GAP
Good Aviation Practice

Becoming a licensed aircraft maintenance engineer

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

Contents

Cover photo: Courtesy of Air New Zealand Aviation Institute.

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.

Introduction

Aircraft technology ranges from the basket and sandbags of a hot air balloon to the carbon fibre and digital systems of modern jets.

For every aircraft you see in flight, there are maintenance engineers back in the hangar who have worked to make sure the aircraft is safe to fly. Maintaining aircraft is a highly specialised job requiring precise technical knowledge and skills. Aircraft maintenance engineers are vital to aviation – without them, no one could fly safely. Actually, no one would fly at all.

If you're a bit of a 'tinkerer', have a technical aptitude, or you're good with computers, you might suit this career. Technology is transforming the industry so you also have to be adaptable to fast-moving changes.

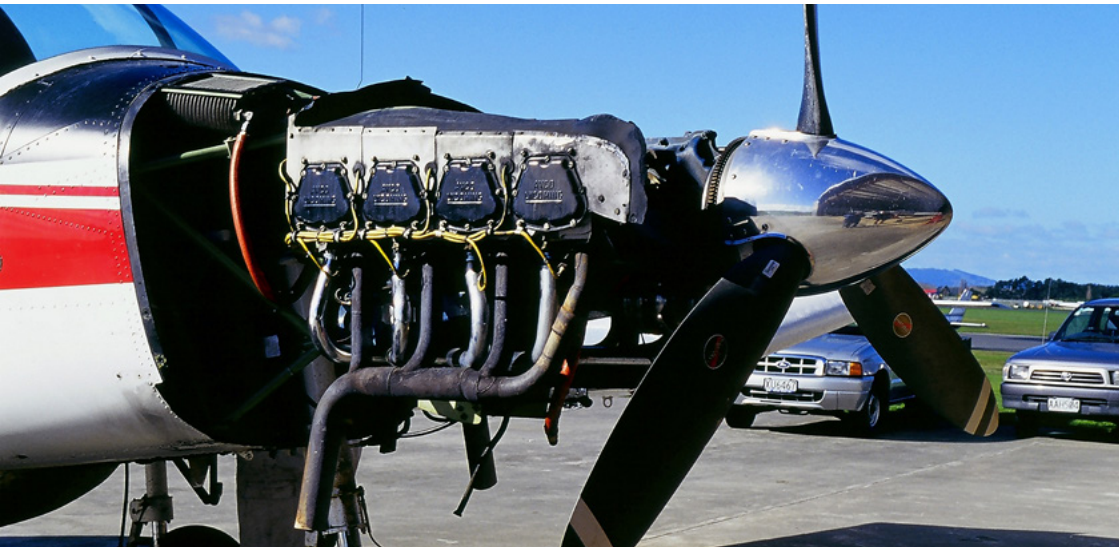
If you like variety in your job, you'll get it in aircraft engineering. You can be carrying out a major rebuild of an aircraft for a couple of weeks, then do two 100-hr checks, then a simple check on a little Cessna, and then head out to the field to change the rotor blade of a helicopter.

Aircraft maintenance engineering is not always about nuts 'n' bolts, however. A fast-growing area in aircraft maintenance engineering is avionics – the design, maintenance and operation of computer systems to support instrumentation on aircraft, satellites, and spacecraft. It's an exciting specialisation, because it's dealing in Star Trek-like systems, except they're real now.

Current aircraft engineers say you can make of the job what you like. You can build a career with the one maintenance provider, or move around, building expertise with different providers. You can specialise, for instance in avionics, or maintain skills 'across the board'.

You might specialise in helicopter work or on fixed-wing aircraft. But some engineers do both.

A piston engine on an agricultural aircraft. Many of these aircraft now use turbine engines.



Aircraft engineering could take you round the world because there's a growing global shortage at present, and those who've worked overseas say they've never had a problem getting jobs.

Once you have a few years' experience, you can go on to roles with more responsibility, like maintenance planning, or into managerial roles.

Aircraft engineering is a 'safety-critical' job. The world's travelling public, airline crews, commercial and recreational pilots, and everyone on the ground will be relying on you to keep your wits about you. Your work has to be carried out in a careful, measured, and methodical way. Not a single step can be missed out or done sloppily. You also have to look after your own wellbeing, so you are always working at optimum strength. There's more about this later in the booklet.

So if this all sounds like you, read on!

Getting started

You might like to approach a local aircraft maintenance company for their advice and insight into the industry.

Search the internet for aircraft maintenance training courses in New Zealand to find out what they offer.

At a training organisation, you'll complete an NCEA pre-employment classroom and workshop-based course. But you'll also get placements of practical experience with a provider – the ideal situation being that, once your course is finished, you'll get employment with that provider, and continue your training with them.

Or you may decide to train with the New Zealand Defence Force.

Alternatively, you could go straight to work at a maintenance provider. As an aircraft maintenance engineer (AME, pronounced ay-mee) you'll be able to work on aircraft, in the areas in which the company has tested and authorised you. But you cannot work unsupervised, and you cannot 'release an aircraft to service' – that means you cannot sign off that an aircraft is safe to fly after maintenance.

Some people like to stay at AME level, without the added responsibility of supervising others' work, and signing off aircraft as safe to fly.

Engineers working on a turbine engine. Photo courtesy of Northland Emergency Services Trust.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Avionics work surrounds all electrical and computerised systems on aircraft, satellites, and space vehicles.

Becoming a licensed aircraft maintenance engineer

(LAME, pronounced lay-mee)

If you do want extra responsibility, and career opportunities, and earnings potential, you can train to become a *licensed* aircraft maintenance engineer. You'll get on-the-job training, going for your exams as you work. You'll also need to be approved by the Civil Aviation Authority.

The sorts of subjects you'll get assessed on are aeronautical science (which includes basic physics), aircraft materials, and human factors (see page 8).

You can also choose to study specialist subjects or 'strands', such as engines and rotorcraft.

To become licensed, you also have to:

- be 21 (although you can work towards getting the licence at any age)
- have passed 10 written examinations, in topics ranging from maths and physics to aircraft materials and human factors
- have passed two exams in air law – one written and one oral
- have been approved by the Director of Civil Aviation as a 'fit and proper person' to carry out the duties of a LAME (see page 9)
- have completed the acceptable amount of practical experience. Without formal engineering training, you'll need five years of practical experience. Traineeship in an aviation technical trade reduces that to four years. If you already have a trade qualification similar to aviation, such as automotive engineering, general engineering, or electronic engineering, you'll need three years of aviation-related practical experience.

The advice from long-time engineers is to do the CAA examinations together with the unit standards, if you're with a training organisation. If you're preparing for an NCEA exam on aircraft materials for instance, you may as well, while your memory is still strong, do the similar exam for the CAA. Then, once you've got the necessary years of experience under your belt, you've also qualified, as far as the CAA is concerned.

Human factors

Aircraft maintenance engineering is so important to the safety of flying that the human being carrying out the engineering cannot be separated from the tasks they carry out.

That means that, not only must the working environment be optimal, and the tools the engineers use be first class, the engineer themselves must be on top form, always.

Human factors is about understanding human behaviour and performance, so the fit between engineers as people, and the systems they work in and with are harmonised: all to improve performance and safety.

Human factors include things like communication, fatigue, stress, distraction, team work, workplace culture, and complacency.

In New Zealand, a review of 81 flying incidents with a maintenance element over the decade to 2018, found 65 percent resulted in emergency calls; delayed, cancelled, or diverted flights; and aborted take-offs. When those incidents were examined, it was found they were due to things like engineer workload, time pressure, and fatigue.

Also, people cannot do their best work if their physical environment is noisy, or too hot or too cold, or subject to unpleasant fumes or vibrations.

So while you're training to be an aircraft maintenance engineer you'll learn about human factors, their critical link to aviation safety, and what you can do to make sure you, yourself, are not a risk to aviation safety.

Avionics

Like many engineering areas, there are fast-moving changes in the aircraft maintenance field. At the centre of those changes is the work of avionics engineers. That work surrounds all electrical and computerised systems on aircraft, satellites, and space vehicles - the last, a developing field here in New Zealand.

Once you have your AMEL, you can work towards additional qualifications, or 'ratings' for particular aircraft, groups of aircraft, and aircraft components. Photo courtesy of Air New Zealand Aviation Institute.

Avionics engineers help to design, test, and calibrate the computer systems that support communication, navigation, and guidance systems.

They research any problems in flight safety systems and come up with solutions to them.

Avionics engineers may help to install and service avionics communications equipment and they ensure all newly installed systems, and those that have been repaired, meet the standards set by the civil aviation rules and the specifications set by aircraft manufacturers.

Keeping a practical training record

To show your assessor the depth and range of your experience when you apply for an aircraft maintenance engineer licence (AMEL) you should keep a detailed experience logbook. This is called a practical training record, or PTR, and the CAA has produced one, together with the industry training organisation, ServiceIQ. You can buy a PTR at serviceiq.org.nz.

Engineers are not required to use this particular PTR, but the format of any acceptable PTR should have the following features:

- provide an overview of experience/ employment in the aviation industry, detailing relevant qualifications, training and courses
- list specific tasks completed and being countersigned by a supervising LAME
- details of the dates and the specific aircraft or components worked on.

As a guide, a typical PTR format has been included in Appendix 5 of advisory circular AC66-1, and there are examples on the CAA website within the 'engineering' section.

Fit and proper person test

Holders of any 'aviation document' (for instance, pilot licence, air operator certificate, or aircraft maintenance engineer licence) must pass what's known as a 'fit and proper person' (FPP) test.

The purpose of the FPP test is to assure the Director of Civil Aviation that the applicant for an engineering licence is capable and honest, and that everyone in the air, and on the ground, is protected from the risk of maintenance being carried out incompetently or recklessly.

The FPP test also looks at the applicant's behaviour, attitude, credibility and past conduct to help determine an individual's likely future conduct. Any evidence of previous non-compliance with the law, such as criminal conduct and transport-related offending, is highly relevant to the assessment.

English language test

The applicant's ability to speak, read, and write the English language will be assessed during the written and oral examinations to qualify for a licence or certificate.

Recognition of foreign AMELs

The CAA will recognise your foreign licence, if:

- it's been granted by an ICAO State, and the CAA has confidence in, and understands, that State's AMEL system
- the other State verifies with the CAA the authenticity and validity of your AMEL
- you have an 'address for service' in New Zealand
- you have passed at least one written and oral air law exam, and one on human factors. A pass in some other exams may be required depending on what sort of foreign licence you have.

Ratings

Once you have your AMEL, you can work towards additional qualifications, or 'ratings', for particular aircraft, groups of aircraft, and aircraft components.

To get a rating, you'll need six months practical experience across a broad range of maintenance tasks on the aircraft, or aircraft groups you want to be rated on, and you also have to pass some examinations or attend a course needed for that rating.

You must also submit your personal training record for review by the assessor. The range and depth of your experience should be readily evident from their review of your PTR. That should be completed within the immediate three years before application, to demonstrate familiarity and currency.

For some individual ratings, you must also complete an approved and acceptable course conducted by an aviation training organisation or the manufacturer of the applicable aircraft or component, or approved by the competent authority of a foreign ICAO contracting state.

A technical oral assessment or examination should establish the engineer's technical competence covering the full rating being applied for. That assessment or exam should be conducted by the applicant's Part 145 maintenance organisation (as part of their company authorisation procedures), or alternatively, by the acceptable training provider using CAA guidelines.

Photo courtesy of Northland Emergency Services Trust.

Group ratings

With non-complex aircraft, similar types of aircraft and engines are grouped together, for the purposes of licensing an engineer. As a guide, typical acceptable practical experience for group ratings should include the following:

Aeroplane and rotorcraft categories

- minimum of three periodic inspections, including avionic systems
- minimum of two aircraft weighings, or weight and balance calculations for the first aeroplane and the first rotorcraft rating
- rectification of defects and component changes including avionic components
- compass compensation for the first rating
- functional testing and servicing of aircraft systems.

Powerplant category

- minimum of three periodic inspections
- rectification of defects and component changes
- functional testing and servicing of powerplant systems, including propulsion engine ground running.

Note that applicants for the Group 2 powerplant rating must hold the Group 1 powerplant rating.

Electrical category

- periodic inspection and testing
- defect analysis and rectification, including component changes
- modification installation.

Instrument category

- periodic inspection and testing
- defect analysis and rectification, including component changes
- modification installation
- compass compensation for the issue of the first rating.

Radio category

- periodic inspection and testing
- defect analysis and rectification, including component changes
- modification installation.

Lighter-than-air category

- periodic inspections
- fabric repairs and other rectification.

If you don't have enough experience for a group rating and that's because you don't get the opportunity to work on more than one type within a group, you can apply to have that type rating issued as a restricted one.

This isn't usual practice, but the provision is included for cases of genuine need. If a genuine need cannot be demonstrated, the application will be declined.

Certificate of inspection authorisation

If you want to become even better qualified, you can get an inspection authorisation certificate. You'll be known as an IA.

This qualification entitles the IA to:

- carry out and sign off a 'review of airworthiness' involving a thorough check of an aircraft's maintenance history against its current maintenance programme
- certify that any major modifications and repairs were done in accordance with civil aviation rules.

You don't have to be rated on the aircraft on which you perform the review of airworthiness, but you must be familiar with the aircraft type so the review of airworthiness meets an acceptable standard.

Photo courtesy of Air New Zealand Aviation Institute.

To show the range of your experience when you apply for an aircraft maintenance engineer licence (AMEL) you should keep a detailed experience logbook. Photo courtesy of Air New Zealand Aviation Institute.

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New Zealand Government

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

aviation.govt.nz

Becoming a licensed aircraft maintenance engineer was revised in March 2021.