THE REDCLIFFE AERO CLUB

Remote Piloted Aircraft - Potential Risk but also an Opportunity for Fun and Profit

AIR CHAT

Issue No: 13
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VET FEE-HELP

NATIONALLY RECOGNISED TRAINING

Official Newsletter of the Redcliffe Aero Club
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CLUB PRESIDENT REPORT

Hello and welcome to the first Air Chat edition for 2017.

So far this year the Club has been enjoying a steady growth across the board. The last of our VET FEE Help students are getting close to conclusion of their courses, closing off the Club's first full year with VET FEE Help. As mentioned in the last edition, the Government has made significant changes to the programme. With the scrapping of VET FEE Help and the introduction of VET Student Loans, the Club had to fully re apply to the Government for VET Student Loans. This was a time consuming exercise for the Club, however our application was lodged before the deadline and we are waiting for the new approval.

Those who fly on a regular basis would notice the new taxi way and run up bay on the R07 end of the field. Council contractors are almost finished after a prolonged time of construction, hampered by some bad weather. This will be a good asset for the Redcliffe operation adding safety to the field.

We had another good turnout to our Anzac Day Dawn Service and Dawn Patrol. It's a good way to commemorate the fallen from ANZAC Cove and all other conflicts around the world. I have a full report in this addition of Air Chat.

The Club has ordered a new flight simulator from Hawker Pacific. This will replace our aging flight simulator. I will leave the specifications and details to Stephen to explain in his CEO Report.

Our Club's flyaways haven't been too successful this year, mainly because of the weather. As we move into the winter months the weather will improve, making our mid-year flyaways more attractive. I'm looking forward to joining you on these activities.

A special thanks to Philip Arthur for his excellent work in getting Air Chat out on time this year. This edition covers many topics and is a good read. Remember that we'd encourage you to contribute an article. If you feel you have a story to tell just email Phil.

Enjoy your flying

Mike Cahill

CEO REPORT

Dear Members, Students and Friends of the Club,

Over the last few months, since our last AirChat we have been working on a number of projects including:

- An upgrade to the IT infrastructure
- The research and purchase of a new Simulator
- Application for ongoing VET Student Loans beyond our current approval level
- An additional survey contract

It has been approximately six years since we invested in IT infrastructure at the Club. In this time we have moved to a cloud based Flight School Management System and accounting system. The internet connection to the Club has up until now been through a microwave link. This has become very unreliable and has been affecting our ability to use our cloud based application and hence affecting operations at the Club. By the time you read this we will have completed a fibre optic internet connection with improved Wi-Fi available to members, and the integration of computer server, Wi-Fi and security systems into one dedicated rack.

Our current SIM has served us well over the years but in recent times has become quite unreliable. We researched available SIM's on the market and the Board recently approved the purchase of a DCX-MAX SIM produced by Precision Flight Controls in the US. It will be capable of being configured as both single engine or multi-engine and both G1000 or analogue instrumentation. It is the current Gold Standard for simulation for flight schools and compares well to, and in some cases exceeds, our competitors' offerings. It will be delivered within the next three months and will be installed in the current SIM's location.

In late February, we submitted a very comprehensive application to the Federal Department of Education and Training for the provision of VET Student Loans beyond our current approval, which ceases at the end of this financial year. We should know the outcome of this application in the coming weeks.

We have also been negotiating to supply survey operations overseas for our existing survey client. Your Chief Pilot, Dan Smith, has been working very hard to realise this contract.

Your Board, management and staff continue to work hard to ensure the Club maintains the strong financial performance of last year, whilst investing in new infrastructure for the Club and its members.

Best regards,
Stephen White, CEO

CHIEF PILOT REPORT

2017 has been a busy year so far at the club. Some of the changes you may notice around the place include:

- The addition of Mark McCann to the team as our new casual grade three instructor
- The continual upskilling of the instructor team
- Farewelling Jarrad Smith who has left us to fulfil his dream of flying a Dash 8. I'm sure I speak for all the membership when I say that we wish him all the best
- The membership will soon benefit from work done behind the scenes to upgrade the technology at the club

As winter approaches we are beginning to see calm, cooler mornings and earlier evenings. I look forward to the commencement of night flying at Redcliffe again this year. Please keep in mind that if you hold a Night VFR Rating, that rating is subject to a flight review every 2 years in addition to the usual currency requirements. CASA has replaced the CAAP on night flying with an Advisory Circular which can be found here.:
https://www.casa.gov.au/file/166951/download?token=WhT2Js7L

The club can assist with Night VFR flight reviews and currency. Just call the office to schedule something. If there are a few people interested in some refresher circuits why not coordinate a night and fire up the BBQ?

With Easter behind us, the club will be open every day until Christmas. Winter in South East Queensland offers fantastic flying conditions. Whether you are conducting your initial training or just looking to enjoy another day in paradise, we look forward to seeing you.

Dan Smith
Chief Pilot and Head of Operations

EDITORIAL

Welcome to the first AirChat of 2017. You may see a drone as a threat, a toy or a great way to gather information rapidly and cheaply. No matter how you perceive them, they're here to stay and will be deployed in ever increasing numbers in coming years. In this edition we provide a brief introduction to the rules and regulations related to Remote Piloted Aircraft (CASA's official nomenclature), their broadening range of applications and discuss how you could to learn to fly this new type of aircraft safely and legally.

Thanks goes to Dan Pearson for sharing with us the joy of mountain flying as he recounts his experiences flying out of Wanaka in New Zealand. Also in this edition, Mike Cahill ticks another item off his bucket list on the island of St Maarten in the Carribbean, getting up close and personal with commercial aircraft on short final.

How did a 10 year old boy first experiencing flight in an 8 seater Dehavilland Dragon biplane turn into one of our club's life members? We share Phil Ware's lifelong passion for aviation as he describes his career in the air force and as an air traffic controller as well as a private pilot and long term member of RAC. Having been on both sides of the fence Phil believes firmly that flying IFR is a great skill that all private pilots should add to their repertoire no matter how late in life they start. He is also a great advocate for the ever more powerful home flight simulator as a means of brushing up our skills to keep us safe in the air while not costing a fortune.

Also in this edition, Brendan Power, who's also been associated with the club for many years, relates some challenges of transitioning from sole pilot to a multi crew environment and how the skills he learned can be applied by all of us.

Would you like to reduce the cost of flying? Alan Carlisle did when he built his own experimental aircraft. Alan's bright orange and grey RV14 is seen around the aerodrome regularly now as he enjoys the fruits of his labour. Read how you too could build and fly your own RV from a kit.

I'd love some feedback on what you like about this edition and what you'd like to read about in future editions. And please offer a story of your own that can inspire others to improve their aviation skills or explore new parts of the world. A trip you did recently or many years ago, a good or bad experience you had while flying or just something you read about. Pass it on so all of us to learn from it. Email all ideas, comments and feedback to:

airchateditor@redcliffeaeroclub.com.au

Philip Arthur

UPCOMING EVENTS

May 27-28: Old Station Flyin, near Gladstone. Camping under the wing. http://www.oldstationflyingclub.com.au/fly_in.php

June 4: Introduction to Experimental Aircraft and Test Flights in RVs – Alan Carlisle and Ashley Miller demonstrate their kit build aircraft at RAC.

June 7: Pilot Information Night, Brisbane Centre. Learn how ATC works.

June 24-25: RAC Flyaway to Stanthorpe. Overnight at Stanthorpe and enjoy local wine, chill night air and a brisk morning on the Granite Belt

July: RAC 10 day Big Trip – Details TBA

August: RAC 10 day Big Trip – Details TBA

Sept 1-2: Birdsville Races

Sept 9-10: Carnarvon Gorge Flyaway – Explore one of Qld's natural wonders

Oct 7-8: Town of 1770/Agnes Water Flyaway – A weekend at the beach

Nov 26: Wellcamp Flyaway (Lunch) – Inspection of Australia's newest airport

Dec 10: Kooralbyn Flyaway (Lunch)

Enquiries & suggestions for further events: flyaways@redcliffeaeroclub.com.au

RECENT ACHIEVERS

The following students have recently achieved the next level of their training at RAC. Congratulations to everyone on your hard work and dedication as you work towards your final goals.

First Solo

Richard Back
Brandon (Ching Lung) Choi
Timothy Evans
Alexander Guy Huckel
Colin Smith
Matthew Smith
Stefan van der Linde

Multi Engine Aircraft Instrument Rating

Nathan Sant,
Allan Brooks,
Tom Hayter
Peter Headley
Murray Norris
Mitchell O'Brien
Nicholas Pratt
Jack Stott-Sugden
Jackson Warner

FIR

Anish Gandhi,
Mark McCann
John-Michael O'Doughert

CPL

Samuel Best
Andrew Harper
Peter Headley
Paul Lane,
Mitchell O'Brien
Travis Robertson,
Christian Tagle
Oliver Van der Walt
Jackson Warne

RPL

Angariia, Gerardo
Lucas Gozzard
Mathew Ready
Julian Simmonds
Thomas Waterhouse
Yao Suyang

PPL

Richard Back
Shawn Clark
Andrew Clegg
Tamara Salins
Jason Samaco

ANZAC DAY DAWN SERVICE & PATROL

By Mike Cahill

It was dawn, 25th April 1915. Hundreds of diggers were being rowed to shore by sailors in lighters to make land at Gallipoli. Young soldiers being placed on a beach totally unknown to them to fight an enemy that was dug into the cliffs. Thousands were killed and wounded on that dawn morning at ANZAC Cove.

102 years on, we commemorated the landing of the Australian and New Zealand Army Corp (ANZAC) on to the Turkish Peninsula, by holding a Dawn Service at our Club.

Approximately 40 people assembled at dawn to pay their respects to the fallen. One of our oldest club members, Phil Ware, led our service to the Anzacs. We had some warming and inspirational words from Phil who pointed out that we owe our freedom to the armed services of Australia who have laid down their lives over the years to give us the freedom that we enjoy today. Not just at Gallipoli but in all world conflicts, in the past and in the present too.

Michael Hawley and Philip Arthur raised the Australian flag to half mast, a symbol of respect for the lost lives from all battles. Sam Keenan and Margot Logan laid a wreath at the base of the flag as a mark of respect for the day. Phil Ware recited 'The Ode' which is an excerpt from the poem 'For the fallen'.

I noticed several people were wearing commemorative pins. Some wore the Rising Sun - a symbol that is identified with the spirit of the Anzacs. Others wore the Red Poppy which symbolises peace, death and sleep of the fallen servicemen and women, and Rosemary, which was found in the fields at Gallipoli. All these symbolic pins worn by us show respect to the fallen.

To finish off our Dawn Service and tribute to the Anzacs, we had bugler Cadet Corporal Jonathan Collen from 212 (City of Redcliffe) Squadron, Australian Air Force Cadets, sound 'The Last Post'.

As a further mark of respect, we climbed into our aircraft and flew a Dawn Patrol up to Noosa, overwater at 500 feet, returning to YRED at 1000 feet. On arrival back at YRED we all enjoyed a BBQ breakfast and chatted about our mornings experience and our flight.

I can only say that if you haven't experienced our Dawn Service and Dawn Patrol, you should mark it down in your calendar for next year. It's a great experience.

"They shall grow not old, as we that are left grow old;
Age shall not weary them, nor the years condemn.
At the going down of the sun and in the morning
We will remember them."
LEST WE FORGET

ANZAC DAY

REMOTE PILOTED AIRCRAFT

By Philip Arthur

"Drones" have become all the rage in the past few years. These unmanned aerial vehicles, or UAS (Unmanned Aircraft Systems) as defined by the FAA in the US, or RPA (Remotely Piloted Aircraft) to use CASA's official term, are being used for a growing number of activities, both recreational and commercial. Simple quadcopter units can be purchased for a few hundred dollars from the local toy shop whilst sophisticated fixed wing designs that can fly long distance over extended periods can be purchased from specialised suppliers for tens of thousands of dollars. While having been used by the military for some years now in various hot spots around the globe, they now represent a new option for recreational aviation as well as opening up numerous potential commercial business opportunities.

Although CASA doesn't yet record the number of RPA in Australia, the FAA registered 2.5 million sales in the USA in 2016 and has forecast the increase in number as shown in the table below. A similar rate of increase can be expected in Australia in the coming years.

Sales Forecast Summary
Million sUAS Units

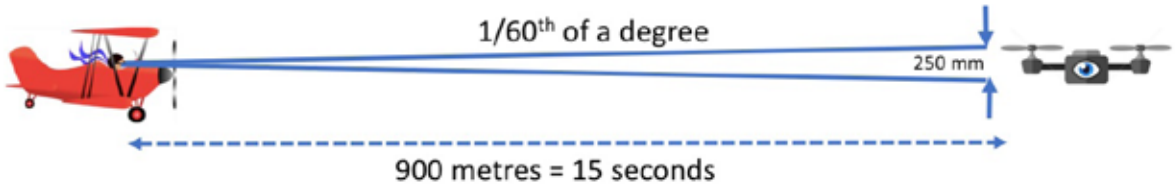
	2016	2017	2018	2019	2020
Hobbyist (model aircraft)	1.9	2.3	2.9	3.5	4.3
Commercial (non-model aircraft)	0.6	2.5	2.6	2.6	2.7
	2.5	4.8	5.5	6.1	7.0

Source: FAA Aerospace Forecast Fiscal Years 2016-2036
https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2016-36_FAA_Aerospace_Forecast.pdf

So what does this growth in RPA mean for the private pilot and aspiring commercial pilot who wants to stay clear of them when flying and possibly consider adding the operation of such equipment to their range of skills? Dan Smith, Chief Pilot at RAC, believes training in RPA operation can complement the traditional training undertaken at the club and provide broader career opportunities for trainee pilots. Dan suggested I talk to Andrew Learmonth from Remote Aviation Australia, a company that provides RPA services and training to the general public. Andrew trained at RAC and was an instructor at the club in the early 2000s. He now flies Dash 8s and as a side line, in addition to being a contributing writer for the Aviation Theory Centre series of publications, he is Flight Training Manager at Remote Aviation Australia. I also had a chat with Colin Smith, who is currently training towards his RPL at the club. Colin, a former member of the RAAF, is the "Chief UAS Controller" at Ninox Robotics, an Australian company that imports military grade fixed wing RPA to carry out a variety of services for the biosecurity industry, government departments, landholders and search and rescue organisations.

What Risks do RPA Pose and What Regulations are there to Reduce the Risks?

For private pilots flying under the VFR we operate under the "see and be seen" or "see and avoid" principle. We know how difficult it can be to spot other light aircraft while in the air, even when we know from radio calls or a traffic awareness system that there's one in our vicinity. A light aircraft has a wing span of 10-15 metres and a similar length. Given the difficulty of seeing one of those, what's the chance of seeing an object that is only 250mm wide at its thickest section? With excellent vision and in good lighting the human eye has difficulty perceiving an object that subtends an arc of less than one sixtieth of a degree. This means it would only be possible for a pilot to see a 250mm wide object once it is **less than 900 metres** away **if you were looking straight at it**. If you're flying at 120 knots it would mean you would have 15 seconds from first possible sighting until impact. So the likelihood of being able to take evasive action and avoid a collision would be very low. Even though the "big sky theory" tells us that such collisions are highly improbable, the difficulty of spotting them in time is one reason why regulations have been developed to ensure that the operation of RPA doesn't present an unacceptable risk of collision with other aircraft, especially in the vicinity of aerodromes where the risk is highest (and the "big sky" is not so big).



The general rules that CASA have implemented for unmanned aircraft, including RPA, are provided in CASR Part 101. When flying for fun and not for any form of economic gain it is possible to fly an RPA without being certified, providing the operator follows some simple safety rules.

- You must only fly in VMC conditions and keep your RPA within visual line-of sight (VLOS) - close enough to see, maintain orientation and achieve accurate flight and tracking. This means being able to see the aircraft with your own eyes at all times.
- You must not fly your RPA higher than 120 metres (400ft) AGL referenced to a point on the ground immediately below the RPA at any time during the flight.
- You must only fly your RPA during the daytime (not after sunset or before sunrise).
- You must keep your RPA at least 30 metres away from other people i.e. any person who is not charged with duties essential to the safe operation of a remotely piloted aircraft.
- You must keep your RPA away from prohibited/restricted areas.
- You must not fly your RPA over any area where, in the event of a loss of control or failure, you create an unreasonable hazard to the safety of people and property on the ground (populous area).
- You must keep your RPA away from aerodromes, avoiding the approach and departure paths, and the movements areas (runways, taxiways and apron).

Despite the widespread belief that you cannot operate an RPA within 3nm of an aerodrome or helicopter landing site, such operations are actually possible and lawful providing you do not operate on:

- the approach and departure path or
- within the movement area or
- create a hazard to aircraft that may be using those areas.

Although these regulations should in theory keep RPA well clear of light aircraft at all times reports of infringements are becoming more prevalent as the number of operators increases.

Commercial operators flying RPA weighing less than 2 kg do not require certification either. However, they have additional restrictions (known as the standard operating conditions) that don't apply to recreational users and certified operators. Commercial operators who want to fly an RPA that weighs 2kg or more, or want freedom from the standard operating conditions, need to be licensed and/or certified by CASA. This authorisation comes in the form of a Remote Pilot Licence (RePL), allowing individuals to fly for operators, who in turn need to hold an RPA Operator's Certificate (ReOC).

Furthermore, CASA requires commercial operators to submit a safety case if they wish to operate higher than 400 feet AGL in controlled airspace or beyond visual line of site. CASA can also issue these operators an approval to operate near aerodromes, if a number of conditions are met. These conditions include making broadcasts on the CTAF (using the callsign "unmanned RPA"), adopting separation distances from manned aircraft (500 feet vertically and 1500m horizontally), landing immediately if a conflict is likely, employing "spotters" to assist the remote pilot, and the publishing of NOTAMs to alert pilots of the potential hazard.

The vast majority of commercial operations are within VLOS, however, some larger operators such as Insitu Pacific, a Boeing subsidiary with offices in Brisbane, and Ninox Robotics, operate beyond VLOS. Insitu Pacific, for example, regularly monitor gas wells on the Western Downs at up to approximately 3000 feet AGL. Such flights require approval from CASA who publish NOTAMs to advise other aviators of their presence, while the RPA is required to have a transponder and strobes to improve its visibility. Operators are required to make regular broadcasts notifying other aircraft of their presence on the Brisbane Centre frequency during operation. GA pilots therefore need to read the area NOTAMs to be aware of these operations and monitor the area frequency while conducting cross country flights in the vicinity when they are operating.

According to Colin Smith the rules as described in CASR Part 101 are still evolving. One fairly recent change was that the 30 metre rule can be relaxed to 15 metres for ReOC holders, with the approval of the persons present and with adequate safety measures applied. People flying for recreational purposes, or sub-2kg operators, still cannot fly within 30m of other people however. He also mentioned that anyone operating under a ReOC can fly at night now. That said if they wish to fly higher than 400 feet AGL or beyond visual line of sight then an area approval is required.

What are Some Business and Career Opportunities for RPA Operators?

So if you're thinking of extending your aviation activities to operation of RPA, what sort of business and career opportunities are there that could complement a GA pilot licence? The one that most people think of immediately is aerial photography or video. According to Andrew Learmonth, although the photography/video market has grown considerably over recent years it is almost saturated. Andrew says there are numerous other uses for RPA however, given that they are so much cheaper to run than alternatives such as helicopters.

An RPA can be used to capture images of the land and structures during construction of new buildings. Software like "DroneDeploy" can be used to capture and process images taken from an RPA, creating a 2D map or a 3D render of the site. Managers of road construction projects, coastal erosion assessments and designers of golf courses are turning to RPA for assistance. Although not completely replacing traditional techniques they can reduce the cost and time needed for such activities. Resource companies and insurance firms are using RPA to inspect industrial assets to provide maintenance information and assess damage, corrosion or leaks. Instead of hiring a person to ascend a tall structure using harnesses and scaffolding an RPA can quickly assess the area. During large construction projects companies are using RPA to track progress and keep track of critical items of equipment through regular monitoring of laydown areas.

Insitu Pacific specialises in long distance and beyond visual line of sight flights using ScanEagle fixed wing aircraft. They provide inspection services for the mining, oil and gas, and agriculture industries and emergency response units. Their RPA are actively used at night to monitor bushfires and map fire fronts to assist in real time planning of bushfire response options.

ScanEagle RPA

A short video can be found via the link:
http://insitupacific.com.au/disaster-emergency/

Ninox Robotics has a licence to operate Beyond Visual Line of Sight (BVLOS) and above 400' and at night. They operate the Bluebird Aero Systems SpyLite aircraft, a 2.75 metre wingspan aircraft imported from Israel. http://www.bluebird-uav.com/spylite/
It comes with a number of payloads including:

- an Electro Optical / Infra Red (EO/IR) combination,
- a 35MP stills camera photogrammetric payload capable of orthomosaic mapping and
- Digital Elevation/ Surface Modelling.

Bluebird Spylite RPA

Ninox work has included feral animal management and macropod counts in a number of regions in Queensland including the Southern and Western Downs Regions, a mapping job to assist with the control of invasive Gambusia (mosquito fish) in the Edgebaston Reserve to the north of Longreach, trials in both SA and WA for the asset management of gas pipelines using both real time video and 3D ortho rectified mapping and survey and mapping of the Wilga State Forest for a coal mine expansion project in WA. They are currently investigating a system called FERMIS which is a prototype fire management payload that combines EO/IR with GPS locator sensor for enhanced situational awareness and fire crew safety. A video showing test deployment of one of the Ninox aircraft can be watched on youtube via the following link:
https://ninox-robotics.com/#introduction

Colin Smith says that as a rapidly expanding industry the RPA sector provides a wide range of opportunities for businesses and people who are qualified to fly the aircraft commercially. "The market for RPA operations is not saturated despite the proliferation of systems. Australia is a big place and there is an increasing number of smaller jobs out there suitable for organisations starting out and with small budgets. That said, some post processing is usually required to provide a satisfactory product to the client. It helps to be tech/IT/photography savvy. A subscription to www.dronesforhire.com.au may provide ideas on opportunity for work throughout Australia."

So How Do I Obtain an RePL/ReOC?

The RePL can be seen as an additional aviation qualification for aero club members and students so they can use it to supplement traditional career opportunities. With an increasing number of general aviation operators using RPA to assist their normal flying activities, such as aerial surveys and inspections, having a remote pilot licence can add another string to a pilot's bow when looking for work early in their career.

Andrew Demonstrating Operation of a DJI Phantom to Dan

Anyone with the minimum of a Recreational Pilot Licence has a very simple process to gain their RePL. They require practical "operational training" from an approved provider (such as Remote Aviation Australia) and 5 hours flying experience. Having existing aviation qualifications means the applicant doesn't need to complete any theoretical training.

Remote Aviation Australia will be running a 2-day operational training course for RAC members, enabling participants to obtain their RePL with a "multirotor" endorsement. There will be 5 hours of training across two days using their DJI Phantoms and Inspire aircraft. After the training has been completed, the student will receive a certificate of completion that they can submit directly to CASA to obtain their RePL. Remote Aviation Australia will give RAC members who attend the course access to their online training site, which will enable them to learn more about RPA air law, risk management, aircraft systems etc. The training will be conducted on the north side of Brisbane over two days on Saturday 20th & Sunday 21st May. It will run from 8:30am until 4:30pm each day and is being offered to RAC members for a reduced price of $649.

More information about the pilot conversion training can be found at: http://remoteaviation.com.au/pilotatc-conversions/. Register your interest in attending at: http://remoteaviation.com.au/course-enrol/.

A VISIT TO ST MAARTEN IN THE CARIBBEAN

By Mike Cahill

As keen aviators there are things that we would all like to achieve in our life-time, things like maybe upgrading to a twin endorsement or an IFR endo or maybe flying onboard your favourite aircraft or even landing at or being at a special airport. Well I had a bucket list item ticked off in January this year when I visited St Maarten, one of the beautiful islands of the Caribbean.

St Maarten is nestled among a group of islands including Barbados, St Kitts and Antigua which were settled mainly by the French, Dutch and English. St Maarten is split in two with one half French and the other Dutch.

Princess Juliana International Airport, on the Dutch side, is where all types of aircraft arrive and is said to be one of the top 10 most dangerous airports to fly into. However I would have to say it's the best airport to view arriving and departing aircraft especially the large jets.

While I was there I saw aircraft ranging from Cessna Caravans, Twin Otters, ATR 72's to Citations, 737's, 757's and A340's.

Their approach runway R10 is only just under 2300 meters long, so large jets like Boeing 747's and A340's that normally require a minimum of 2500 meters need to be on the numbers to get it right.

So that's what makes this approach interesting for the spectators and aviation lovers around the world who congregate on the famous Maho Beach to watch the landings. The larger the aircraft the better spectacle because the aircraft appears to be much closer to the water and you receive a bigger wake turbulence effect.

As the planes touch down you witness the massive amounts of rubber coming off the tyres and with the spoilers and reverse thrusters deployed. The pilot's aim is to slow the jets down on the runway as quickly as possible.

It's a real spectacle being under the approaching aircraft and being so close to them as they pass over you especially with the scenic background of the beautiful clear waters of the ocean.

Witnessing departures is a real blast too, especially when you're hanging onto the wire fence just in front of the Armco barrier that has warnings painted on it saying " Danger Jet Blast Do Not Stand ", as you wait for the jet to depart. The feeling is like getting sand blasted, deafness for a short while and the smell of jet fuel burning as they depart. Nothing better. I can highly recommend it.

Bucket list. ✔

theaviatorstore

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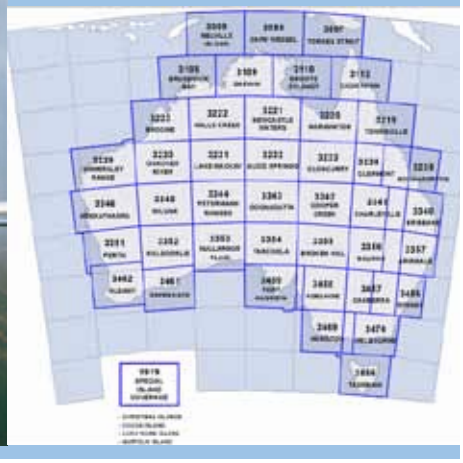


MOUNTAIN FLYING IN NEW ZEALAND

By Dan Pearson

I'll always remember the parting words of my otherwise taciturn right seat companion on the day I passed my PPL flying test: "Ok, well done, but remember - this is a licence to learn."

As a private pilot I am always on the lookout for challenges that both improve my flying skills in general and to be honest, are fun and vindicate my ongoing flying budget! In recent times aerobatics training has provided said challenge, but really last year I was on the lookout for something that would challenge all the foundation skills of my flying and provide me with some hard core training to increase my skills base. This opportunity was to present itself through an unexpected turn of events - an ad hoc short holiday to Queenstown, New Zealand!

Initially my thoughts were of enjoying the wine and culinary delights of the Otago region. As it was November any thought of skiing was out, so what should I do to work up an appetite/thirst for the local delights? I recalled a conversation held well back, at a wings dinner, on the subject of mountain flying and the art of mastering the up and downdraughts of the mountains. The person at the time (name escapes me) mentioned they had gained this understanding and skills base while in New Zealand. The thought bubble appeared and a quick scan of the global knowledge base (Google) revealed indeed there were flying schools that offered mountain flying training not too far from Queenstown.

Having been to New Zealand a number of times for both business and pleasure I was reasonably versed in the North Island. However I had only spent one Easter trip in the South Island so really didn't know the topography of the "Mainland" (as the locals call it) well at all. After a further scan of Google (maps this time) I worked out that the flying school offering said training was located at Wanaka which was only a one hour drive from Queenstown. The plan was coming together. With a hire car this would easily be in reach as a day trip from our accommodation. All that remained was to reach out to the flying school to make the necessary arrangements and I was away!

Learn to Fly NZ (www.learntoflynz.com) is located at Spitfire Lane, Wanaka airport (cool street name – good omen) half way between Wanaka and Luggate. It's about ten minutes from Wanaka or one hour from Queenstown. You hang a left just after the airport entrance and it's about two hundred metres down on the right (second or third hanger). Before I expand on Learn to Fly NZ other points of interest in the vicinity include War Birds and Wheels (good museum, great food), the clay target range directly opposite the airport (aptly called "Have a Shot") and the toy and transport museum approximately five hundred metres back towards Wanaka (great place for rev heads). Why is this of interest? The weather in NZ is on par with the UK so can be highly changeable so it's worth having some extra interests on hand in the event that hanger flying is the only option!

Ok, back to Learn to Fly. I had reached out to the school about a month prior to arriving in NZ. An email dialogue with the club's extremely helpful operations manager (Julie Hendriks) locked in both the date and the course. Since my stay in Queenstown was of a short duration I selected the one day introductory mountain flying training. Tracey (my wife) and I decided to spend Sunday (the course was booked for Monday) in Wanaka so set off on the hour long trip to Wanaka from Queenstown via the Crown Range road (although longer in distance the views on this route are stunning!) On arriving in Wanaka I thought I would drop in on the club to get my admin sorted out prior to commencing the following day. On arrival at the club I was greeted by my flying instructor Sue Telford. After a quick chat on the weather forecast for next day, and an introductory tour of the hanger (residents of which included a Tiger Moth, Citabria and the ubiquitous Cessna and Piper aircraft) I was ready to go for the next day! We headed back to Queenstown for the night.

I enjoyed the rally driving experience of the twisting road over the Crown Range in the Monday morning sunshine (except for the locals who were going even faster than me which was saying something). Thanks to Google maps I arrived within the prescribed one hour and after a quick coffee in the Warbirds and Wheels Café I was seated in the Learn to Fly NZ briefing room going through a smart A5 red folder containing a variety of Civil Aviation Authority (CASA in NZ) documentation on safe flying in mountainous conditions.

Sue - Font of All Mountain Flying Wisdom

Sue Telford has been a local in the Wanaka area since the 1980's and has been flying for just as long. My initial impression of her was of a calm, experienced pilot who had a truck load of both flying and mountain experience (handy when you experience the conditions in the Southern Alps!). Although theory was the order of the day for the first couple of hours, the session was largely interactive rather than transmit/receive and my torrent of questions were patiently answered and clarified from the knowledge base of thirty odd years of flying experience. During this session we were joined by a number of the aero club members and instructors including a gentleman from the Gold Coast undertaking his PPL accreditation in a Citabria! All I can say in light of the mountain conditions and using a real aeroplane (tail wheel what else..) enough respect to him.

Theory concluded, coffee drunk, it was time to go flying. Sue indicated our plane of choice was a Cessna 172N with registration ZK-KAS. I wandered through the hanger past the cool collection of planes and after a pre-flight and fuel up we were ready to go. With shades of MSJ (for those of you in the club who remember her) I reintroduced myself with the plane and after taxying out to runway 29 and completing the run ups took off and headed into the mountains. During our briefing Sue had warned me that today was going to be "interesting" due to the winds being around the 40 knots from ground level to 6000 feet and up to 70 knots above that! I gained a full appreciation of the part the winds were going to play on take-off from Wanaka – we were airborne in less than 25 meters! Also to add to the strength of the wind, establishing wind direction in the mountains is more of a "vision" than a reality – there's no forecast wind direction - they come from all directions depending on which valley you're in.

Learn to FlyNZ Hanger

So off we head into the mountains. After climbing to five grand or so, first port of call is a little airstrip at a place called "Geordie Hills Station". The only thing that marked the airstrip at this location was a scuff of mud at one end and a hut at the other. For those of you interested there is a YouTube clip on landing at said location.
https://www.youtube.com/watch?v=tITsY6mzeOU.

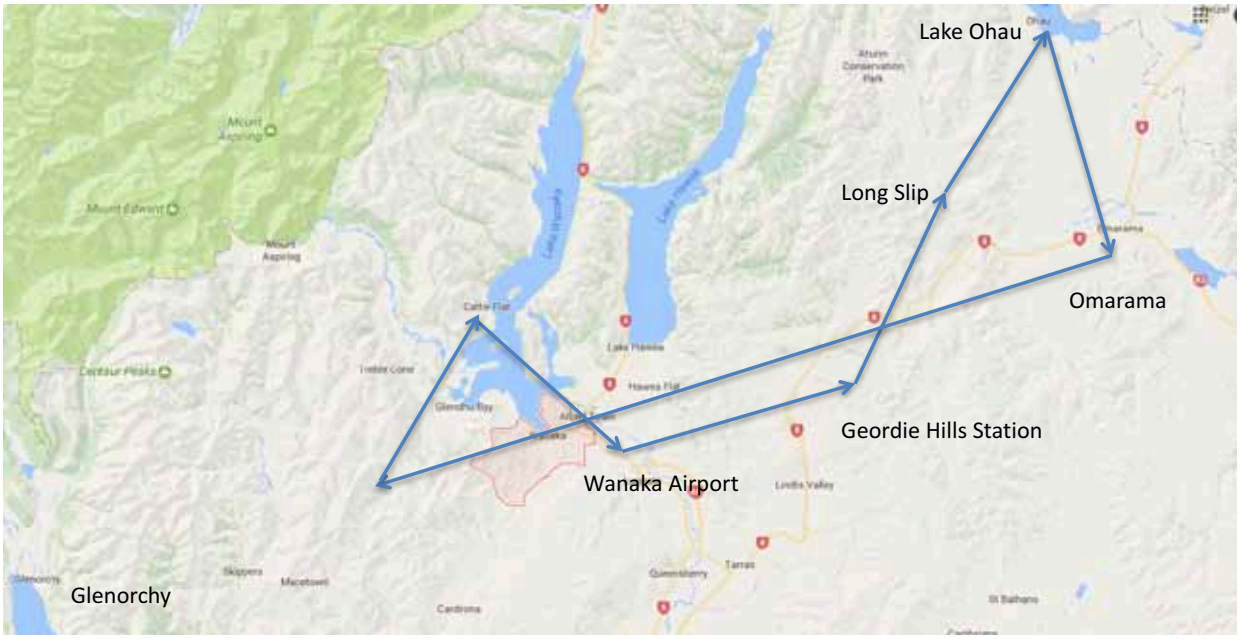
Sue cheerfully announced we would land, do a full stop then back track and head off again – sounds simple enough. As I overflew the airstrip the turbulence and wind of the valley made itself known to me in a big way. After wrestling KAZ on to the ground (strip), dealing with high speed gusting winds and a realisation that most landings were going to be made at near full power (something new) a quick "not bad landing you were handling the winds ok..." and we were off again bouncing along the long grass strip heading to our next destination – Long Slip.

In the way of instructors Sue continued her educational monologue into the fine art of mountain flying – never fly down the middle of the valley, look at the cloud movement/shadows and ground features to determine the wind patterns then work out which side of the valley you are going to fly up etc. Meanwhile I'm trying to fly our bucking bronco (KAZ in turbulence) and keep the revs down (oh for a CSU) whilst paying attention (easier said than done) to the sage advice. A quick turn around the valley and we are heading towards Long Slip. Long Slip is a top dressing strip owned by the Patterson family and is located in the lower Ahuriri valley. It's about 850 metres in length and about 20 metres wide.

Long Slip Runway

I note there is a power line and fence to my left and a creek to my right. Ok this time should be easier I tell myself, get the aircraft in the right configuration, quick overfly and then back round to land, how hard can this be? As I roll in on final I realize just how strong the head wind is. On final we have around 70 knots indicated air speed yet the plane seems to be hovering and almost going backwards to the point where I can make out features clearly on the ground they are moving so slowly! It also dawns on me that we have a cross wind that is almost certainly close, if not over the 15 knot limit (by the gusts) judging by the fact my right foot is flat to the floor on the rudder and we still aren't straight on the nose! So once again I wrestle KAZ to the ground and we come to a full stop.

Sue congratulates me on keeping the aircraft straight down the runway with the winds in play (the fence and creek honed that one, trust me). "Ok let's park her and walk the strip - rabbits love to make warrens around here!" So to add to the creek on my right, power line on the left, and a full on cross wind we now have bunnies to deal with! A walk down the strip and back reveals all to be ok so we hop in KAZ, back track and after bouncing down the strip trying to get ground speed to something flyable we take off and head towards Lake Ohau.



I am now coming out of the initial fuzz experienced when flying in strange conditions and aeroplanes and am now starting to take in the scenery of the locality. I fully appreciate the privilege we have as pilots to take in (literally) bird's eye views in beautiful regions like this. But there's no time for soaking in the scenery - we're heading to our next destination - an airstrip alongside Lake Ohau. After a run in (coming into land) that feels like what I imagine a world war II bomber run (with flak) to be, Sue determines the turbulence is too much to land so it's time to head somewhere more sedate – Omarama airfield home of the Omarama gliding club (www.glideomarama.com – videos are cool).

We make a comparatively sedate (by today's standards) landing, which apart from all the visual clues being odd (extremely steep landing approaches and virtual full power) we pull up for a lunch in the café next to the strip (I could get used to this!).

After a quick chat with the gliding school CFI on weather and flying in general we're on our way to Glenorchy. At this point Sue tells me today is unusual in terms of weather and that the conditions are fairly extreme (I am wondering where she is going with this...). I can now see how well the updraughts work as the VSI needle goes shooting up past 500 feet mark to a point where the plane feels like it's in an elevator! "Get closer to the mountain to get the benefit of the updraught..." this piece of advice has replaced the "more power" on landing from Sue in her usual, calm matter of fact way. I already feel a close bond to the sheep grazing peacefully on the hill side unperturbed by how close we seem to be to slicing through them with the wing tip!

As we head down to Glenorchy we realize with the near continuous turbulence and vibration that it isn't going be worth it so do a quick right turn, fly up through some valleys and a lumpy right turn at the aptly named "neck" on Lake Wanaka sees us heading back to Wanaka airport. After an uneventful touchdown and refuel we are once again in the club briefing room.

The usual debrief and a cup of tea later a smiling Sue shakes my hand with a casual "wasn't that fun!" remark. "She may be old aircraft but as long as you fly within the aircraft's limitations KAZ keeps you honest". This I can attest to having worked her (or she me) for the last three or so hours.

To conclude this account, I would like to thank Learn to Fly NZ for a thoroughly enjoyable experience. If I end up heading back to the Otago region in the near future I will be sure to (hopefully) team up with Sue and either KAZ or the Citabria (love that plane). To my fellow club members I cannot understate how much fun and valuable flying experience this trip was and would happily recommend it to anyone interested in challenging both their flying skills and themselves in this beautiful part of the world.

A LIFETIME OF AVIATION

Phil Ware is one of three life members of our club. He was 10 years old when he first experienced flight. He was aboard an 8 seater Dehavilland Dragon biplane that departed Moruya on the south coast of NSW for a joy flight. Young Phil stood behind the pilot during the cruise and was transfixed as they soared over the countryside. The flying bug had well and truly bit him. He was hooked.

Phil was born in Sydney in 1938, just before the start of the second world war. At six weeks his parents moved to Kiama on the south coast where he was free to enjoy the sun and the surf for his childhood years, blissfully unaware of the war raging around the world. At 10 years of age, they moved to Moruya, where the first flight took place, sparking a love of aviation that has lasted a lifetime.

In 1954 Phil moved to boarding school in Canberra. It was in Canberra that he saw his first P2V Neptune flying over the schoolyard and on the spot decided he wanted to fly in one. Phil's French teacher was a refined and genteel lady, named Freda Whitlam – former Prime Minister Gough Whitlam's sister. One day she said to Phil in exasperation ... "Phillip Ware, no-one is ever going to pay you good money to just look out the window at every aeroplane that flies past" – it turned out she was wrong.

P2V Neptune

As soon as he turned 17 Phil joined the RAAF. His first port of call was the Richmond No1 Training School, at RAAF Base Richmond, located 50kms north-west of Sydney. Richmond was the first Air Force base to be established in New South Wales and the second within Australia. From 1923 to 1936, RAAF Base Richmond was used as a supplementary airport for Sydney, with Sir Charles Kingsford-Smith landing the Southern Cross there after his trans-Pacific flight in 1928. During World War 2, Richmond developed into a base of major importance to Australia's defence, and evolved from a combat centre to become the home of Air Mobility Group. This is where Phil reported for duty on his first day in 1955.

Arriving at the base with a busload of other fresh recruits Phil had a blunt introduction to his new home. Moments after the youngsters had assembled their new Warrant Officer, a sort of Sergeant Major, stormed out of his office. Initially ranting and raving about how he'd never seen such a bunch of hopeless misfits etc. he stopped mid-sentence when he noticed Phil with his full head of hair. Looking straight at him he cried "What are you supposed to be son, some kind of Curly are we? Go straight to the barber and get your hair cut!" And by the end of day one at the RAAF Phil had even less hair than he has today! Today he says his head is like the sea shore – waves and beach, although it would appear the tide has gone out, and it is all beach.

As his hair gradually grew back Phil moved to air crew training at an RAAF base near Ballarat in western Victoria. At Ballarat he graduated as a signaller and air electronics officer. The role involved operating radios with Morse Code and radar equipment, as well as "electronic counter measures" systems that were current at the time. Phil met his wife Bev in Ballarat in 1956. She heard about the nickname that the warrant office had called him, thought it was a hoot, and the name Curly stuck. Phil and Bev were married in 1960, and had five children, David, Katherine, Elizabeth, Stephen and Natalie.

While based in Richmond on Neptunes in the 60's, Phil went for a few demonstration flights on U.S.Navy P3 Orions which the RAAF subsequently acquired to replace the P2V Neptunes. The first were purchased in 1967.

There was also plenty of scope for travel to exotic locations. There were joint military exercises with US military in Hawaii and the Philippines, and with the RAF out of Butterworth in Malaysia. Each exercise was for a month every year. Phil also went to Vietnam for one month as air co-ordination officer on the USS Salisbury Sound. The Salisbury Sound was a Currituck Class Seaplane Tender named for Salisbury Sound, Alaska, a strategically located basin which forms a natural harbour especially suited for seaplane base operations.

Salisbury Sound was capable of supporting two 15 plane squadrons, both in material upkeep and repair and personnel subsistence. Her most striking feature was her large aft deck where two P5 M Marlins could be hoisted aboard and have their engines serviced under cover at the same time. Two enormous cranes, one on her aft deck and one on her superstructure, could lift the planes with ease. While Phil was assigned to it, there were 24 seaplanes moored around it.

Phil went back to the RAAF school of radio instruction for RAAF cadets in Laverton on Port Phillip Bay in 1966. As he approached 30 years of age he had a difficult decision to make. He had the opportunity to remain in the RAAF and try to ascend through the ranks or he could move out of the air force into a civilian aviation career. In 1968 he decided on the latter, joining the Department of Civil Aviation (now Air Services). Following his RAAF experience, he was eligible for an abbreviated training course in Melbourne. Six months of theory was followed by 3 months practical training and 3 months on the job training. So after about 12 months he graduated and became a qualified air traffic controller.

Phil initially worked at the Brisbane control tower, before moving to Coolangatta control tower, then the Mackey tower and finally to Brisbane Centre. His roles included check controller and training annex supervisor, specialising in particular areas of air traffic control. In the 70s there was much less technology involved with only basic radar screens and manual identification of aircraft. Flight progress strips, similar to those used in D Class aerodromes today, were used to keep track of aircraft.

Back in Richmond, the Met Man used to give the morning squadron briefing, and Richmond was usually fogged in during the winter months. He would look out the window and announce with all authority "the sun will burn this off at 10 o'clock. That was precisely what would happen. So come Phil's final check in the Tower at Brisbane Airport, the Check Controller's final question was "Now Phil, what's going to happen with this fog". He says he had no idea, but the words of the Met Man came back to him and he announced with complete authority – "the sun will burn it off at 10 o'clock!", and that was precisely what happened. Written on the documentation for his final check are the words "This graduating ATC displays an above knowledge of local meteorological phenomena".

Given so many years of exposure to the aviation industry Phil had long harboured a desire to learn to fly. Having settled in the Brisbane area he joined the Redcliffe Aero Club in 1983 and started taking lessons. He completed his PPL, Night VFR, variable pitch propeller, retractable undercarriage, and twin engine rating. With this amount of training under his belt Phil was able to take part in the club activities and enjoy recreational aviation while continuing to work as an air traffic controller in Brisbane.

Phil and Bev moved their family to Redcliffe in 1991 and found a house that coincidentally was very handy to the aero club. His level of activity at the club increased as a result, culminating in him obtaining his Command Instrument Rating at the age of 70.

Although Phil has a tendency of being successful in things that he attempts, he has been less successful at retirement. His first retirement attempt was in 1992 at the tender age of 54. Air Services were looking to reduce numbers and offered him the chance to take early retirement. Phil thought that was a great idea and on finishing up at Air Services began to increase his amount of volunteer work in his community, including at the aero club. He also travelled to the US to attend the Sun and Fun International Fly-in and Expo in Florida.

Before he'd reached 56 however, Phil received a phone call from his former employer asking whether he would like to be reemployed, this time as an instructor. Feeling like he could do with a new challenge Phil agreed. He instructed ATC trainees until he reached 61 years of age. During this time he acquired the nick name "the florist". He would tend to "make his own arrangements" and the trainees have to would fit in around his schedule.

On the eve of a new millennium, Phil decided it was high time for his second early retirement. The second one lasted almost 6 years and Phil carried out numerous volunteer jobs at the aero club keeping the aircraft spic and span and doing ferry flights to and from Caloundra. He also moved aircraft around for an air safari travel company, ferrying 172s in and out of Kilcoy.

Retirement was put on hold yet again in 2004, when he was 66. He was approached by Air Services once more. This time they asked him whether he would accept a simulator role of training ATC's. In this role Phil "played" pilot in the ATC simulator, providing the trainees with a "real world" type of experience before they had to deal with actual pilots in real aircraft. This role kept him occupied full time until he retired for the third time in August 2016. Phil can now devote more time to flying and his family.

Over the years the aero club has changed along with its members and employees but the amount of activity is similar to what it was in the 1980s. When Phil started his flying training there were five instructors. Chris Thurecht is now with CASA, Spiros Potamianos now flies A380s for Qantas and Kelly James, who instructed him in Night VFR, went on to be captain on a Dash 8 with Sky Trans. She now works with Virgin in administration. Ian Meredith and George Brown both went on to Sunstate flying Shorts 360's and Dash 8's.

With Spiros Potamianos

First Solo to Gympie

The club owned three Cessna 152s and three 172s in those days. There used to be monthly flying competitions during the 90s and early 2000s. Competitors had to drop flour bombs onto targets from 300ft and carry out spot landings, touching down on a precise spot on the runway. They used to fly out over Bribie Island, throw a roll of toilet paper out the window at 3500ft and then attempt to cut it as many times as possible, preferably with the wing, as the toilet roll descended. With an instructor alongside they would take off at Redcliffe and with the ASI and altimeter covered the instructor would nominate a speed and height to level off at. Typically they'd have to maintain 1000ft on downwind with the altimeter covered up. This was all good supplementary training and held in a congenial, fun atmosphere.

With his background in ATC, and having obtained his instrument rating in recent years after flying VFR for many years Phil is an advocate of IFR training for all. He's keen to see more club members undertake the private instrument training especially now that the private IFR is offered by the club. For cross country travel IFR provides significant advantages over VFR including ongoing ATC coverage with traffic information and the ability to fly through inclement weather to reach a destination. Advances made in GPS systems in recent years enable instrument approaches to be carried our more simply and more accurately than they were in the past using NDBs and VORs. The use of auto pilots makes them even more straightforward. Phil is aware that some pilots may be apprehensive about dealing with ATC while flying IFR, especially if they're used to flying in G Class airspace. However, ATC are there to provide assistance and improve safety levels for all and are generally very supportive of pilots. He believes that once you've started flying IFR you'll wonder why you did anything else.

Phil honed his instrument skills on his home simulator and continues to brush up his skills with Microsoft Flight Simulator, Prepar3D and most recently XPlane 10. The system was updated recently and can now be considered state of the art for a home system. He is happy to show it off to anyone who may be interested in purchasing a similar system.

Phil believes that any career in aviation is rewarding, fun, and develops qualities of leadership, decision making skills, and confidence. Finally Phil says many people say "I've always wanted to learn to fly", but believe they are too old at 50, 60, 70 and beyond. Nothing could be further from the truth, as flying training at the Redcliffe Aero Club is open to all who wish to give it a go. All it takes is patience to master each procedure as the training progresses, after which it will all come together.

Short Final RWY 07 in Prepar3D

He says that anyone reading this article who thinks they've left it too late to learn should put those thoughts aside and come out to the club for an initial trial flight. It's highly likely that as with Phil the flying bug will bite and there'll be no looking back from that point on.

ONE WAY TO CUT THE COST OF FLYING

By Philip Arthur

Experimental aircraft. It's a term that's talked about a lot these days but what exactly does it mean? I decided to talk with the owner/builder of one recently to find out more about them. Alan Carlisle is the proud owner of a new RV14, an experimental aircraft that he and his wife Suzanne assembled over a 30 month period. Why build your own aircraft? Alan says the first reason is that it's a very satisfying challenge that anyone with time and a little bit of interest in machinery and working with their hands can master. And the second reason is because experimental aircraft make flying much more affordable for the private pilot.

Richard VanGrunsven founded Van's Aircraft in 1972. He began by selling plans for the first RVs (from Richard VanGrunsven) and a few parts he manufactured himself from a small shop behind his house in Oregon, USA. Van's Aircraft eventually began producing full aircraft kits and in 2000 the company moved to a small town not far from Portland. At its base at the Aurora State Airport (KUAO), the employee-owned company currently employs over 50 people and keeps them busy manufacturing several hundred complete RV aircraft kits a year. Having started with the single seat RV3 (not sure why it wasn't an RV1) they progressed through a variety of 2 seater versions (tandem and side by side) called RV4, 7, 8 and 9. The RV 10 was the first 4 seater version. This was the model that Ashley Miller built and wrote about in AirChat last year. The RV10 was followed by the two seater RV12 and more recently the two seater RV14 (aerobatic), which apparently has a more upright seating position than earlier versions. As of 1st May 2017, 9,661 RV's had been completed according to the Van's website. Van's brags that on average more than one brand new Vans aircraft takes to the skies for the first time every day of the year.

The Van's concept is for owner/builders to take delivery of the kit in such a way that they can gradually increase the level of complexity as they progress through the build. Typically therefore the tail is the first part to be assembled and you work forward from there, with the engine and instrument panels being installed last.

Alan and Suzanne's RV14 was apparently the 10th RV14 to fly. They placed their order while the model was still in development. It was released in 2012 as a prospective kit, with the empennage only becoming available at that time. As this was the first part to assemble that worked fine.

Initially they received training under Col Crittenden, a local professional aircraft builder. Col worked with them for the first week, teaching them how to rivet, deburr and prepare the various components. Alan says it was quite daunting on day 1 but already after 3 days training with Col he felt they could have managed on their own. They continued after the one week of training, assembling the plane in their garage at home. Suzanne became the expert at riveting while Alan focussed on the prepping and deburring. The proximity to home was critical as it allowed them to work all times of the day, stopping only for meals and sleep. By March 2014 they'd finished the tail section and Alan felt he had a good feel of how to put the frame together.

All up it took Alan and Suzanne two and a half years to build. It could have been completed in 18 months but their progress was delayed waiting for each successive part of the kit to arrive from the US. About ¾ of the work was completed in their garage. By June 2015 they moved into a hangar at Redcliffe where the remainder of the work was carried out.

By September 2016 the RV was ready to fly. At that time they'd used over 15,000 rivets. For every rivet, the skin had to be dimpled to enable to the rivet to sit flush in the skin. This design feature reduces the wind resistance and makes the plane more slippery, and 10 knots faster. However, each rivet hole (which are all predrilled in the factory) must be dimpled and deburred on each side. As with many such jobs 75% of time is spent on preparation and deburring is very labour intensive. With two sheets for each joint and each sheet having two sides that means 4 activities per rivet ie over 60,000 dimpling and deburring activities! But Alan says that once you've done a few days of riveting it becomes second nature and you can do it (almost) in your sleep. The average build time for an RV is apparently 5-7 years. Alan believes that it would have taken them 14 months to build full time, if they worked continuously 6 hours/day for 6 days per week.

Alan is retired, so had the time to invest in the project. However for those of us who can't retire yet or just take leave from our full time job for a year or two there is another option. RV QuickBuild Kits are assembled at a company called Famous Secret (FS) in the Philippines, from parts supplied by Van's. Famous Secret have been assembling Van's QB Kits for more than twenty years and claim to cut the number of hours required to build an RV in half, from about 2000 to 1000 hours. Famous Secret fully assemble the wings, fuel tanks and fuselage which are then shipped back to Oregon for QA checks. Tail assembly is not included in the QB kit as this is the least complicated part to build and is a good part to learn the assembly process on. Alan estimates the tail would take about 3 months to assemble. So the Quickbuild aircraft could be assembled in a further 3 months full time or 6 months part time.

Alan's RV14 has a Hartzell constant speed propeller and a Lycoming IO-390 with 210 hp which allows it to cruise comfortably at 160 knots and climb at more than 1500ft/min at its gross weight of 2050lb (930kg). It has a takeoff distance of 150 metres and a range of about 800 nautical miles on the 190 litre tank. It is certified as Private IFR. Alan elected to install good quality avionics including two Garmin G3X EFIS (Electronic Flight Information Systems). These are 10" and each has an AHRS (Attitude and Heading Reference System). The G3X is designed specifically for experimental/kitplane and light sport panels. It provides full PFD attitude/directional guidance along with electronic engine gauges and terrain/obstacles alerting. Alan installed the optional ADS-B "In" with traffic and weather, ADS-B "Out" transponder, and angle of attack sensor. A Garmin autopilot system is also installed with flight director, indicated air speed hold and straight and level button. A GTN650 GNSS navigation system completes the package. One of Alan's tips for the newbie owner/builder is to definitely seek expert advice with the installation of the avionics. It's too complicated and important to be left to an amateur. An aviation electronics professional should be hired.

The other job that should be left to a professional is the painting. An aviation painter will ensure that the finish is smooth. An auto painter will not be experienced with the details of rivets and the job will be less than satisfactory as a result. Otherwise Alan believes that anyone with an interest in mechanics and reasonable dexterity could undertake the project themselves and finish with a quality aircraft that performs as well if not better than many commercially available options at a third to a half of the cost.

Alan couldn't wait to take me up for a flight so I was soon climbing into the cabin next to him. The interior is very comfortable with plenty of width for two large adults and plenty of headroom. The bubble canopy hinges at the front allowing easy access and access to the front of the instrument panel for maintenance.

As we taxied out to RWY07 Alan briefed me about the flight and warned me about the "RV Grin". Apparently it's common for passengers to be so impressed by the aircraft's power and agility that they break out into a somewhat manic grin while flying. Alan explained the short take off run and how, after rotation and once at a safe take off speed, he likes to climb out steeply.

Sure enough, we accelerated down the runway, lifted off and after accelerating to about 70 knots Alan said "hold on" and pulled back on the stick. And the plane climbed like the proverbial rocket! The RV Grin hit me. We were at 1000 ft in no time and levelled out to head out across the bay to Bribie. At 170 knots we were soon over the Bribie Bridge and Alan started to put the plane through its paces. A couple of snappy steep turns showed off its agility. Then it was my turn. He said, just throw it into a roll and see how easy it is. I had to agree it was extremely responsive and very very different from a Cessna 172 or 182. The RV Grin returned as we turned left and right over central Bribie. Then it was time for a few stalls. Pulling back, pulling back, pulling back until the nose dropped slightly and the descent began. I pushed the nose forward and it recovered. On the final attempt with full flaps there was a slight left wing drop, but otherwise it stayed level through the stalls. A bit of low level flight at 500 ft above the waterways and the islands followed, demonstrating what a delight it is to fly in.

As we approached Beachmere at 500 ft Alan pulled back on the stick and the RV shot back up to 1500 ft. We levelled out and I felt the negative g's as I was momentarily lifted off my seat. Good that there are five point seat belts on the thing!

Entering the circuit was normal apart from the fact that we had to slow down appreciably to stay behind the 172 ahead of us on downwind. Alan flew a wide base and we touched down smoothly and taxied back to the hangar.

In the hangar Alan showed me some of the special equipment he'd bought for the build. All up he estimates the special tools including an air compressor for the rivet gun cost about $5000.

Alan's only regret about the experience is that he ordered the kit before it was really ready for distribution. The piecemeal approach to delivery as various components became available increased the cost. Now all the various components can be ordered in one delivery so the total freight costs would be significantly lower. For this reason Alan recommends that anyone thinking of building an RV should order the complete kit in one order.

Alan said the only legally required quality inspection of an owner built aircraft is at completion, to obtain a Certificate of Airworthiness (C of A), although he recommends that they're carried our more frequently. He had his inspected before closure of all various components, such as ailerons, elevators, rudder and vertical stabiliser, wings and fuselage.

Final inspections must be carried out by an Authorised Person (AP), who is appointed by CASA for the issuing of Certificates of Airworthiness. The Sports Aircraft Association of Australia (SAAA) provides APs who are members of SAAA and operate under the SAAA Procedures Manual. The SAAA endorsed AP provides a service to members on a fixed fee for service basis.

And the costs? Alan estimates the aircraft cost them about A$200,000 in all to build. According to the Van's website the current cost of the kit is:

Empennage with tailcone	US$4,185
Wing	US$7,835
Fuselage	US$9,490
Finishing	US$11,755
Kit Total	US$33,265
Or with QuickBuild	US$45,885
Plus	
IO-390 210HP Engine	Approx US$40k
Propeller	Approx US$8,000

Alan said approximate additional costs were:

Freight	A$7,500
Complete panel with avionics (installed)	A$45,000
Painting	A$15,000
Special tools and compressor	A$5,000
Upholstery (Aviation Leather)	A$3,000
Inspections and certification	A$2,000k

Alan is keen to spread the word on experimental aircraft as he believes they can really make flying much cheaper for private pilots. He maintains you can fly IFR in your own RV14 at 160kts for $100 per hour with annual service costs as low as $150. The number of experimental aircraft hangered at Redcliffe is rising steadily and Alan says there are almost as many as there are certified aircraft. Both Alan and Ashley Miller (who owns the RV10) are club members and are keen to offer assistance to anyone interested in taking up the challenge of building and owning their own experimental aircraft. Alan encourages others to build their own like he did and will happily provide advice on this sort of project. It could make ownership of a brand new aircraft capable of cruising faster than many twin engine aircraft a very affordable reality. As the word gets around about experimental it is fair to assume it will result in more of them taking to the sky more often in the future. Alan and Ashley Miller are planning an "introduction to experimental aircraft" event at RAC on Sunday 4th June. They'll demonstrate each of their RVs and discuss the process they went through to build them and how much fun they are to fly. Those interested in learning more about building a kit aircraft and going for a flight in an RV should contact Alan before May 29th. His email is: alancarlisle@optusnet.com.au and phone 04 0332 3973. More information on the RV14 is available on the Van's website including a "virtual demo flight" found here: https://www.youtube.com/watch?v=p8R-q1vGlio

A TRIP TO 1770

By Philip Arthur

In September 2016 my wife and I flew to The Town of 1770/Agnes Water for a couple of nights. This twin town is the site of Captain James Cook's first port of call in what is known today as Queensland on his voyage of discovery up the east coast of Australia in May 1770. There were just two small settlements here until it started being developed as a tourist hub about 20-30 years ago. At 500km north of Brisbane it used to be quite remote, especially given that it took 4-5 hours to drive the last 60km from the main highway over a rough track. In the mid 90's a sealed road was completed. Since then resorts and accommodation galore have popped up. Fortunately for private pilots, there's a grass airstrip too, located smack bang between the township of Agnes Water and the Town of 1770 and there's a resort literally just across the road from it.

We took off from Redcliffe on a pleasant Sunday afternoon. It happened to be the day of the aeroclub open day so, after spending a few hours at the club in the morning, we managed to taxi away in the ROC (Cessna 182) just after lunch and climb out to the north west. It was about a 90 minute flight via Gympie, and to the west of Bundaberg. I'd decided to fly IFR as there were a few clouds forecast on our way. As it turned out our flight path actually managed to avoid the clouds even though some reasonably heavy rain was falling closer to the coast.

Town of 1770 from the West on Take-off

There's a hill at the southern end of the runway at Agnes Water and it slopes down gently to the north, so normal practice is to land from the north and take off to the north unless there's a strong northerly wind. Guess what? I'd rung up the aerodrome owner ("Woody") before we started and he'd said that although the strip was in good condition there was a strong northerly blowing and we may have to land from the south. As I'd already been there before on a IFR training flight and knew the lay of the land that didn't bother me. I'd just have to be prepared to do a couple of overflies and check it out well before we attempted to land. If it proved too difficult I could divert to Gladstone.

I made an approach call on the Agnes Water frequency when we were 10 miles out and was advised by one of the local pilots that they were landing from the south. He was heading off up the coast so said we'd have the circuit to ourselves. There'd be plenty of room for us to check out the field with a couple of overflies.

Approaching from the south at about 1500ft I advised Brisbane Centre that we were in the circuit of Agnes Water and cancelled the Sarwatch. I then concentrated on the state of the strip, the wind and the surroundings. We did a midfield crosswind join on RWY33 then joined the left downwind, eyeing off the hill to the south of the strip and the houses on its flanks. Turning base and then final I got a feel for how high I'd have to be to clear the hill and how I'd have to drop down to reach the threshold. On this first pass, however, I remained at 500ft and did a overfly to inspect the strip, check the windsock and look for animals or obstacles. It was all clear and the wind was a consistent 10 knots from the north. The strip looked in good condition and I could see a clear path to climb out to the north if we had to abort the landing and go around.

We climbed back up to 1000 ft and turned downwind for the second time. This time I was confident we could land so prepared the aircraft and turned base once again. Passing over the top of the hill we turned final and once we'd cleared the crest dropped down towards the threshold. We touched down softly not too far down the runway and taxied the remaining distance to the tie down area.

Early Morning on RWY 33

We put our landing fee into a secure box mounted within a tree trunk and walked 300m down the bush track and across the road to the "Lagoons at 1770" resort. This is a top spot with amazingly friendly staff and a restaurant that would do any capital city proud. It was a 5 minute walk to the beach that stretches 6km from the Agnes Water town centre in the south to the Joseph Banks Conservation Park at the northern tip of the peninsula on which The Town of 1770 is located.

We spent two nights at Lagoons at 1770, spending the Monday on and around the beach, exploring Agnes Water and 1770 and swimming in the pool. There are bikes for hire and it's easy to get around by taxi if you want to be less energetic.

On day 3 it was time to head back to Redcliffe. The weather was fine and clear with no cloud forecast so I decided on a VFR flight back along the coast. We checked out at about 9am and by 10am were rolling down RWY33 to the north (with a slight tail wind). One of the local pilots told us over the radio that they'd just seen a number of whales breaching about 25 km north at the northern end of Bustard Bay so we headed up that way to look for ourselves. We weren't as lucky. We couldn't see any whales and after doing a couple of orbits we headed back south, passing over 1770 and Agnes Water towards Bargara.

Agnes Water and Airstrip from the North

The weather remained kind as we continued down the coast to Hervey Bay. As we passed to the west of the airport we saw a Virgin jet taxiing to the runway. He called up and asked our intentions. I mentioned we were heading direct to Rainbow Beach and he said "Where is Rainbow Beach". Once I explained I meant the southern tip of Fraser Island he understood and said he'd climb out to the east to avoid us.

The Cooloola Coast was full of holiday makers with 4WDs on the beach. There must have been some good fishing spots down there. As we passed Noosa we called up Sunshine Coast Tower and got a clearance through the D Class airspace and then set course direct to Redcliffe via Bribie Island.

Inskip Point (left) and Fraser Island (right)

It was great trip and a perfect example of the sort of weekend or mid week getaway that a PPL allows you to do. The proximity of a number of resorts to the airstrip makes it very convenient. A taxi can be used to reach accommodation in central 1770 or Agnes Water. Although the strip can be a bit tricky in a northerly wind it's not anything that anyone who's landed at Dunwich wouldn't be able to handle although they may need to go around once or twice to get a feel for it. Under normal conditions you'd land from the north over some mud flats. The $50 landing fee may seem steep but it's used to maintain it and Woody provides a very friendly service and advice on the local area. And there's plenty of room to park and tie down. The Club has scheduled a Flyaway to 1770/Agnes Water on 7-8th October so I thoroughly recommend you consider taking part.

4WDs on the Cooloola Coast

THE MULTI CREW ENVIRONMENT

By Brendan Power

Hello, my name is Brendan Power and for those who don't know me, I've enjoyed a long and happy association with the Redcliffe Aero Club. My first real contact with RAC was whilst working for another operator at the aerodrome from 1995 and then from 1999 when I was taken on by the club as an instructor. I continued as a full-time employee until 2007 and then again for a period in 2015. During the times described I served for some periods (totalling around 3 years), as the club CFI.

Needless to say, I share the passion that unites us all – a fascination for anything that flies! Who amongst us is not compelled by some irresistible force to look skyward at the merest sound of an aircraft of any kind passing overhead? My neighbours have learned to associate the sound of any low flying aircraft with the sound of my front screen door slamming as I bolt outside to have a look at whatever it is. Obsession? – Yes! – From the earliest age that I can remember.

During my professional aviation career, I've spent a significant amount of time instructing and flying charters in piston engine aeroplanes such as those operated by RAC and with which we are all familiar. I have never lost the feeling of enjoyment afforded by this style of aviation, nor the passion for teaching and will take the opportunity whenever I can to go flying with RAC. Over the past decade though I have been employed flying turboprop aircraft (initially Saabs and then Dash 8s) on regional airline routes. The work has involved a mixture of regular public transport and charter operations (mostly to fixed schedules).

I fly Dash 8 aeroplanes for "Skytrans". We not only pride ourselves in providing a high quality charter service to regular clients, but are also a major force particularly in Northern Queensland, making vital and dependable connections between small communities and larger centres. Some of these places are known to many people as just a place name alongside a dot on the map. Places like Coen, Bamaga, Weipa, and Horn Island etc. One could say that we join the dots with our Dashes. (If one were a fan of the Dad Joke genre that is!)

The experience of leaving and returning to my home in the city, whilst spending my working day in the more far flung regions of our country is one which I find incredibly rewarding. It is a lifestyle which combines the stimulation and variety of working alongside people who live in the country, the bush and the outback with the love of flying in such territory.

So, what are the differences between flying a C172 or Partenavia and a Saab or a Dash 8?

Unsurprisingly, the mechanics of flying these different types of propeller driven aeroplanes is very similar (although I can't speak about flying jets). Even though operating weights may be greater, or handling speeds different and with some extra systems (such as pressurisation) thrown in, the basic skills we apply in operating a C172 are the same skills we adapt to flying the Dash 8. In my transition to the regional airline (turboprop) environment, challenges included learning all of the associated information and coming to terms with a new organisational structure. Tasks that I had dealt with myself as a pilot were now handled by dedicated departmental staff. Most important of all, though, was learning to operate in a multi-crew environment.

Although it doesn't sound that significant, once one has already achieved what it takes to successfully fly an aeroplane as the sole pilot, it does indeed require learning a new philosophy in order to truly reap the extra rewards of safety and efficiency offered by having multiple members of an operating crew. This is in many ways similar to moving from a single engine to a multi engine aeroplane. There are significant benefits to be gained, as long as additional learning occurs and the knowledge is applied.

So why do we fly with multiple crew members?

The crew on board the aircraft consists of pilots and cabin crew. On the ground we have other crew members such as engineers, ramp staff, check-in staff and general operations staff. Each person plays an important role by ensuring that their own area of specialty is covered safely and efficiently and remains compliant with a myriad of safety regulations. Not only are these crew members focusing on compliance within their own areas but, in a well-run operation, will develop a feel for what to expect as either normal or abnormal operating practice when interacting with team members from another area. For example, a check-in person will learn to anticipate what is on average a reasonable expectation of the maximum payload available on the day. When the weather is forecast to be bad, operations staff can expect larger quantities of fuel to be ordered (with subsequent reduction in payload). If something doesn't seem to fit the expected pattern, these people are taught to speak up and seek confirmation.

But why two pilots?

When I look back to my first experience of operating in a multi crew environment, I realize that I had to unlearn some well entrenched thoughts and practices. These stemmed somewhat from the normally held concept that an aircraft has "A" pilot. i.e. one person who is capable and responsible for doing EVERYTHING connected to flying it. The initial impression is that when a second pilot is carried, this is only to add a redundancy measure to guard against the incapacitation of "THE" pilot. Certainly in earlier times, (including bomber operations in WWII) this was the original concept, with the philosophy holding on well into the jet age. Even today, when we see reports in some media, relating to accidents or incidents involving large or transport category aircraft, reference is often made to "THE" pilot. I'm sure that if we think about the relatively recent successful ditching of an Airbus into the Hudson River in New York, the singular name of "Sully" springs to mind.

Within the industry though, the reality has been very different and evolving for the better for many decades. This process has been pushed along by the investigation of many accidents and incidents which had their source (either wholly or partly) in a reliance on ONE person alone (with all of their human failings) to provide meaningful input into all of the decisions vital to the safety of the flight. An early and very prominent example of such an accident was the collision between the Pan Am and KLM 747s at Teneriffe in the Canary Islands in 1977. The reality is, that even though both pilots are trained to be capable of flying the aircraft alone and bringing the flight to a safe conclusion should either of them become incapacitated, single pilot operations are definitely NOT "Ops. Normal"! Transport category aircraft are designed to be operated by a minimum of two pilots working as a team. The flight manual will stipulate that the minimum flight crew is one pilot and one co-pilot. To have a fully qualified person in a pilot's seat simply as a standby contingency, would in fact be a terrible waste of a resource that should be used to enhance the safety and efficiency of any operation at all times. Modern multi crew operations make full use of all crew members at all stages of the flight. The methodology to be used will be stated in the company's operations and procedures manual.

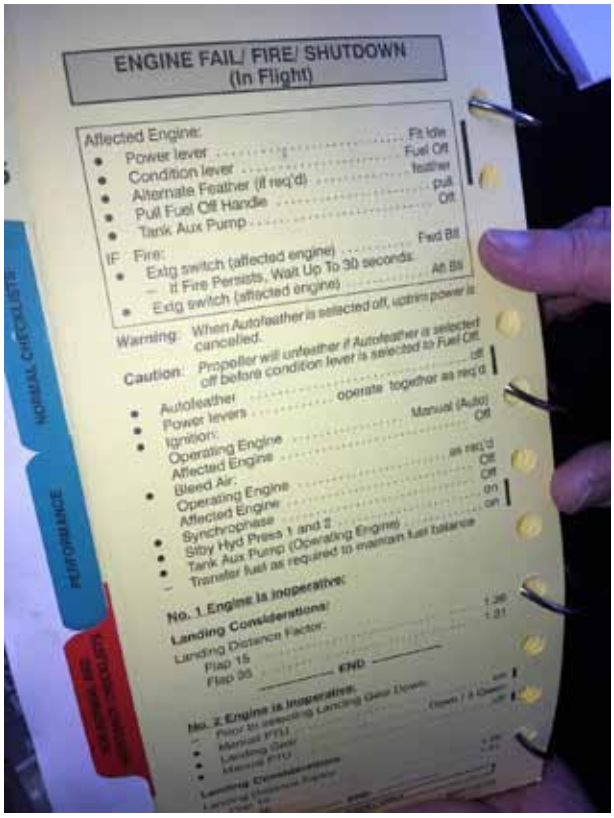
For this process to work effectively there must still be a Pilot in Command (Captain). It is also essential that there is a very well considered process in place to ensure that each person knows exactly who is responsible for doing what at any particular time. These processes are contained within operating manuals (which must be known intimately by all crew members), and backed up by checklists. The manuals cover both normal and non-normal (emergency) procedures. The procedures described fall under the general title of "Standard Operating Procedures" (SOPs) and are the greatest friend to any pilot operating in a multi crew environment. I have on many occasions flown for the first time with another pilot from within the company, but because of SOPs the result has been a seamlessly successful operation from beginning to end. Even though we started the flight as strangers and on occasions had to deal with trying circumstances (such as severe weather conditions) along the way, the SOPs meant that we each knew not only our own tasks, but had an expectation of the other pilot's actions too. It's just like flying with an old friend. Likewise, I've been rostered for check exercises in the simulator and paired with a pilot with whom I've never flown. Once again adherence to the SOPs has proven to be the oil that keeps things running smoothly through a whole range of practice emergencies.

The multi crew concept requires a small shift in general etiquette with which I (as have many others) struggled initially. Firstly, even though I need to be capable of carrying out all of the tasks necessary to operate the aircraft, there is definitely no need for me to have to PROVE that fact under normal circumstances. Just because one is capable of reaching over and selecting a new radio frequency is not a reason to do it. Without a proper understanding of how SOPs are designed to work, one could think that doing someone else's job is perhaps "being helpful" or saving the other pilot some bother. It does in fact though, send a message (which may be perceived as rudeness), which says that maybe they're not up to the task or as "ahead of the game" as you are. It also introduces completely unnecessary confusion, which can lead to vital tasks being missed due to the altered expectations as to who is doing what.

In a properly operating multi crew environment, we do our own job and use the rest of our brain space to monitor the tasks of our counterpart. This way we have two brains on the job. Surely a much safer and more efficient way to fly! If someone misses something, their opposite number will alert them to it verbally ("Call" it). No offense is given and none taken – this is a normal part of operating in the environment. We all make calls and "get called" occasionally if something is omitted. It's amazing how this practice results in a far less "busy" cockpit which allows us all to remain so much more situationally aware and "ahead of the aircraft".

The use of checklists

Another essential ingredient for flying a multi-crew aircraft is the correct use of checklists. Although there are some variations to this rule, a checklist is generally something which is consulted at the end of a preparation process before moving on to a new phase. In other words, it is not a "To Do" list but a means of checking that everything essential has been carried out. This is best achieved by firstly carrying out a memorised "Scan" or "Flow" with often the cockpit layout providing a logical sequence. After the flow is complete, a checklist is consulted. The checklist questions (interrogates) a list of items or actions and allows for an answer (response) to each interrogation.



A good example of this is say, conducting the "Pre Take off Checklist", when as part of the "flow" a particular flap setting has been selected. In the case of a C172 for example, on reaching "Wing Flaps" on the checklist, (the interrogation) the response would then be "0 degrees" if a normal take off has been planned, or "10 degrees" if a maximum performance take off is the intention.

In a multi crew environment, the checklist is always carried out by both pilots. One reads the interrogation and the other gives the appropriate response. On several critical items, both pilots will provide a response in turn, to make sure that they both agree (e.g. the fuel quantity figure).

This concept is one that anyone operating as a sole pilot can also employ to their benefit. After completing the tasks in your flow (and upon which the applicable checklist is based), read the checklist aloud to yourself and imagine that the interrogation has been provided by another person (the writer of the list). You, the pilot make a fresh consideration of the item under question and provide a verbal response. e.g. "Trim?' ---- "Set for take-off!"

In conclusion, the proper use of checklists and adopting SOPs is a way in which the obvious benefits of operating in a multi crew environment can be brought to a large degree to single pilot operations. By strictly adhering to what you know to be established and safe practice at all stages, from planning the flight onwards, and by rigorously applying the correct checklists throughout, the process itself becomes your other crewmember. It will enhance your expectations about what you should be doing (and what should happen next) as well as giving a means to regularly "step outside yourself" to check on your own actions. For those who may be anticipating a move across to multi crew operations, it is also a way of developing a mindset that will easily adapt to the change.

Happy flying to you all!

INSTRUCTOR INTRO

Mark McCann is the newest instructor at the Club. He is currently employed as a casual grade three instructor.

Mark's path into aviation began seven years ago here in Redcliffe, where he had his first introductory flight. Shortly after that, he began studying at Griffith University where he graduated with a Bachelor of Aviation, and a Graduate Diploma of Flight Management. Mark completed his flight training at Archerfield Airport, achieving his commercial licence and MECIR in 2014.

After graduating in early 2015, he worked for a year and a half in a warehousing role before making a move to the north side of Brisbane. He then completed a flight instructor rating here at RAC.

Mark is keen to help students achieve their flying goals. Please say Hi to Mark next time you see him at the club.

NATIONALLY RECOGNISED TRAINING

VET FEE-HELP

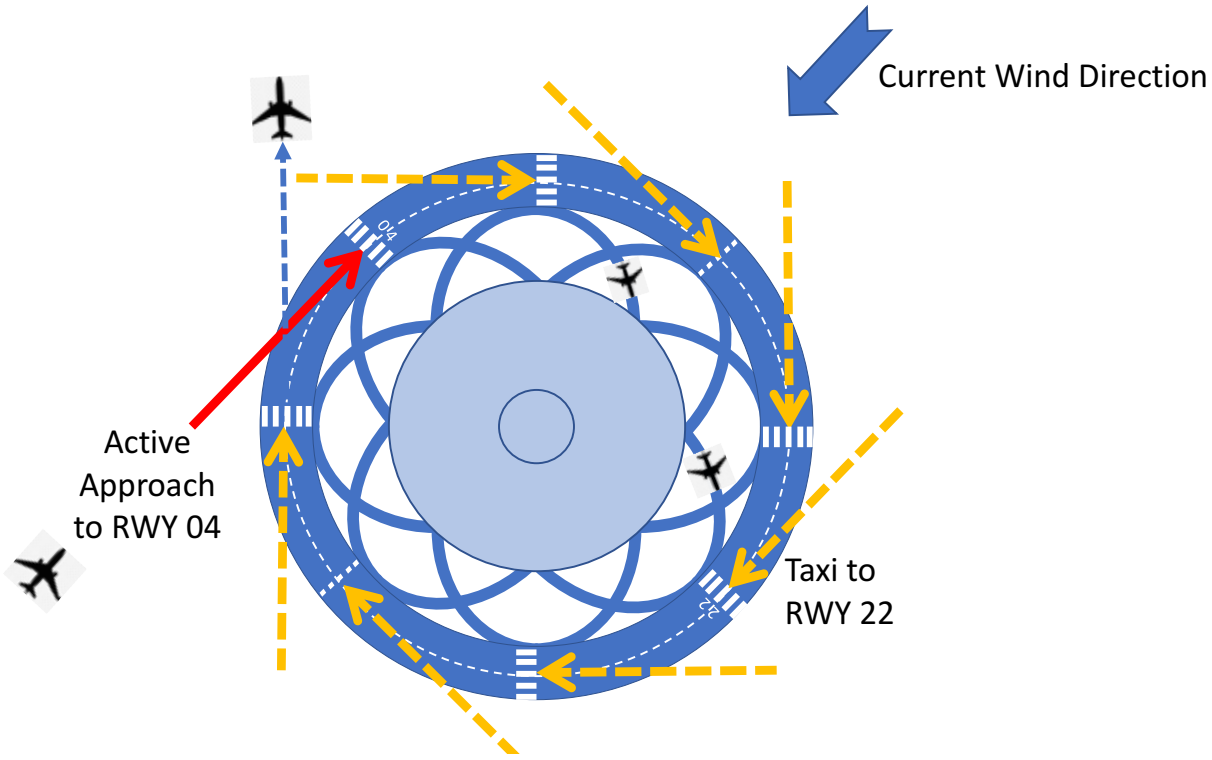
THE ANSWER TO CROSSWING LANDINGS?

Although we may relish the challenge of landing in a crosswind at Redcliffe, practising our crabbing combined with a quick bit of rudder to align with the runway and aileron into the wind just prior to touchdown, cross wind landings are the bane of many a pilot. The number and variety of YouTube videos of cross wind landings good and bad is a demonstration of the interest in this high level piloting skill. As a result there have been many attempts over decades to alleviate the problem of landing in a crosswind. One of the more obscure ideas to have surfaced in the field of aviation is the proposal for circular runways, as depicted on a BBC "Think Again" film.

The idea is that by building a runway that is circular, it will be possible to service more aircraft movements in a given footprint while better coping with changing wind direction and also distributing the noise pollution from landing and departing aircraft over a wider area above major population centres. The proposal from Holland would see an airport like London's Heathrow with two parallel runways replaced by one circular strip with a diameter of at least 3.5 km. The circumference of such a circular runway would be more than 11km, potentially allowing three aircraft to land or take off simultaneously in still conditions. The runway would be banked like a speedway to allow aircraft to cope with the centrifugal forces that would arise from a circular track over the ground.

With stronger wind conditions, it should be possible to have one aircraft landing and one departing simultaneously. Depending on the wind direction at the time, air traffic control would instruct the pilots to select one of say 8 possible ILS approaches at 45 degree intervals to direct the aircraft in on final approach. With our example below, with the wind from the north east, they would approach and land on runway 04. Once they touched down the wind direction would no longer be critical and they could decelerate and peel off onto taxiways leading to the apron and terminal complex in the hub.

For take off, the main thing would be to have a head wind just as you rotate, to provide maximum lift for a given ground speed. So as one plane touches down on 04 in our example, a second aircraft could be starting to accelerate on RWY 22, with the aim of rotating before it reaches the 04 threshold. This would require a bit of retraining for the air traffic controllers. If they keep a check on the directions of arriving and departing aircraft and avoid conflicting flight paths it may not matter if the second aircraft rotates prior to reaching the 04 threshold.



So, is this a serious contender for future airport designs? Check out the video and decide for yourself.

http://www.bbc.com/news/magazine-39284294

WHO IS THIS?

This is former member and employee of the club pictured after taking a Patanavia (IYC) to Lord Howe Island for a day. He now leads the training department for a commercial airline. Do you know who he is, how he became involved in flying and how his career progressed after leaving the club? Find out in the next AirChat.

Beechcraft | Cessna | Hawker

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Please contact us for further information and 'factory end of financial year pricing' on these demonstrator aircraft, including management of change to VH register

CESSNA TTx 240

Exterior Apex Radiant Red Pearl Minor
Interior Stealth Interior
Systems TKS FIKI System
Avionics Garmin G2000 with ESP
Garmin G2000 with SVT
Jeppeson Chart View
XM Weather
Garmin TAS
TAWS-B

CESSNA Skylane 182

Exterior
Elec Red Pearl

Wheel Fairing
Stabilizer Boots

Interior
Leather Seats
Systems
95 Amp Alternator
Avionics
G1000 with TAS
Garmin Synthetic Vision Technology (SVT)
Garmin ADS-B Out
Jeppesen Chartview

CESSNA Skylane 182

Exterior
Medium Concorde Blue Pearl

Wheel Fairing
Stabilizer Boots
Interior
Luxor II Leather Seats
Systems
95 Amp Alternator
Avionics
G1000 with ADF,DME & TAS
Garmin Synthetic Vision Technology (SVT)
Garmin ADS-B Out
Jeppesen Chartview