operating Rules

101.107 Equipment

A person ~~shall~~ **must** not operate a heavy free balloon unless—

- (1) it is equipped with—
 - (i) at least 2 payload flight-termination devices or systems, whether automatic or by telemetry, that operate independently of each other; and
 - (ii) ~~in an area where ground based SSR equipment is in use, a secondary surveillance radar transponder~~ an ADS-B system, if the balloon is to operate in transponder mandatory controlled airspace above flight level 245 designated under Part 71 within the New Zealand FIR; or
 - (iii) a surveillance transponder with an altitude reporting capability, which is continuously operating on an assigned code, or which can be turned on when necessary by the tracking station; if the balloon is to operate within transponder mandatory controlled airspace below flight level 245; and
- (2) for polyethylene zero pressure balloons, at least 2 methods, systems, devices, or combinations, that function independently of each other and are employed for terminating the flight of the balloon envelope; and
- (3) the balloon envelope is equipped with—
 - (i) at least 1 radar reflective device; or
 - (ii) radar reflective material that will present an echo to surface radar operating in the 2,700 MHz to 2,900 MHz frequency range.

Part 103 Microlight Aircraft – Operating Rules

[NOTE – The main changes in Part 103 are editorial changes to references from “SSR transponders” to “surveillance transponders” in rule 103.217(c)(3)]

103.217 Maintenance and inspection requirements

- (a) An operator of a microlight aircraft must ensure that—
- (1) the aircraft is maintained in an airworthy condition; and
 - (2) every applicable airworthiness directive is complied with as required by Part 39; and
 - (3) between required inspections, every defect is rectified.
- (b) An operator of a microlight aircraft that meets a type design standard specified in rule 103.207(a)(1), must ensure that the aircraft is maintained in accordance with the designer or kitset manufacturer maintenance requirements.
- (c) Subject to paragraphs (d) and (g), a person must not operate a microlight aircraft unless—
- (1) an annual inspection of the conditions of the aircraft has been carried out within the preceding 12 months; and
 - (2) rule 103.217(a)(2) is complied with; and
 - (3) except as provided in paragraph (h), any applicable tests and inspections required under the following rules have been complied with:
 - (i) rule 91.605(e)(2) regarding test and inspection of automatic pressure altitude reporting system if the microlight aircraft is equipped with a ~~SSR~~ surveillance transponder:
 - (ii) rule 91.605(e)(3) if the microlight aircraft is equipped with a ~~SSR~~ surveillance transponder:
 - (iii) rule 91.605(e)(8) if the microlight aircraft is equipped with flotation equipment.
- (d) The annual condition inspection required by paragraph (c)(1) must be—
- (1) performed by—
 - (i) a person authorised by a microlight organisation to perform annual condition inspections; or
 - (ii) the Director; or
 - (iii) a person who holds a current aircraft maintenance engineer licence with appropriate aircraft and engine group ratings issued under Part 66; and
 - (iv) acceptable to the Director with regard to the items and components inspected.
- (e) The person who performs the annual condition inspection required by paragraph (c)(1) must, if the person finds the aircraft to be in an airworthy condition,—
- (1) certify in an inspection form that the aircraft is airworthy; and
 - (2) permanently affix the inspection form required under paragraph (e)(1) to the aircraft in a prominent place adjacent to the point of entry; and
 - (3) retain a copy of the inspection form required under paragraph (e)(1) as a record of the certification; and
 - (4) for a class 2 microlight aircraft, enter the details of the certification in the applicable maintenance record required under rule 91.617.

- (f) The aircraft inspection form required under paragraph (e)(1) must include the—
- (1) aircraft registration markings; and
 - (2) aircraft type; and
 - (3) due date for the next annual condition inspection; and
 - (4) date, signature, and licence or certificate number of the engineer or inspector who carried out the annual condition inspection.
- (g) If the annual condition inspection that is required under paragraph(c)(1) shows that the aircraft is not airworthy, the operator of the aircraft must not permit the aircraft to be flown until it has been re-inspected and certified as airworthy in accordance with paragraphs (d), (e), and (f).
- (h) A person operating a microlight aircraft is not required to comply with—
- (1) the test and inspection requirements in rules 91.605(e)(2) and (3) until the date of the first annual condition inspection that is carried out after 1 March 2007; and
 - (2) the test and inspection requirement in rule 91.605(e)(8) until 1 March 2008.

Part 172 Air Traffic Service Organisations – Certification

[NOTE – The changes in Part 172 are minimal, editorial ones to remove references to “radar” and to change references from “SSR transponders” to “surveillance transponders” in rules 172.57 (c)(2)(x), 172.75(d), 172.115(b)(4), (c)(3), (d)(2) and (e), 172.155(a)(3) and 172.355(c). As well as these changes, a correction is made to NM (meaning nautical mile) previously written as nm in rules 172.253, 172.265, 172.267, 172.269, 172.287(2), 172.293]

172.57 Facility requirements

- (a) An applicant for the grant of an air traffic service certificate must establish the following facilities that are appropriate to the air traffic services listed in the applicant’s exposition:
- (1) aerodrome control towers:
 - (2) approach control offices:
 - (3) area control centres:
 - (4) aerodrome flight information offices:
 - (5) flight information centres:
 - (6) dedicated training and assessment facilities.
- (b) Except as provided in paragraph (h), an applicant for an aerodrome control service, or an aerodrome flight information service, must establish procedures for ensuring that any aerodrome control tower or aerodrome flight information office, including any temporary tower or office, listed in the applicant’s exposition, is—
- (1) constructed and situated to provide—
 - (i) the maximum practicable visibility of aerodrome traffic; and
 - (ii) protection from glare and reflection; and
 - (iii) protection from noise; and
 - (2) safeguarded from any development that would affect the requirements of paragraph (b)(1); and

-
- (3) at solo watch locations, provided with—
- (i) toilet facilities that ensure the minimum possible interruption to, or degradation of, air traffic services; and
 - (ii) storage and preparation facilities for food and drink in the visual control room; and
- (4) provided with equipment for two-way voice communication with—
- (i) any aircraft, in or adjacent to airspace for which the applicant has responsibility; and
 - (ii) any aircraft, vehicle, and person, on, or adjacent to, the manoeuvring area; and
- (5) provided with the following minimum equipment:
- (i) a display system or systems designed to show the disposition of current and pending aerodrome traffic together with ancillary information for individual aircraft:
 - (ii) a power supply:
 - (iii) appropriate and current maps and charts:
 - (iv) binoculars:
 - (v) clocks:
 - (vi) log keeping system:
 - (vii) outside temperature indicator:
 - (viii) QNH display:
 - (ix) signal lamp with green, red, and white functions:
 - (x) telephone communications:
 - (xi) status monitors for approach and landing aids and any road or rail signalling equipment affecting the use of a runway:
 - (xii) visibility and cloud height checkpoints:
 - (xiii) voice and, if applicable, data recording equipment:
 - (xiv) wind direction and wind speed display:
 - (xv) an audible emergency alerting system:
 - (xvi) an AFTN terminal or, if provided for in an ATS letter of agreement, an alternative means of reception and transmission of information normally conveyed by AFTN:
 - (xvii) if applicable, airfield lighting controls panel; and
- (6) provided with 2 independent sources of the current altimeter setting, at least 1 of which must be an aneroid barometer or barometric altimeter situated in the visual control room.
- (c) The applicant must establish procedures for ensuring that an area control centre, a flight information centre, and an approach control office is—
- (1) provided with equipment enabling—
 - (i) to the fullest extent practical, two-way voice communication; and
 - (ii) if applicable, data communication—

- with any aircraft in, or adjacent to, airspace for which the applicant has responsibility; and
- (2) provided with the following minimum equipment:
- (i) a display system or systems designed to show the disposition of current and pending flights together with ancillary information for individual aircraft:
 - (ii) a power supply:
 - (iii) appropriate and current maps and charts:
 - (iv) clocks:
 - (v) log keeping system:
 - (vi) status monitors as appropriate for navigation, approach, and landing aids:
 - (vii) telephone communications:
 - (viii) voice recording equipment and, if applicable, data recording equipment:
 - (ix) an AFTN terminal:
 - (x) for an approach control operating position, an ILS/MLS status monitor at the approach control procedural or approach control surveillance operating position for the aerodrome concerned:
 - (xi) for an approach control operating position responsible for aircraft on final approach, or aircraft landing or taking-off, a wind direction and wind speed display fed from the same source as the corresponding equipment in the aerodrome control tower.
- (d) The applicant must establish procedures for ensuring that the aeronautical telecommunications equipment required by paragraphs (b) and (c) are operated as specified under Part 171.
- (e) The applicant must establish procedures for ensuring that any visual display unit used by an air traffic service is positioned with due regard to the relative importance of the information displayed and ease of use by the staff concerned.
- (f) The equipment required by paragraphs (b)(4) and (5), and (c)(1) and (2), must have a level of reliability, availability, and redundancy, that minimises the possibility of failure, non-availability, or significant degradation of performance.
- (g) The applicant must establish procedures for ensuring that the status monitors required by paragraph (b)(5)(xi) and paragraphs (c)(2)(vi) and (x) are fitted with—
- (1) an aural signal to indicate a change of status; and
 - (2) a visual indication of the current status.
- (h) A temporary aerodrome control tower and a temporary aerodrome flight information office are not required to be provided with the equipment required under paragraphs (b)(5)(xi), (xvi) and (xvii) if it is impracticable to do so and other appropriate measures are taken, as the case may be, to—
- (1) provide the person providing the air traffic service from the temporary tower or office with the information that would be available from the equipment required under paragraphs (b)(5)(xi) and (xvi); and
 - (2) control the airfield lighting if applicable.

172.75 Area and approach control services

(a) An applicant for the grant of an air traffic service certificate in respect of an area or approach control service must establish systems and procedures for —

- (1) determining from information received, the positions of known aircraft relative to each other; and
- (2) providing for the issue of ATC clearances, instructions, and information in accordance with the airspace classification and type of flight for the purpose of preventing collisions between aircraft under the control of the unit, and for expediting and maintaining a safe and efficient flow of traffic; and
- (3) co-ordinating clearances with other ATC units as necessary; and
- (4) displaying information on aircraft movements together with a record of clearances issued, in a manner that permits ready analysis of such information.

(b) Except as provided in paragraph (d) and rule 172.91, the procedures required by paragraph (a)(2) must specify that vertical or horizontal or composite separation under paragraph (c) must be provided between—

- (1) all flights in classes A and B airspace; and
- (2) IFR flights in classes C, D, and E airspace; and
- (3) IFR flights and VFR flights in class C airspace; and
- (4) IFR flights and Special VFR flights in classes B, C, and D airspace; and
- (5) Special VFR flights in classes B, C, and D airspace when the flight visibility is reported to be less than 5 km.

(c) The separation required by paragraph (b) must be in accordance with the applicable criteria and minima prescribed by—

- (1) Subpart E; or
- (2) Annex 11; or
- (3) Document 4444; or
- (4) Document 7030.

(d) In Class D or E airspace, the ATC separation required by paragraph (b)(2) does not apply to a flight using IFR if the pilot has been cleared to maintain own separation from other flights using IFR. The clearance must not be issued unless—

- (1) the clearance is in response to a specific request from the pilot of the aircraft; and
- (2) the flight is during the day and visual meteorological conditions exist; and
- (3) an ATS surveillance control service is not available; and
- (4) the clearance is for a specific portion of the flight; and
- (5) the pilots of all flights that will be essential traffic agree with the application of the procedure; and
- (6) essential traffic information is passed to the pilots of all affected flights; and
- (7) the flights concerned are on the same ATC frequency.

172.115 Records

(a) An applicant for the grant of an air traffic service certificate must establish systems and procedures for identifying, collecting, indexing, filing, storing, securing, maintaining, accessing, and disposing of, records necessary for—

- (1) the operational provision of air traffic services; and
- (2) the purpose of assisting with any accident or incident investigation.

(b) The records referred to in paragraph (a) must include—

- (1) telephone communications; and
- (2) radio broadcasts and communications; and
- (3) air-ground digital data exchanges; and
- (4) ~~radar information~~ ATS surveillance system data; and
- (5) filed flight plans including standard and repetitive plans; and
- (6) flight progress strips; and
- (7) staff duty rosters; and
- (8) appropriate meteorological and aeronautical information, except where the information is retained for an equivalent period by a meteorological or AIS organisation; and
- (9) [revoked]
- (10) a record for every person who is required to be trained under rule 172.165, including details of—
 - (i) each segment of training that is undertaken; and
 - (ii) knowledge testing or competency assessment as appropriate for the training conducted.

(c) The applicant must establish systems and procedures for ensuring the electronic recording of—

- (1) all ATS radio and telephone communications; and
- (2) all high-frequency air-ground communications; and
- (3) all relevant data from ~~primary and secondary radar equipment, or obtained through automatic dependent surveillance (ADS)~~, ATS surveillance systems used in providing or supporting an ATC surveillance service; and
- (4) ~~for any equipment coming into service after the date this Part comes into force, any transfer and acceptance of control process not conducted by telephone.~~ all relevant data from an ADS system used in supporting an ATC procedural service;
- (5) ~~and~~ for any equipment coming into service after the date this Part comes into force, any transfer and acceptance of control process not conducted by telephone.

(d) The applicant must establish systems and ~~procedures for ensuring~~ that electronic records referred to in paragraph (c)—

- (1) include time recording, correct to within 5 seconds of UTC, as determined by reference to a standard time station or GPS time standard; and
- (2) either—
 - (i) replicate the voice communications, and, if applicable, ~~the radar picture,~~ an air situation display presentation applying at the particular operating position; or

- (ii) are accompanied by a statement fully describing the differences between the recording supplied and a recording under paragraph (i).
- (e) For the purposes of paragraph (d)(2), the term air situation display includes any visual presentation of aircraft position.
- (f) The option provided by paragraph (d)(2)(iii) only applies to equipment that was in service on 1 January 1998.
- (g) The applicant must establish systems and procedures for ensuring that all records, except where replication is required by paragraph (d)(2)(i), are sufficiently clear to convey the required information.
- (h) The applicant must establish procedures for ensuring that the records referred to in paragraph (b) are retained for 31 days from the date of entry, except for—
- (1) staff duty rosters which must be retained for 2 years; and
 - (2) written records associated with the requirements of rules 172.121(a)(2) and (3) which must be retained for 2 years; and
 - (3) training records which must be retained for a period of 3 years from the date the affected person ceases to work or be associated with the air traffic service organisation.

Subpart C — Operating Requirements

172.155 Trials

- (a) The Director may, upon application in writing from the holder of an air traffic service certificate, approve, subject to such conditions on that approval as the Director considers necessary in the interests of aviation safety, the conduct of trials regarding—
- (1) separation minima; or
 - (2) standard phraseology; or
 - (3) ~~radar~~ ATS surveillance service procedures.
- (b) A trial may be approved by the Director for a single period of no longer than 3 months, and upon further application in writing by the certificate holder, be extended by the Director for a single period of no longer than 3 months.
- (c) A trial approved under this rule may be terminated by the Director at any time.

Subpart E — Separation criteria and minima

172.253 Composite visual separation

An aerodrome controller may apply a composite of geographical and visual separation, provided instructions are issued as necessary to maintain adequate separation, between—

- (1) an aircraft continuously in sight of the controller, and within 10 ~~nm~~ NM of the aerodrome; and
- (2) an aircraft not in sight of the controller, but whose current position has been determined by ~~determined by radar~~ approved use of an ATS surveillance system or a pilot position report.

172.265 Reduced separation when providing an ATS surveillance service

The Director may, in accordance with paragraph 8.7.4.2 of Document 4444, approve a reduction of the standard 5 ~~nm~~ NM minimum separation prescribed in paragraph 8.7.4.1 of Document 4444.

172.267 Separation from an unidentified controlled flight by ATS surveillance service

- (a) A minimum ~~radar~~ separation of 5 ~~nm~~ NM may be applied between an identified aircraft and an unidentified controlled flight entering or about to enter ~~radar~~ ATS surveillance system coverage under Document 4444 Part VI paragraph 7.3.7 a) and b); or
- (b) ~~Radar~~ Separation may be applied between a previously identified aircraft which has since passed out of ~~radar~~ ATS surveillance system cover, and a following identified aircraft, provided the following aircraft can achieve the appropriate vertical separation at least 5 ~~nm~~ NM before the position at which the preceding aircraft passed out of ~~radar~~ ATS surveillance system cover; or
- (c) ~~Radar~~ Separation may be applied between aircraft on reciprocal tracks, when an identified aircraft is at least 5 NM past the position at which a previously identified aircraft passed out of ~~radar~~ ATS surveillance system cover; or
- (d) A minimum ~~radar~~ separation of 5 ~~nm~~ NM using an ATS surveillance system may be applied between an identified aircraft and the cleared route of an unidentified controlled flight using VFR procedures.

172.269 Separation from holding aircraft in the ATS surveillance service

A minimum ~~radar~~ separation of 5 ~~nm~~ NM using an ATS surveillance system may be applied between an identified aircraft that is not holding, and other identified aircraft that are holding, despite that individual identity of the holding aircraft may be lost.

172.287 Separation of successive departures using IFR

A following IFR aircraft may be cleared for take-off when—

- (1) the initial departure track differs by at least 30 degrees from the departure track of the leading aircraft, and visual observation by the aerodrome controller confirms that the leading aircraft—
 - (i) has turned to clear the departure track of the following aircraft; or
 - (ii) has reached a point where adequate separation will exist from the following aircraft, or
- (2) the initial departure track differs by at least 20 degrees from the departure track of the leading aircraft; and
 - (i) ~~radar~~ identification using an ATS surveillance system will be established within 1 ~~nm~~ NM of the end of the runway used for take-off; and
 - (ii) the leading aircraft is 1 ~~nm~~ NM ahead of the following aircraft, and confirmed by visual or ~~radar~~ observation using an ATS surveillance system as having turned to clear the departure track of the following aircraft.

172.293 Separation from active special use airspace

(a) Except as provided in paragraph (b), when applying the separation required by rule 172.79, the minimum separation must be—

- (1) when aircraft within the active special use airspace may be operating in IMC—
 - (i) 1000 feet vertical separation up to FL290; or
 - (ii) 2000 feet vertical separation above FL 290; or
 - (iii) 5 ~~nm~~ NM ~~radar~~ separation in the provision of an ATS surveillance service; or
- (2) when aircraft within the active special use airspace are operating in VMC—
 - (i) 500 feet vertical separation up to FL290; or
 - (ii) 1000 feet vertical separation above FL290; or
 - (iii) ~~Radar~~ separation of 1 ~~nm~~ NM plus the accuracy tolerance of the ~~radar system in use~~ ATS surveillance system in the provision of a surveillance service; or

- (3) achieved by the use of minima or instrument flight procedures—
- (i) approved by the holder of an instrument flight procedure service certificate issued under Part 173; or
 - (ii) approved under rule 19.155(b) that was in force before 23 October 2009; or
- (b) When no separation minimum or procedure is specified under paragraphs (a)(1), (2), or (3), separation must be achieved by keeping controlled flights clear of active special use airspace.

172.355 ATS co-ordination phraseology

(a) Release instructions to aerodrome control

- (1) When there are no restrictions:

“RELEASED”

- (2) When the aircraft is to be held on the ground:

“HOLD”

- (3) When a release is based on clock time:

“CLEARANCE VALID/EXPIRES AT (time)”

- (4) When a release is based on time interval:

“RELEASED (number of minutes) MINUTES BEHIND (leading aircraft)”

- (5) When a release is based on the application of vertical separation:

“RELEASED AFTER (leading aircraft call sign) HAS PASSED (level)”

- (6) When a release is subject to aerodrome control providing separation from specified traffic, where *RYS* means *“Released, your separation”*:

“RYS (call sign of conflicting traffic) (details of conflicting traffic, if not already passed)”

(b) Clarification of responsibility for providing separation

- (1) When assigning or clarifying who is providing separation, and to acknowledge the arrangement:

“MY SEPARATION/YOUR SEPARATION (call sign call sign of conflicting traffic)”

(c) Co-ordination between ~~radar~~ surveillance controllers

- (1) When effecting a transfer of control:

“~~RADAR~~ RELEASE (details)”

- (2) When ~~radar~~ identity only is being transferred:

“~~RADAR~~ IDENT (details)”

(d) Negotiation of revised estimate messages

- (1) Invitation by transferring controller:

“WILL YOU ACCEPT (details)”

- (2) Refusal by accepting controller:

“NEGATIVE, WILL ACCEPT (alternative details)”

Subpart G — Radar ATS surveillance procedures**172.401 Verification of SSR transponder Mode C level information**

- (a) Subject to paragraph (b), aerodrome control may verify the Mode C level information of a departing aircraft when the tower radar indicates a positive rate of climb from the aerodrome elevation.
- (b) Mode C information must not be used when the displayed level varies by more than 300 feet from the aerodrome elevation during the take-off roll.

172.403 Speed control

Speed control must not be applied or continued after a point 4 ~~nm~~ NM from the runway threshold on final approach.

Appendix 1: Draft Civil Aviation Authority Notice**Notice of Requirement****NTC 91.258**

Revision 0

Automatic Dependent Surveillance-Broadcast (ADS-B) systems

91 XXXX 2017

Preliminary

The Director of Civil Aviation issues the following requirements (“the requirements”) relating to ADS-B systems under section 28(5) of the Civil Aviation Act 1990 and Civil Aviation Rule (CAR) 91.258.

Purpose

The purpose of this notice is to specify the requirements determined by the Director referred to in rule 91.258, in particular:

- the equipment requirements for ADS-B systems comprising a 1090 MHz Mode S Extended Squitter transponder and a compatible GNSS position source;
- the performance standards for an ADS-B system;
- equipment installation and approval requirements;
- the minimum message set elements that may be broadcast by ADS-B systems;
- any conditions relating to ADS-B Out equipment or design change requirements or combinations of position source and transponder; and
- testing and power requirements.

General

A notice is issued under the Civil Aviation Rules made according to section 28(5) of the Civil Aviation Act. This section permits the Minister of Transport to make ordinary rules, on any terms and conditions specified in the rules:

- to require or provide for a matter to be determined, or undertaken or approved by the Authority, the Director or another person; or
- to empower the Authority, Director, or another person to impose requirements or conditions as to the performance of any activity, including but not limited to any procedures to be followed.

A notice is a tool used by the CAA to enable performance-based regulation, and improve flexibility and responsiveness, for example, in circumstances where new technological changes or challenges require more flexibility than prescribing requirements in the rules (and rule making may get

quickly out-dated), or where there is a need for an urgent regulatory response to safety issues which the rules cannot adequately deal with.

A notice contains requirements including the detail about the approvals, standards, conditions, procedures and technical specifications that have been approved or determined by the Director under the Civil Aviation Rules. These requirements apply in particular circumstances to the aviation document holders specified in the notice.

The CAA will continue publishing advisory circulars (ACs) where appropriate.

These requirements set out in this notice must be complied with.

Related Rules

Rules 91.255, 91.257, 91.257A

Rules 91.258, 91.258A

Effective date of notice

This notice comes into effect on [date].

Revision History

Revision 1	Original

Automatic Dependent Surveillance-Broadcast (ADS-B) systems

1. Application

These requirements apply to:

- (1) every operator of aircraft operating in controlled airspace within transponder mandatory airspace above flight level 245 designated under Part 71 in the New Zealand FIR;
- (2) every installation of ADS-B system in New Zealand referred to in rule 91.255;
- (3) every person operating an aircraft in controlled airspace within transponder mandatory airspace below flight level 245 in the New Zealand FIR, if the aircraft has an ADS-B system already installed; or
- (4) any new installation of ADS-B system in aircraft in controlled airspace within transponder mandatory airspace below flight level 245 in the New Zealand FIR.

2. Performance standards of ADS-B equipment

ADS-B transmission rate

- (a) An ADS-B system must transmit updates at least once every second.

ADS-B transmission latency

- (b) An ADS-B system must transmit the aircraft's geometric position no later than 2.0 seconds from the time of measurement of the position to the time of transmission.
- (c) Within the 2.0 second total latency allocation, a maximum of 0.6 seconds can be uncompensated latency. The ADS-B system must compensate for any latency above 0.6 seconds up to the maximum 2.0 seconds total by extrapolating the geometric position to the time of message transmission.

ADS-B transponder performance requirements

- (d) Except as provided in paragraph (e), ADS-B systems must meet these minimum performance requirements:
 - (1) the NACp figure must be 6 or greater;
 - (2) the NACv figure must be 1 or greater;
 - (3) the NIC figure must be 5 or greater;
 - (4) the SDA must be 2 or greater: and
 - (5) the SIL must be 3 or greater;
 - (6) any changes in NACp, NACv, SDA and SIL must be broadcast within (10) seconds;
 - (7) changes in NIC must be broadcast within (12) seconds.
- (e) An ADS-B transponder certificated to TSO-C166() must provide a NUC figure of 4 or greater.

ADS-B equipment standards

- (f) The following performance standards meet the performance requirements for transponders and position sources specified in paragraph (d):

Transponder

- (1) TSO-C166() or demonstrate performance equivalent to that standard – Conditions: Allowed to operate in the New Zealand Flight FIR if fitted before 31 December 2018 and meets the performance requirements set out in clause 2(e); or
- (2) TSO-C166(a) or demonstrate performance equivalent to that standard – Conditions: Allowed to operate in the New Zealand FIR if fitted before 31 December 2018 and meets the performance requirements set out in clause 2(d); or
- (3) TSO-C166(b) or demonstrate performance equivalent to that standard and meets the performance requirements set out in clause 2(d).

Position Source

(g) The position source must be capable of Fault Detection and Exclusion (FDE) or equivalent capability by compliance with the following requirements:

Requirements

- (1) TSO-C129() or demonstrate performance equivalent to– Conditions: Only with a letter of acceptance from OEM accepted by the Director for FDE; or
- (2) TSO-C145() or demonstrate performance equivalent to that standard; or
- (3) TSO-C146() or demonstrate performance equivalent to that standard; or
- (4) TSO-C196() or demonstrate performance equivalent to that standard.

3. Power requirements

An ADS-B Out transponder that operates within controlled airspace designated under Part 71 within the New Zealand Flight Information Region above flight level 245 must have an output power of at least 125W.

4. ADS-B system approval requirements

(a) An ADS-B system that meets the performance requirements of clause 2(d) or 2(e) of this notice and meets all the following criteria does not require the Director's approval for use if:

- (1) the transponder is TSO-C166() or (a) or (b); and
- (2) the GNSS position source is certified TSO-C145() or TSO-C146() or TSO-C196; and
- (3) the combination of the transponder and position source is a proven combination as a previously certified STC or approved modification, an OEM recommended combination, or from the FAA approved combinations list; and
- (4) the ADS-B system has been installed using Acceptable Technical Data as defined by Civil Aviation Rule Part 21 and the appropriate modification documentation has been completed; and
- (5) post installation testing proves that the ADS-B system meets the required accuracy parameters specified in this notice; and
- (6) the operator provides the CAA with a transponder performance test report which shows the tested accuracy parameters.

(b) ADS-B systems must be installed by a group 3 rated Avionics Licensed Aircraft Maintenance Engineer or an equivalent person in a Part 145 organisation.

5. Minimum broadcast message element set for ADS-B Out

The Director approves the ADS-B message set elements set out in the table and their use as mandatory (M) or optional (O) elements **for TSO-C166(a) and TSO-C166(b) transponders or any transponder demonstrating equivalent performance** in the following aviation conditions:

Mandatory for airborne movements:

- (1) A.2.3, A.2.4, A.2.5, A.2.13, A.2.14, A.2.16, A.2.17, A.2.19, A.2.20, A.2.22, A.2.27, A.2.28, A.2.30, A.2.31, A.2.33, A.2.34

Mandatory for surface movements:

- (1) A.2.6, A.2.9, A.2.10, A.2.11, A.2.12, A.2.18,

Optional for airborne and surface movements:

- (1) A.2.1, A.2.2, A.2.7, A.2.8, A.2.21, A.2.23, A.2.24, A.2.29,

	<i>Message Element</i>	<i>Meaning</i>	<i>Mandatory or optional</i>
A.2.1	ADS-B capability	Only the 1090 ADS-B In message (which indicates if the aircraft has the ability to receive 1090 ES ADS-B messages installed):	O
A.2.2	Airspeed	True airspeed or indicated airspeed. The airspeed source should be approved to output airspeed data	O
A.2.3	Barometric Pressure Altitude	This indicates the aircraft's barometric pressure altitude referenced to standard sea level pressure of 29.92 inches or 1013.2 hectopascals:	M
A.2.4	Call Sign Flight ID	This is the radiotelephony call sign assigned to an aircraft for voice communication purposes sometimes called "flight identification" or "flight ID". For general aviation aircraft it is normally the national registration number; for airline aircraft, it is usually the company identification and flight number; and for the military it is usually numbers and code words with special significance for the operation conducted.	M
A.2.5	Emergency Status	This alerts ATC that the aircraft is experiencing emergency conditions and indicates the type of emergency so the aircraft can take appropriate action. Applicable emergency codes are found in ICAO 12/07/15 AC 20-165B Appendix A Annex 10 Volume 4, Surveillance Radar and Collision Avoidance Systems:	M
A.2.6	Emitter Category	This provides an indication of the aircraft's size and performance capabilities and are defined in TSO-C166b. It is designed to provide information on the wake turbulence that an aircraft produces:	M for surface
A.2.7	Geometric Altitude	This is a measure of altitude provided by a satellite-based position service and is not affected by atmospheric pressure. It is only available with a GNSS position source:	O
A.2.8	Geometric Vertical Accuracy (GVA)	This indicates the 95 percent accuracy of the reported vertical position (geometric altitude) within an associated allowance:	O
A.2.9	GNSS Antenna Offset and Position Offset Applied (POA)	The GNSS antenna offset indicates the longitudinal distance between the most forward part of the aircraft and the GNSS antenna and the lateral distance between the longitudinal center line of the aircraft and the GNSS antenna:	M for surface
A.2.10	Ground Speed	This provides ATC with the aircraft's speed over the ground:	M for surface
A.2.11	Ground Track Angle	This is the direction of the horizontal velocity vector over the ground and must be transmitted while on the ground in order to complete velocity information:	M for surface
A.2.12	Heading	This indicates the direction in which the nose of the aircraft is pointing and must be transmitted while on the ground to complete velocity information:	M for surface
A.2.13	Horizontal Velocity	This provides the rate at which an aircraft changes its horizontal position with a clearly stated direction and is expressed with north/south velocity and east/west velocity while airborne and a combination of ground speed, heading, ground	M

		track while on the ground:	
A.2.14	ICAO 24-bit Address	This is a unique address assigned to an aircraft during the registration process and are defined blocks of addresses for countries or states worldwide. Additional information regarding the address can be found in ICAO Annex 10, Part 1, Volume III, appendix to Chapter 9 , a World-Wide Scheme for the Allocation, Assignment and Application of Aircraft Addresses:	M
A.2.15	IFR Capability	This parameter existed in TSO-C166a compliant equipment but was removed from TSO-C166b equipment:	O
A.2.16	IDENT	This is a flag manually set by the pilot at the request of ATC in ATCRBS, Mode S and ADS-B messages and highlights the aircraft on the controller's screen:	M
A.2.17	Latitude and Longitude	These are derived from the position source and provide a geometric based position)	M
A.2.18	Length and Width of Aircraft	This provides ATC and other aircraft with quick reference to the aircraft's dimensions while on the surface:	M for surface
A.2.19	Mode 3/A Code	This is a four digit number. Secondary surveillance radars and ADS-B will concurrently provide surveillance so the Mode 3/A code is included in the ADS-B message:	M
A.2.20	Navigation Accuracy Category for Position (NACp)	The NACp specifies the accuracy of the aircraft's horizontal position information (latitude and longitude) transmitted from the aircraft's avionics. The ADS-B equipment derives a NACp value from the position source's accuracy output such as the HFOM from the GNSS. The NACp specifies with 95 percent probability that the reported information is correct within an associated allowance:	M
A.2.21	Navigation Accuracy Category for Velocity (NACv)	The NACv is an estimate of the accuracy of the horizontal geometric velocity output.	O
A.2.22	Navigation Integrity Category (NIC)	The NIC parameter specifies a position integrity containment radius. NIC is reported so surveillance applications such as ATC or other aircraft may determine whether the reported geometric position has an acceptable level of integrity for the intended use. The NIC parameter is closely associated with the SIL. NIC values range from 0 to 11:	M
A.2.23	NIC Baro	NIC Baro indicates if pressure altitude is provided by a single Gilham encoder or another altitude source. Because of the potential for an undetected error in the Gilham encoding, many Gilham installations are cross checked against a second altitude source. NIC Baro annotates the status of this cross-check:	O
A.2.24	Position	These parameters are derived from the position source and provide a geometric based position:	O
A.2.25	Receiving ATC Services	This parameter is a bit set in the ADS-B system of an aircraft indicating that the Mode A code is not set to "1200". This parameter existed in TSO-C166a compliant equipment but was removed from TSO-C166b equipment:	O

A.2.26	Single Antenna Bit	This parameter indicates if the ADS-B equipment is transmitting through a single antenna:	O
A.2.27	Source Integrity Level (SIL)	The SIL field defines the probability of the reported horizontal position exceeding the radius of containment defined by the NIC, without alerting, assuming no avionics faults:	M
A.2.28	SIL Supp	The SIL Supp defines whether the reported SIL probability is based on a per-hour probability or a per-sample probability:	M
A.2.29	System Design Assurance (SDA)	The SDA parameter defines the failure condition that the ADS-B system is designed to support. The supported failure condition will indicate the probability of an ADS-B system malfunction causing false or misleading position information or position quality metrics to be transmitted:	O
A.2.30	TCAS Installed and Operational	This parameter indicates whether the aircraft is fitted with a TCAS II and if the TCAS II is turned on and operating in a mode that can generate resolution advisory alerts:	M
A.2.31	TCAS Traffic Status	This parameter indicates if a TCAS II equipped aircraft is currently generating a TCAS resolution advisory:	M
A.2.32	Trajectory Change Report Capability	This information is permanently set to “zero” in TSO-C166b equipment. No installation interface is required.	M
A.2.33	Vertical Rate	The vertical rate is the barometric or geometric rate at which the aircraft is climbing or descending, measured in feet per minute. The vertical rate is typically generated by an air data computer or GNSs position source or equipment:	M
A.2.34	Version Number	The applicable TSO Minimum Operational Performance Standard level is communicated through the version number which is fixed at the time the ADS-B equipment is manufactured. Version 2 applies to ADS-B equipment that meets MOPS documents RTCA/DO-260B with corrigendum 1 or RTCA/DO-282B with corrigendum 1:	M

Appendix 2: Advisory Circular



Revision 0 // CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

Automatic Dependent Surveillance- Broadcast (ADS-B) Systems

xx yy 2017

General

Civil Aviation Authority advisory circulars contain guidance and information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

However the information in the advisory circular does not replace the requirement for participants to comply with their own obligations under the Civil Aviation Rules, the Civil Aviation Act 1990 and other legislation.

An advisory circular expresses CAA policy on the relevant matter. It is not intended to be definitive. Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular. Should there be any inconsistency between this information and the rules or legislation, the rules and legislation take precedence.

An advisory circular may also include **guidance material** generally, including guidance on best practice as well as guidance to facilitate compliance with the rule requirements. However, guidance material should not be regarded as an acceptable means of compliance.

An advisory circular may also include **technical information** that is relevant to the standards or requirements.

Purpose

This advisory circular provides information and guidance on ADS-B systems equipment requirements, accuracy parameters requirements; operational requirements, testing and installation requirements and procedures and information on the approvals process.

Related Rules

This advisory circular relates to Civil Aviation Rule Parts 21, 43, and 91, and specifically to rules 43.46 and 91.257, 91.258.

Change Notice

This is the initial issue of this advisory circular.

1. Introduction

In line with ICAO guidance, standard and recommended practices and to improve the safety and efficiency of the air traffic management system, Automatic Dependent Surveillance - Broadcast (ADS-B) has been selected as the main source of air traffic surveillance data when the current primary and secondary surveillance system is decommissioned after 2021.

The intention of this advisory circular is to provide:

- (a) information on the ADS-B approvals process for aircraft operating above flight level 245;
- (b) guidance on equipment requirements for aircraft operating ADS-B systems in New Zealand; and
- (c) guidance on accuracy parameters requirements.

2. Related Reading Material

FAA advisory circular:

AC 20-165B, *Airworthiness Approval of Automatic Dependent Surveillance - Broadcast Out Systems*

3. List of Acronyms

See also Part 1 of Civil Aviation Rules for other terms

AC Advisory circular

AWU Aircraft Airworthiness Unit

ADS-B Automatic dependent surveillance – broadcast

ATM Air traffic management

CAA Civil Aviation Authority of New Zealand

DAPs Downlink aircraft parameters

FAA Federal Aviation Administration (U.S. Department of Transportation)

FIR Flight information region

FDE Fault detection and exclusion

GNSS Global navigation satellite system

NACp Navigation accuracy category for position

NACv Navigation accuracy category for velocity

NIC Navigation integrity category

NUC Navigation uncertainty category

POA Position offset applied

SA Selective availability

SBAS Satellite based augmentation system

SDA System design assurance

SIL Source integrity level

UAT Universal access transceiver

4. List of Definitions

See also Part 1 of Civil Aviation Rules for other terms

NAC_p specifies the accuracy of a reported aircraft's position, as defined in TSO-C166b.

NAC_v specifies the accuracy of a reported aircraft's velocity, as defined in TSO-C166b.

NIC specifies an integrity containment radius around an aircraft's reported position, as defined in TSO-C166b.

SIL indicates the probability of the reported horizontal position exceeding the containment radius defined by the *NIC* on a per sample or per hour basis, as defined in TSO-C166b.

SDA indicates the probability of an aircraft malfunction causing false or misleading information to be transmitted, as defined in TSO-C166b.

NUC is a codified parameter used to report the maximum position error, which might not be detected with a predefined probability. *NUC* originates in a position-determining system and is transmitted by aircraft ADS-B systems complying with TSO-C166 initial.

Position source refers to the equipment installed on board an aircraft used to process and provide aircraft position (for example: latitude, longitude, and velocity) information.

5. Background

5.1 Mandating ADS-B in New Zealand

In order to use ADS-B, operators need to install equipment on board aircraft, and that equipment needs to meet certain performance requirements to ensure the surveillance data received by the ANSP are accurate and complete. For this reason, Civil Aviation Rules require the carriage of ADS-B in aircraft in controlled airspace above flight level 245.

The National Airspace and Air Navigation Plan (NAANP) proposes that ADS-B above flight level 245 will be phased into use in two stages:

- For all aircraft in controlled airspace above flight level 245 from 31 December 2018; and
- For all aircraft in all controlled airspace from 31 December 2021.

This proposal relates to the first of these two proposed mandates. The second proposed mandate will be the subject of further policy work and rule development.

This AC will be updated to reflect requirements for ADS-B operation in controlled airspace below flight level 245 once the policy development and rule-making processes have been completed.

5.2 About ADS-B

ADS-B is a surveillance technology incorporating both air and ground aspects. Compared to the current secondary surveillance radar system, ADS-B provides air traffic control (ATC) with a more accurate and frequent picture of the aircraft's position.

The aircraft broadcasts its identification, position, altitude, velocity, and other information, described as ADS-B Out functionality. The ground portion comprises a network of ADS-B ground stations, which receive these broadcasts and direct them to the ANSP for presentation on a controller's display.

In addition, aircraft equipped with ADS-B In capability can receive these broadcasts and display the information to improve the pilot's situation awareness of other traffic.

ADS-B is automatic because no external interrogation is required. It is dependent because it relies on the global navigation satellite system (GNSS) as its position source and broadcast transmission systems to provide surveillance information to ATC and other users.

Figure 1: How ADS-B works

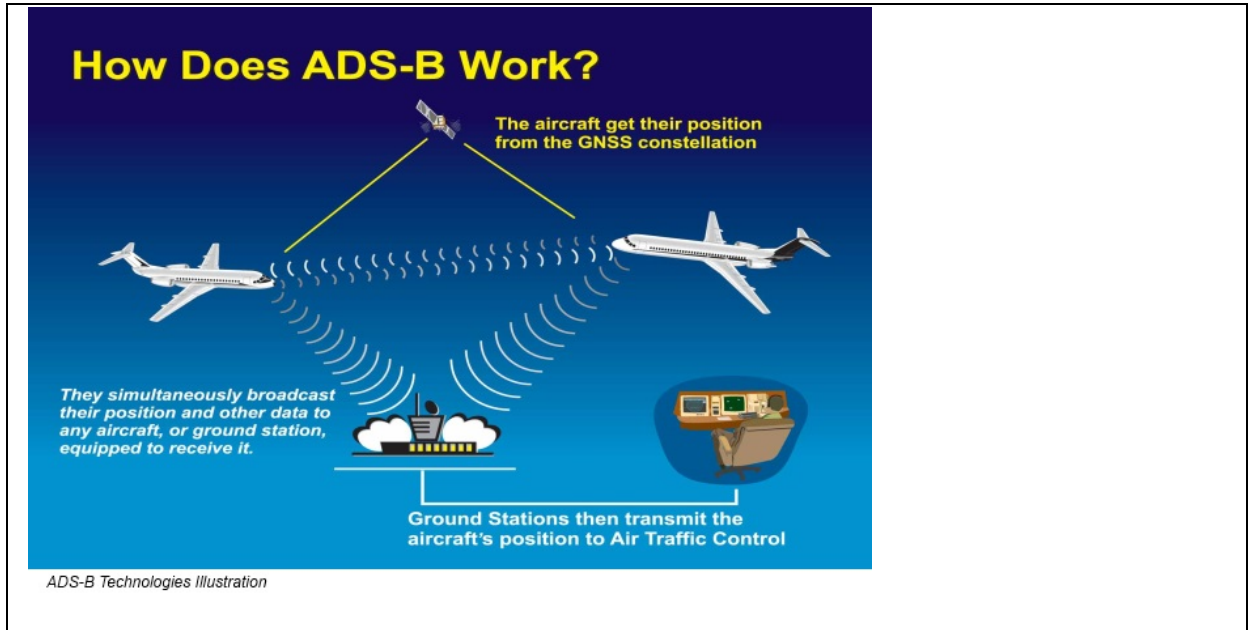
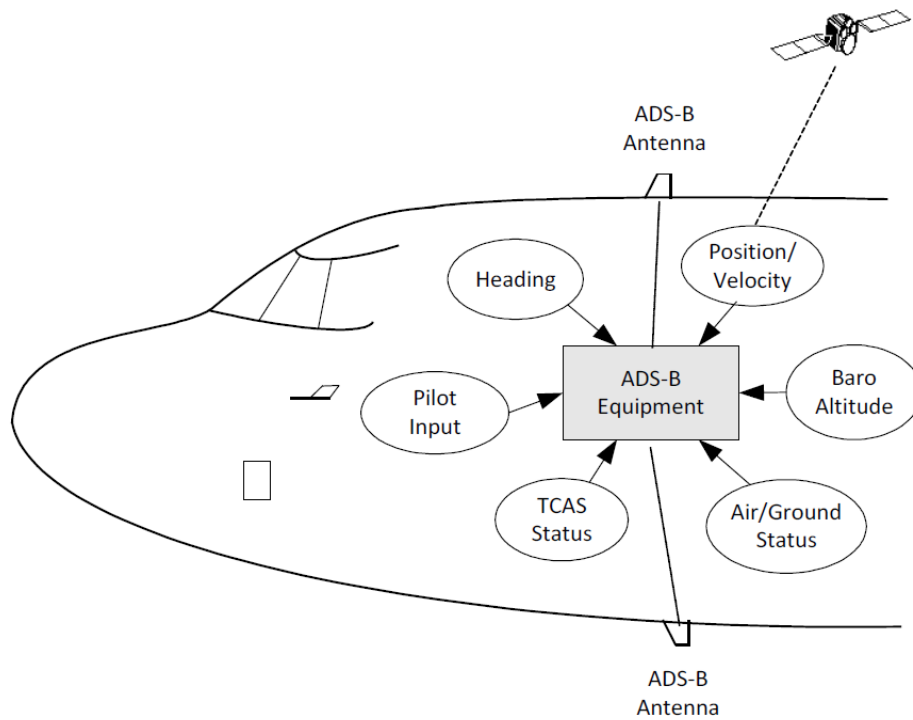


Figure 2 provides a functional overview of an aircraft ADS-B system



Source: FAA AC 20-165B

6. ADS-B Equipment

ADS-B systems installed in aircraft operating in the New Zealand FIR must meet the performance criteria as described in Parts 43 and 91, and NTC 91.258.

The New Zealand implementation of ADS-B is based on 1090 MHz Mode S Extended Squitter equipment.

ADS-B Out requires both an ADS-B Out transponder and a suitable and compatible GNSS position source.

For ADS-B systems that do not meet the criteria in NTC 91.258 clause 4(a), operators should seek advice from a design organisation or CAA including but not limited to:

- (1) ADS-B systems with TSO-C129 GPS with FDE as the position source:
- (2) ADS-B systems including a transponder and/or a GNSS position source that is not TSO certified:
- (3) any unproven ADS-B transponder-position source combinations:
- (4) ADS-B systems with no Acceptable Technical Data:
- (5) Aircraft that will operate in the New Zealand FIR fitted with a UAT transponder.

6.1 Transponder standards

Transponders that are certified against the following technical standard orders (TSO) meet the New Zealand performance requirements for ADS-B Out transponders:

- TSO-C166 initial issue or can demonstrate equivalent performance
 - TSO-C166(a) or can demonstrate equivalent performance
- NOTE that all transponders installed after the rule comes in to force **must** be TSO-C166(b) or demonstrate equivalent performance*
- TSO-C166(b) or equivalent – required for fitment after the rule commencement date, or upon aircraft ADS-B transponder replacement for TSO-C166 initial and TSO-C166(a) transponders.

Under NTC 91.258 clause 3, ADS-B Out transponders that operate in controlled airspace above flight level 245 must have an output power of at least 125W.

Mode S downlink aircraft parameters (DAPs)

Recent developments have enhanced the value of Mode S by introducing Mode S EHS (Enhanced Surveillance). Aircraft with Mode S EHS also provide the following operational benefits: Access by controllers to aircraft intent DAPs, such as selected altitude enables cross-checking of climb/descent instructions and helps the early identification of potential level bust incidents.

Mode S enhanced surveillance downlink aircraft parameters (Mode S EHS DAPS) but capability is not a function of ADS-B, but is also strongly desired as part of the aircraft transponder functions for those aircraft that are capable of Mode S EHS.

6.2 ADS-B system Position Source

At this point in time, GPS is the only approved GNSS position source for ADS-B.

For the New Zealand ADS-B system, the GPS position source equipment must be certified according to or provide the equivalent performance to the relevant TSO. The following GNSS certifications meet the requirements for ADS-B position sources.

- TSO - C145 ()³– (or can demonstrate equivalent performance).
- TSO - C146 ()³– (or can demonstrate equivalent performance).

- TSO – C196 ()³- (or can demonstrate equivalent performance).

Note:

- *The GPS positions source must also be capable of fault detection and exclusion (FDE).*
- *The position source for ADS-B can be the same GNSS unit used for the aircraft navigation but it does not have to be.*
- *GPS units fitted in accordance with CAA advisory circular AC43-14 are not permitted as an ADS-B position source. This is because GPS position integrity cannot be guaranteed and if they are installed in accordance with AC43.14, they can only be used for situational awareness.*

6.2.1 TSO - C129 ()³

TSO-C129 was the first TSO to apply to GPS equipment providing aviation navigation data, and preceded the current operating environment, or anticipating ADS-B as a surveillance technology. As a result, operators of TSO-C129 GPS equipment need to ensure that they understand the functionality and limitations of their equipment.

TSO - C129 ()³ GPS equipment would only meet ADS-B position source requirements if the GPS unit is capable of FDE and has an FDE letter of approval from the GPS OEM.

6.3 Fault detection (FD) and fault detection and exclusion (FDE)

TSO-C129 GPS receivers include FD functionality. These receivers can detect corrupted or otherwise inaccurate data from any one of the satellites from which it is receiving data. An FD receiver will, at that point, stop providing a navigation solution based on GPS.

FDE is the next generation technology which enables the receiver to identify and exclude inaccurate satellite data, and, provided it still has access to a sufficient number of satellites, it will continue to provide a navigation solution.

FDE is required for GNSS receivers being used for ADS-B. If an FD receiver stops providing data then the aircraft's ADS-B system will also stop operating and providing data to air traffic controllers. If the aircraft is also outside radar range, the aircraft will not be visible to controllers. FDE provides an important additional safety benefit for both navigation and surveillance in an ADS-B environment.

6.4 Selective availability (SA)

Selective availability was an intentional timing delay in the GPS satellite signal to degrade accuracy for the standard civilian GPS signal. Early TSO-C129 GPS (described as "SA on") receivers expect SA to be present in the GPS satellite signals. SA on equipment may report a worse accuracy than the device has actually determined, therefore GPS sources that function as SA on are not permitted as a position source for ADS-B. SA aware receivers—, which can distinguish whether SA is on or not—are permitted.

6.5 Integration – Transponder and Position Source

Installing certified ADS-B transponder and GNSS position source does not necessarily guarantee that the equipment in an ADS-B system is mutually compatible. There are known instances of TSO certified transponders and GNSS receivers that do not work with each other to produce an accurate ADS-B broadcast signal.

CAA recommends that operators use proven combinations of transponder and position source to ensure compatibility between the ADS-B Out transponder and the position source.

Proven combinations are described by previously approved combinations as per certified STCs or modifications, OEM recommended combinations and FAA approved combination list.

If you install an unproven combination, you are required under Part 21 to provide a full engineering evaluation to demonstrate that the transponder and position source are compatible and the output meets the performance criteria in NTC 91.258 clauses 2(g) and (3). Unproven combinations may also require a flight test to prove compatibility with the ADS-B ground system.

6.6 Integration – Other Equipment

ADS-B reports 2 kinds of altitudes: barometric and geometric. Barometric or pressure altitude as displayed on the altimeter in the aircraft. Geometric altitude is calculated by GPS as the height of the aircraft above the earth ellipsoid. These 2 altitudes are not the same, but having both allows for applications that require one or the other as an altitude source and provides a means of verifying correct pressure altitude reporting from aircraft.

Barometric altitude is also required as ANSP will only use barometric altitude for vertical separation. New Zealand Civil Aviation ADS-B Rules do not alter any existing regulatory guidance regarding the barometric altitude accuracy or resolution.

6.7 ADS-B In

CAA does not propose to mandate ADS-B In in New Zealand; however, if operators do install ADS-B In those systems are subject to the same installation, design change and safety requirements as ADS-B Out systems to ensure that the information provided by the ADS-B In system to the pilot is not misleading.

FAA advisory circular AC20-172B is a suitable source of ADS-B In guidance. ADS-B In receivers use data from in-range ADS-B Out transmissions. ADS-B In provides pilots with information that aids visual acquisition of other aircraft to support (but not interfere with) see-and –avoid requirements, and generally enhance situational awareness

The Director does not accept ADS-B In as a substitute or an acceptable means of compliance for ACAS requirements.

Operators should note that online ADS-B position report services (such as Flightradar24) have no guaranteed accuracy performance, may incorporate intentional timing delays, may not provide information about aircraft without ADS-B, and therefore may provide misleading information to the pilot ADS-B Transponder Power.

6.8 Antenna diversity requirements

Currently in New Zealand there is no requirement for transponder antenna diversity (i.e., bottom and top mounted antennae) in order to operate an ADS-B system. However, antenna diversity may be required for utilising a space-based ADS-B service and/or airfield ground movements or in accordance with system installation requirements. Operators may wish to consider antenna diversity to counter aircraft shielding during turns that could affect the reception of ADS-B signals for the ground system and ADS-B in operators.

6.9 Multiple Transponder Fitments

Dual transponder fitment - currently in New Zealand there is no requirement for multiple transponders. Operators may choose to fit more than one transponder for redundancy. In this case, the transponders should be the same make and model and transmit one at a time.

6.10 ADS-B Only Transmitters

While actual ADS-B data is automatically broadcast and does not rely on the signal interrogation and reply operation of a transponder, ADS-B functionality is normally enabled as part of a Mode S transponder's extended squitter capability.

To provide the required message sets, transponders need to broadcast ADS-B Out and Modes A/C and Mode S functionality.

ADS-B transmitters are available that transmit ADS-B data only (i.e. no Mode A/C or Mode S data).

These ADS-B transmitters are not an acceptable ADS-B solution because they would not be detected by ACAS systems. Transponders that also transmit Modes A, C and S data would continue to function if the aircraft lost its GPS signal. In that situation, air traffic controllers may still be able to see the aircraft if it was within radar range. This would not be case for ADS-B only systems.

6.11 Universal Access Transceiver

Universal Access Transceiver (UAT) is an alternative ADS-B solution used in the USA. It is not compatible with the ADS-B system used in New Zealand or anywhere else in the world.

UAT uses a different frequency and an entirely different ground infrastructure system that will not be installed in New Zealand. For these reasons, UAT ADS-B transponders should not be used in New Zealand. Transmission of 978 MHz UAT is specifically prohibited by rule 91.257A(2).

Dual 1090 MHz ES and 978 MHz transponders are available. They can be used in New Zealand as long as the appropriate requirement for the 1090 ES data link is met and the 978 MHz transmission is disabled, as required by rule 91.258(d).

The Director approves ADS-B systems that include a UAT transceiver. This is to ensure that the UAT transponder has been disabled in compliance with rule requirements and that CAA is aware of its presence in the New Zealand FIR.

6.12 Non-Compliant Data

As ADS-B Out will be the primary source of surveillance data in the New Zealand FIR, all ADS-B data transmitted from aircraft equipment must meet the requirements of the associated Civil Aviation Rules and Notice NTC 91.258.

Non-compliant data includes incomplete, inaccurate and/or misleading ADS-B data, and data not transmitted frequently to meet the system requirements. The risks associated with non-compliant or misleading data are that the aircraft's position, identity, heading, velocity etc. may not be displayed on air traffic control screens; or, more seriously, give controllers an incorrect indication of those parameters.

Any aircraft transmissions that do not meet the minimum ADS-B requirements are considered to be non-compliant. Any ADS-B transmissions that interfere with ground or other airborne ADS-B systems are also considered to be non-compliant.

Aircraft that transmit non-compliant or misleading data may be excluded from entering or may be managed by ATC as provided for by rule 91.247(e). Operators of these aircraft will be advised that the aircraft is transmitting non-compliant data and asked to rectify the problem.

Airways routinely shares information about non-compliant ADS-B data to CAA. If you are informed that your aircraft is transmitting non-compliant data, you are responsible for ensuring the problem is fixed before entering controlled airspace.

*Note: If you are advised by an air traffic controller that your aircraft is transmitting non-compliant data, **you should not switch the transponder off unless instructed to do so by air traffic control.** Aircraft flying without ADS-B capability and outside the range of primary radar may be invisible to air traffic control. If the transponder's ADS-B Out transmissions are non-compliant this does not necessarily mean that the Mode S transmission is affected. Therefore, the Mode S transmission may still be valid for contingency surveillance systems and ACAS.*

6.13 Testing

Operators must conduct post installation testing in accordance with the manufacturer's instructions. Testing should be conducted, including using appropriate specialist test equipment to prove the ADS-B systems meets the required transponder performance requirements (refer to Part 43, Appendix E.12(a) and CAA NTC 91.258 clause 4(a)(6)).

Operators should provide CAA with evidence and results of the test for transponder performance requirements on initial installation of the ADS-B system, or as required by CAA, or document it in the aircraft maintenance records (refer to Part 43, Appendix E.12(b)).

Evidence may be in the form of automated test reports or test equipment screen shots if automated test reports are not available.

Airways' surveillance system will be able to identify aircraft that are not transmitting appropriate ADS-B Out data; however, the surveillance system is in place to provide a safe separation service, not as a proxy test system. The onus is on operators to ensure that the ADS-B system is transmitting accurate data before the aircraft enters transponder-mandatory airspace where ADS-B Out is required.

Operators should not rely on air traffic control to advise them of ADS-B equipment problems, because the ATC system cannot identify all equipment failure modes in all situations, and may not be able to distinguish between

data that appear to be normal but are in fact misleading. For that reason, robust testing is essential at the time of installation, and on a regular basis (refer to Part 43, Appendix E.12(a)).

Smart device/online ADS-B position reporting applications are not acceptable for ADS-B Out transponder testing. This includes, but is not limited to, online tools such as Flightradar24³, or flight following systems.

6.14 ADS-B Approval

Notice NTC 91.258 sets out which ADS-B systems that require CAA airworthiness or operational approval.

ADS-B systems that do require approval will require a design change and/or a [Form CAA 24091/7](#) application under Part 21. The key requirement for ADS-B system approval is the post installation testing including using specialist test equipment to prove the required ADS-B system meets the performance requirements set out in NTC 91.258 clause 4(a)(6). A copy of the test report needs to be attached to [Form CAA 337](#), [Form CAA 24091/7](#), or certificate of airworthiness (refer to Part 43, Appendix E.12(b) and NTC 91.258 clause 4(a)(7)).

Operators of aircraft with ADS-B systems already installed should conduct formal testing to ensure those systems meet the applicable requirements. If the systems do not meet those requirements, operators should contact the CAA for advice.

Note: that aircraft with systems that produce non-compliant data cannot be operated above flight level 245 after 31 December 2018.

The Director will not accept prior fitment of equipment before the ADS-B rules come into force as a mitigation if the equipment is transmitting non-compliant data.

6.15 Instructions for Continued Airworthiness

Installers and operators should consult OEM and/or designers' requirements for instructions for continued airworthiness.

Under rule 91.605(e)(3), at a minimum, every ADS-B system must be tested at least every 24 months to ensure that it remains compliant including testing of the accuracy parameters.

6.16 Equipment standards

The operator of an aircraft that is already installed with an ADS-B system at the commencement date will need to ensure that the ADS-B system meets the requirements of rule 91.257.

An operator equipping **after** the date of commencement must install a TSO-C166(b) transponder (or demonstrate equivalent performance) and GNSS position source compatible to the TSO-C166(b).

TSO-C166b is the current version of the TSO, so all new ADS-B transponders produced now must meet this standard to be certified. Equipment certified to this standard provides ATC with more precise information.

TSO-C166 or TSO-C166(a) transponders that have been installed before 31 December 2018 are acceptable if the equipment meets the applicable requirements.

6.17 Mode A/C transponders in transponder mandatory airspace outside controlled airspace

Aircraft being operated in transponder mandatory airspace (including within special use airspace) that is outside controlled airspace will not need to be equipped with ADS-B. However, those aircraft must be equipped with and be operating a Mode A/C transponder as a minimum, as per the current rule 91.247 and 91.541.

Note that the Mode S and ADS-B message sets include Mode A/C data.

³ <https://www.flightradar24.com/-/37.31,174.75/7>

6.18 Design Change/Modification Classification Guidance

CAA considers the installation of GNSS installed for the purposes of navigation to be a major design change / major modification.

The installation of an ADS-B transponder that has an internal GNSS position source (i.e. an ‘all in one’ ADS-B solution) could be considered a minor design change / not major modification as long the GNSS in the transponder cannot be used for aircraft navigation purposes. However, integration with other systems may require a higher classification: i.e., be considered major design change / major modification.

The installation of a Mode S transponder could be considered a minor change/ not major modification. However intergration with other systems may require a higher classification: that is, be considered major design change/major modification.

CAA considers the installation of an unproven combination of ADS-B Out transponder and position source to be a major design change / major modification (refer to NTC91.258 clause 4(b)(3)). This is due to the engineering analysis required to ensure the compatibility of the equipment, and the requirements on the operator to demonstrate that the equipment meets the applicable ADS-B requirements.

Part 21 requires that owners, designers, and installers take responsibility for ensuring the overall safety of the system installation and ensure the design change is treated accordingly.

Other factors including (but not limited to) complexity, installation of antennas in pressurised aircraft and intergration may require a higher classification.

6.19 Operational Guidance

Operators should enter EXACTLY the same characters as used in field 7 (call sign) of the flight plan.

Operators who have lodged a flight plan should enter the aircraft’s registration (without the ZK-).

AIP table ENR1.10 provides information on the correct use of Flight ID and other important information about transponder use. Operators should note the requirement to include an indication of the surveillance equipment and capability.

7. Appendix A: ADS-B Message Set

The following message set elements may be contained in an ADS-B Out message.

- (a) *ADS-B capability* – only the 1090 ADS-B In message (which indicates if the aircraft has the ability to receive 1090 ES ADS-B messages installed).
- (b) *Barometric pressure altitude* indicates the aircraft’s barometric pressure altitude referenced to standard sea level pressure of 29.92 inches or 1013.2 hectopascals.
- (c) *Call sign/flight ID* is the radiotelephony call sign assigned to an aircraft for voice communication purposes sometimes called “flight identification” or “flight ID”. For general aviation aircraft, it is normally the national registration number; for airline aircraft, it is usually the company identification and flight number; and for the military it is usually numbers and code words with special significance for the operation conducted. The call sign is required to be transmitted except when using the TSO-C154c anonymity feature.
- (d) *Emergency status* alerts ATC that the aircraft is experiencing emergency conditions and indicates the type of emergency so the aircraft can take appropriate action. Applicable emergency codes are found in ICAO Annex 10 Volume 4, Surveillance Radar and Collision Avoidance Systems, and FAA AC 20-165B, Appendix A.
- (e) *Emitter category* provides an indication of the aircraft’s size and performance capabilities and are defined in TSO-C166b and TSO-C154c. It is designed to provide information on the wake turbulence that an aircraft produces.
- (f) *Geometric altitude* is a measure of altitude provided by a satellite-based position service and is not affected by atmospheric pressure. It is only available with a GNSS position source.

- (g) *Geometric vertical accuracy (GVA)* indicates the 95% accuracy of the reported vertical position (geometric altitude) within an associated allowance.
- (h) *GNSS antenna offset and position offset applied (POA)*. GNSS antenna offset indicates the longitudinal distance between the most forward part of the aircraft and the GNSS antenna and the lateral distance between the longitudinal center line of the aircraft and the GNSS antenna.
- (i) *Ground speed* provides ATC with the aircraft's speed over the ground.
- (j) *Ground track angle* is the direction of the horizontal velocity vector over the ground and must be transmitted while on the ground in order to complete velocity information.
- (k) *Heading* indicates the direction in which the nose of the aircraft is pointing and must be transmitted while on the ground to complete velocity information.
- (l) *Horizontal velocity* provides the rate at which an aircraft changes its horizontal position with a clearly stated direction and is expressed with north/south velocity and east/west velocity while airborne and a combination of ground speed, heading, ground track while on the ground)
- (m) *ICAO 24-bit address* is a unique address assigned to an aircraft during the registration process and is defined blocks of addresses for countries or states worldwide. Additional information regarding the address can be found in ICAO Annex 10, Part 1, Volume III, appendix to Chapter 9, A World-Wide Scheme for the Allocation, Assignment and Application of Aircraft Addresses.
- (n) *IDENT* is a flag manually set by the pilot at the request of ATC in ATCRBS, Mode S and ADS-B Out messages and highlights the aircraft on the controller's screen.
- (o) *Latitude and longitude* are derived from the position source and provide a geometric based position.
- (p) *Length and width of aircraft* provides ATC and other aircraft with quick reference to the aircraft's dimensions while on the surface.
- (q) *Mode 3/A Code* is a four digit number. Secondary surveillance radars and ADS-B will concurrently provide surveillance so the Mode 3/A code is included in the ADS-B Out message.
- (r) *Navigation Accuracy Category for Position (NACp)*.
- (s) *Navigation Accuracy Category for Velocity (NACv)*.
- (t) *Navigation Integrity Category (NIC)*.
- (u) *System Design Assurance (SDA)*.
- (v) *Source Integrity Level (SIL)*.

Source: FAA AC 20-165B