

Assignment of Mode S Address

General

Civil Aviation Authority advisory circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

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 AC.

Purpose

This AC describes an acceptable means of compliance with standards for the operation of an aircraft equipped with Mode S transponder equipment. It also documents the management of Mode S codes for non-aircraft use.

Related Rules

This AC relates specifically to Civil Aviation Rule Part 91.247(b).

Change Notice

Revision 2 updates address information for the Aircraft Register and provides updates throughout to reflect changes to how Mode S addresses are assigned.

We have also added a Version History.

Revision 1 makes the following changes:

- Adds hex code as an easier means for expressing Mode S addresses.
- Adds the management of Mode S addresses for military aircraft.
- Adds the management of Mode S addresses for ground vehicles in a multi-lateration surface surveillance environment.
- Amends the FAA TSO reference.

Version History

History Log

Revision No.	Effective Date	Summary of Changes
AC91-2, Rev 0	1 April 1997	Initial issue of this AC
AC91-2, Rev 1	17 July 2008	<p>Added information on:</p> <ul style="list-style-type: none">• the hex code as an easier means for expressing Mode S addresses• the management of Mode S addresses for military aircraft, and• the management of Mode S addresses for ground vehicles in a multi-lateration surface surveillance environment. <p>Amended the FAA TSO reference.</p>
AC91-2, Rev 2	XX XXXX 2022	<p>Updates address information for the Aircraft Register.</p> <p>Updates sections to reflect changes to how Mode S addresses are assigned.</p> <p>Adds a Version History.</p>

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Introduction

Aircraft are required to be equipped with, and operate, Mode S transponder equipment in certain segments of airspace within the USA. This is also a requirement within the European Airspace as of 1 January 1999 and will be extended to other airspace over time. Automatic Dependent Surveillance – Broadcast (ADS-B) will also use the Mode S transponder in aircraft. As ADS-B is implemented in airspace, the requirement for aircraft to be fitted with Mode S transponders will increase. Prior to operating in such airspace, the Mode S transponder equipment must be assigned a unique address code by the aircraft's State of Registry, which, for New Zealand, is done by the Director of CAA (the Director).

Requirement for Mode S address code

ICAO Annex 10 requires that selective surveillance and data link communications with a Secondary Surveillance Radar (SSR) Mode S equipped aircraft is established through the use of an SSR Mode S aircraft address composed of a unique combination of 24 bits, known as a unique SSR Mode S address code.

In New Zealand, this is reflected in rule 91.247(b) requires which states that aircraft with Mode S transponder equipment installed must have a unique SSR Mode S address code assigned by the Director.

Allocation of Address Code

The fundamental concept of SSR Mode S operations requires that in accordance with ICAO Annex 10 and rule 91.247, each aircraft needs to be assigned a unique 24-bit SSR Mode S address code by the State of Registry. In practice, New Zealand-registered aircraft are assigned SSR Mode S address codes by the Director, based on the principles that:

Addresses are assigned in accordance with the following principles:

- at any one time, no address will be assigned to more than one aircraft
- only one address shall be assigned to an aircraft, irrespective of the number of transponders on board
- the address shall not be changed, except under an exceptional circumstance, and shall not be changed in flight
- when an aircraft changes State of Registry, the previously assigned address shall be relinquished and a new address shall be assigned by the new registering authority, and
- the address serves only a technical role and is not to be used to convey other information such as aircraft performance or other operating characteristics.

Under Annex 10 Volume 1, ICAO allocates blocks of SSR Mode S addresses to each State of Registry. The first bits of the address comprise the national identification code followed by the individual address code. The length of the national identification code varies from State to State but the complete address is always 24 bits.

For New Zealand the national code is **1100 1000 0**. The remaining 15 bits provide the individual aircraft address codes, which, for New Zealand-registered aircraft, comprise the binary form of the aircraft identification number in the CAA database. An example of a complete address is

1100 1000 0000 1110 0110 0101

To make the Mode S code easier to read and interpret, it is often expressed as a six-character hexadecimal (hex) format word.

In hex format, New Zealand Mode S addresses will always be in the range C80000 to C87FFF. For the code example above, in hex format the code is C80E65.

Mode S Transponder Equipment

Mode S transponder equipment must meet the requirements of FAA TSO-C112 and be capable of replying to:

- Mode 3/A interrogations with the code specified by ATC
- Intermode, and
- Mode S interrogations.

Military Aircraft Mode S Codes

New Zealand military aircraft that operate in Mode S airspace are also required to carry a New Zealand Mode S code. CAA has allocated a block of codes for military use, and they are assigned to individual military aircraft and managed by the RNZAF. Issue of the Mode S code will be managed by the Directorate of Aeronautical Engineering, RNZAF Headquarters, Wellington. To enable the RNZAF to manage their own Mode S codes, the codes in the range C87F00 through C87FFF are reserved for military use.

Other Mode S Codes for Ground Vehicles Uses

With the introduction of Multi-Lateration (MLAT) surface surveillance to support low visibility operations at major airports, some vehicles at these airports will require Mode S transponders to be fitted to enter the manoeuvring area. These vehicles are assigned will need Mode S codes to ensure compatibility with the system. The Mode S codes in the range C87E00 through C87EFF are reserved for ground vehicle use. CAA has allocated a block of codes for ground vehicle use, and these are individually assigned and managed by the operator of the vehicles. Blocks of codes have currently been allocated to Airways Corporation and Auckland Airport Authority.

When an airport operator requires codes for vehicle use, they will request the CAA to allocate a block of address codes suitable for the number of vehicles that need transponders. Once a block of codes has been issued to an airport operator, the operator will be responsible for the management and issue of codes for all vehicles at that airport.

Uncrewed Aerial Vehicles (UAVs)¹

Rule 91.1(c)(2A) excludes UAV operations conducted under rule parts 101 and 102, so it is unlikely UAV operators will need to request a Mode S code. Should CAA believe there is a specific safety case that warrants the use of a transponder and allocation of a Mode S code for a UAV, this will be considered on a case-by-case basis and managed through the Part 102 certification process.

¹ The term "Uncrewed Aerial Vehicles" should be interpreted as meaning the same as the ICAO definition "Unmanned Aerial Vehicles".

Application for Allocation of Mode S Code

A Mode S code is automatically generated when an aircraft is registered. They can be found on the CAA website by looking on the [Aircraft register search](#).

If you need a formal letter specifying the Mode S code, or you need the code to programme a transponder before the aircraft is able to be registered (provided an application for registration has been made), this can be requested from the Aircraft Registrar.

A request An application for a Mode S transponder code should normally be submitted by letter, email or facsimile to: AircraftRegistrar@caa.govt.nz

Aircraft Registrar
Civil Aviation Authority of New Zealand
PO Box 31 441
Lower Hutt 5040

Facsimile: 04 560 9452

Email: aircraftregistrationclerk@caa.govt.nz

The following aircraft information must be supplied by the requestor must supply their contact details and sufficient information to identify the aircraft, including the:

- make
- model
- serial number, and
- aircraft registration mark.
- For an aircraft already on the New Zealand Register of Aircraft, the aircraft registration mark
- For aircraft not on the New Zealand Register of Aircraft, the expected date of registration,

Aircraft that are not New Zealand registered aircraft, or not intended to be, New Zealand registered aircraft, cannot be allocated a Mode S code by the Director.

Applicants must forward their request for a Mode S code to the appropriate authority in the State of Registry for that aircraft.