Amateur-built Aircraft

What better way to indulge a passion for aviation than to build your own aircraft? Here's what you need to know.

We've been brought up on the notion that New Zealand is a nation of tinkerers. Nothing proves this better than the number of aviation enthusiasts choosing to build their own aircraft.

While a project like this may hold great appeal, there are a few things to consider before diving head-first into your spanner set.

The Three Fs

The Sport Aircraft Association (SAANZ) web site lists the three essential components of success for an amateur-built aircraft as being Finance, Facilities, and Family.

The upfront costs of such a project may seem clear at first, but have you factored in certification, training, tooling, or the potential impact of a change to your financial situation?

Many a home build has been derailed by an unexpected injury, redundancy, or the addition of a new family member.

While these events may be difficult to predict, it pays to allow appropriate contingencies.

Bill Sisley, SAANZ President and constructor of Europa XS ZK-CHV, notes that a project can at least be deferred.

"Fortunately, an aeroplane can be built in ten months, or ten years, so can be pushed back into the shed when money runs out."

What about the facilities you're planning to use? While you don't initially need a space large enough for the whole aircraft, you will need a space large enough for completed parts of the aircraft.

"We find people building in their front rooms, with bits of aeroplane all through the house, which is fine if it doesn't get in the way. A lot of modern aircraft though, are built in jigs and need more room, whereas space maybe isn't as important when building in wood and fabric," notes Bill.

Whether it's a dedicated workshop space, or the family car playing second fiddle as the garage is taken over by engines and ailerons, the aircraft will need to be built somewhere.

Arguably, the most important of the three factors is family. Such a project could easily take years to complete, putting pressure on relationships and consuming spare time.

David Gill, CAA Team Leader Registration and Airworthiness, notes it is not uncommon for a project to remain incomplete after 20 years.

Photo courtesy of Penny Belworthy.

"People will often complete 80 per cent of an aircraft, but those last details like wiring and the interior can take as long again," he says.

Bill says the process should be inclusive.

"We believe there is room for the rest of the family to share in both the building, and the enjoyment of flying. It's a partnership, rather than just one person being isolated and stuck in the shed."

A Simple Process

The CAA process for amateur-built aircraft has been simplified greatly, and no longer requires notification of intent, or staged inspections.

"It's now a very simple process, based on the American system. The CAA inspects the finished aircraft for the things we consider will make it safe, and it is then proved by flight testing," says David.

Design and Build

The freedom of flight draws many to the skies, but there is also a generous amount of freedom allowed in the design and build phase of an aircraft project. One SAANZ member is even building a steam engine for his Pietenpol.

"The law on home-building used to be fairly restrictive, but now allows people to build almost anything they like. A builder must use best practice, and demonstrate that components like the wings are suitable for the aircraft, but otherwise there is total freedom," says Bill.

Designing an aircraft from scratch is best left to those who have prior experience, or some experience in aircraft engineering. It is also a longer process that may require additional testing.

Kitsets are a popular choice, however, as they allow builders to get into the air sooner, and potentially with less technical knowledge.

The 'Special Category – Amateur-built' airworthiness certificate is applied to aircraft built for the education and recreation of the builder themselves. Because of this, the CAA requires that at least 51 per cent of the construction be carried out by the builder.

If you're building from a kitset, make sure it's an appropriate 51 per cent kit.

Those looking for more of a challenge can opt to build an aircraft from plans. This may prove cheaper than a kitset, but can also take longer to complete.

Whichever way you've decided to build your aircraft, it is worth talking to SAANZ about your options. Their mentoring programme will also be a great help to a new builder.

"The main thing is to communicate with others, and share your progress," says Bill.

David agrees with this. "There is an awful lot of information available through user groups and SAANZ. Some aircraft may not be well supported by the manufacturer, but there are probably people building them around the world who can help."

Registration and Inspection

Amateur-built aircraft must be registered before their Special Category airworthiness certificate can be issued.

To do so, fill out a CAA 24047/01 *Application for Registration of an Aircraft* form, which can be found in the 'Forms' section of the CAA web site, and submit with the appropriate fee.

Registration marks and an identification plate must then be affixed to the aircraft, along with any required markings and placards. See AC21-4 *Special Category – Amateur-built Aircraft Airworthiness Certificates* for further guidance on this.

Once registered, the constructor may apply for a Special Category airworthiness certificate in the Experimental subcategory, via Form CAA 24021/06 *Application for a Special Category Airworthiness Certificate*.

Documentation submitted to the CAA at this stage could include drawings or photographs, a notarised CAA 2115 *Eligibility Statement Amateur-built Aircraft form*, and a letter identifying the aircraft, proposed testing area, and test pilot.

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The Jodel D9 and Clutton FRED (Flying Runabout Experimental Design) amateur-built aircraft of the Belworthy family.

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Trish Stephens flying her Van's RV-6A, originally built in 2003 by Kent Aston. Trish says it's great for aerobatics up to Sportsman level.

It is essential that all major structural components, control runs, and systems be photographed before the final skin or fabric is applied, if this will otherwise prevent visual inspection.

"We encourage people to take photographs of anything that will be covered later. The more detail that is recorded, the easier it is for us to check," says David.

Stage inspections, while no longer mandatory, are still recommended for those areas.

This evidence can be documented in a construction record, eg, the EAA *Service and Maintenance Manual*, or the *Construction Record for Amateur-built Aircraft* from SAANZ.

It is worth remembering that the owner is solely responsible for the safe and sound construction of the aircraft.

Before the CAA inspection you should also have the following documentation ready:

- CA006 Tech log
- CAA1464 AD log
- CAA2101 Airframe log
- CAA2158 Engine log
- CAA2110 Propeller log
- CAA2102 and CAA2173 Weight and Balance form
- CAA2129 Radio station approval form
- An approved maintenance programme
- Evidence of inspections signed by the constructor, describing all inspections conducted during construction, including mentor visits and vital point inspections.

Logbooks and forms are available from www.caa.govt.nz, "Quick Links > Forms".

Getting Airborne

Once the aircraft is ready to fly, registered, and certified, it's time for test flights.

Amateur-built aircraft are initially test flown using a Special Category – Experimental airworthiness certificate.

During this phase, the aircraft will be subject to operating limitations and a specific flight evaluation area.

Aeroplanes and rotorcraft with type-certified engine and propeller combinations are required to log at least 25 hours of flight time, or 40 hours if non-certified.

Amateur-built gliders, balloons and airships built from kits must fly for at least 10 hours of satisfactory operation, including at least five takeoffs and landings.

The minimum standards for test pilots are specified in AC21-4 *Special Category – Amateur-Built Aircraft Airworthiness Certificates*.

Recommended flight evaluation procedures can be found in FAA Advisory Circular 90-89A *Amateur-built and Ultralight Aircraft Flight Testing Handbook*. SAANZ can also provide flight test record documentation.

The test pilot must be a person approved by the Director of Civil Aviation who holds a valid pilot licence.

Taxi tests are recommended as a first step, for the test pilot to gain familiarity with the characteristics of the engine and ground handling.

It is also important to ensure emergency equipment and personnel are readily available for test flights.

Once certified, an aircraft registered as Special Category – Amateur-built must be flown by a pilot with, at minimum, an RPL or PPL. An aircraft registered as a microlight can be flown by a pilot holding a Pilot Certificate from an appropriate Part 149 organisation.

Ongoing Maintenance

Maintenance of an amateur-built aircraft requires an approved programme in accordance with rule 91.607 *Approval of maintenance programmes*.

The aircraft constructor may themselves be issued a CAA Maintenance Approval, but it is strongly recommended that they first gain practical experience under the guidance of a licensed aircraft maintenance engineer.

A limited degree of pilot maintenance is also allowed under rule 43.51 *Persons to perform maintenance*, but all other maintenance must be carried out and certified by persons approved or licensed under Part 66.

"We have an agreement with the CAA that anybody who has built their own aircraft can attend a SAANZ training course and sit an Aspeq exam to be certified to maintain their own aircraft. Doing so is very cost effective," shares Bill.

Modifications may be made to the aircraft after it is completed, but must be notified to the CAA if they alter the primary structure, components, or aerodynamics. It is possible that further testing may be needed at that point.

"The CAA needs to be informed of modifications, and will then decide whether they need to be flight tested for approval. An aircraft is grounded immediately by a major modification, whereas minor modifications can be approved based on Acceptable Technical Data," says David.

For the many people whose aircraft has been registered as a microlight, rather than an amateur-built aircraft, the system is both simpler and more strict.

"People are allowed to do their own maintenance on a microlight, but they must adhere to the manufacturer's instructions. Amateur-built owners have more freedom to make changes, as long as they are flight tested," says David.

So, after the long hours and hard work, is it worth it? Bill Sisley has no doubt.

"It's extremely exciting when you've built your plane and it first goes up. That thrill doesn't go away for a long, long time." ■

CAA's New **Principal Aviation Examiner**

David Harrison is replacing Bill MacGregor as New Zealand's top examiner.

After two years as CAA's Training Standards Development Officer, David Harrison is moving three desks over in the licensing unit, to become Principal Aviation Examiner.

David is filling the role vacated by Bill MacGregor who is retiring, after almost four years, to Auckland.

David, originally from Britain, flew and instructed for the Royal Air Force. He has 3000 hours fast-jet time, principally on the Phantom and Tornado F3, and was both a weapons instructor and flying instructor.

He was also commander of the RAF's busiest flying training base at Linton-on-Ouse.

In New Zealand, he became a CFI and examiner with Hamilton's CTC Aviation (now L3 Flying Academy) followed by a stint with Aviation Services Limited (now Aspeq).

David is also a glider pilot.

In his time as Training Standards Development Officer, David has been enthusiastic and energetic about the vital role of good flight training in aviation safety, "particularly as the industry moves towards a risk-based approach," he says.

David says he will continue to have a strong focus on the maintenance of flying standards, and the key role of the flight examiner in that process.

"I will also continue, myself, to be an active examiner, to keep my perspective 'real'," he says. ■