BRISBANE VALLEY FLYER

December 2023

Watts Bridge Memorial Airfield, Cressbrook-Caboonbah Road, Toogoolawah, Q'ld 4313.

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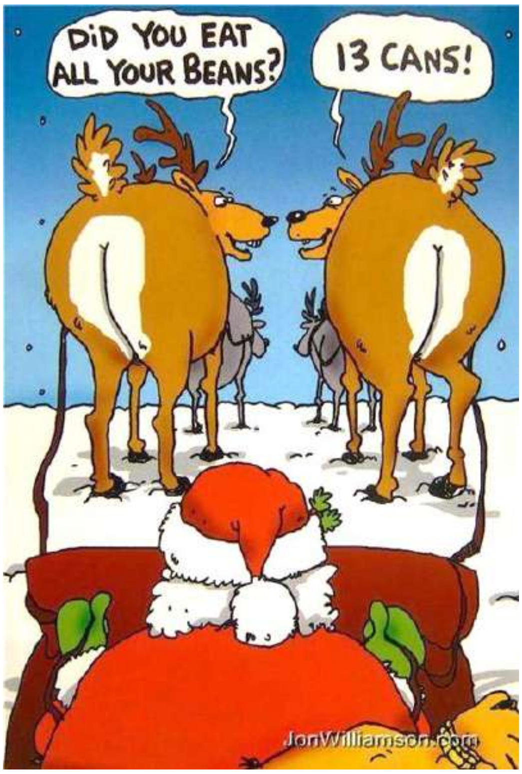

Emissions targets affect everyone!

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Our website - **bvsav.com.au**

Greetings members,

Well looks like we made through another year. At least this one was better than the last few.

We celebrate our club Christmas party a week or so ago at the Grand Hotel in Esk. It was a very good day with 17 members and their family attending. We all had a good time catching up with each other for a nice lunch. See some photos overleaf.

This was our last meeting for this year and our next will be 2 February 2024

The BVSAC board would like to wish you all a Merry Christmas and a Happy New Year, please stay safe and share some time with your family and friends.

Hope to see you all next year.

Best wishes

Peter Ratcliffe
President BVSAC

Brisbane Valley Flyer -

Images from the BVSAC Christmas Lunch held at the Grand Hotel in Esk.

Ice!

By Rob Knight

As an Aero Club CFI, I had my employment duties to carry-out, plus ensure that I logged enough recent experience for my various ratings. The VFR items were fine, my normal instructing and examining duties provided an ample sufficiency to cover Reg-76 checks/BFRs etc, but from time to time my instrument recent experience needed topping up. A friend, working for NZCAA, who also held an appropriate instructor/flight examiner ticket, was in the same predicament, so we periodically grabbed an aircraft and disappeared together for a day. As instructors, and able to fly left or right seat, it was both easy and economical to keep our instrument ratings current – we didn't even need to change sides.

On one particular flight, we departed Wellington in ZK-DSK, after filing an IFR plan for an approach into Wanganui, divert to RNZAF Ohakea for a practice PAR[1] approach, then on to Nelson Airport in the South Island for a pit-stop and late lunch. After Nelson, it was back to Wellington to end the day. The forecasts were good; cloud – plenty of it, generally stratiform, with bases around 2500 feet AMSL, light winds at altitude (an IFR PA28-151 needs all the light winds it can get), and a high freezing level, given as 11,000 feet. With no de-icing gear on the 151, such a high freezing level was ideal as the minimum safe altitude (MSA) for the route Nelson – Brothers NDB – Wellington was, as I recall, around 5500 feet so we had plenty of upper elbow room for our unsophisticated aircraft.

Departure from Wellington was straight forward, as were the flight sectors to Wanganui and back to Ohakea. After departing Ohakea and on climb, we requested and received a weather update which projected no significant changes so we relaxed and settled back, looking forward to a "milk-run" to Nelson and back to Wellington. True to form, thus far, our arrival at Nelson held no surprises and, feeling sated after a cuppa, we ultimately departed the airport for the Brothers NDB[2] waypoint, before heading straight home to NZWN.

As pilot flying for this sector, Nelson – TOC[3] - Brothers NDB, I levelled out at TOC (9000 feet), setting cruise RPM, leaning the mixture, and trimming the elevator and rudder (we were not equipped with auto-pilot). Temps and pressures were all greens. I tightened the friction lever locking the throttle and mixture controls. We sat, relaxed, with little talk – it's too intense when hand flying in IMC. Inside the heavy cloud it was quite dark but that was no issue as my attention was taken up on the gauges. After about 20 minutes, I needed to add throttle to maintain RPM and height. I did a quick carb ice check and re-set the mixture. But surprisingly soon after, I needed to add even more throttle to return the RPM to the pre-set value whilst maintaining height. I pressed the lever further forward. We were close to full throttle height anyway so there was little limited forward movement available. We were maintaining height, but if the airspeed continued to decrease, I would have to sacrifice height to maintain speed.

The engine was running smoothly - no cause there for concern, but something was dragging us back. I re-scanned the engine panel - checked the CHTs – all OK. I brought the unusual throttle placement position to my colleague's attention. He had been watching, and looked up and across at me with concern as I added a stroke to the trim wheel to remove a touch of yoke pressure. The falling ASI reading now indicated close to 65 knots; 30 knots lower than our planned TAS. He took a torch and looked along the leading edge of his right wing. After a blunt expletive, he passed me the torch and said, "Have a look, I have control".

I looked along the leading edge and the top surface of the port wing. In the reflected torch light, much of the leading edge and back a bit was covered by a glittering layer of sparkling diamonds. We

[1] A precision, ATC controlled approach, using ATC instructions instead of on-board radio-nav equipment.

[2] NDB – Non-Directional Beacon – a radio navigational aid.

[3] TOC – Top of climb.

were looking at rime ice. The aircraft skin was below freezing and water droplets in the cloud were freezing onto the skin and trapping air, leaving a rough, drag creating surface which was stealing our airspeed, changing out aerofoil shape, and adding to our weight. But our falling airspeed was only the beginning. If ice formed on the propeller, too, our problems would grow exponentially and we'd quickly lose the ability to maintain flight. As I have already said, we had no de-icing gear, for wings or propeller, and so had no means of removing any ice once formed. A descent into the heaving freezing waters of Cook Strait was not a pleasant thought. I turned on the fuel pump and checked I was still on the fullest tank. Fuel pressure was not an issue, but turning it on meant I had less to worry about. The fuel gauges indicated lower than I hoped, but this was a natural reflection. I guesstimated that we had about an hour and thirty minutes in our present state before we'd be into our reserves. In IMC and looking at going into reserves is a worry on top of other worries.

We immediately called Wellington Area Control and advised them of our predicament, requesting urgently both a weather update and a descent clearance, hopefully to MSA and into warmer air. They returned with new weather giving a revised freezing level of **4000 feet**, *bloody hell - a drop from 11000 to 4000 feet in ninety minutes – what is happening*. This was vastly below our current 9000-foot altitude. To be that far above the actual freezing level explained why the ice had formed so quickly – over only about ten minutes.

Wellington Area advised that they were unable to give us a descent to MSA unless we declared an emergency – blocking the way was an RNZAF F27 Friendship engaged in holding patten practice with one engine out, at MSA, at the Brothers NDB, and adding that they were planned to be there for about another twenty minutes. The Brothers are a group of islands in Cook Strait on which an NDB beacon is placed for radio navigation. But we were offered an immediate decent to not below 7000 and maintain track for the Brothers NDB. I quickly weighted up the several miles-high mountain of paperwork and explanations that would inevitably be demanded and decided to hold the big guns. I accepted their offer- at least we had started on the way down.

7000 feet was still 3000 feet above the new freezing level, but it should be a few degrees warmer and, hopefully, slow the ice growth. Leaving the throttle where it was, I went to full rich mixture and gently lowered the nose, easing into a shallow dive. I wanted that engine warm, and the heat source for the carburettor heat air alive. Even so, I was anxious about our fuel consumption, our burn rate at full throttle would be around three times the planned consumption at cruise RPM. I was too busy to do any serious calcs so I got my colleague to do them. A few minutes later, after a more thorough check, we decided we likely had just under an hour flight time remaining (ex reserves), so gas was not quite an urgent consideration - yet.

Levelled at 7000, I got a hairsbreadth under 60 knots on the ASI, way too slow AND only achieved with full throttle still applied. I re-leaned the mixture for the lower altitude. The OAT[4] gauge was indicating minus 14°C, too cold to anticipate any lessening of the problems although I wasn't actually sure of the value of this because we had no electric heating element in the temperature probe, and I had no idea as to how accurate it might be if it, too, was frozen. Thank God the winds were light - even so - our headwind component at 7000 feet was a good 20 knots as the wind in that area experiences a venturi effect through Cook Strait. From the DME[5] readings we got a ground speed of 40 knots and a distance to intercept the ILS at Wellington of 38 nm. The values gave us a remaining run-time of almost exactly an hour – how long is eternity? This brought the issue of our high fuel burn number back into the high-light - but I had to put it to the back of my mind for now, first I still had to keep flying for an hour before I got there and it became real. I couldn't throttle back.

Waiting for the ADF[6] needle to swing 180° and indicate our crossing the Brothers NDB exercised patience. I was almost bending the throttle lever, subconsciously seeking more power. We both

[4] OAT – Outside Air Temperature.
[5] DME – Radio distance measuring equipment.
[6] ADF – Automatic Direction Finder – tuned into an NDB frequency to give bearing to that NDB.

checked our wings again and agreed there seemed no change to the ice. The radio broke in and advised us that the RNZAF F27 had heard our transmissions and had called clear of the Brothers and was tracking for Woodbourne, their base. Area cleared us, on crossing the Brothers, down to not below 5500 feet. I asked if they had any cloud base reports for the Cook Strait area and they returned a PIREP[7] giving 1800 feet for a general cloud-break. Before I had even acknowledged their call, I was in the descent towards 5500 feet in the fervent anticipation of crossing the beacon – all high ground except the island itself was behind us, its maximum elevation was only about two hundred feet AMSL so we were effectively over the sea. I steadied the aircraft, re-trimmed, and felt the first easing of my tension. We were still in trouble, but now we were headed into a lower altitude air, still above the freezing level but, surely, we could expect some warming and, maybe, a ceasing of further ice development. A check on the wings, though, shown the same Santa's-sparkling-scene of glistening be-jewelled white along the front quarter of the span.

Still in solid, dark, IMC, I levelled at 5500. Eons later, the ADF needle swung and pointed towards the tail – we had crossed the beacon. I advised Area control, and requested a radar vectored descent into VMC, then to cancel IFR and proceed to Wellington under VFR. This was not a normal procedure but, over Cook Strait there were no obstacles, However, we still hadn't declared an emergency so they declined. I checked our ground speed and gave ATC an updated guestimate time of intercept for the ILS for runway 34, we were not planning on wasting any time in getting down and landed.

Twenty minutes later and about fifteen miles further on, the airspeed had not fallen further: in the warmer air the ice accretion appeared to have ceased, or at least slowed down markedly. The ASI had now settled about a needle width under 60 knots. My colleague did another DME calculation and confirmed my ETA at intercept as being about 33 minutes ahead. While we sat and waited for the remaining miles to pass, the sky lightened and then darkened again, signs of a possible break in the cloud solidity. Suddenly the cockpit stayed light. My colleague exclaimed that we were in a hole. I looked up from the instrument panel and could see the cloud on the other side of a wide gap. Looking down I could the deep grey-green rolling swells of the Strait, and the edge of the cloud base was only about 1500 feet below us. I rolled left……

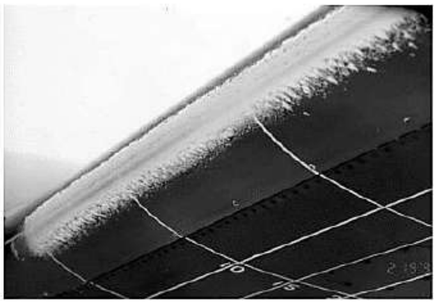
I advised Area that we were now in VMC, in a cloud break, and requested immediate cancel IFR and continue VFR. They acknowledged the change and told us to call Wellington Tower for onward clearances and vectoring. I changed and reported, and Wellington ATC passed us the local weather, a request to report at "Red Rocks", a VFR reporting point close to Island Bay, a suburb of Wellington on the south coast, and reset the altimeter.

Our relief was boundless. Without the concentration required to operate in IMC in an impaired aircraft, it was almost pleasurable to see the low-reading ASI and feel the sluggish handling of the aircraft. Almost!

As directed, I called abeam Red Rocks, level at 1800 feet, and was immediately cleared to join left base for 34, nil approach traffic. The nose went down again and I left 1800 for 1000 feet. With the ice glistening even brighter in the sunlight, and only a general idea of what effects it might have on our aerodynamics, as soon as we were close enough, I set up 80 knots to ensure I had airspeed to flare and called left base. It was acknowledged and I called again turning finals about a half mile out. We were cleared to land. What a beautiful voice that controller had!

[7] PIREP = Pilot Report.

With more than 2000 metres of grooved bitumen available, I left the flaps alone. With the added drag from the rough ice surface, the descent angle was quite steep, in spite of the power I was still holding. We crossed the piano keys beside Lyall Bay at the southern end of the runway. The runway grew wider and I started the flare.



Light rime ice on a DH Twin Otter wing.

We fell onto the runway, rolling very fast. That, plus the extra weight of the ice, made braking noticeably less effective. I had been harbouring concerns about the brakes, maybe they were iced up, too, but they functioned perfectly and, after burning up about four times as much runway as usual, we taxied clear and wandered along the taxiways to the Aero Club to park in front of the hangar.

It seemed an anti-climax, with everything appearing in slow motion as we crawled out through the door of the Cherokee. In the clubrooms, I opened the counter-flap and walked behind to enter the flight details and it seemed almost other-worldly. I filled in the flight record and, in the column marked, “Remarks”, for the last sector, recorded – “Ice”. My colleague asked if I wanted a coffee? No thank you, I didn’t. Neither did he!

The paperwork completed, we both walked back out to the aircraft to have a look at the wings from the outside. That ice - it certainly was rough. The text books advise the rime ice is brittle and breaks away easily. But ours was different. Perhaps it was mixed with some translucent rime but whatever - it was very difficult to remove: stuck absolutely solid onto the metal skins. The only way to remove it would be to let it melt off. Its thickness varied, from a maximum of about 25mm in a few places inboard, to around 6 – 8 mm. I unrolled the aircraft washing hose and began sloshing water over the ice.

The extent of the ice patches covered each wing on the both upper and lower surfaces, running from the leading-edge curve to about 20% back. It extended the whole leading-edge span, from the gusset at the root to the tip fairings. We could have ended a drought with the melt. It took so long to clear that we had to get help from the members. In the end, we left and went home, the members finished the job.

DSK, 1987, back on the line in front of the Wellington Aero Club (background) after being de-iced.

I never got an explanation from the MET Service as to how the freezing level went into free-fall and nearly caught us. They just looked uncomfortable and said an inquiry was underway and that I’d get a report; yeah, right! My arguments that other pilots must have reported it were met with the Civil Service standard cone of silence.

My colleague left NZCAA for airline pilot employment outside New Zealand, and our paths have not since crossed. I have wondered if he ever looks back on that ninety-minute period when, through no fault of our own, we lost the surety that we’d be able to complete our flight in the manner in which we had expected. I know I have!

Happy flying

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The Davis DA-2A Home-Built.

By Bud Davisson Published in Air progress, May 1973

The strange little V-tailed Davis DA-2A is nothing new on the homebuilt scene. It's been flitting back and forth at fly-ins for six or seven years now. Though it's not disliked, it somehow manages to go relatively unnoticed in a world of super-exotic airplanes. The Davis isn't as fast as a Thorp, it won't lomcevak with a Pitts, and next to a Midget Mustang it looks like a packing crate. Sleeker, faster, sexier backyard bug-smashers are the eye-catchers, but in a contest for the most underrated homebuilt, the Davis DA-2A should be the winner.

The Davis DA-2A was the first homebuilt I ever flew. I've flown them off and on since then and I'm still convinced that they are one of the most overlooked designs out there. With a A-65, they are good and with a C-85/90 or 0-200 they are sensational. In this day where so much is being spent on speed, there's something to be said for a super easy to build airplane that cruises at 125-130 mph on 5 gallons an hour.

While half the world sighs over the BD-5, and Pitts smoke obscures anything that won't go straight up, the Davis stands by itself and offers something called practicality. Here is an airplane that can carry two adults and a child at Cherokee 140 speeds with only half the horsepower. While many home-builts have a reputation for demanding more piloting savvy than a Sunday pilot can muster, the Davis handles about like a Cherokee with a thyroid problem. It's actually easier to fly than a Cherokee. The BD-5's compound curves may provoke sighs from its admirers, but the Davis stands in the wings and reminds us that nothing is simpler to build from scratch than flat skins and square corners.

I feel guilty that I haven't jumped to the Davis' aid before. The first time I saw the Davis was in Norman, Oklahoma, where I was nursing a sick Cessna 195 back to health. One day I stepped around the usual pool of oil under my airplane's nose, and, to and behold, nestled under one wing was the cutest, most angular aluminium airplane I had ever seen. Leeon Davis had decided to tie his newly finished DA-2 next door.

Davis was an experimental metal worker at Aero Commander's prototype facility, and since he wanted an airplane, but didn't want to sell his wife and kids to get one, he decided to build his own. He wanted to make it an easy airplane to duplicate, so he had to use his experience to simplify rather than complicate. He drew up plans for the simplest metal shape that would enclose two people and baggage, use a Clark Y aerofoil and get lots of lift out of a tiny package.

The Davis fuselage is a box with the cockpit section framed by small, square steel tubing. All formers, frames and other skeletal parts are short pieces bent up on a brake, then riveted together. A form block isn't needed. A fuselage normally has complicated fittings and reinforcements to mount the wings, but the Davis doesn't. The spar runs through the middle, and the fuselage sits on it; the two are joined by simple flat sheet stiffeners.

The swept-back main gear is steel tubing, a la Steve Wittman, and the go-cart-wheel nose gear is a cross between a vocational shop project and a Mooney. The nose roller is mounted on the end of a piece of tubing that telescopes into another longer piece. The bigger tube is filled with rubber doughnuts that act as shock absorbers. No air, no oil, no springs. Simplicity.

The wings are as simple as the gear. Forming ribs, flanging lightening holes and getting rid of distortion are the kinds of tasks that discourage would-be homebuilders, but Leeon has the rib problem knocked. He uses normal sandwich-type form blocks for rib forming but rather than trying to stretch the metal around the corner, he beats it over with a plastic hammer. Then he gets rid of the distortion-causing excess by pounding the flanges into flutes filed in the form blocks. Result: perfectly straight ribs every time.

I don't know how long it took Leeon to make his butterfly tail work, but the final solution was incredibly simple. The mixing unit that gives elevator and rudder motions to the two surfaces consists of a couple of U-shaped steel pieces nested inside each other, gimbled so that rudder cables work one and elevators the other. Works like a charm.

There are many ways to find out how an airplane flies, and I lucked out with the Davis. I flew it for 13 hours, and made almost 100 landings in nearly every kind of wind condition with every kind of load. How did I wangle all the time? I hopped passengers at the EAA annual convention, in Rockford (Editor's Note from the year 2001: yeah, I've been at this game a LONG time!)

Because Leeon is well known for his super-simple approach to building airplanes, and because that kind of know-how is in such demand at the convention, he spends more time talking than flying. He is hard-pressed to give rides to those who want them. I was eager and free. Did I want to help him? Sure. Had I ever flown a Davis? No. How about a Cherokee? Yes. Okay, get in and go flying.

That was how I checked out in the Davis. We went to a nearby field, and he turned me loose. He kept comparing his plane to a Cherokee, and he was right except in one respect-it does everything better. Taxiing out for take-off, I found that all I needed to steer the nose wheel was my big toe; the stick was like a toothbrush in my hand.

Sitting at the end of the runway, looking through a square windshield, I felt I had forgotten something. The cockpit feels like any airplane the size of a Cessna 150, but as I glanced out the side-windows I realized what was missing-the wings. There aren't any. The nearly normal-sized cockpit sits between two tiny stubs that can hardly be called wings.

The throttle is mounted high in the middle of the squarish panel to clear the fuel tank; pushing it in produced the clatter of 65 horses and acceleration that felt just like a Cherokee's. I didn't have to steer it, and when I tried to lift the nose wheel at 70 to 75, I accidentally lifted the entire airplane. I was going flying in spite of myself.

It climbed at 500 to 600 fpm at 85 mph and felt like a fighter. In level cruise it squeaked along at 115 mph indicated and did everything it could to bolster the fighter image. Its controls are beautiful. It has plenty of stability but if you want to bend it around a corner, it reaches out with those teeny ailerons and cranks over into a bank so effortlessly you'd think you were in a Pitts. Sensitive? No, just smooth and enjoyable.

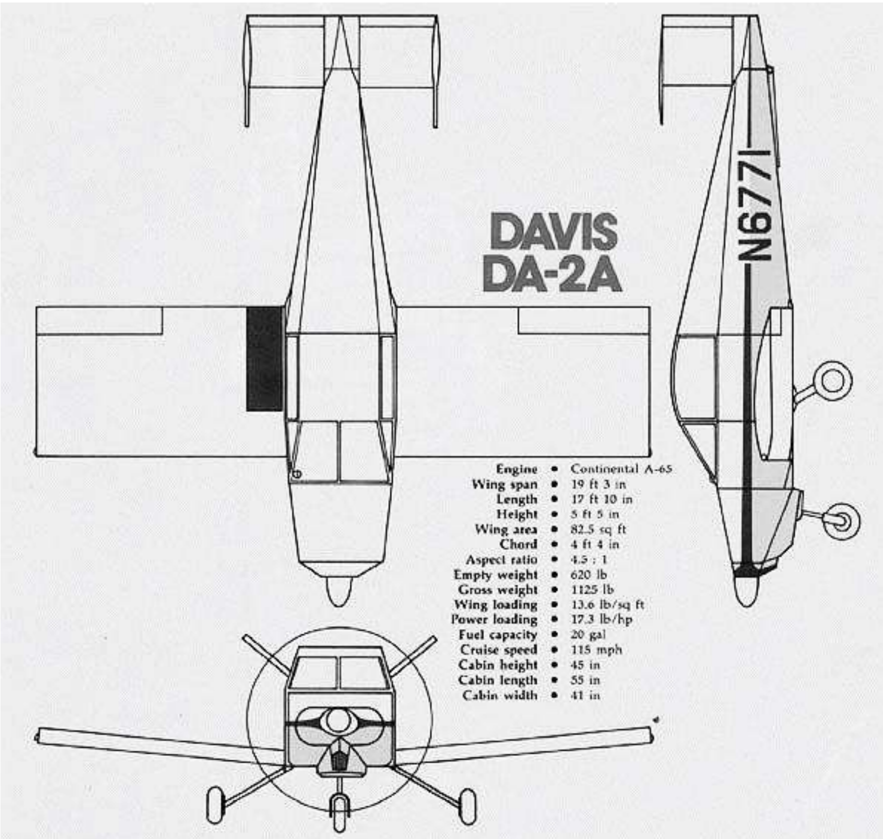
The V-tail behaves like the old-fashioned rudder/stabilizer combination; there's no trace of the well-known "Wichita Wobble" that plagued the early Bonanzas.

I played around with glides up high because I expected a vertical glide-path the second I reduced power, but I couldn't tell much until I was back in the pattern. Leeon had said "... like a Cherokee," so I got the carb heat and the power out and set up an 85-mph glide. It actually glided. It wasn't like a standard-class Cirrus, but it stayed up at least as well as a Cherokee and probably better. I moved the power in a bit to catch the runway before it ran away from me, then started to flare. I could have let the plane land itself. The fat blanket of air under the wings let it find the runway leisurely, the stiff gear bumping solidly on to the pavement.

Now I knew I could fly it, but I wouldn't know the whole Davis story until I started stuffing people into it. Several incidents are testimony to the airplane's performance and forgiving nature: To keep the airliners out of the EAA traffic pattern, the FAA had us turn base before crossing the runway that intersected the end of the one we were using. It was like landing on the shank of a T without touching the top of it. There really wasn't a final because base leg was pointed right at the end of the runway. We were also supposed to get down and off the runway in the first half because the last half was being used for take-offs. I was skipping down a right-hand base and turning final with my wingtip practically in the bushes, but I couldn't get down short enough because the Davis wanted to keep on flying. Eventually, I was killing power on base and making a power-off carrier approach, turning right into flare and eliminating final completely. No matter how big the load, the Davis did it every time.

One passenger, a stubby 240-pounder, swore he couldn't possibly wedge himself into the cabin. When he did get in (barely), he bet we wouldn't get off the ground. We weren't over gross technically, but we needed a lot more power to get moving---the wheels had started sinking into the grass. We didn't have STOL performance that time, but we did get off---again, "just like a Cherokee."

On another day, the wind was getting bouncy but we were still making carrier approaches because it was the only way to get in. It kept me a lot closer to the grass than I liked, and I thought it would be a problem. No sweat. Even when I wandered into the slipstream of a departing Mustang while only a few feet off the ground, a few quick jabs with the stick told the Davis what I wanted it to do, and it did it.



Crosswinds are the Davis' meat. It sits so close to the ground that the wind has a tough time sneaking under the wingtip. It doesn't matter, though, because the tubing gear will twist (it almost castors) and you can plunk down in a crab and let the gear take care of you.

The Davis DA-2A is an easy airplane to overlook. But it shouldn't be. It should be scrutinized, the wing attachment fittings should be examined, the "ruddervator" mixing unit explained and the landing gear ought to be perused. Only by touching and crawling under and around can you really understand what the Davis is. It's the much-talked-about, but almost non-existent simple airplane. And, it hasn't compromised anything except curvy aesthetics for this simplicity. It's an extremely well-engineered, strong airframe, and it has baby-carriage flight characteristics. If you sit down and really look at the Davis, it's not a bad-looking package after all. But what the package contains and what it offers the homebuilder is what makes the Davis DA-2A a downright beautiful flying machine.

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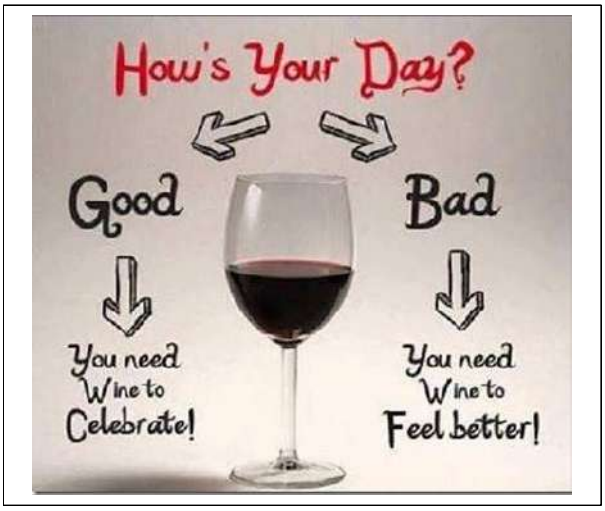
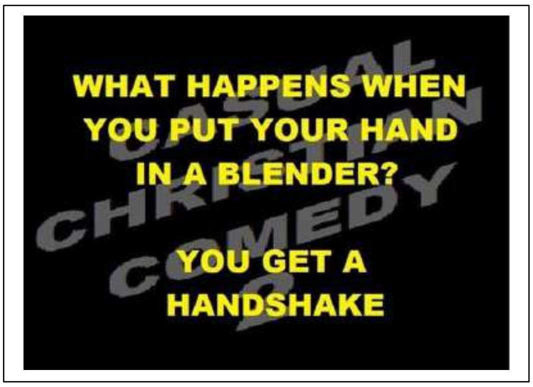


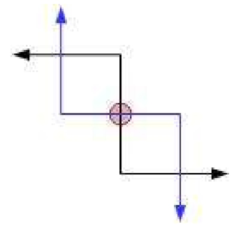


How to become a Statistic, or
Stalling with the Centre of Gravity Aft of the Limit

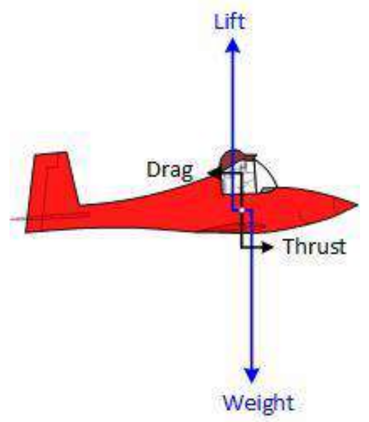
By Rob Knight

A recent accident report from the USA stated that an aircraft operating in IMC stalled after a power reduction when entering a holding patten. How could this happen? Was the pilot so inept that he failed to control his attitude and thus his angle of attack? No-one would knowingly get anywhere close to a stall when in a holding pattern, even in VMC, let alone when there was no horizon available. Maybe there's something else acting here. Wait, there's more! Let's look at the probable scenario

First, some principles of flight. There are four forces acting on any normal aeroplane in flight; two are fixed. Weight, which acts through the Centre of Gravity (CofG), and the thrust line which is fixed because the engine(s) and propeller(s) are fixed to the airframe. The remaining two (drag and lift) may change their points of application. Drag, because flaps/undercarriage may be raised/lowered, and lift, because the Centre of Pressure (CofP), the point through which the lift force acts, moves forward and back along the chord line[8] as the angle of attack varies. These four forces are combined to make two couples, a lift/weight couple and a thrust/drag couple, each couple acting in opposition to the other: the lift/weight couple trying to pull the nose UP, and the thrust/drag couple pushing the nose DOWN.



Two couples – each of two forces pulling about a common point. BLUE pulls clockwise, black pulls anticlockwise.



Two couples – two forces pulling about a common point. BLUE pulls clockwise, black pulls anticlockwise. Note that the magnitude of the lift and weight couple is drawn 10 X larger than the thrust and drag forces, the thrust and drag forces have arms 10 X longer so equilibrium is established.

These forces are carefully arranged to ideally produce these two couples matching one-another so there is no residual pitch up or down tendencies when the aeroplane is in flight. This is called being in a *state of equilibrium*. Where residual imbalances in the couples does occur, the tailplane/elevator arrangement provides specifically adjustable forces to counter the imbalances and provide adequate control. Where a constant balancing force is required, adjustable elevator trim tabs hold the elevator in the specific position to maintain, within limits, the required constant balancing force and relieve the load on the pilot. Note, though, that should any major imbalance occur, the corrective action by the elevator is absolutely limited by the authority of that control surface. The authority of the elevator is controlled by the airspeed/slipstream and the elevator angular deflection remaining available before the control meets the control limit stops.

The magnitude of the force provided by a couple is dependent on two things – the power of the force AND the distance the force acts from the point about which it is acting – the arm. This is the personification of the term, *doing it with a system of levers*, the longer the arm (lever), the greater the force about the point of action. The force about the point of action is called a *moment* and a moment is calculated by multiplying the force magnitude by the arm length.

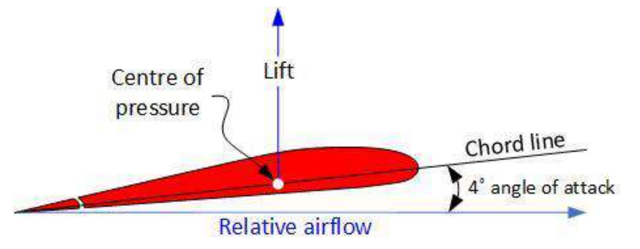
Note that the lift and weight forces combine to make the lift/weight couple that pulls the nose down, while the drag and thrust forces combine to form the thrust/drag couple that pushes the nose

[8] Chord line – A straight line joining the leading edge of a wing and its trailing edge.

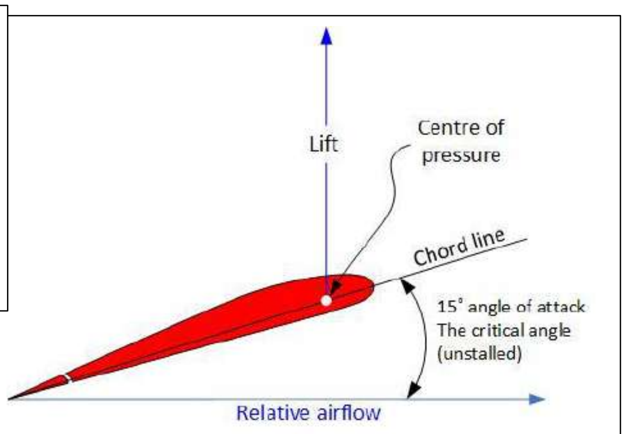
up. If the moment of the nose up couple equals the moment of the nose down couple, we have equilibrium.

For this system of couples to function safely, the aircraft CofG must ALWAYS be ahead (towards the aircraft's nose) of the CofP.

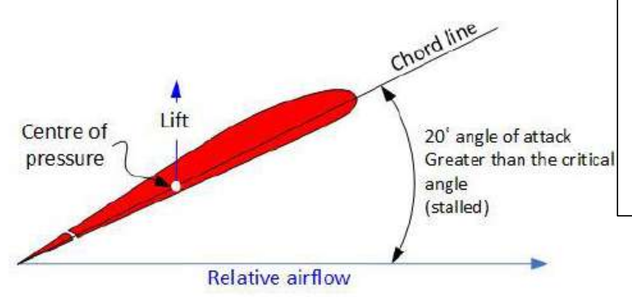
As stated, the CofP, that spot on the wing's chord through which the lift acts, is only stationary on the chord line when the angle of attack is unchanging. Increasing the angle of attack on an unstalled wing will result in the CofP moving forward, towards the leading edge and vice versa. This is an unstable action because that movement, effectively moving the lift forces forward towards the CofG, will tend to disempower the lift/drag couple because that movement will reduce the arm and consequently the moment produced. This produces an imbalance between the two couples and the now more powerful thrust/drag couple will push the nose up on its own. This will increase the angle of attack further, without any pilot command to do so - it will be automatic, and, as the angle of attack increases, so will it further tend to increase. As stated, this is unstable and will continue until the stall occurs on a correctly loaded aircraft.



1. In level flight, the CofP position on the chord line.



2. At the critical angle, the lift has increased with the increased angle of attack, and the CofP has moved well forward on the chord line. THIS MOVEMENT IS UNSTABLE.



3. Stalled. The lift has reduced dramatically and the CofP has retreated to a position well back on the chord line. This movement is stable.

To prevent the scenario depicted above, the aircraft manufacturer sets CofG position limits that will prevent an instability situation actually developing as indicated. However, **and it's a VERY big however**, if the CofG is EVER located further aft than POH or Flight Manual stated limit, the manufacturer's guarantee of stability is CANCELLED FORTHWITH.

An uncontrollable and fatal crash situation in an aircraft flown with a CofG position aft of the prescribed rear limit is likely to unfold as follows.

The aircraft takes off with its CofG aft of the designer's aft limit. With the high slipstream, the elevator is still able to maintain sufficient authority to hold the nose attitude and maintain the correct climb airspeed. The signs that something is wrong are missed by the pilot. These signs would likely include lighter than usual elevator control pressures, and the indicator for the trim tab position would be well into the nose down part of the position indicating scale, close to the end stop.

On reaching his top of climb, the pilot levels out using the correct procedure – select the level flight attitude, and, when the airspeed is accelerating close to the normally expected cruise speed, reduce power to the desired cruise setting. With the power set, adjust the elevator trim until the level flight attitude is maintained without control pressure by the pilot. Again, the trim indicator position should be a warning, but how many pilots ever look at it except for setting elevator trim during the pre-take-off checks. The elevator control pressures are still likely to be a little less than usual and maybe, the airspeed a little higher than that achieved at that power setting under normal CofG positions.

The flight continues in this fashion until the pilot reduces power and the slipstream reduces which will diminish the elevator authority. The pilot, wishing to reduce airspeed, holds the nose up and the ASI indication falls back. With now both the slipstream AND the airspeed reduced, so the authority of the elevator reduces while the CofP marches forward requiring forward stick and down elevator to hold the uncommanded rising nose under control.

The elevator down physical stop is reached. The stick is fully forward but the nose continues to rise. The point of no return has been passed and the aerodynamic nose up forces exceed the power of the elevator to reduce the angle of attack. The aeroplane is out of control and there is no way to retrieve it. A stall is inescapable, and, with no angle of attack control available because the elevator is powerless, recovery is simply not possible. The aeroplane will spin without possible recovery. If the machine is fitted with a ballistic parachute NOW is the time to use it!

The aircraft stalls and one wing will drop. As the aircraft rolls with the wing-drop, the rolling action will vastly FURTHER increase the angle of attack on the dropping wing, and further deepen the stall condition. The rising wing may be stalled or unstalled: the point is irrelevant. The angle of attack is uncontrollable and autorotation will continue indefinitely, regardless of the stalled condition or otherwise of the rising wing.

The pilot will remain strapped in his/her seat as the aeroplane gyrates and the altimeter needle winds down almost quicker than can be read. The VSI is pegged out on the down stop pin. The situation will continue until the aircraft impacts violently with the ground, at which time an unsurvivable accident occurs and the accident statistics are about to be revised.

But, was it REALLY an accident? Accidents are supposed to occur with an element of chance but there was no chance here. The stall and demise of the aircraft and occupant(s) was a *foregone conclusion* from the time the wheels left the runway at the commencement of the flight.

Thus far I have depicted Crash-Case-One, where the CofG position was such that flight was possible with, airspeed and slipstream available to empower the elevator. Here, at the end of the flight when the slipstream and airspeed are diminished, the aft loading simple exceeds the now reduced ability of the elevator to correct the out of balance forces. But there is also a Crash-Case-Two, where an uncontrolled nose pitch up develops as the aircraft gets airborne on take-off. Crash-Case-Two occurs when the CofG is a little further aft than in Case-One, now the aft CofG is even further back, and very close to where the CofP will be in flight. The act of rotating with back stick, just prior to lift off on an otherwise normal take-off, will increase the angle of take-off and move the CofP AHEAD of the CofG. This is totally disastrous as the aircraft now will have the both couples pitching the nose up. With all the aerodynamic forces acting to pitch the nose up, the elevator is powerless and the aircraft is absolutely out of control in pitch. Flying any aircraft with the CofG aft of the given limit is the same as playing Russian roulette with all chambers loaded!

When a manufacturer is designing an aeroplane, they look at where the centre of pressure will be on the chord line at all stages of flight and all realistic angles of attack. Then they must design the aircraft so the CofG is ALWAYS forward of the forwardmost position of the CofP, and in addition to that, by a sufficient distance (moment arm) to provide the lift/weight couple with sufficient power to counter the thrust/drag couple. The manufacturer tells you through the LIMITATIONS SECTION in his Flight Manual or POH that the CofG MUST not be further aft (or rearwards) than the given distance limit from his given datum to ensure that you can control the aircraft that he has designed for you.

It is possible to have a CofG shift aft, if a load moves aft in flight/when an aircraft takes-off. The following link is to the demise of a Boeing 747 freighter in Afghanistan when such an event occurred.

https://www.youtube.com/watch?v=7sUWC2jfjqI

Note: the aircraft stalls and the starboard wings drops. The CofP moves aft, the aircraft pitches nose down as yaw caused by the dropping starboard wing yaws the nose right. A classic incipient spin with aft CofG.

Happy flying

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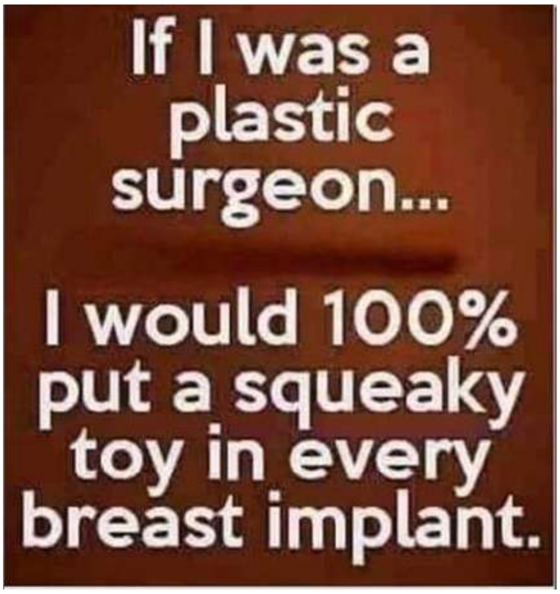
Writer's Creed

Don't use a big word when a singularly loquacious and diminutive linguistic expression will satisfactorily accomplish the contemporary necessity.



The ATRX-700, a Fly-By-Wire Helicopter

By RACHEL CORMACK. *Published in The Robb Report August 2023*

You Can Fly This New Helicopter with Your Driver's License and Just 30 Hours of Training

It could soon be much easier for the average Joe to fly a helicopter.

The ATRX-700. P*hoto by Advanced Tactics*

Advanced Tactics and Rotor X have teamed up to design a two-seater chopper that caters specifically to rookie aviators. Christened the ATRX-700, the newcomer was inspired by the RotorWay RW7 but has a modern drivetrain and simplified "fly-by-wire" flight controls that make it easier to operate.

The design is in line with a new regulation that the Federal Aviation Administration announced in June. The proposed Modernization of Special Airworthiness Certification (MOSAIC) rule would put helicopters into Light Sport Aircraft category for the first time, thereby enabling new pilots to fly and buy choppers with ease. The proposal is under official review until October, but the perks are already apparent. Most notably, it's far easier and quicker to hit the skies in a light sport helicopter.

No FAA medical certificate is required to fly the ATRX-700. In fact, anyone with a driver's license and appropriate training can get the green light. Fliers can be trained by Advanced Tactics at its facilities in Torrance, California at a much lower cost than traditional helicopter instruction. And you only have to notch up 30 hours of flight training before you are free to take off. Advanced Tactics charges $300 per hour for flight training. Alternatively, you can be trained by a Certified Flight Instructor (CFI) who is versed in the craft.

The 1,700-pound copter has a cruising speed of 100 mph.
Photo by Advanced Tactics

The ATRX-700 requires no assembly, either. The chopper is good to go as soon as it is delivered from the factory. Available in a range of hues, the 1,700-pound copter is powered by a turbocharged engine that can churn out about 178 horses. It has a cruising speed of 100 mph (87 knots), a service ceiling of 16,000 feet, and a range of 300 miles. It can also carry can carry 650 pounds.

Advanced Tactics says it will have the first ATRX-700 built and certified by February 2025, unless the FAA regulations are delayed. The helicopter is now available for preorder for $188,000.

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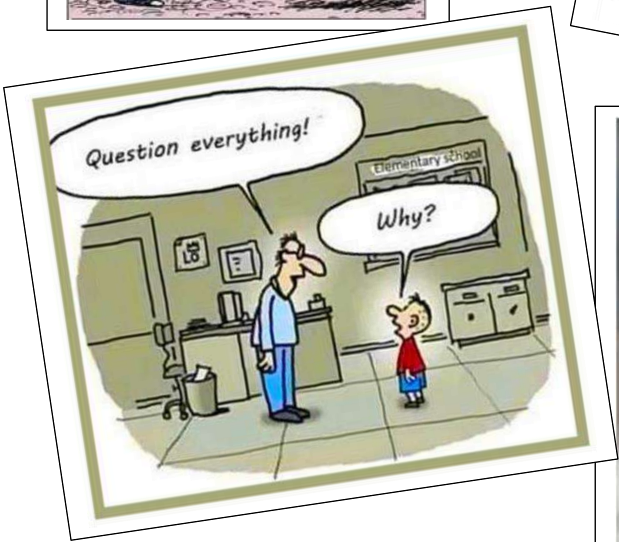
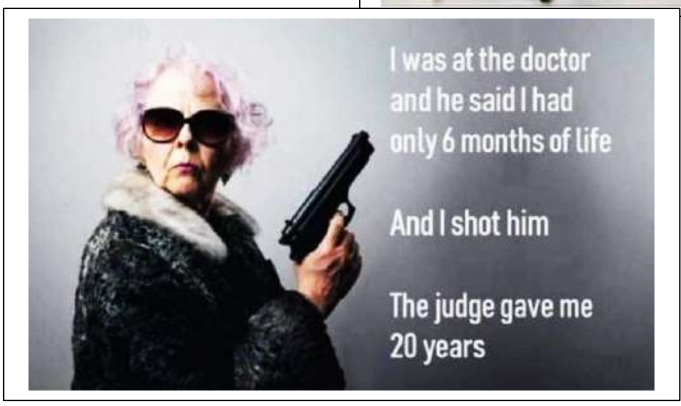
FLY-IN Invites Looming

WHERE	EVENT	WHEN
Murgon (Angelfield) (YMRG)	Burnett Flyers Breakfast Fly-in	**Find Next Planned Event";** **Sunday, December 10th.** **Confirm details at:** **http://www.burnettflyers.org/?p=508**





The Days of Our Lives (Feedback from a Flying Instructor).

By Rob Knight

Wayne joined the Waitemata Aero Club as a partly trained student. He had been flying Cessna 150s at Dairy Flat airfield north of Auckland City and had just completed his Batchelor's degree in mechanical engineering at the Auckland University. He had joined the staff at a Papatoetoe factory so was now living closer to Ardmore than his home Aero Club.

I don't recall who finished off his PPL training, but his name had already been admitted to the list of "Those who needed to be Watched" that was regularly discussed at our monthly Instructor's meetings. His issue was grossly excessive self-confidence.

Wayne and I first shared an aircraft in DGJ, a late model PA28 140, to start his conversion to type. Our first flight was a disaster as he was clearly of the opinion that the conversion dual was a waste of his time and money, and he should have been given a circuit and signed off. To that date he had flown 2 types of aircraft, the Cessna 150s that he soloed in and the Victas that he had converted to at Waitemata.

The first on type flight was a disaster. He badly under controlled DGJ, was unable to maintain height in a 45° banked turn, and his stalls were sloppy with excessive height loss. His attempt at a forced landing brought him to a vitriolic outpouring of the stupidity of the training.

The next flight was a ditto of the first. I discussed his attitude shortcomings with the CFI as he was threatening to change instructors to use one of the Clubs junior and lesser experienced instructors to gain his PA28 type rating (as it was called at that time). From that moment I had acquired a real problem.

About 4 hours flying later, he finally flew as he had to and I signed him off. Post flight, sitting in the aircraft, I de-briefed him, advising him to step back and not push the boundaries. He returned my effort at goodwill with a sullen silence. The following week I went on 14 days leave.

Over this leave period, Wayne had attempted to book ZH-DIX, our brand-new Cherokee 151 Warrior. He became incandescent with rage when he was refused and was told the CFI had required all club members wanting to fly DIX to do a checkout to ensure the pilots were aware of the change in the float characteristics of the new Cherokee sub-type. After a lengthy discussion, this time with the CFI himself, he acquiesced and made a booking with the CFI to do his required checkout.

A few days later, he loaded his girlfriend and a picnic lunch into DIX and departed on a flight plan for Great Barrier Island where they enjoyed a last supper under the trees beside the runway. Later, as Wayne was pre-flighting for his return, two French visitors with dive gear approached and asked for a lift back to Auckland as their transport hadn't showed up. Wayne loaded their heavy equipment into the rear luggage compartment and strapped them in.

Their return track was blocked by an extensive array of CB activity, but he could have headed north, through the Hauraki Gulf, and returned to Ardmore via the VFR transit lanes along the East Coast. However, his last call to Auckland Information was that he considered it safe to continue as planned and fly direct to Clevedon and then up the valley to Ardmore.

About 20 minutes later, several fishermen near Ponui Island, hiding in cabins from the torrential rain and hail falling from the CBs, saw the separated fuselage and wings of an aeroplane tumbling, wafting, and falling into the sea all around them. ZK-DIX no longer existed.

The wings and tail were found early, but the fuselage took about two months to find. Some other fishermen had caught it in their net several miles from Ponui Island near where the impact had occurred. Inside were the remaining missing bodies and an excessive amount of dive air cylinders and weight belts etc still in the back……….

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Death by Time Builder

By Rob Knight

In the US of A, last week, there was a fatal flight in Kentucky. Its participants were a brainless and ill-trained flight instructor who demonstrated his lack of skill as a teacher in his use of Snapchat to demean his young student pilot. The tragedy was entirely preventable.

Here in Australia, as in the USA, flight instructors can fall into three categories - time builders, experience builders, and flight instructors. They have one thing in common – they all work for flight training establishments. But only two of them are serious about teaching you to fly. Flight instructors are longer term teachers, forging a career out of teaching people to fly. Experience builders use their time teaching people to fly to accumulate their own hours, looking to move on to other branches of aviation when they see the opportunity. Flight instructors and experience builders are more likely to use a syllabus and the required certification standards from day one, and so develop the toolbox of skills a pilot needs to become competent and confident in the left seat. They are also caring about their treatment of their students to engage their confidence.

Time builders are different. They still hold flight instructor qualifications, but are focused inwards - on themselves, their egos, and on growing their hubristic self-image; they have little interest in what the student gets from a lesson. They may not even know how to teach beyond their last flight test because that's all they have – minimal flight experience for their qualification, and only their basic training to provide underpinning knowledge. This is particularly common if they went through an accelerated program where the focus from the school is to get their money and get them out as fast as possible and with the absolute minimum number of hours in the candidate's logbook. In these 'pressure cooker' training schemes, people are taught how to pass a flight test, not how to really fly.

A rote trained instructor can have great difficulty teaching the manipulation of aeroplane controls. Without the instructor having depth in their underpinning knowledge as to why the controls need to be moved in particular it can be impossible to assess and pass on this knowledge so he/she seldom promotes skill and competence. Rote learning lacks the topic depth and understanding an instructor needs to provide good quality instruction where the student reaps a long-term benefit. Example – using aileron in a stall exit often means that student also fails to keep straight in level flight with rudder. This means the problem should be revisited by ensuring keeping straight in level flight is done using rudder, not aileron. At the stall, under stress, the trainee naturally falls back onto what they always do – in this case use their hands and not their feet. The problem is not with stall exits, but rather an unrecognised failure to fly properly from the first lesson. This means a serious issue is then passed on to students who then become instructors and so the problem is bred into future pilots. Rote trained pilots/instructors won't recognise the cause, only the symptom.

This issue is coming back to bite us. The number of time builders teaching in training establishments to the rote level is obvious at the RAAus certification and private pilot level as clear in their demonstrated skills post qualification. These students are being pushed through the trainee-pilot-pipeline just as many of their instructors were. The experience boxes have been ticked and endorsements awarded, but even if the applicant passes the check ride, that doesn't mean they are ready for the real world. This is especially significant in instructor applicants.

The following was published on October 3, 2023, being written by Meg Godlewski in America. Meg has been an aviation journalist for more than 20 years and a CFI[9] for more than 18 years. If she is not flying or teaching aviation, she is writing about it. Meg is a founding member of the Pilot Proficiency Center at EAA AirVenture and excels at the application of simulation technology to flatten the learning curve. Follow Meg on Twitter @2Lewski.

[9] CFI (USA) – Certified Flying Instructor. In Australia, and New Zealand, it means "Chief Flying Instructor."

Currently, the instructor community at large is talking about a particular crash—I cannot in good conscience call this one an accident—that happened in Kentucky last week involving a time builder instructor with an affinity for social media and an 18-year-old private pilot candidate. I can't call it an accident because there were so many blatant mistakes and failures to identify and address. I have been a CFI for 20 years, and I have never seen one like this before.

Details: On September 27, the Piper Warrior belonging to Eagle Flight Academy in Owensboro, Kentucky, was supposed to make a night flight from Owensboro/Davies County Regional Airport (KOWB) to Bowling Green-Warren County Regional Airport (KBWG) in Kentucky.

Aboard were Connor Quisenberry, a private pilot candidate, and flight instructor Timothy McKellar Jr., 22.

The events of the evening were documented by McKellar on Snapchat. That's right. The flight instructor decided to document the flight. It is clear that Quisenberry is not a regular student of McKellar's, because McKellar's Snapchat story begins with him talking to the camera and shaking his head along with the caption, "me and this student should not get along if he was my full-time student. I've seen faster at the Special Olympics."

If that blatant smear isn't enough to turn the viewer away, it gets worse. The camera angle is then reversed to show Quisenberry, flashlight in hand, performing what appears to be the preflight inspection of the Warrior. McKellar impatiently taps his fingers on the outside of the aircraft.

McKellar expresses impatience with Quisenberry who "wanted to have a conversation" when the instructor wants to get the flight over with because he has to be up at 4:30 a.m. McKellar refers to Quisenberry as "Forrest Gump." The time stamp of the Snapchat shows 8:39 p.m. as McKellar is heard saying, "C'mon." He posts that the pair have a three-hour flight ahead. The video continues showing the night take-off and in-flight cruise.

McKellar makes a second reference to Quisenberry as Forrest Gump, stating that he is "just giving it to him straight up," to which Quisenberry allegedly replies to the criticism by saying, "I don't mind you being hard on me. I know I need it."

The final Snapchat posted by McKellar shows a preview of the flight path from Bowling Green to Owensboro over top radar showing severe storms heading toward them.

McKellar circles the storms and writes, "headed are [sic] way like a group of pissed off hornets."

It has not escaped the instructor community that McKellar, who was critical of the intellectual capacity of Quisenberry, uses "are" instead of "our" in his post. And continued the flight into a thunderstorm.

The TAFs and METARs from the area at the time of the flight showed severe weather in all quadrants. The question is asked: Given this information as noted by Snapchat, why did the flight continue?

The Last Moments: You cannot visually see thunderclouds at night, but apparently the flight continued into them as FlightAware shows the aircraft made some extreme altitude fluctuations, and McKellar asked for an IFR clearance and was told to head east before contact was lost.

According to local law enforcement, the wreckage was found spread out over three-quarters of a mile in mountainous terrain. The National Transportation Safety Board is expected to release a preliminary report on the accident in a few weeks.

Aftermath: McKellar's behaviour will likely be used as a case study for future flight instructor candidates. Frustration on the part of both the instructor and learner is a normal part of the flight training process, and both must learn to deal with it.

The flight instructor is supposed to be able to compartmentalize it, or at the very least restrain themself from publicly shaming their learner on social media. It goes the other way too. Learners who do this to their instructors will likely find themselves ostracized from the flight school. Remember the phrase "praise in public, criticize in private"—and make that criticism constructive.

McKellar's friends and family have defended him on social media, insisting "Junior was a jokester and just messing with his student" and suggesting people view McKellar's YouTube channel.

There is a lot of aviation there, including a video where McKellar appears to sip 100LL from a sump cup then jokes how he will smell like fuel for the rest of the day.

McKellar was a relatively inexperienced instructor. His social media shows he soloed in October 2020 at a small flight school then did the bulk of his training at ATP Flight School, the largest accelerated training program in the U.S. He earned his commercial and flight instructor certificates in May 2023. It is not clear how many hours of dual instruction he had accrued before the last flight.

Had McKellar not chosen to Snapchat the ill-fated flight, this might have been viewed as just a bad accident. Rule No. 1 is to keep the learner safe, noting the pilot in command (PIC)—in this case, the CFI—is responsible for the safety of the flight. McKellar was PIC, and he failed miserably at this task.

Is This One Age Related? It has been suggested that age is a factor in this event. How mature were you at 22? Were you starting a business? Going to school? Still living off Mom and Dad? Starting a career? Trying to find a career? Maturity at any age runs the gamut.

While there is a numeric quality to maturity, it very much depends on the person. There is no maturity test for flight instructors, which is unfortunate since, although it is an entry level position to a flying career, the stakes are quite high.

There are 18- to 20-somethings who work as CFIs[10] as a means of building their hours and are good teachers. They listen to their learners and seek the counsel of more experienced instructors when they run into a challenge. They may even sit in on the ground schools taught by more experienced instructors because they want to improve their skills. They understand that telling a learner about something or demonstrating it in the aircraft doesn't necessarily mean learning has taken place.

Much of this comes down to communication skills. As far as McKellar's "giving it to [sic] the learner straight up," direct communication can be accomplished without being insulting. When providing guidance to the learner, refer to the airman certification standards for the metrics they are measured to. "Your altitude sucks" or "you're so rusty, we need a jack hammer" are neither professional nor helpful communication. All the learner may take from this is that they don't want to fly with you again.

It is heartbreaking that Quisenberry allegedly accepted McKellar's behaviour as the norm. Connor, I know you can't hear me when I say this, but I speak to all the other Connors out there: I am sorry this happened to you. Albeit, the concept of an instructor being hard on a learner can be a matter of perspective. If an instructor says your skills need some work, they don't say it to be mean. The professional CFIs will pull out the ACS[11] to show you where the

[10] Certified Flying Instructors.

[11] ACS (USA) – Aeronautical Common Services

soft spots in your skills are. Then they will help you shore them up. No CFI wants you to bend metal, get hurt or fail a check ride.

There is a big difference between "being hard" on a learner by holding you to the standards set forth in the ACS and being insulting or verbally abusive. If you had a little more life experience under your belt, you might have walked away from this CFI. And no one would have blamed you.

I know about this issue from personal experience – I am the result of such a scheme. I learned to fly mostly at Kaikohe airfield, in the northern North Island of New Zealand. There was no air traffic control – and no runways, either. It was just a great big grassy area with a couple of windsocks strategically place to give a fair indication of the wind direction. The first time I flew at Ardmore was only the second controlled airfield I had flown at and so had no experience with ATC operations. All weather forecasts I gathered in training were by making phone calls to the MET service in Auckland and writing them out long-hand.

In 1969, with PPL in hand, I enrolled at the New Zealand College of Aviation, the CPL training side of the Auckland Aero Club. I paid my deposit and bought my place on Course 1; it was a new establishment.

I thought that getting a CPL at 150 hours instead of 200 would save me considerable money in the long run but the economy just wasn't there. I sat and passed my CPL flight test with 191 hours and 55 minutes in my logbook – not much of a saving. I don't blame the school for this, we had an exceptional run of inclement weather and aircraft serviceability issues, and I had unbudgeted extra time required for revision and maintaining skills waiting for it to clear enough for a test. However, I am critical on the scope of their training.

On one occasion, very early in my CPL training, I was doing a dual cross-country nav flight that passed through Hamilton airport (in New Zealand). We had planned to stop for coffee at the local flying school, and get weather and NOTAM updates before returning to Ardmore. The café was very busy. George M., the fill-in instructor, a locum for my regular one (away on leave), ordered me to go to the tower and get the updates. I innocently asked what, exactly, I should ask for, and where was the airfield weather office? George subjected me to several minutes of public humiliation, in front of all present, ranting about my incompetence, rank stupidity, and how he'd ensure that my failings would never stain his personal instructing integrity because he'd never fly with me again. A stranger (a local school instructor, as it turned out) intervened and took me over to the control tower and introduced me to the local weather man, and also introduced me to the controllers on duty. George, meantime, regaled all who would listen with stories about his personal flying skills and how he was wasting his life instructing.

My embarrassment was immense, I have never forgotten how it felt, and it made me so wary of such behaviour I determined never to stoop to it. In later life, as a CFI[12] myself, over the years I fired three junior instructors for similar behaviours. One insisted on demonstrating spins on trial flights, the second reduced a woman student to tears on her third flight because she'd failed to memorise her pre-take-off checklist, and the third instructor kept propositioning woman students for sex. This type of behaviour has NO PLACE in any good-quality pilot training establishment. ***DON'T EVER TOLERATE IT!***

Rob Knight

Happy Flying

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[12] In New Zealand - Chief Flying Instructor.

Not Your Normal Garden Gnome

By Bill Repucci, Kitplanes, July 2023 **O23-036**

Bruce Kimme, in his Great War uniform, standing in front of the massive prop bolted to the Gnome.

Fans of round engines are a unique breed. They tend to build new old planes. One problem they have is finding a suitable round engine. Moreso if they are building a replica from the Great War a.k.a. WW I and desire a true radial engine, not just a round engine.

Well, KipAero has an engine for them!

Even the case tag is period – well – sort of – kind of!

Bruce Kimme of Dallas, Texas built a Nieuport 11 and a Half Strutter from KipAero plans and for thrust, put a rotary engine up front, yes, a real honest to goodness cylinder attached to the massive prop, castor oil-spitting, blip switch speed-controlled rotary engine. The kind where the crankshaft is attached to the firewall and the engine spins around the crank, not the other way around as in more modern radial engines.

Produced in New Zealand and imported to the USA by KipAero, the new production nine-cylinder rotary makes 125 hp. KipAero attributes the increase in HP over the original Gnome as coming from better machining, aluminium pistons (the originals were cast iron), better valves, higher octane fuel (regular pump gas vs. 60+ octane from the Great War), and modern spark plugs.

Details

- Price: $62,000 W/O the prop
- Weight: 330 Lbs.
- HP: 125 at 1125 RPM (578 Ft-Lbs. Torque)
- Bore & Stroke: 110 mm x 150 mm
- Size: 12.830 Litres
- Fuel: Automotive, Regular Unleaded with or without ethanol.
- TBO: Unknown (80 hours during the Great War, due to modern metals and machining, the reproduction engines are well past that number. The TBO should not frighten a reproduction plane pilot because the engines are very simple and easy to rebuild.)
- Ignition: Electronic
- Carburettor: Yes, kind of, sort-of, not really

Consumption per hour

- Fuel: 15 Gallons
- Castor Oil: 2-1/2 Gallons (Total Loss System) (Oil used was castor oil)

Speed control is accomplished via a “Blip” button, by leaning the engine to just above stoppage, or running the electronic ignition at “half speed.”

A smaller seven-cylinder is in the works, and should be available in the near future.

Visit www.kipaero.com for more details.

The pushrod-activated exhaust valve on top of the cylinder

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Test Flying the Sopwith Pup

By Andy Sephton OM-049

I'm strapped in and ready, parked at the end of the duty runway. The sky around Old Warden is clear, the airfield closed to all other traffic. I've checked the cockpit; the switches are off. The blocktube and fine adjustment (see note on right) had full and free movement and are now closed, the fuel is wire locked on, and the Jones air pressure valve was free to move. The condition of the instruments was fine and the altimeter bezel was rotated so that the needle now points to zero. The fuel tank air pressure was pumped to 2.5 psi and is holding with no significant leaks. The flight controls have full, free and correct movement.

I call to the ground crew: "Switches off, ready to prime". They turn the propeller slowly to expose each cylinder in turn and using an antiquated brass syringe, squirt a measured amount of fuel into each by depressing the exhaust valve.

They continue: "Switches off?" I confirm: "Switches Off". They spin the propeller a few times to distribute the mixture. I check clear all round and confirm I have a man holding down the tail.

They shout "Set". I open the blocktube about 35%, ensure the fine adjustment is closed and confirm: "Set".

The groundcrew call: "Contact". I set the switches on, hold the control column hard back and reply: "Contact".

Operating the Rotary Engine

The engine handling of the Le Rhone rotary engine would make the aircraft challenging to operate for any modern day pilot. The engine controls comprise 2 levers mounted side by side on a graduated quadrant on the left side of the cockpit. The longer lever (known as the 'block tube') is connected to a simple block tube carburettor. This controls the fuel air mixture entering the hollow crankshaft and subsequently reaching the cylinders. However, life is not that simple! There is a second, shorter lever, known as the 'fine adjustment' that can further-effect the amount of fuel in the mixture at a particular block tube setting. This essentially controls a fuel tap upstream of the block tube carburettor, but a tap that is capable of very fine adjustment. For each block tube setting there is therefore a small range of 'fine adjustment' settings over which the engine will still run. These are bounded at one end by the lean cut (too little fuel, engine will cut out) and at the other the rich cut (too much fuel, engine will stop). The latter case is far more serious, as it takes a long time to clear a rich cut with the attendant over fuelling. This would certainly be longer than the time available in a glide if the engine failed below a couple of thousand feet.

The levers on the left side of the cockpit (in an Avro 504)

They turn the propeller as sharply as they can, it turns slowly, there's a cough, followed by another. The propeller accelerates, there's a cloud of smoke, whipped over the cockpit as the engine bursts into life, a brief smell of burnt castor oil, then the engine's winding down….. I slowly advance the fine adjustment to introduce pressurised fuel to the engine. If done too quickly, there's a bang and silence (too rich). If too slow, the initial silence remains (too lean). Just right and the engine bursts back into life.

I shuffle the blocktube and fine adjustment levers to stabilise the engine at about 7 – 800 rpm. Each adjustment is made slowly and its effect noted before another movement made. The mixture of air and a certain amount of fuel from the blocktube must be matched to the fuel introduced by the fine adjustment. Too much or too little fuel will lead to a rich or lean cut – either way the engine stops. In practice, about 35 to 40% on the blocktube and about 30 to 35% on the fine adjustment gives smooth running at the required engine speed.

A minute after engine start she's now warm and ready for a run up. The engine cylinder walls are thin for lightness and heat up easily. The oil is total loss, impossible to pre-warm.

I open the blocktube slowly to about 75%, the engine coughs and falters, before she loses momentum and stops, I slowly open the fine adjustment by about 5%, the engine picks up. I run her at about 1050 rpm for about 30 seconds, any more and she'll overheat. Rotary's can be run for about 2.5 minutes in the summer and about 3 minutes in the winter before overheating, but that's all I need to check all is well. I check the rich and weak end of the running range with small movements of the fine adjustment – about 35 to 40% on the fine adjustment lever. I note the positions of both control levers for best power and bring her back to 'idle'.

Time is now running out, I have about a minute left to get her off the ground before the engine overheats. I wave the chocks away. The engine is now 'idling' at about 800 rpm. It's a very fast idle and gives about 60% thrust, far too much for taxi, or even a descent when in the air. I depress the 'blip button' on the control column, which instantly cuts the ignition. The engine noise dies, she continues to rotate, slowing all the time. Before she stops, I release the 'blip button', she bursts into life again, accelerating to her fast idle. I repeat the process and the groundcrew pull the chocks. Before we move off, I note the position of the far horizon with respect to the nose of the aircraft – I'll need that later to judge the three-point attitude for landing.

The Pup edges forward, I release the 'blip button' and advance the blocktube, the engine falters. I advance the fine adjustment, the engine comes back, the aircraft swings, hard, to the left. Full right rudder brings her back, I centralise the rudder, she's now off to the right, left rudder, centralise, control the swing…. We accelerate and the rudder has more effect. A small pressure on the control column lifts the tail. She's off to the left again, but this time with more purpose – gyroscopic precession from the rotating engine initially wins over the small rudder, but as airspeed increases, she comes back onto the straight and narrow.

I ease back the fine adjustment slightly as the Pup accelerates – as airspeed increases, the propeller unloads, the engine accelerates and centrifugal force enriches the engine. I can't support a rich cut on take-off, so the mixture is leaned during the take -off run.

The controls now have feel and presence, the aircraft is coming alive. She bounces over the grass, she's talking to the pilot, the sign of a thoroughbred, she's eager to fly. Slight backpressure on the control column raises the nose, slight right pressure on the rudder kills the precession and we're in the air again…….

It's been a long time coming. The Pup was on the ground for a year or so, undergoing major servicing which included a recover and repaint as a rocket equipped balloon fighter. Initial flight tests have been made without the rockets, as to fly them requires aircraft modification and CAA approval. The timeframe we gave ourselves didn't allow for the flight testing of the rockets as there were other more important things to do with the Collection engineering time. But here's hoping that we can get them into the air one day!

The Shuttleworth Pup came off the production line as a Sopwith Dove, the two-seat variant of the Pup. She was initially constructed as a Pup, but was changed into a Dove during production. Older aviation lists will show her registered as a Dove from 1925. Richard Shuttleworth acquired her in the 1930's and converted her back to single seat status. She has remained with the Shuttleworth Collection ever since. Now registered as a Pup, she retains her original registration of G-EBKY.

On the day, a final check of the paperwork was made, all was found in order. The load sheet was checked again and the aircraft fuelled to the required weight.

As time goes on, aircraft, as with humans, gain weight. Further, as time goes on, the average weight of a human increases. In the days of the Sopwith Pup, the average pilot weighed around 10 stones, we (Collection pilot's that is) now approach 15! The cleared all-up-weight of the aircraft was based on a pilot of the day, so it can be easily seen that we have a continual weight issue with the aircraft. We don't have to carry ammunition any more, which helps, and we can wear less clothing as we don't need to go to high altitude, but the problem remains. We manage it by reducing the fuel and oil carried, and by ballasting for the various weights of the pilots we use.

To reduce taxi time, the aircraft is moved to the end of the duty runway before flight. The pilot makes his walk Around check prior to strapping in and completes all checks prior to take off before engine start. Thus, once the engine is running, all is ready for flight. Any delay would lead to engine overheat, so the machine would have to be shut down and a cooling period taken.

Now, let's get back to the flight…….

She's climbing steadily at about 60 mph indicated, Shuttleworth airfield falls away beneath the wheels. The Pup is an absolute delight in the air. The feel of the controls is light and positive. Small pressures on the control column suggest to the machine where she should go and she follows without delay. Larger movements of the control column are answered with enthusiasm by the airframe, a large grin appears on my face. Alright, I admit that I'm looking at all of this with some rose-colour in my spectacles, and she is a little bit loose in yaw, but the machine is truly a delight in the air and nobody can take that away.

After take-off, I make a gentle turn back over the airfield, always minded of engine failure in the early stages of the flight. The speed at lift off was about 45 to 50 mph and I can use that as a last-look over-the-hedge speed should the worst occur. We continue climbing, circling over the field, listening to the engine for any sign of distress and to the airframe for any weakness. Fuel tank air pressure is holding at 2.5 psi, although the needle is vibrating somewhat. Luckily, the Rotherham propeller pump is working well for if not, fuel air pressure would have to be maintained by the handpump – not a happy duty for the pilot. As the aircraft climbs, I ease back the fine adjustment to reduce the fuel flow to the engine to match the lowering outside air pressure. As with the acceleration on take-off, if nothing was done during the climb, the engine would eventually run rich, then stop.

I stop the climb at about 2500 feet above Old Ward the engine setting remains at full power. She settles sideslips confirm that nothing is untoward with her towards about 2 G, still nothing unusual is noted. In have done an excellent job!

Now for some engine-off work. Remember, the fast power for a descent at normal airspeeds so she mus shut her down by cutting the fuel rather than 'blippi it's applied, whereas cutting and re-introducing the deceleration and reduce engine loads.

Sopwith Pup

I gingerly move the fine adjustment back, the engine falls silent, I return the lever, slowly to its original position and the engine comes back to life. I try it again and again, increasing the time with the engine off to ensure that engine handling is acceptable. Old Warden airfield is still underneath, I may need to return quickly if the engine decides not to re-start.

The engine's fine, I leave her off for a few seconds longer and reduce the airspeed until the wings stall. The nose is high, wind noise reduces to an eerie silence, there's a light buffeting increasing through the airframe, then, with a slight shudder, the nose gently drops, she's had enough, the wings have stalled. Slight forward pressure on the control column further lowers the nose and un-stalls the wings, the noise increases as does the airspeed. I re-introduce fuel to the engine: she fires back into life. The air speed indicator at stall read 35mph, just as she has always done.

I now know that a good approach speed will be 50 to 55 mph, so I confirm that the airframe will accept full rudder sideslips in both directions with the engine off. Progressive left rudder needs progressive right aileron and the force on the controls increases with the deflection. It's a similar story side-slipping the other way – just as it should be.

There's just one more thing to try before a return to Old Warden, a simulated go-around. I cut the engine and leave her in a glide for about 500 feet. I bring the engine back on line and she picks up without faltering. I now know that if I need to go around on approach to land, the engine will not let me down.

I fly over the airfield and check the windsock. Whilst being a delight to fly, the Pup is very unforgiving in some areas; the landing being the most critical. It must be into wind and it must be on three-points. The engine is shut down for landing, so there is little airflow over the rudder to control a swing should one develop. If she's not into wind at the start of the landing run, then she will be at the end! Further, if she's wheeled on, she'll swing markedly to the right as the tail is lowered due to the gyroscopic precession of the still rotating engine. The precessional swing is now more powerful than the rudder and she'll certainly ground loop.

Looking down, I find a path into wind on the ground in the middle of the airfield. I only need about 50 yards once I'm down, so I can afford to aim well into the field. I fly abeam the planned landing line, about ½ mile displaced and in the opposite direction to that of the planned landing. We're about 800 feet above the ground. I've checked my harness is tight and fuel air pressure is holding – both are good.

Abeam the touchdown point (the middle of the airfield), I cut the engine by retarding the fine adjustment lever. Engine noise stops, wind noise remains. I look at the touchdown point and start a spiral towards it. I check the aspect of the ground. If it steepens, I ease out of the turn to lower it. If it lowers, I turn into the airfield to steepen it. Eventually, I find a happy medium when the touchdown point aspect remains the same. I continue the gentle turn down into the field. As I approach the airfield boundary and I'm sure of getting in, I steepen my approach with sideslip and bring the touchdown point nearer the boundary fence. At about 50 feet to go, I slowly move the fine adjustment forward to bring the engine back on line, engine noise increases, as does power – I kill it with the 'blip switch' before it takes effect. I now have useable engine that I can bring on line by releasing the 'blip switch', should I need it to control a swing.

Cockpit of the Sopwith Pup

I bring her out of sideslip and align her with the direction of flight. I hold her off. The nose comes back, slowly, slowly, the picture out of the front of the aircraft is as noted before take-off. I feel a rumble as the wheels touch the Old Warden turf. There's no time for self-congratulation, she's off to the right, or is it the left, no it's the right, now left…. I dance on the rudders, release the 'blip switch', the engine fires, she backs off to the left, I retard the fuel, now to the right, I bring the blocktube back to fast idle, right again, replace the fuel, then 'blip' as the aircraft slows. We come to rest in a final flurry of rudder input and "blip switch". The engine's now brupp-brupping, oblivious of the frenzied activity of a few moments ago, but the airframe's still pointing in the direction we started – a success! I let the engine temperature stabilise for a minute at slow idle, then I cut the fuel. The ensuing silence is broken by the sound of the approaching 'Fergy', the boys (and girls) have arrived to tow me back in. I can't stop grinning, but neither can the groundcrew – the successful flight was as much theirs as mine.

I forgot to tell you about the oil. It's important to the engine that oil flows throughout the time that the engine is running. An oil pulsator is located on the instrument panel to check this fact. The pilot should note the slow raise and fall of the meniscus in the pulsator as the flight progresses. I have to say, I have yet to notice any change in the level at any time. Notwithstanding, as the oil system is total loss and a copious amount is thrown out of the engine during operation, the pilot is never in any doubt that oil is flowing. And that is a fact that I shall confirm when I get up tomorrow morning…………

The Vintage Aviator Ltd Sopwith Pup "Betty" is the colour scheme of FSLt J.S.T. Fall.
This is a replica of a Sopwith R.N.A.S. Pup N2605 operating April 1917.

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Keeping up with the Play (Test yourself – how good are you, really?)

1. During the run-up in an aeroplane fitted with a carburettor heat device, it is checked for function by noting a drop in RPM when and while heat is applied. What causes that RPM drop?
   - A. The carburettor heat control is linked to the throttle cables so opens the throttle a little.
   - B. The hot air reduces frictional drag on the engine's moving parts.
   - C. The mixture is richer with hot air applied.
   - D. Less fuel enters the carburettor through the main jet when heat is applied.

2. An airspeed indicator displays a white arc, beginning at 40 knots and ending at 82 knots. What does the beginning of the white arc represent?
   - A. The aircraft minimum take-off safety airspeed.
   - B. The full-flap stall airspeed.
   - C. The take-off rotation speed.
   - D. The maximum decision airspeed.

3. A tail-dragger pilot with a propeller rotating clockwise from the cockpit, is attempting to turn in a confined space using slipstream to power the rudder as the aircraft has no differential braking. If the wind is calm and there is no slope, should they turn to the left, or to the right?
   - A. Left.
   - B. Right.
   - C. No advantage, either way.

4. For what purpose are differential ailerons fitted?
   - A. To minimise the effects of adverse yaw resulting from aileron drag.
   - B. To improve the roll rate when entering banked angles.
   - C. To lighten the control loads for the pilot when substantial; aileron deflection is applied.
   - D. To assist with keeping straight when flying straight and level.

5. A pilot preparing for a long flight finds they can add 35kg to bring the aircraft up to its maximum take-off weight. How many litres of petrol can they add to the tanks?
   - A. 17 litres.
   - B. 22 litres.
   - C. 35 litres.
   - D. 48 litres.

See answers and explanations overleaf

If you have any problems with these questions, See Notes below or call me (in the evening) and let's discuss them. Rob Knight: 0400 89 3632 (International +64 400 89 3632), or email me at kni.rob@bigpond.com.

1. C is correct.

As hot air is less dense than colder air, there is less air per unit volume of hot air than cold. Therefore, as it provides the same suction drawing fuel through the jets, a warm-air mixture will have more fuel in it than the normal ratio, i.e. the warmer air mixture is richer than the colder air mixture.

2. B is correct.

The white arc is commonly referred to as the “flap operating range” since its lower limit represents the full flap stall speed and its upper limit provides the maximum flap speed (Approaches and landings are usually flown at speeds within the white arc).
Also See: https://wiki.ivao.aero/en/home/training/documentation/Airspeed_indicator

3. A is correct.

Both the propeller torque flattening the left tire and the “P” factor from the propeller with power applied will cause a nose swing left which will provide an additional left turning forces and so assist the turn in this direction. A right turn, on the other hand, will see both the forces working against the turn and so the right turn radius will likely be larger.

4. A is correct.

With differential ailerons, the up-going aileron extends further upwards than the down-going aileron extends down. The extra upward aileron movement produces extra drag, yawing the aeroplane into the turn, while the reduced degree of down-going aileron lessens the drag tending to draw the aeroplane out, or away, from the direction of turn.
In other words, differential ailerons reduce adverse yaw in turns.

5. D is correct.

The relative density of petrol is 0.72 so a litre of petrol will weight 0.72kg. (or 720 grams). Therefore 35 kg of petrol will equate to 35÷0.72 = 48 whole litres of petrol.

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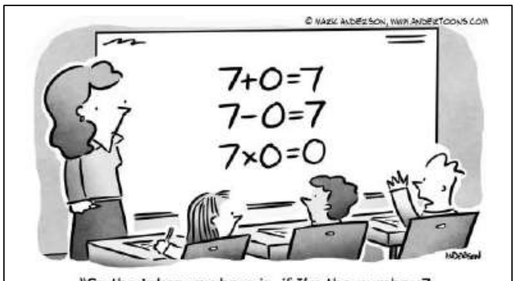

“So the takeaway here is, if I’m the number 7, avoid multiplication at all costs.”

Aircraft Books, Parts, and Tools etc.

Contact Rob on mobile – 0400 89 3632

Tow Bars

Item	Condition	Price
Tailwheel tow bar.	Good condition	**$50.00**

Aircraft Magnetic Compass (Selling on behalf)

Item		Price
Wired for lighting • Top of panel mount, • Needs fluid replenished.		**Open to Offers**

Propeller Parts

Item	Condition	Price
Propeller spacers, Assorted depths, all to fit Rotax 912 UL/ULS propeller flanges	Excellent	**$100.00 each**
Spinner and propeller backing plate to suit a Kiev, 3 blade propeller, on a Rotax 912 engine flange.	Excellent	**100.00**

For all items, Contact me - on mobile – 0400 89 3632

Or email me at:

kni.rob@bigpond.com

Aircraft for Sale

Kitset - Build it Yourself

$1,780.00 neg

DESCRIPTION

All of the major components needed to build your own aircraft similar to a Thruster, Cricket or MW5.

- Basic plans are included, also
- Hard to obtain 4" x 3" box section, 2 @ 4.5 metres long.
- Wing spar & lift strut material - 6 tubes of 28 dia. x 2 wall.
- 20 fibreglass ribs plus the moulds,
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- All instruments including,
- A Navman flow meter,
- A Powermate rectifier regulator,
- A ballistic parachute,
- A 4-point harness,
- Set fibreglass wheel pants, and
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Box sections and tubes

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A very comprehensive kit of materials

Colin Thorpe. Tel: LL **(07) 3200 1442**,

Or Mob: 0419 758 125

Ribs, tubes, spats, etc

Thruster T85 Single Seater for sale.

$9,750.00 NEG

Beautiful classic ultralight single seater taildragger Thruster for sale; to good Pilot. Built in 1984, this is a reluctant sale as I inherited Skyranger V Max and two aeroplanes are too many for me.

The aircraft at Kentville

New Engine Rotax 503 Dual Ignition has only 10

Fuel tank

Instrument panel

Details

Built - 1991	Serial Number - 312
Model - Thruster 85 SG	Rego Number – 10-1312
TTIS Airframe - 638	Original logbooks - YES
Engine - *NEW* Rotax 503 DIUL	Next Annuals due – 05/11/2023
TTIS Engine – 10 hours	Propeller – Sweetapple, Wood, 2 Blades (as new)

Instruments - RPM, IAS, VSI, ALT, Hobbs meter, New Compass, CHTs, EGTs, Voltmeter & fuel pressure gauge

Avionics - Dittel Radio 720C and new David Clark H10-30

Aircraft is fitted with Hydraulic Brakes. Elevator Trim. Landing Light. Strobe Beacon. Auxiliary Electric Fuel Pump.is in excellent mechanical condition and the skins are “as new”.

Offers considered. Call Tony on 0412 784 01

Sky Dart Single Seat Ultralight for Sale.

$4,500.00 NEG

A single seat, ultralight, Taildragger. Built in 1987, this aircraft has had a single owner for the past 18 years, and is only now I am regretfully releasing it again for sale. I also have a Teenie II and am building another ultralight so I need the space.

The landed Sky Dart III rolling through at YFRH Forest Hill

TTIS airframe is 311 hours, and the engine, TTIS 312 – is just 1 hour more. Up-to-date logbooks available. 2 X 20 litres tank capacity. To be sold with new annuals completed.

It is easy to fly (for a taildragger), and a great way to accumulate cheap flying hours.

Call me to view, Bob Hyam, Telephone mobile 0418 786 496 or Landline – 07 5426 8983, or Email: bobhyam@gmail.com

Landed at McMaster Field after my flight back from Cooma just West of Canberra. In the cockpit with me is GeeBee, my dog

Single Seat T84 Thruster, disassembled and ready for rebuild.

I have a T84 single seat Thruster project in my hanger at Watts bridge.

The fuselage is on its undercarriage, the wing assemblies are folded up and the skins are with them.

Included is a fully rebuilt Rotax 503 dual ignition engine and propeller.

And, most importantly – the aircraft logbook!

Asking price $5000.00

Contact John Innes on **0417 643 610**

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Continental O200 D1B aircraft engine

Currently inhibited but complete with all accessories including,

- Magneto's,
- Carburettor,
- Alternator,
- Starter motor,
- Baffles and Exhaust system, and
- Engine mounting bolts and rubbers.

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Total time 944.8 hours. Continental log book and engine log are included.

Phone John on 0417 643 610

ROTAX 582 motor.

Ex flying school, TTIS 600 hours, and running faultlessly when removed from aircraft for compulsory replacement.

No gearbox, but one may be negotiated by separate sale if required.

Interested parties should contact.....

Kev Walters on Tel. **0488540011**

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