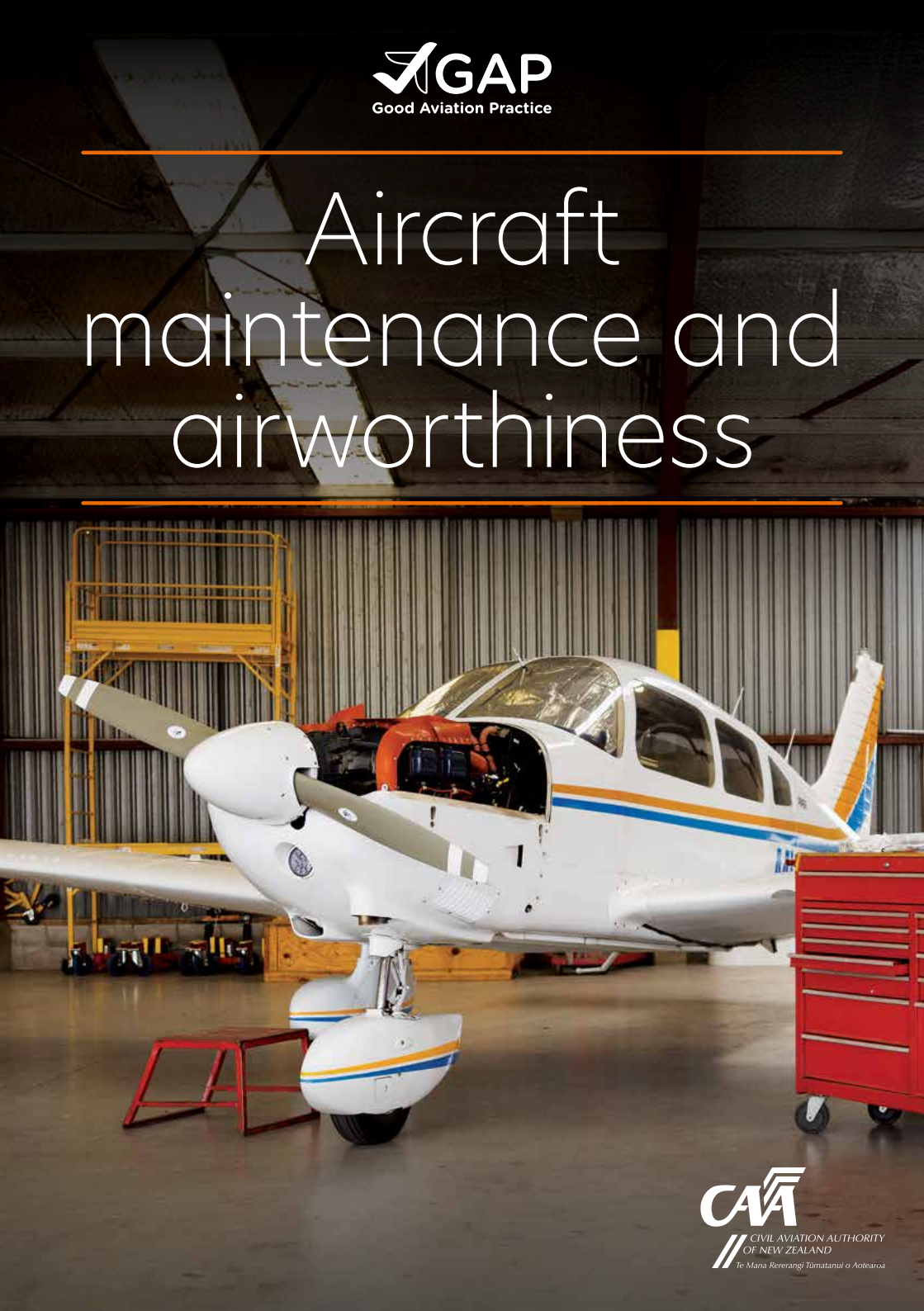
GAP
Good Aviation Practice

Aircraft maintenance and airworthiness



CAA
CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Contents

Cover photo: CAA

Introduction

Aircraft maintenance and airworthiness play a critical part in aviation safety. This Good Aviation Practice (GAP) booklet aims to provide easily readable guidance on some key requirements you need to know.

It's not just about complying with civil aviation rules - aircraft maintenance and airworthiness are vital to making sure crew, passengers, and those on the ground are safe.

Aside from safety (which should be a motivation in itself), it's no secret that aircraft are incredibly expensive assets. So, it's important to look after them - it'll help improve your enjoyment of them, their usefulness, and their potential resale value.

There are also, of course, civil aviation rule requirements. There's lots to unpack on this topic - read on through this GAP booklet to learn more, and for guidance on where to find out more. Keep in mind that this booklet provides only a taster on what there is to know about aircraft maintenance and airworthiness, and the rules.

A note on owner and operator terminology

In this GAP, we'll be using the terms *owner* and *operator* throughout. The official definitions are stated in the Civil Aviation Act 2023:

- The aircraft owner is the person entitled to possession of the aircraft for 28 days or more.
- The aircraft operator is the person who causes or permits the aircraft to fly, be used, or be in any place, whether or not the person is present with the aircraft.

If you're an aircraft owner, also make sure to get a copy of our other GAP booklet, *How to be an aircraft owner*. Go to **aviation.govt.nz/gap**.

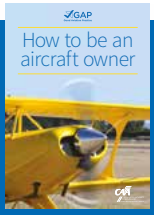


Photo: CAA

Who is responsible for airworthiness?

Simply put, the aircraft operator is responsible for airworthiness – not the aircraft's maintainer or engineer.

It's a common misconception that the maintainer of an aircraft is responsible for airworthiness - but actually, it's the operator's responsibility.

It's written in rule 91.603 *General maintenance requirements*. This states a range of responsibilities of aircraft operators – including that they must ensure their aircraft are maintained in an airworthy condition. This includes making sure that every applicable airworthiness directive is complied with and that every defect is rectified before flight.

The operator needs to ensure that all rule requirements are being followed.

What is "airworthy condition"?

Airworthy condition is defined in Part 1 *Definitions and Abbreviations* as *...the condition of an aircraft, including its components, fuel, and other materials and*

Photo: CAA

substances essential to the manufacture and operation of the aircraft, that complies with all the requirements prescribed by the Civil Aviation Rules relating to design, manufacture, maintenance, modification, repair, and safety.

For an aircraft to be considered as being in an airworthy condition, it must be maintained in accordance with acceptable technical data. Technical data are drawings, instructions, or other data needed for product certification, approvals, and authorisations under Part 21, or for the maintenance, modification, and repair of products, their components, and appliances under Part 43.

It's important to note that decisions related to airworthiness should be able to be traced to relevant technical data.

For example, should damage be found on an aircraft, an engineer will consult the relevant technical data along with their experience and judgement. This will help them to interpret how to respond to a defect, while ensuring that the repaired aircraft remains compliant with the relevant technical data.

More information

Refer to Part 21 *Certification of Products and Parts*, Appendix D *Acceptable Technical Data* to see a list of acceptable technical data and the appropriate conditions to which that data is applicable.

The rules and more

There are a lot of important documents to get your head around – ranging from civil aviation rules to advisory circulars, notices, CANs, and ADs. But what are they?

The rules

The civil aviation rules set the minimum standards that everyone can depend on to help manage risks in aviation. The rules are divided into about 50 groups of related rules, called 'Parts'. They cover all aspects of the aviation system, including aircraft maintenance.

Generally, when it comes to aircraft maintenance, two key points are these:

- Part 91 *General Operating and Flight Rules* is the rule governing **what** must be done.
- Part 43 *General Maintenance Rules* is the rule governing **how** to do it.

Get familiar with some of the key Parts relating to aircraft maintenance in the table on the following page.

Photo: CAA

Part 91 *General Operating and Flight Rules*

Part 91 sets out the general rules for how aircraft should operate in New Zealand. It outlines the minimum standards that everyone must follow. These rules apply to all aircraft operators and passengers. For aircraft maintenance under Part 91, refer to Subpart G *Operator Maintenance Requirements*.

Part 43 *General Maintenance Rules*

Part 43 sets out the rules about making sure aircraft maintenance is done correctly and safely. It covers the requirements for maintenance and release-to-service of aircraft and aircraft components required by Part 91 to have an airworthiness certificate issued under Part 21.

Part 21 *Certification of Products and Parts*

Part 21 is focused on making sure aircraft products and parts meet and maintain airworthiness standards.

Part 66 *Aircraft Maintenance Personnel Licensing*

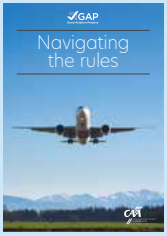
Part 66 covers the standards, specifications, restrictions, and requirements for issuing aircraft maintenance licences, certificates, and ratings. It also sets the rules for the privileges and limitations of licences, ratings, and certificates (such as maintenance approval and inspection authorisation).

Part 145 *Aircraft Maintenance Organisations Certification*

Part 145 sets the standards, specifications, restrictions, and requirements for the issue and exercise of an aircraft maintenance organisation certificate.

Beyond the Parts mentioned above, there are many others linked to them that you should be aware of. The rules diagram on page 8 helps show the links between the various parts that relate to aircraft maintenance.

Some helpful resources

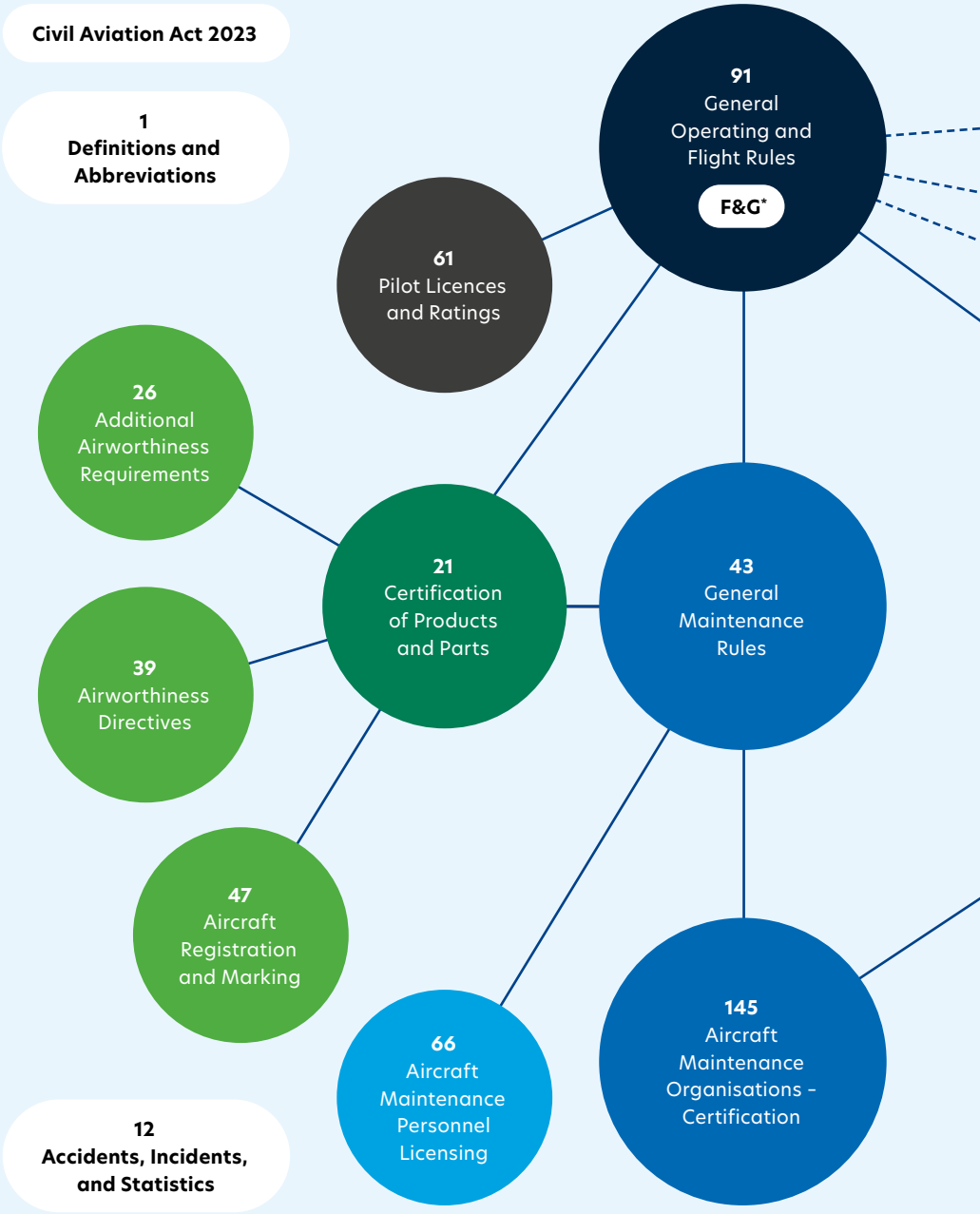


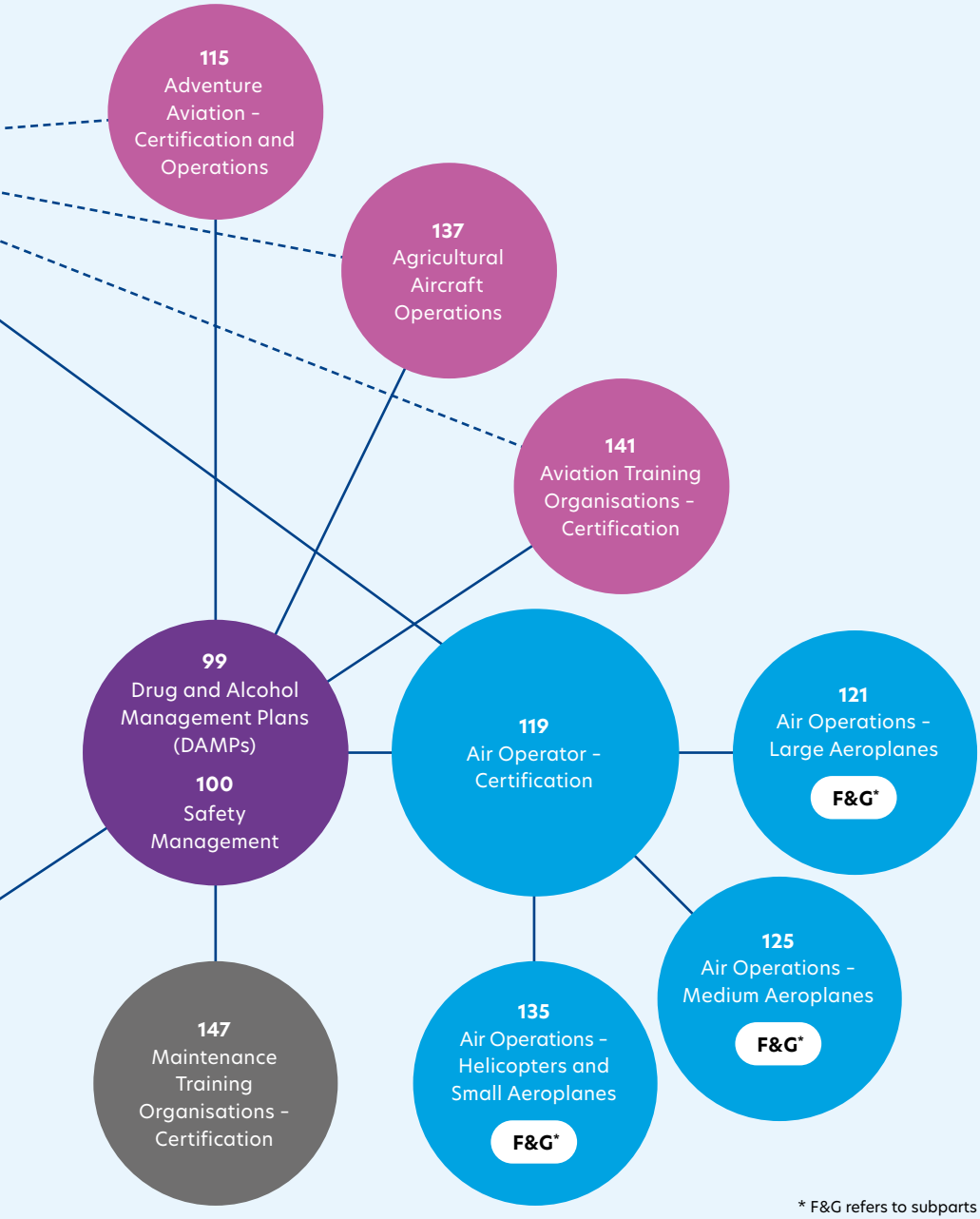
For more information on the civil aviation rules, read the GAP booklet *Navigating the rules*. There's also a helpful *Civil aviation rules and advisory circulars* poster available.

The *Aircraft operator requirements* poster is also a really handy resource, showing the various requirements aircraft operators need to know.

You can download digital copies of these resources or order free printed copies at **aviation.govt.nz/education-resources** or scan this QR code:

How the civil aviation rules interact





* F&G refers to subparts

Advisory circulars

Most rules are supported by advisory circulars (ACs). These provide advice, guidance, and information on complying with the rules. They are often used by the CAA to explain an acceptable means of compliance, without limiting other acceptable ways of doing so.

When new standards, practices, or procedures are found to be acceptable they are also added to the relevant AC.

Take Part 43 *General Maintenance Rules* for example - there are around 15 ACs accompanying Part 43 - ranging from general aircraft maintenance advice to guidance around emergency equipment and non-destructive testing.

More information

For more information on ACs, visit **aviation.govt.nz/rules > advisory circulars**. Here you can also see if there are any ACs open for consultation.

CAA Notices

From time to time, the Director of Civil Aviation will issue CAA Notices to ensure the CAA remains responsive and adaptable to changes or emerging risks in the aviation system. Notices specify requirements that must be complied with, and they have a similar look and format to ACs.

CAA Notices:

- support performance-based regulation
- are more adaptable to technological changes than rules
- are more responsive to immediate safety issues than rules
- can refer to specific operations and equipment.

A Notice could include, for example, the technical specifications for equipment or technology required to support a performance-based rule, procedures for training, or conditions associated with the use of an aircraft or other aviation product.

Remember: A Notice has the same level of authority as the rule it applies to.

More information

For more information on Notices, visit **aviation.govt.nz/rules > CAA Notices**. Here you can also see if there are any proposed Notices open for consultation.

Continuing airworthiness notices

The CAA will issue a continuing airworthiness notice (CAN) to bring industry attention to an issue which does not necessarily meet the threshold of an 'unsafe condition' - which would warrant an airworthiness directive (AD).

A CAN alerts, educates, recommends, and guides. Sometimes, it gives options to address the issue. And, unlike an AD, it's up to the operator to decide if they'll carry out any of the CAN's recommendations.

CANs differ from manufacturer service information in that, typically, a CAN alerts operators and maintenance providers to an airworthiness concern identified by operators in this country, rather than overseas. There are many examples of defects being reported in New Zealand which have led to a CAN being issued. See the chapter on defect reporting on page 28.

CANs may have different names or acronyms depending on the country issuing them. For example, in Australia they're referred to as airworthiness bulletins and in the UK they're referred to as safety notices.

More information

You can find CANs on **aviation.govt.nz/aircraft > airworthiness directives > continuing airworthiness notices**.

More information on international advisories can be found at **aviation.govt.nz/aircraft > airworthiness directives > other authorities airworthiness advisories**.

Airworthiness directives

Sometimes an aircraft or component may have a safety issue requiring all other aircraft or components of the same type, to be checked. To achieve that, the Director can issue an airworthiness directive (AD).

ADs usually require aircraft owners or operators to have specific inspections, repairs, or modifications completed by an engineer. ADs can result from defect reports by engineers, accident investigations, manufacturers' recommendations, or from ADs issued by other National Aviation Authorities.

When an AD is issued, you must assess whether it's applicable to your aircraft. If it is, you must act on it and record it. If it's not applicable, you must record that you've assessed it as not applicable.

The CAA issues new and amended ADs monthly, but emergency ADs can be issued at any time. When an emergency AD is issued, the CAA notifies aircraft operators in writing and sends them copies directly. You can also subscribe to receive alerts via email – go to **aviation.govt.nz/subscribe**.

The CAA maintains New Zealand AD schedules on **aviation.govt.nz** by listing the state of design AD number, the AD title, and the AD effective date. New Zealand AD schedules are made up of all the New Zealand ADs issued before 1 October 2012, as well as the state of design ADs issued or revised since that date.

The New Zealand AD schedules are updated towards the end of every month. The CAA does not usually publish the wording of state of design ADs as these are readily available online.

The operator (not their maintenance provider) is responsible for making sure their aircraft complies with all applicable ADs.

More information

You can find more information about ADs on **aviation.govt.nz/aircraft > airworthiness directives**.

Links to state of design ADs are on the CAA website at **aviation.govt.nz/aircraft > airworthiness directives > state of design airworthiness directives**.

Quick reference table

Refer to the table below for a quick overview of the different documents and what to do with them. They can all be found at **aviation.govt.nz**.

Name	What is it?	What do you do with it?
Civil aviation rule	The rules set the minimum standards that everyone can depend on to help manage risks in aviation. The rules are divided into about 50 groups of related rules, called 'Parts'. They cover all aspects of the aviation system, including aircraft maintenance.	Comply with the rules.
Advisory circular (AC)	ACs provide advice, guidance, and information on complying with the rules. They're often used by the CAA to explain an acceptable means of compliance, without limiting other acceptable ways of doing so.	Use it to help you understand how to comply with the rules.
CAA Notice	Issued to make certain that the CAA remains responsive and adaptable to changes or emerging risks in the aviation system. Notices specify requirements that must be complied with, and they have a similar look and format to ACs.	Comply with the Notice.
Continuing airworthiness notice (CAN)	Issued to bring attention to an issue which does not necessarily meet the threshold of an 'unsafe condition' – which would warrant an AD. It alerts, educates, recommends, and guides. Sometimes, it gives options to address the issue. It may precede an impending AD.	Assess and act on it if applicable.
Airworthiness directive (AD)	A mandatory airworthiness requirement that operators must comply with. It may specify modifications, inspections, conditions, or limitations to ensure continued safe operating conditions.	Assess whether it's applicable. If it is, you must act on it and record it. If it's not applicable, you must record that you've assessed it as not applicable.

Maintenance programmes

The purpose of a maintenance programme is to maintain aircraft in an airworthy condition – it ensures all maintenance requirements are captured. It's the responsibility of the operator to make sure it's carried out.

A maintenance programme details what, when, who, and how maintenance is performed. The aim of having this programme is to maintain the aircraft's airworthiness through its operational life.

A maintenance programme contains details of the maintenance tasks which must be carried out – referred to as the schedule – and the procedures for maintenance. The programme should include references to the relevant manufacturers' technical manuals for maintenance standards and methods.

Refer to Part 91, Subpart G *Operator Maintenance Requirements* for all the rules on this.

Who needs to have a maintenance programme?

If you're a private owner of a standard category aircraft, you don't need to have the CAA approve your maintenance programme. Instead, you can maintain your aircraft under the manufacturer's maintenance schedule (see rule 91.605(a)).

Part 115 and 119 operators must have a maintenance programme approved by the CAA. Also, those with aircraft issued with a special category airworthiness certificate must maintain the aircraft under a maintenance programme approved under rule 91.607.

Photo: CAA

The maintenance programme is specific to both the aircraft and the operator. You must provide a copy of the maintenance programme to the person who performs the maintenance (see rule 91.605 (G)(4)).

For Part 119 operators, the CAA-approved maintenance programme is linked to the operator's maintenance manual. This is part of the operator's exposition.

What does a maintenance programme need to include?

The maintenance programme should be based on the manufacturer's recommendations for maintenance.

It must cover the complete aircraft and all installed equipment. Some examples which may not be detailed in the aircraft maintenance manual include:

- modifications
- supplemental type certificates (STCs).

The maintenance programme must include all instructions for continued airworthiness (ICA) applicable to the aircraft and all installed equipment, and all relevant service information.

More information

The CAA has a helpful maintenance programme template available at **aviation.govt.nz/aircraft > aircraft maintenance**. There are also examples in AC91-12 *Aircraft Maintenance Programmes*.

Instructions for continued airworthiness

Instructions for continued airworthiness means the current airworthiness data provided by the manufacturer of an aeronautical product or component. Operators need to be familiar with the ICA for their aircraft, including the service information relevant to the aircraft, aeronautical products, installed equipment, and any modifications.

ICA also include any related airworthiness limitations mandated by the airworthiness authority of the aircraft's State of Design. Airworthiness limitations are mandatory requirements which are typically listed in chapter 4 of the manufacturer's maintenance manual. They must be complied with and cannot be changed.

All aircraft and equipment should have instructions for continued airworthiness. If you're following the manufacturer's maintenance schedule (ie, 91.605(a)(4)), you'll need to ensure the ICA issued by the aircraft manufacturer and suppliers of any installed modifications, STCs and so on, are addressed as part of the maintenance of the aircraft. Only then will the modified aircraft be maintained in an airworthy condition.

Service information

Aeronautical product manufacturers issue service information for a variety of reasons, including product improvement, changes to maintenance recommendations, and in response to maintenance and manufacturing defect issues. These are often called service bulletins or service letters.

Each manufacturer will have their own titles and formats for service information. They'll also place differing importance on their service information – some manufacturers consider service information to be integral to their ICA and others do not. It's important that operators understand the manufacturer's use of service information, and its place within the ICA.

Manufacturers will usually explain the service information's relevance within their ICA in the aircraft or product maintenance manuals, the product type certificate data sheets, modification data, or in the service information itself.

Knowledge of the configuration (build standard, modifications, etc) of the aircraft is necessary to ensure the appropriate service information relevant to the aircraft is identified and assessed. The result of the assessment should be captured in the aircraft logbook, or other appropriate record.

Operators who do not feel confident in identifying or assessing service information should get help from their maintenance provider.

Note: When a manufacturer issues service information which contains a change to the airworthiness limitations of the aircraft or product, compliance is mandatory. Also, when manufacturer service information becomes the subject of an AD, compliance is mandatory.

More information

For more guidance, refer to CAN 05-002 Rev 1 *Manufacturer Service Information Compliance*.

Getting your maintenance programme approved

To apply to have your maintenance programme approved, you need to submit a specific form to the CAA. To find the form, go to **aviation.govt.nz/forms** and click on the filter for Part 91.

On this form, you need to identify yourself, the maintenance organisation that will conduct the maintenance in accordance with the programme, and the aircraft, engine, and propeller descriptions as required by the form.

Refer to rule 91.607 *Approval of maintenance programmes*. Go to **aviation.govt.nz/rules**.

Induction

When an aircraft is added on to a maintenance programme, it's important to make sure the aircraft complies with the new schedule. It may be necessary for the aircraft to undergo maintenance as part of the induction process. Your application should clearly explain how you'll do this, and include any follow-up checks needed to confirm the aircraft was properly 'inducted' into the maintenance programme.

Escalations and latitudes

AC91-12 *Aircraft Maintenance Programmes* provides guidance on some specific maintenance programme considerations including the following:

- **Escalation:** Under 91.603 (d) *General maintenance requirements*, products and components may be operated beyond the manufacturer's recommended "time between overhauls" (TBO) if the operator complies with TBO escalation procedures that are detailed in a maintenance programme that is approved under Part 115, Part 119, or approved under rule 91.607.
- **Latitudes:** Part 91 (specifically 91.611 *Inspection planning latitude*) allows the inspection intervals required by rule 91.605 to be extended by up to 10% for maintenance planning purposes.

  A good example of applying an inspection latitude could be to an avionics inspection. Avionics inspections are referred to in rule 91.605 (e)(1) through (5). So, if an inspection is an annual requirement, you can extend by 36 days. If it's a two-yearly requirement, then it's 72 days.

  It's important to note that latitude applies to inspections only, with the exception that they cannot be applied to any initial inspection required by an airworthiness directive. Additionally, latitudes cannot be used for hard time life replacements or any other airworthiness limitations.

More information

For more on maintenance programmes, you can refer to Part 91, Subpart G *Operator Maintenance Requirements* as well as AC91-12 *Aircraft Maintenance Programmes* which offers a lot of guidance. Go to **aviation.govt.nz/rules**.

Photo: CAA

Photo: CAA

Who can perform maintenance

There are important rules on who can perform maintenance on aircraft and components.

To be allowed to perform maintenance, one of the following is required (see rule 43.51(a) *Persons to perform maintenance*).

- **A current aircraft maintenance engineer licence** with the appropriate category and rating, issued under Part 66.
- **A current Civil Aviation Safety Authority of Australia (CASA)-issued aircraft maintenance engineer licence** with the appropriate rating (and it needs to be registered by the Director of Civil Aviation under the Trans-Tasman Mutual Recognition Act 1997).
- **Be authorised by a Part 145-certificated aircraft maintenance organisation** holding the appropriate rating.
- **A current certificate of maintenance approval**, with appropriate endorsement, issued under Part 66.
- **If performing maintenance outside New Zealand**, hold an appropriate current maintenance engineer licence or approval issued by an International Civil Aviation Organization (ICAO) Contracting State for that type of aircraft or component.
- **Working under the direct supervision**[1] of someone who meets one of the above requirements.

1 Refer to AC43-1 *Aircraft Maintenance* 2.1 43.51(a)(6) *Under direct supervision* for guidance on what constitutes direct supervision.

Alternative options for performing maintenance – including pilot maintenance

If you don't meet the requirements under rule 43.51(a), you can still do certain types of maintenance if you hold one of the following licences.

- **A current pilot licence**, with a type rating for the aircraft, issued under Part 61.
- **A current aircraft maintenance engineer licence** (not rated) issued under Part 66.
- **A CASA-issued aircraft maintenance engineer licence**, as long as it's registered by the Director of Civil Aviation under the Trans-Tasman Mutual Recognition Act 1997.

Holding one of the above means you can:

- Do the maintenance listed in Appendix A.1 (*Aircraft used to perform air operations*) on aircraft used for Part 115 or 119 operations.
- Do the maintenance listed in Appendices A.1 and A.2 (*Aircraft not used to perform air operations*) on aircraft not used for air operations.

But to do this maintenance, you must also meet the following conditions.

- Be authorised in writing by the aircraft operator, and be properly trained by someone who holds a current and appropriate aircraft maintenance engineer licence (Part 66).
- If the aircraft must be maintained by a Part 145-certificated maintenance organisation, you must be properly trained and have the appropriate authorisation from the Part 145 organisation to work on that aircraft type.

Note: All maintenance, regardless of who carries it out, must still comply with the requirements of Part 43.

What about the installation and removal of dual controls?

The installation and removal of dual controls is considered fitting and removal of role equipment. As these are flight controls and so require a subsequent (duplicate) inspection (see A.1(6)(iv)), this cannot be carried out by a pilot under the privileges of a Part 61 licence. Instead, it requires the issue of a certificate of maintenance approval. See page 26 for more about this certificate.

Regardless of the aircraft type, the simplicity of the control system, or the experience of the person conducting the maintenance, the removal or installation of any dual control must be carried out in accordance with acceptable technical data. The maintenance activity must also be recorded, and be subject to a duplicate safety inspection before being released to service.

That inspection is to confirm that, following maintenance, the control system functions correctly, and is correctly assembled and locked.

An example of an installation of dual controls in a helicopter. Photo: CAA/John Keyzer.

Maintenance documentation

It's crucial that maintenance is recorded both carefully and completely, using the appropriate logbook.

Maintenance records should be made carefully and completely as they form the complete history of the aircraft. They are critical for a number of reasons, including:

- providing evidence that the aircraft has been maintained in an airworthy condition
- fault finding, reporting, or other analyses (including in the event of an accident)
- protecting the value of the aircraft as a business or personal asset
- avoiding problems when the aircraft is sold
- justifying maintenance invoices when the maintenance provider sends them to the owner/operator.

Keep in mind that maintenance records are the responsibility of the aircraft operator – not the maintenance provider. The operator owns the documents and maintenance providers should surrender the documents when required to do so by the owner/operator. The operator of the aircraft cannot fulfil their obligation to maintain the aircraft in an airworthy condition if they do not have all the maintenance records.

So, while the owner may arrange or contract for an engineer or maintenance organisation to maintain these records, it remains the owner's responsibility to see that all relevant aircraft records are completed accurately and on time. Log entries must be made of all work on the aircraft, including field maintenance, or instrument or avionics work by a separate organisation, for example.

When the possession of an aircraft is transferred, the owner is also responsible for transferring all records.

Logbooks

Logbooks are a sub-set of maintenance documentation. They provide a concise summary of maintenance records.
As detailed in Part 1 *Definitions and Abbreviations*, there are four kinds of maintenance logbook, each with a formal CAA number, including:

- CAA 2101 Aircraft Logbook
- CAA 2110 Propeller Logbook
- CAA 2158 Engine Logbook
- CAA 1464 Aircraft Airworthiness Directives, Aircraft Modifications, Engine and Propeller Installations Logbook.


The inside cover of each logbook contains the instructions for its use, including that all sections are mandatory to complete. The use of alternative logbooks, or sections of a logbook, require prior acceptance by the Director of Civil Aviation.

If any lifed items form part of role equipment, (such as rescue winches or rotorcraft hook assemblies), it's good practice to have a dedicated logbook to record maintenance for that equipment.

Which rules apply to logbooks?

Rules 43.69 *Maintenance records*, 91.616 *Maintenance logbooks*, 91.617 *Maintenance records*, and AC43-1 *Aircraft maintenance* contain details of the logbook entries that must be made after completion of any maintenance. These include the minimum details that must be entered in the aircraft, engine, propeller, or airworthiness directives logbooks, as well as acceptable logbook formats and instructions for their use.

Can other documentation be used in the place of logbooks?

Additional work records, worksheets, and work cards may be used if they are acceptable to the Director of Civil Aviation. These records should be in a permanent form and include the details listed. The additional records should be treated as part of the maintenance history of the aircraft and be treated in the same way as records in the logbooks.

Do logbooks have to be in hard copy form?

Not necessarily. Electronic records can be kept, but it's crucial to have systems in place that assure the records' security, integrity, and retrieval. A back-up system is appropriate for this if it's kept completely up-to-date. The use of electronic logbooks needs to be first approved by the CAA. See AC00-6 *Electronic Signatures, Electronic Recordkeeping and Electronic Manuals* for more.

Photo: CAA

Technical logs and maintenance record sheets

Often referred to as the 'tech log', the CA006 *Technical log* provides the pilot with a concise summary of the aircraft's current maintenance status. To do this, all required relevant maintenance, routine or otherwise, must be recorded between inspection intervals.

It's the operator's responsibility to make sure the tech log is correctly filled out after maintenance. However, this is often done by the maintenance provider.

The tech log must be carried in the aircraft, and should be used to record defects and maintenance required between scheduled inspections. A release-to-service may be certified on the tech log, as well as the CAA400 *Maintenance record sheet* – the CAA400 is an extension of the tech log. All certified maintenance must be summarised in the aircraft logbook – as required by rule 43.69 *Maintenance records*.

Make sure you have the correct information on the tech log. Rule 91.619 *Technical log* states all the various bits of information you need on it, ranging from the name of the operator of the aircraft to details of the aircraft's maintenance status.

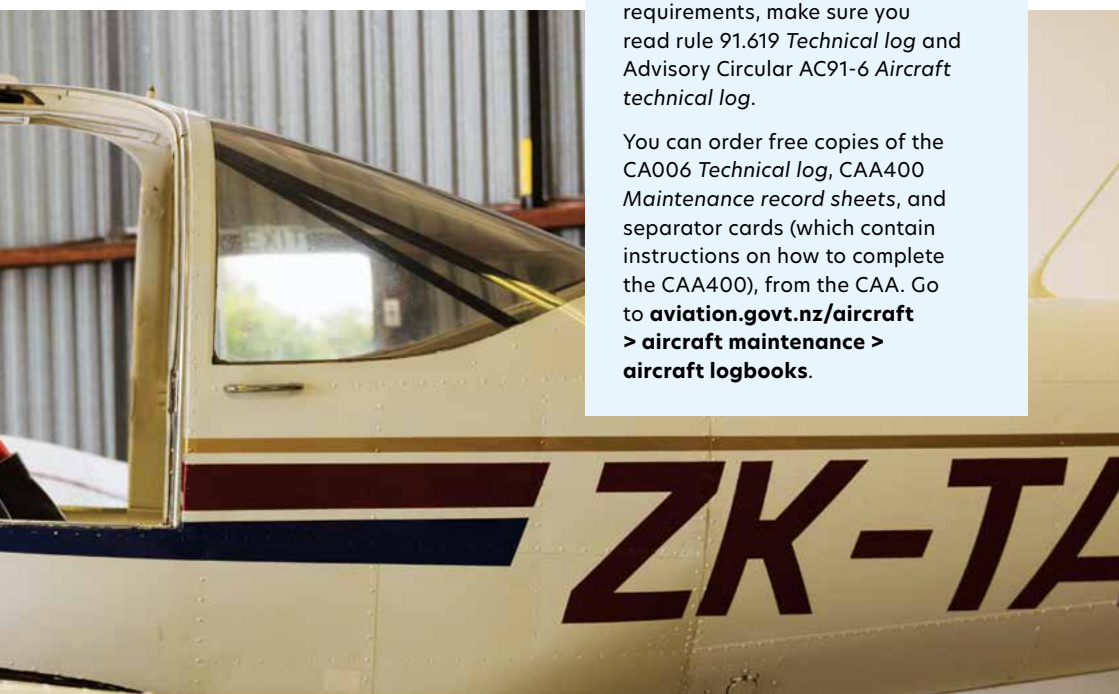
As part of this information, you need to ensure that any defects found during the preflight inspection, during a flight, or following a flight are recorded, as well as the details of:

- the rectification of defects occurring between scheduled inspections, and the certification for release-to-service for the rectification
- details of any deferred rectification of defects, including any instruments and equipment that are inoperative, in accordance with rule 91.537 *Inoperative instruments and equipment*.

More information

To really get to grips with the requirements, make sure you read rule 91.619 *Technical log* and Advisory Circular AC91-6 *Aircraft technical log*.

You can order free copies of the CA006 *Technical log*, CAA400 *Maintenance record sheets*, and separator cards (which contain instructions on how to complete the CAA400), from the CAA. Go to **aviation.govt.nz/aircraft > aircraft maintenance > aircraft logbooks**.



Duplicate inspections

Part 43 *General Maintenance Rules* requires the maintenance of control systems to be double-checked before the aircraft is released to service.

More specifically, under rule 43.113, a person releasing an aircraft to service after maintenance that has involved the disturbance of any control system must ensure that a duplicate safety inspection has been carried out.

The pre-formatted statement (refer to rule 43.113(c)(3)) outlines what must happen for a duplicate inspection to be properly robust:

> *We certify that a duplicate safety inspection has been carried out and the identified control system of the aircraft/ component functions correctly, and in respect of the maintenance performed, the control system is assembled and locked correctly.*

Each system requires individual attention to check the correct assembly, locking, and function of that system, in accordance with the appropriate maintenance manual(s). It takes only one of these three elements to have been done incorrectly for a system failure to occur.

Consider having two different people carry out the duplicate inspections following assembly or adjustment of a control system. That is, the first or second part of the duplicate inspection is not carried out by the same person performing the task.

Certifying duplicate inspection

Rule 43.113

The duplicate inspection must be recorded in the appropriate maintenance logbook or worksheet.

The statement to the right must be included.

It must identify the control system that has been inspected, as well as the scope and extent of the safety inspection that has been carried out.

It must also contain the details of the two people who informed the duplicate inspection.

We certify that a duplicate safety inspection has been carried out and the identified control system of the aircraft / component functions correctly, and in respect of the maintenance performed, the control system is assembled and locked correctly.

System: _____

1st insp name: _____ Signature: _____
Lic / Auth / App no: _____ Date: _____

2nd insp name: _____ Signature: _____
Lic / Auth / App no: _____ Date: _____

Photo courtesy of Kāpiti Districts Aero Club

Dual flight controls

Rule 43.113 also applies to the removal and refitting of dual flight controls. Many small aircraft may be operated with either single or dual controls for the purpose of providing flight instruction. For convenience, manufacturers often provide a 'quick release' mechanism to permit removal and installation of the secondary controls, when a passenger seat is to be occupied, for example.

To avoid needing special tools, there are a variety of mechanisms designed for this purpose, as well as instructions provided in the aircraft flight manual on how to carry out the task.

Regardless, the rule still applies. It's still the removal or installation of a flight control, which could result in a flight hazard. The hazard of incorrect assembly is the most obvious. If not locked in place the control could come loose at a critical moment such as the instructor correcting their student's stall recovery.

For this reason, the duplicate inspection requirements of 43.113 apply whenever you disturb the aircraft's controls, (including dual flight controls secured in place with quick release fasteners).

Who can perform a duplicate inspection?

Under rule 43.113(b), the first part of a duplicate safety inspection can be carried out only by a person who meets the requirement in rule 43.101 to certify the aircraft or component for release-to-service.

The second part of the duplicate inspection must be carried out by another person who has adequate training, knowledge, and experience to carry out the safety inspection, and who is a LAME, or holds one of the following.

- A maintenance approval issued in accordance with Part 66.
- A current pilot licence with a rating on the aircraft type, issued under Part 61.
- An authorisation issued by the holder of a Part 145-certificated maintenance organisation.
- A maintenance engineer licence or approval issued under the authority of an ICAO Contracting State.
- For gliders, a current glider pilot certificate or an engineer's approval issued by a gliding organisation.

Photo: CAA

Release-to-service

After any maintenance is performed on an aircraft, the work completed needs to be certified for release-to-service before the aircraft can be flown again.

Under rule 91.603(a)(7) the operator of an aircraft must ensure that the aircraft is certified for release-to-service under Part 43, after the performance of any maintenance on the aircraft.

Note: The release-to-service applies only to the maintenance which has been carried out. Unless it's explicitly stated, a release-to-service does not attest to the general condition or airworthiness of the aircraft.

Who can release to service?

Rule 43.101 *Persons to certify release-to-service* sets out who can release to service – including those who:

- **hold a current aircraft maintenance engineer licence** with the appropriate category and rating, issued under Part 66
- **hold a current CASA-issued aircraft maintenance engineer licence** with the appropriate rating (and it needs to be registered by the Director of Civil Aviation under the Trans-Tasman Mutual Recognition Act 1997)
- **are authorised by a Part 145-certificated aircraft maintenance organisation** holding the appropriate rating
- **hold a current certificate of maintenance approval**, with appropriate endorsement, issued under Part 66
- **if performing maintenance outside New Zealand**, hold an appropriate current maintenance engineer licence or approval issued by an ICAO Contracting State for that type of aircraft or component (and is acceptable to the Director of Civil Aviation)
- **perform the maintenance under rule 43.51(b)** – though someone carrying out maintenance under direct supervision cannot release to service under 43.101 *Persons to certify release-to-service*.

Certifying release-to-service

Depending on what type of maintenance has been carried out, there are different requirements for certifying release-to-service.

If the maintenance may have affected the flight characteristics or operation of the aircraft (such as the replacement of a flight control component), the aircraft needs to have had a satisfactory flight check carried out. See 43.103 *Requirements for certifying release-to-service* for more on this.

Further, when any part of the aircraft control system, or control system of a component, has been assembled, disturbed, or adjusted, it cannot be certified for release-to-service unless a duplicate safety inspection has been carried out. For example, after installing or removing dual controls. See rule 43.113 *Duplicate inspection of control system.*

The release-to-service statement

The person who certifies an aircraft or component for release-to-service after maintenance must certify it in the maintenance logbook or worksheet, or a technical log as may be necessary, alongside the record of maintenance carried out. The release-to-service statements are stated in the rule and must be used verbatim.

Release-to-service statements must be accompanied by the name, signature, and licence, approval, or authorisation number of the person releasing the aircraft or component to service, and date of the entry. Find out more by referring to rule 43.105 *Certifying release-to-service after maintenance.*

For components not installed or allocated to an aircraft, the release-to-service must be certified on either the CAA Form One or CAA Form Two.

Certifying release-to-service

Rule 43.105(a)

A person who carries out certification of release-to-service 'must record the following information in the appropriate maintenance logbook or worksheet, and the technical log ... immediately adjacent to the details of the maintenance that is required to be recorded under rule 43.69'.

The statement to the right must also be included, unless the maintenance logbook, worksheet, or technical log has a correct preformatted equivalent statement.

Name: _____

Signature: _____

Licence / approval / authorisation number: _____

Date: _____

The maintenance recorded has been carried out in accordance with the requirements of New Zealand Civil Aviation Rule Part 43 and in respect of that maintenance the (aircraft) (component)* is released to service.*

** delete as appropriate*

Certificate of maintenance approval

What is it and how do you apply for one?

The certificate of maintenance approval allows the holder some specific privileges regarding performing and certifying maintenance.

The certificate can be issued to a pilot if they've successfully completed specific training – for example, on how to remove and install dual controls.

The certificate is valid for up to five years before it needs to be applied for again.

Who's eligible?

To be eligible for a certificate of maintenance approval, a person must (in a way acceptable to the Director of Civil Aviation):

- have practical experience for the type or group of aircraft or components for which the maintenance approval is sought, and
- have successfully completed a course of training for the type or group of aircraft or components for which the maintenance approval is sought, or have passed examinations, including an examination in Air Law.

What are the privileges under the certificate?

There are some specific privileges under the certificate of maintenance approval, including:

- the authorisation to perform maintenance on, and certify for release-to-service, any aircraft type for which the holder doesn't have the practical experience required by rule 66.103(2)
- the ability to perform or supervise (while not holding an aircraft maintenance engineer licence):
  - maintenance specified on the certificate on an aircraft or component, and certify the aircraft or component for release-to-service; or
  - maintenance on, and certify for release-to-service an aircraft with a special category airworthiness certificate issued in accordance with Part 21, Subpart H.

Photo: CAA

More information

For more information about the certificate of maintenance approval, see subpart D *Certificate of Maintenance Approval* in both Part 66 *Aircraft Maintenance Personnel Licensing* and AC66-1 *Aircraft Maintenance Engineer Licence – General*.

Defect reporting

If someone else has identified an issue with an aircraft type you operate, wouldn't you want to know about it?

The CAA receives more than 10,000 occurrence reports each year across a range of occurrence types, including defects. So while it can't respond to every individual report, when defects are reported to the CAA, the data is collated and assessed to build a better picture of a problem and analyse trends over time. An issue that seems irrelevant today could be identified as part of a bigger pattern in coming months and years.

There's huge value in these reports as the CAA can work with the designer or manufacturer to issue a continuing airworthiness notice, so others can be made aware of the potential problem – see the case study later in this chapter for a real example of this.

Include as much detail as you can when submitting a report – including part number, serial number, and utilisation. If you can, include photos of the defect as these are valuable, especially if the CAA wants to share the findings with the original equipment manufacturer, or another national aviation authority.

What has to be reported?

Part 12 *Accidents, Incidents, and Statistics* defines a defect incident as *an incident that involves failure or malfunction of an aircraft or aircraft component, whether found in flight or on the ground.*

A defect could be something found at scheduled maintenance, or something that came to light through an airworthiness directive or service bulletin. It could be structural or mechanical, or resulting from a maintenance control failure where a part has exceeded its overhaul period.

Advisory Circular AC12-1 *Mandatory occurrence notification and information* provides detailed guidance on what constitutes a 'defect incident' so check there too. It also notes that: *when there is substantial damage which occurs between the time any person boards an aircraft with the intention of flight and such time as all persons have disembarked, and the engine, or any propellers or rotors, come to rest, is to be notified and reported as an accident.*

How to report?

The helpful CAA GAP booklet *How to report occurrences* has guidance on this. But the simple answer is to go to **aviation.govt.nz/report** and complete the occurrence report form.

Alternatively, you can fill out the CA005D *Defect report* form and email it to **triage@caa.govt.nz**.

Again, remember to include as much detail as you can when submitting a report – the specific part or component information and history, as well as photos.

Who has to report?

It's usually the maintainer who submits the defect report to the CAA and notifies the original equipment manufacturer (OEM) of any faults. But because airworthiness issues are the responsibility of the aircraft owner or operator, they should always check this has been done.

Liaise early with your engineer if your aircraft has suffered damage or if you've identified corrosion, for example. Your engineer can assess what is required and determine if a defect report needs to be submitted.

Under Part 12, there's a requirement for some operators to complete their own investigation (refer to rule 12.59 *Investigation and reporting*). Meanwhile, some operators may need to conduct a safety investigation under Part 100 *Safety Management*.

An example of this is Part 141 *Aviation Training Organisations*. They're not required to submit an investigation report to the CAA under Part 12 however they are required to conduct safety investigations under Part 100.

More information

For more information on defect reporting, read the CAA GAP booklet *How to report occurrences*.

To go even deeper, refer to Part 12 *Accidents, Incidents and Statistics* and the two accompanying advisory circulars – AC12-1 *Mandatory occurrence notification and information* and AC12-2 *Occurrence investigation*.

// CASE STUDY

From "*Defect reporting – A vital part of the safety system*" from *Vector* magazine (Spring 2024)

A New Zealand engineer was carrying out routine maintenance on a Guimbal Cabri G2 helicopter when they noticed a hairline crack on the main rotor swashplate. They immediately called the CAA's South Island airworthiness Aviation Safety Advisor, Richard Lane (35+ years in engineering, PPL-holder).

"Given the direct and prompt communication from the somewhat concerned engineer," says Richard, "I immediately contacted the CAA's Chief Advisor Airworthiness, Warren Hadfield, to discuss it with him."

The CAA promptly contacted the manufacturer.

Thanks to these prompt actions, Guimbal quickly deemed that a fleet-wide inspection was necessary to detect any other failed parts.

"The CAA is able to engage with manufacturers and overseas regulators in a way that's not possible for the individual operator or maintainer," says Richard.

The CAA published Continuing Airworthiness Notice 27-027 Guimbal Cabri G2 Main Rotor Swashplate Assembly Cracking to raise awareness of the defect.

Case study continues...

// CASE STUDY

The Guimbal Cabri G2 helicopter main rotor swashplate with hairline crack visible. Photo from CAN 27-027.

Then, direct discussions between Guimbal personnel and the New Zealand engineers who found the defect helped refine and clarify the details, ahead of the manufacturer issuing Service Bulletin SB24-001A.

Subsequently, the defect was the subject of Airworthiness Directive 2024-0071 from EASA (European Union Aviation Safety Agency), requiring global action to inspect the swashplate assembly.

Once again, our local engineers were sought out by EASA for their advice on the inspection criteria for the swashplate.

"The willingness of our New Zealand engineers to be open and forthright, and to support not only the CAA, but the manufacturers and other National Aviation Authorities, can save lives," says the CAA's North Island airworthiness aviation safety advisor, John Keyzer (25 years rotary-wing engineering).

"It also contributes to a culture of honesty and safety first." He credits Guimbal for being open to investigating the defect, in conjunction with regulatory and industry representatives.

Review of airworthiness

Reviews of airworthiness (RA) are a critical airworthiness check and balance.

An RA checks the aircraft's conformity to approved type design or properly modified design (standard category aircraft). It also checks applicable maintenance compliance since the last RA. The RA is not a maintenance activity.

Standard category and special category general aviation aircraft must have an RA completed unless they undergo a maintenance review.

The aircraft operator is responsible for making sure the RA is completed on time, all defects are rectified, and the aircraft is not flown until all defects are rectified.

When is an RA carried out?

Under 91.615 *Review of airworthiness*, the RA must be carried out every 12 months. However, this is extended to every 24 months for aircraft used only for private operations. A common misconception is that operators can apply the 10% latitude rule for the two-yearly RA, but that isn't correct.

In practice, the RA is often carried out at the same time as the periodic maintenance check. Rule 91.615(c) allows for planning latitude of 36 days for the sole purpose of obtaining an RA, but the aircraft must have no other maintenance overdue (or be outside of its own latitude). Otherwise, a special flight permit will be required.

If an RA has not been certified within the periods prescribed in 91.615, the aircraft should not be flown.

Photo: CAA

Who can perform an RA?

For most aircraft, the review can be performed and certified by only a LAME who holds a certificate of inspection authorisation (IA) issued under Part 66 *Aircraft Maintenance Personnel Licensing*. For a glider, the RA can be performed by a person authorised to do so by a gliding organisation certificated under Part 149 *Aviation Recreation Organisations – Certification*.

What are the requirements for an RA?

Under 43.153 *Review requirements*, the RA includes a check for conformity against the aircraft's type certificate data sheet (or equivalent acceptable data sheet), a check that the aircraft has all the required instruments and equipment, and a general condition inspection.

It also checks for all the following since the last RA or issue of an airworthiness certificate:

- all modifications and repairs have been correctly recorded and certified for release-to-service, with the applicable technical data listed
- all due maintenance required by the aircraft maintenance programme has been correctly recorded and certified
- the maintenance programme is the correct one for the aircraft
- all the relevant ADs have been assessed, embodied as required, and properly recorded
- every defect recorded in the CA006 *Aircraft Technical Log*, has been properly recorded and rectified, and the aircraft released to service
- instruments and equipment permitted to be inoperative are properly placarded and recorded
- the aircraft weight and balance is properly controlled and documented
- the aircraft flight manual and its supplements are current
- all the overhaul and finite lives are recorded and are within the manufacturer's limitations; and serial numbers are verified by physical inspection where practicable.

If an RA inspection is incomplete, the IA holder must enter any defects found into the aircraft logbook and must not complete the RA certification. If the review is not completed and certified, the IA holder must forward a report of the review to the CAA within seven days after the 30-day period specified in rule 43.153(a) for completing the review.

What happens if defects are found?

If the RA finds defects, they must be rectified by a person who's allowed to perform the maintenance in accordance with rule 43.51 *Persons to perform maintenance*. An aircraft can be made airworthy only when identified defects are rectified and certified in the logbook. The aircraft can be flown to another location to complete the RA only if the CAA issues a special flight permit.

Modifications and repairs

Any changes to an aircraft can affect its ability to fly. So, modifications or repairs to an aircraft or component must be done using acceptable technical data. As aviation safety advisor John Keyzer says, "You can't go modifying your aircraft in accordance with a 'good idea'."

Technical data are drawings, instructions, or other data required to be used for product certification, approvals, and authorisations under Part 21 or for the maintenance, modification, and repair of products, their components, and appliances under Part 43.

For any design change, there must be technical data which completely defines the modification or repair. Rule 21.503(a) requires that technical data must only be used if it's approved or acceptable to the Director of Civil Aviation.

Included in rule 43.53 *Performance of maintenance* is the following:

> A person performing maintenance on an aircraft or component must use:
>
> - methods, techniques, and practices that are specified in the instructions for continued airworthiness issued for the aircraft or component; or
> - equivalent methods, techniques, and practices that are acceptable to the Director.

In a situation where there are no specific manufacturers' repair instructions, Part 21 *Certification of Products and Parts* Appendix D *Acceptable Technical Data* is the correct place to look for information relating to the certification of products and parts. It lists specific acceptable technical data and the appropriate conditions to which that data is applicable. A product or modification designer's instructions for continued airworthiness are one type of acceptable technical data referred to in Part 21.

Photo: CAA

More information

Advisory Circular AC43-9 *Modifications, Repairs, and the Form* CAA337 provides further guidance on acceptable technical data and the process for approving data that's not yet acceptable.

See also Part 21, Subpart N *Technical Data and Airworthiness Specifications*.

For more information, talk to an IA certificate holder or head to the CAA website to view the modification and repair process diagram. It's available at **aviation.govt.nz > licensing and certification > engineering**.

Tooling and calibration

Tooling covers all the various specialised tools used to perform aircraft maintenance.

As you'd expect, the tools used on aircraft are specially designed for that purpose – and must not be used in any way they're not designed or intended for.

If you're conducting maintenance on an aircraft or its components, you must follow the methods, techniques, and practices specified in the instructions for continued airworthiness issued for that aircraft or component. Alternatively, you can follow other methods as long as they're acceptable to the Director of Civil Aviation.

As part of this, the necessary tools, equipment, and test equipment must be used. See rule 43.53 *Performance of maintenance* for more on this.

Calibration

Calibration is critical for special tooling. Calibration ensures the accuracy of the tools, and inspection, measuring, and test equipment used to return aircraft, engines, and components to service. Calibration minimises measurement errors and uncertainties to acceptable levels.

Refer to AC43-13 *Calibration of tools and test equipment for maintenance of aircraft* for more information on this.

Tool control

Leaving a tool behind in an aircraft or component can be catastrophic. Tools that are used need to come off (or out) again. In some tool control systems, the use of toolbox foam inserts is popular because it's easier to account for all the tools.

You also need to be careful to avoid leaving any FOD (foreign object debris). Be sure to have a thorough tidy and check for things like rags, torches, split pin heads, and so on. There should be nothing left in the aircraft that shouldn't be there. Anything sitting on the floor could hit the cabin ceiling in turbulence or during aerobatic manoeuvres.

An example of the use of foam inserts in a tool box. Photo: CAA/Richard Lane.

Photo: iStock.com/RgStudio

Microlights and special category aircraft

Microlights and special category aircraft have their own maintenance requirements.

Microlights

Part 103 *Microlight Aircraft Operating Rules* sets out the airworthiness and maintenance requirements for microlight aircraft in subpart G.

An operator of a microlight aircraft must make certain the aircraft is maintained in an airworthy condition; every applicable airworthiness directive is complied with as required by Part 39 *Airworthiness Directives*; and between required inspections, every defect is rectified.

The operator must ensure that the aircraft is maintained in accordance with the requirements of the designer or kitset manufacturer.

There's an annual inspection requirement for microlight aircraft, too.

Special category aircraft

Special category enables some slightly more specialised aircraft to be operated without the need for the rigorous requirements of a type certificate, but under more limiting conditions.

There are six sub-categories: experimental, primary, amateur-built, LSA (light sport aircraft), limited, and exhibition. Two of the most common ones include amateur-built aircraft and LSA – read more below.

All special category aircraft must have a maintenance programme that's been approved under rule 91.607 *Approval of maintenance programmes*.

See Part 21 and Advisory Circular AC21-3 *Product certification – Airworthiness certificates in the special category* for more information.

Amateur-built aircraft

Amateur-built aircraft are those which are at least 51% built by their owner for their own education or recreation.

This category is intended for the private recreational sector where the owner is the aircraft builder and operator. It allows for greater innovation and creativity, without the need for compliance to an airworthiness design standard, but the trade-off is that there are more restrictive operating conditions.

The aircraft builder is responsible for the quality of workmanship, materials, maintenance, and, ultimately, the airworthiness of the aircraft.

If the builder has purchased a Sport Aircraft Association NZ (SAANZ) Maintenance Programme for the aircraft, this is accepted by the CAA and can be approved at the time of the survey. If the builder has produced their own customised maintenance programme, this should be submitted well in advance for CAA review and approval.

As part of this process, it's recommended you join the SAANZ. They can provide build assist documents and technical mentors to guide you through the construction process.

More information

Guidance on the construction, certification, maintenance and operation of amateur-built aircraft of all types is covered under AC21-4 *Special Category-Amateur-Built Aircraft Airworthiness Certificates*.

Go to **aviation.govt.nz > licensing and certification > sport and recreation > amateur-built aircraft** for more information.

Light sport aircraft

Light sport aircraft – also known as LSAs – are aircraft that have been produced and certified by their manufacturer to an agreed set of industry standards – known as ASTM (American Society for Testing and Materials). These standards are developed by an international committee, of which the CAA is a member. These aircraft require a manufacturer's statement of compliance.

Also be aware that some acceptable technical data (Part 21 Appendix D) may not apply to light sport aircraft which have been issued an airworthiness certificate under rule 21.201 as the certificate requires the LSA manufacturer to approve all changes to the type design (a condition of the ASTM standard).

Terms and abbreviations

Terms

Acceptable technical data	Technical data are drawings, instructions, or other data required to be used for product certification, approvals, and authorisations under Part 21 or for the maintenance, modification, and repair of products, their components, and appliances under Part 43. See Part 21 *Certification of Products and Parts*, Appendix D *Acceptable Technical Data*.
Aeronautical product	Anything that comprises or is intended to comprise any part of an aircraft or that is or is intended to be installed in or fitted or supplied to an aircraft, including fuel and other similar consumable items necessary for the operation of the aircraft.
Aircraft operator	The person who causes or permits the aircraft to fly, be used, or be in any place, whether or not the person is present with the aircraft.
Aircraft owner	The person entitled to possession of the aircraft for 28 days or more.
Air operation	An air transport operation, a commercial transport operation, or an adventure aviation operation.
Airworthy condition	The condition of an aircraft, including its components, fuel, and other materials and substances essential to the manufacture and operation of the aircraft, that complies with all the requirements prescribed by the Civil Aviation Rules relating to design, manufacture, maintenance, modification, repair, and safety.
Direct supervision	Refer to AC43-1 *Aircraft Maintenance* 2.1 43.51(a)(6) *Under direct supervision* for guidance on what constitutes direct supervision.
Exposition	A manual, or suite of manuals, detailing the policies and processes that underpin the way the organisation goes about its day-to-day business.
Ground test	A test of an aircraft's systems and components while it's on the ground.
On condition maintenance	A preventative process where an item is monitored - either continuously or at specified periods. The item's performance is compared with an appropriate standard to determine if it can continue in service.

Operational flight check	A check to make sure that the flight characteristics of an aircraft have not appreciably changed as a result of maintenance.
Release documentation	Release documentation provides authenticity and traceability of an aircraft part.
Special flight permit	A permit issued to an aircraft to authorise a single flight or series of flights for a particular purpose, such as a ferry flight to a maintenance base.
State of Design	Means the State, or an organisation established by a group of States, having jurisdiction over the organisation responsible for the type design.

Abbreviations

AC	Advisory circular
AD	Airworthiness directive
ATD	Acceptable technical data
CASA	Civil Aviation Safety Authority of Australia
ICA	Instructions for continued airworthiness
ICAO	International Civil Aviation Organization
RA	Review of airworthiness
STC	Supplemental type certificate
TBO	Time between overhauls

This Good Aviation Practice booklet was produced by the Safety and Security Education team of the Civil Aviation Authority of New Zealand.

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See the CAA website for civil aviation rules, advisory circulars, airworthiness directives, forms, and more safety publications. Visit **aviation.govt.nz**.

Every effort is made to ensure the information in this booklet is accurate and up-to-date at the time of publishing, but numerous changes can occur with time, especially in regard to airspace and legislation. Readers are reminded to obtain appropriate up-to-date information.

Photo: CAA

GAP
Good Aviation Practice

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See the CAA website for civil aviation rules, advisory circulars, airworthiness directives, forms, and more safety publications.

To order publications such as GAPs and posters, go to aviation.govt.nz/education-resources.

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