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

Advisory Circular
AC43-4

Revision 1

On-condition maintenance

5 April 2025

General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** 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 Civil Aviation Rule Part 43 relating to on-condition maintenance of New Zealand registered aircraft.

Related Rules

AC43-4 relates to on-condition maintenance requirements under Part 43, *General Maintenance Rules*.

Change Notice

Revision 1 is a general update of this AC, to align with current AC style and format. We have also taken the opportunity to add a Version History.

Version History

The history of revisions is detailed in the table below:

Revision No.	Effective Date	Summary of Changes
AC43-4, Rev 0	25 Dec 1997	Initial issue
AC43-4, Rev 1	5 April 2025	General update, to align with current AC style and format. Adds a Version History

Published by
Civil Aviation Authority
PO Box 3555
Wellington 6140

Authorised by
DCE Aviation Safety

Table of Contents

Introduction

Part 43 sets out the requirements for the maintenance and release-to-service (RTS) for all aircraft, and components, required under Part 91 to have a Part 21 airworthiness certificate. These requirements include on-condition maintenance to ensure that all aircraft are maintained to a standard that will result in safe operation.

This is achieved by prescribing:

- the minimum standard of maintenance required for aircraft
- the minimum standards for the performance of maintenance
- the persons who may certify maintenance, and
- the way maintenance is to be recorded and certified.

This AC provides information on the acceptable methods, techniques, and practices for on-condition maintenance of New Zealand-registered aircraft. It also covers the different terms for aircraft maintenance, as carried out by the general aviation industry.

On-condition maintenance is a preventative process that allows for some deterioration of components by monitoring those components for their continued compliance against a required standard.

It is not ‘fit until failure’ or ‘fit and forget’. After components are fitted, they still need to be regularly monitored and checked, even when they seem to be working well.

Different types of maintenance

This AC provides information to industry to more clearly define the different terms that cover aircraft maintenance as carried out by the general aviation industry.

Confidence in continued airworthiness has traditionally been based on maintaining safety margins by prescribing fixed component lives and aircraft and component overhaul periods. Fixed lives have been applied to items that are safety-critical or where fatigue is known to be a limiting factor. Overhaul lives have been applied where deterioration occurs which may not be discovered during routine inspection.

In recent years maintenance practices have been influenced by changes in aircraft design philosophy and improvements in engineering technology. Advances in manufacturing techniques and material specifications have made it less necessary to disassemble aircraft and components frequently to establish confidence. The need to be competitive and to reduce costs has meant that the industry has sought to gain advantage from these improvements by moving to a philosophy of scheduling maintenance based on the condition of the aircraft or components.

As this change occurs, it is necessary to understand the different maintenance processes for general aviation aircraft. These processes, which can be used together or separately, are aimed at preventing aircraft or components failing in service and include:

- Airworthiness Limitations
- Hard-time maintenance, and
- On-condition maintenance.

Airworthiness Limitations

Airworthiness limitations are periods at which specific components must be removed from service. These periods are set by the manufacturer of the aircraft or component and consider such things as:

- the criticality of the functions performed
- the in-service loading of parts, and
- the exposure of parts to fatigue or wear.

Airworthiness limitations have to be published in the Airworthiness Limitations section of the aircraft maintenance manual (AMM) and are mandatory. They may also be published as Inspections for Continued Airworthiness (ICAs). National Airworthiness Authorities (NAAs) may also set component life limitations, as Airworthiness Directives (ADs), in cases where they are not prescribed by the manufacturer.

Hard-time maintenance

Hard-time maintenance is a process where the known deterioration of an item is limited to an acceptable level by maintenance actions at given periods of time, such as:

- calendar time
- number of cycles
- number of landings, or
- aircraft hours in service.

The maintenance actions include:

- overhaul, such as removal of an engine for overhaul and testing to specification
- partial overhaul, such as removal of radio or navigation equipment for bench calibration at prescribed periods, or
- parts replacement in accordance with the relevant manuals.

These actions allow the aircraft or component to be released to service for a further specified period.

On-condition maintenance

On-condition maintenance is a preventative process in which an item is monitored either continuously or at specified periods. The item's performance is compared to an appropriate standard to determine if it can continue in service.

The standard may be:

- an upper or lower limit of an indicated parameter such as a fluid-pressure instrument reading, or
- a simple go- or no-go indicator such as a fuel-filter pressure-drop warning light.

On-condition maintenance should include:

- the assessment of pilot-monitored performance,
- functional checks, and
- scheduled maintenance,

and use circumstantial servicings to assess the fitness of components. Circumstantial assessments can be done as a result of:

- other component failures,
- routine component replacement due to life limitations, and/ or
- the findings from accidents investigations.

Other examples of the types of maintenance that provide on-condition inspections are:

- the precession check of an instrument gyro which may indicate that bench testing is required
- a run-down check on a turbine which may indicate a need to check for turbine rub, or
- the spectrometric examination of lubricant which may indicate imminent component failure.

The continued satisfactory operation of the structure or component may be determined by inspection, operation, or examination in situ without detailed dismantling. Depending on the condition of the components, they or the aircraft may need bay service, recondition, overhaul, or repair.

Failure of the item to continue to meet the documented standard will indicate that further maintenance actions are necessary. The fundamental purpose of on-condition maintenance is to remove an item before it fails in service. As noted in the Introduction, on-condition maintenance it is not a philosophy of ‘fit until failure’ or ‘fit and forget’.

Application

Most routine maintenance programmes contain elements of airworthiness limitations, hard-time maintenance and on-condition maintenance.

General aviation aeroplanes tend to have few airworthiness limitations, whereas rotorcraft may have many.

Most NAAs consider that only those necessary items, prescribed by the manufacturer, should be included in the Life Limitations at Type Certification. These items should have a mandated life or removal time, and are usually fatigue-critical. Other items may be made mandatory in ADs issued by the controlling NAAs.

Aircraft and component manufacturers generally make hard-time recommendations, usually referred to as Time Between Overhaul (TBO), which specify how long they consider their products should remain in service. These recommendations are based on average use and conditions and usually recommend that the item is fully stripped and returned to the original specification. These recommendations are not considered mandatory by various responsible NAAs.

Without checking the airworthiness limitations, or having a detailed knowledge of how the component is being used and the conditions in which it is operating, it is not possible to make generalisations about how long a component should remain in service. This can only be determined on a case-by-case basis by assessing the operational history and condition of the component.

As long as a component continues to meet the documented standard either continuously or at the appropriate frequencies, it is considered satisfactory to remain in service. Routine maintenance inspections are carried out in this way on the airframe and airframe components of most aircraft used in general aviation. This on-condition maintenance approach can be extended to engines and propellers.

Summary

New Zealand civil aviation requirements have been amended over time to allow a greater degree of on-condition maintenance compared to hard-time maintenance. For example:

- the 50 hour inspections recommended by the manufacturer have been changed to a programme based around the 100 hour cycle, and
- the requirement for instrument and radio equipment to be removed from the aircraft for bench checking has been changed to a system where on-board monitoring and ramp testing is an acceptable alternative.

These changes are intended to encourage operators to monitor the performance of their equipment and to allow licensed aircraft maintenance engineers (LAMEs) greater discretion in deciding whether an aircraft or aircraft component can safely continue in service.

This philosophy has now been applied to engines and propellers that are fitted to aircraft not used on air transport operations. An on-condition inspection and test schedule, which must be applied to an engine or propeller when it reaches the manufacturer's recommended TBO, is detailed in AC43-5, *Engine and propeller overhaul and testing*.

A LAME can use this inspection and test schedule to decide whether the engine or propeller can continue in service. The inspection and test is repeated after every 100 hours in service after the manufacturer's recommended TBO is reached. If the engine or propeller fails the inspection or test, it will be withdrawn from service and the necessary rectification action taken to bring it back within the parameters of the required inspection.

It is a LAME's decision whether they carry out any required work and release a component to service.

If the LAME is unable to satisfy themself with the tools, equipment, and expertise available, that the engine or propeller is fit for return to service, they should recommend to the operator that appropriate remedial action is taken by a person or organisation properly competent to do so. It is the operator's decision, using the advice of their maintainer, whether the component is overhauled or repaired.