BRISBANE VALLEY FLYER

September - 2022

BRISBANE VALLEY SPORT AVIATION CLUB INC

www.bvsac.com.au

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

Rob Knight (Editor) Tel: 0400 89 3632, Email kni.rob@bigpond.com

Now no-one's safe – A bipedal STOL CH 701 – see page 10.

Peter Ratcliffe (Pres.)	0418 159 429	Ian Ratcliffe (Treasurer)	0418 728 328
John Innes (Vice Pres.)	0417 643610	Acting Secretary	0418 159 429

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From the Club

Hello all,

ZOOM – and yet another month is GONE!

Our last meeting was to be held at Kholo Gardens. However, due to the rain that was falling, at the last minute we relocated it back to the club house. Apologies for the quirks of nature but it would have been very uncomfortable for us all to try and to hide under the one shelter shed.

Our next meeting will be back in club house, and the week after that Phillip Cooper has arranged a visit to the Oakey aviation base museum.

For those who are thinking of coming please email me so I can put you on the list. We have booked 15 places but that may be able to be changed if we know in advance.

NOTE that the club will be paying for members to enter the museum.

After the museum, we will then head over to Oakey RSL club for lunch at your own cost.

PLEASE LET ME KNOW ASAP IF YOU INTEND TO PARTICIPATE IN THIS EVENT.

Thank you.

Peter Ratcliffe

President (and acting Secretary) BVSAC

NOTICE

The BVSAC memberships fees for 2022 – 2023 are now due and payable. Invoices have been sent out to all of our members.

Thank you to the members that have already paid, but if you wish to renew your membership, please remit your payment.

If you did not receive the invoice, please contact the treasurer Ian Ratcliffe at "treasurer.bvsac@gmail.com" or call on **0418 728 238**.

Peter Ratcliffe
Secretary (acting) BVSAC

Instrument Flying for Plonkers (Like Me!

By Rob Knight

I got my PPL when I was a mere 17, and, in keeping with all teenagers of that age, I felt world-wise and 1000% capable. In reality, I was anything but!

At that time, I was working on my parent's farm in the Waiotehue Valley, about seven miles SSW of Kaitaia, New Zealand's most northern town, and I worked, read, slept, and saved to do my CPL the moment I could gather the funds.

On good flying days, I gazed wistfully skywards, and thought about flying whilst doing the thousands of jobs that arise an a dairy and dry-stock farm. On cloudy/rainy ones, I still looked skywards, but thought about instrument flying. At that time PPL training was all VFR, no instrument training was required, and I had never experienced any. However, I still thought about it.

I was subscribed to several flying magazines and, from time to time, read stories about the practise which led me to conclude two completely contrary things: that instrument flying was easy (from all the apparently successful stories that I read), and it was impossible and deadly dangerous – from all the stories where the pilot failed and had fatal accidents. Totally confused and with no instructor for 150 miles, I could only mull over my confusion. After prolonged and deep thought, I came to conclude that instrument flying would not be easy because it would be hard to believe the instruments readings when bodily sensations countered the instrument indications and interpretations of attitude situations. However, whilst I would avoid the need to encounter instrument flight, I firmly believed that I could do it should I ever require to. But then I recalled Vince Draffin.

Vince was a young CPL whom I had once met at Kaitaia when my father, then a student pilot, was taking a lesson in the Club's Cub. Vince was there and I helped him refuel a Cessna 180. He was on a charter flight to return passengers to Auckland after they missed their NAC Flight. At the time, about 1960, he seemed to be everything that I wanted to be. Then a few months later I heard that he's been killed on a flight from Wellington to Auckland. He'd had flown into worsening weather and, in poor visibility, crashed into a cloud-shrouded ridge. If he couldn't fly on instruments in an emergency and climb up to clear the ridge, perhaps there was a flaw in my reasoning. At least I had the wit to wonder!

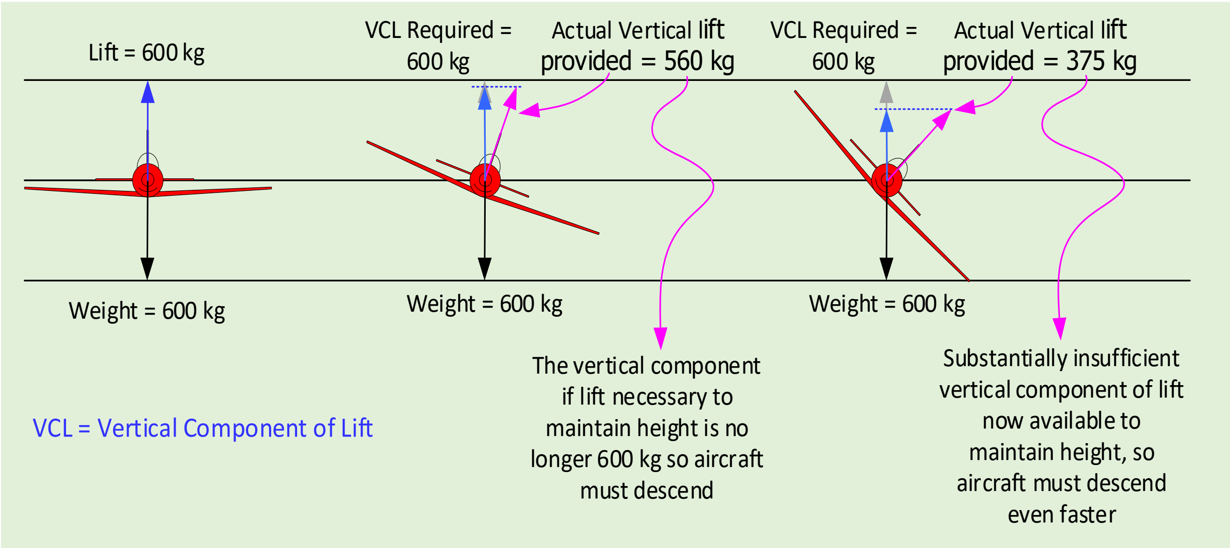
I suffered the necessary mindset change to be a competent pilot when I started my basic panel instrument flying in 1969 when I was doing my CPL training with the Auckland Aero Club. I drove my instructor so mad with my "flying on the gauges" ineptitude that he threatened to annotate my logbook to the effect that instrument flying was not a natural attribute for me.

Humour aside, I was typical of many other pilots at that time. Until I proved otherwise, I couldn't see that it was impossible for me to operate an aeroplane in cloud for more than a few seconds without entering a spiral dive and killing myself.

Now I am "on the other side of instrument flight training", the reason I couldn't understand why my belief was absolutely flawed, was sheer ignorance - I had no idea of the scan speed necessary to read the instruments and digest their indications, let alone the flying ability to act on them timely and appropriately to control my aeroplane across all three aircraft axes. Even this ignores the vital need to interpret engine instruments, radio, and fuel, and manage them, too.

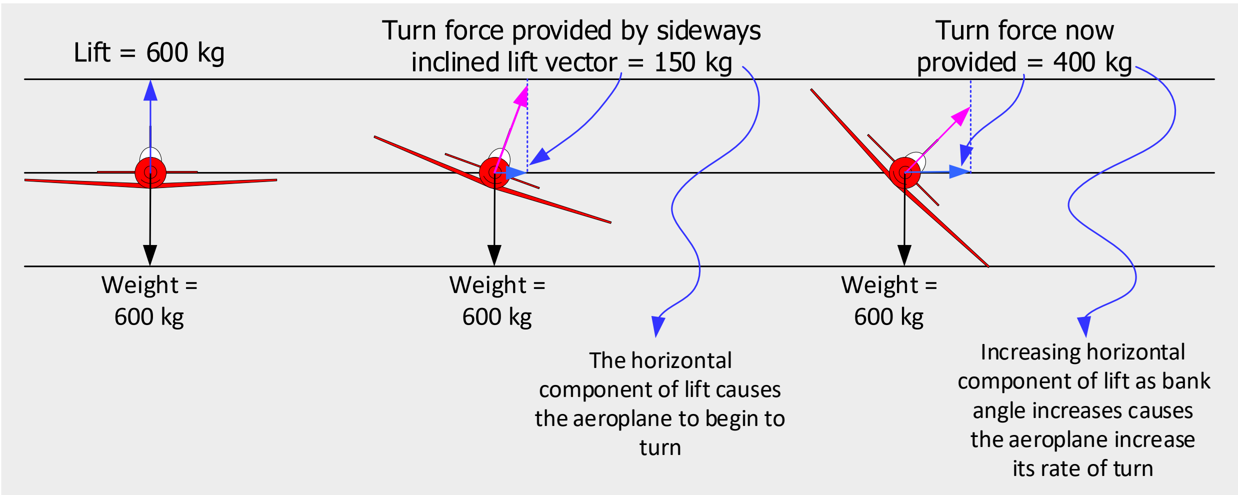
Let's look (from the inside) at what happens to an aeroplane if inadequate or inappropriate pilot control is exercised to maintain wings-level flight – the most prolific cause of spiral dives in clouds.

If an aeroplane is rolled, even a few degrees to one side, the vertical lift will be inadequate to support level flight and the aeroplane will begin to descend.



A reducing vertical component of lift will set up a descent

At the same time, the banked attitude will incline the lift vector, which then provides a lateral force (the horizontal component of lift) to the side of the lowered wing, and the aeroplane will begin to yaw (turn) in that direction.



A sideways force from the inclined lift vector, now causes the aeroplane top begin and continue to turn

But wait! There's more: now that the aeroplane is scribing an arc because it's turning, the outer wing will travel faster than the inner wing so the aircraft will NOW further roll and FURTHER increase its rate of turn.

But even this is not the end. The banked aircraft will now also begin to slip (also caused by the inclination of the lift vector). Thinking back to your ***Effects of Controls*** lesson, I'm sure you're remembering that slip promotes roll. Now you have TWO forces combining to aggravating the aeroplane's desire to roll.

But, as you were taught in that same ***Effects of Controls*** lesson, roll promotes yaw.

You're now simultaneously descending, rolling, and yawing, and the rate associated with each is increasing exponentially.

There are two things that will now impress themselves on the poor pilot, the instrument display, and the messages interpreted from his/her body sensations is sending to his/her brain.

THE INSTRUMENT DISPLAYS:

- The A/H[1] in most light aircraft will have toppled and the horizon bar will be wobbling around the instrument screen only serving as a distraction.
- The altimeter will be unwinding like a catherine wheel fully ignited and burning. The direction of needle rotation will indicate decreasing altitude The increase in the rate of needle rotation will indicate an ever-increasing rate of descent.
- The ASI[2] needle will already show an excessively high airspeed, and it, too, will be indicating an ever-increasing airspeed.
- The VSI[3] will be steady, pegged out on the maximum reading stop, usually 1500 fpm, 2000 fpm, or 2500 fpm, depending on the instrument manufacturer.
- The balance ball will likely indicate a slip, with the ball sitting on the side of the down-wing.
- The tachometer, will show very high RPM, perhaps already in excess of the engine's red line RPM - AND IT, TOO, WILL BE RISING.
- The compass will be spinning on its gimbals, the low centre of gravity of the compass card will cause its indications to be impossible to interpret due to the very and rising rate of rotation.

THE BODY'S MESSAGES TO THE BRAIN:

Unfortunately, these were driven into our subconscious minds at the time we began to walk. Tottering around on two legs soon illustrated that leaning too far forward or backwards resulted in a fall that was painful. Also, leaning too far sideways caused us to fall sideways and hurt out heads and ears. But we could spin around faster and faster until we fell over in a dizzy heap of laughter. Message to brain – pitch and roll are dangerous because too much causes us fall over and get hurt, but you can have as much yaw as you like and its FUN, FUN, FUN!!!! This leads us into over correcting on roll and pitch and under correcting on yaw. A fateful flaw, indeed.

Unless re-conditioned adequately in our ab-initio training, we tend to carry this propensity for a flawed priority list of aircraft axis movement into our flying habits, and will always be uneasy when

[1] A/H - artificial horizon
[2] ASI – airspeed indicator
[3] VSI - vertical airspeed indicator

the wings aren't level and/or, the nose attitude is high or low on the horizon. But we are completely unconcerned if the nose is yawing all over the sky.

When instructing, I have seen the same flawed axis priority appreciation exhibited by virtually every instrument student that features in my logbooks. Describing their sequence of actions merely serves to reiterate the sequence that I gave before. The only regular variation being the rate at which things turned to custard, and that was a byproduct of the personality of the student, and the turbulence on the day

First, the left wing (almost always left) will begin to sag, just a little – maybe to just 3 or 4 degrees of bank. The VSI will move a needle-width down to indicate the beginnings of the descent. The nose starts to yaw left against the horizon. The changes are small and, even with the nose pegged close to the reference point, I (without an instrument hood) can see the movement is almost miniscule. Then the VSI indicates a 20 feet per minute descent and the left wing sags a little further. The nose has now moved a couple of inches left. The changes are accelerating. Suddenly the bank reaches 15 degrees and I wonder why the student doesn't act on the turn needle indication. The descent rate now hits 50 fpm and the bank angle climbs to 45 degrees, the nose has now yawed 45 degrees from or original heading. Then the student reacts, overcontrolling and shoving the stick abruptly right to level the wings, and pulling it back to stop the height loss. The aircraft rolls left, far too quickly for accuracy and the beginnings of the G loading are felt. With the uncorrected roll and yaw, the nose is now 60 degrees from our original heading. The plot thickens as, with the ball no longer centered, the turn needle (or the turn coordinator indicator) is no longer an accurate indicator of where the wings are in relation to the plane in balance, there is no way of knowing where wings level is. The student returns the stick to central with the aircraft in a spiraling right turn and the airspeed is rising fast.

Recognizing the ball is no longer centered, stepping on it with the appropriate rudder pedal until it centers corrects it. Now the turn needle indicates more correctly. We are now in a 60-degree left bank, the nose is about 45 degrees below the horizon, and the airspeed continues to rise, as is indicated by the rising engine RPM and the noise.

The pilot applies left aileron (still insufficient rudder) and the aircraft rolls left (again). The pilot responds to the rising RPM and adjusts the throttle to reduce it whilst the bank increases to around 80 degrees. The altimeter is unwinding frantically and the pilot pulls back hard to stop the dive he is in.

Alas, with the steep angle of bank now applied, the back-stick merely increases the rate of turn and the G loading. The aircraft continues to roll left and is now vertical. The VSI is pegged out on the stop and the aircraft is closing on its V_{NE}. The severe and still rising G loading makes the pilot think that he's still in a wings-level dive and still he pulls the stick back. But all he's likely to achieve is a high-speed stall in a spiral dive, at or above his V_{NE}. The pilot, panicked (or close to it), has totally lost the ability to appreciate the aircraft's attitude and, with the increasing rate at which things are going wrong, there is no way he can re-establish control. Then the instructor says those magic words, "I have control".

A limited panel (AH and gyrocompass blocked out). Displaying indications relevant to a steep spiral dive to the left. Note – missing the magnetic compass.

Until I had actually experienced this for myself, it was impossible (in my ignorance and unwitting arrogance) to have ever understood the ease with which I would lose control of the aircraft. Alas, for too many others, this scenario reflects the last lesson they should have learned but now never would.

The pilot will first feel the rising G loading and will begin to pull the stick back. His/her ears will advise them the airspeed is rising and they may/may not glance at the ASI, but this will affirm their appreciation of being in a dive and needing to pull out of it. Their desire to stop their descent aggravates their decision to pull the stick back further.

WHY, WHY, WHY, does it all go so wrong, and in the same way?

For several reasons, actually. As I said earlier, without practice, our scan rate is too slow. Also, we stop at each required correction and “fix it” before moving on to the next instrument. This makes our corrections too slow to be effective across the board.

The scan and react method that I was taught was to move the controls as little as possible and not to fix any issue all at once. If a wing was low on the turn needle, check the ball was centered so the turn needle was accurate, and then just start a tiny slow roll the other way with minute use of the aileron and ALWAYS balancing with rudder. Then hold the controls dead still whilst scanning to checking the attitude (by airspeed and altimeter readings remaining steady) and heading were constant (by magnetic compass indications). Then immediately look at the slip/skid/turn indicator to return to the wings-level issue, and either stop the roll by removing the aileron and rudder input, or hold for another scan. Believe me, such an exercise takes more than a little practice and simply cannot be satisfactorily achieved in a few minutes patter by an instructor OR by reading a book about it.

I can hear the sound of rising revolt. Surely this was in the dark ages, what about using an artificial horizon?

If by using the term “dark ages” you mean the late 1960s, you are absolutely right. 1969 to be exact. It was a requirement for all CPL trainees to pass their CPL flight test, instrument flight section, with two parts to the test. One was using a partial panel where the only instruments available to the pilot were the ASI, Altimeter, the VSI (and not all aircraft had one of these), the RPM indicator and the magnetic compass. This was quite important because the artificial horizons of the day would frequently topple and provide just a madly waving horizon indication if roll or pitch exceeded about 60 degrees. In today's world, PPL candidates are also required to undergo basic instrument training but I sincerely hope that it's to achieve the knowledge that instrument flight is not something to take casually. It takes much practice to gain adequate competency, and even more regular practice to maintain proficiency

With good instruction and lots of practice, partial panel instrument flying became surprisingly easy and relatively accurate. In reality, its primary purpose is to allow the pilot to regain control (if control has been lost due to pilot disorientation), then to maintain controlled flight whilst climbing or maintaining level flight, and carrying out a 180 degree turn to return to VMC conditions.

Many of the light aircraft I peek into today reflect similar shortcomings to the Victas and Cessnas that I flew as a student. Their panels sport neither a turn coordinator nor a slip/skid (turn) indicator so there is no way even partial panel instrument flight can be undertaken in them. To me, looking backwards on my flying life, I am convinced that instrument flying in IMC in a single engined aircraft is probably non-habit-forming in the long run. It's a bit like being inside a space invader machine where there are no spare lives. If you stuff up, you're dead. One mistake and it's "game over".

Example of full instrument panel for instrument flight, the two central flight instruments are (top) the artificial horizon and (bottom) the gyro compass.

Happy Flying

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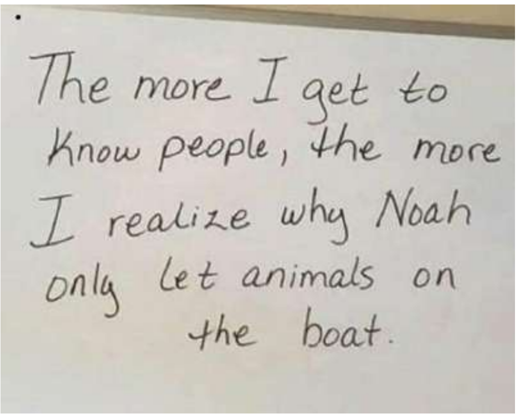

A Tailwheeled STOL CH701

Originally by Ariana Rayment. Published: June 23, 2022

This personalized "Sky Jeep" was modified by Ivan Gromala, the owner and manager of Quality Sport Planes, Zenith's West Coast representatives.

What's that? A custom-built Zenith STOL CH 701 taildragger? Now that's something you don't see every day. As we all know, Experimental aviation provides builders with more room to, well, experiment. Ivan Gromala of Quality Sport Planes (QSP), took advantage of this additional room to roam and put his STOL CH 701 on conventional landing gear.

Originally designed as a nosewheel airplane, Zenith's STOL CH 701 has excellent short take-off and landing performance, allowing pilots to get off the ground in less than 90 feet of hard surface or 120 feet of grass, at gross weight. The tricycle-gear configuration also allows for better forward visibility, an added bonus when operating off-airport. Overall, the combination of short-field capabilities with ease of construction makes for a great backcountry option for low-time pilots and first-time builders who don't necessarily want a tailwheel airplane. That's partly why Zenith has prioritized the trike in its kit offerings.

But what if you do want a taildragger? Ivan was up for the challenge. This is what happens when you have the freedom to experiment. As we all know, home-builts reduce the amount of obstacles builders face when trying to modify their aircraft. You can build what you want, using the parts, materials and resources you want.

Ivan was inspired to do the conversion because numerous QSP customers showed interest. His shop is located in beautiful Cloverdale, California. Wine country. He noted there are some really nice spots to fly in and out of, where you might want more prop clearance. His airplane has a 75 inch three-blade WhirlWind propeller, Rotax 912 ULS with an Edge Performance fuel injection kit and Beringer wheels and brakes with 29-inch Alaskan Bushwheel tires on it.

As for the gear and shocks? Tony of Shock Monster created those. Ivan modified everything for the airframe to fit the gear and tailwheel, which took a lot of trial and error. His tool, die and machinist background proved valuable as he worked to get it structurally sound. He's still working with the gear to get it more aligned by changing angles, camber, tire pressure and pressure for the shocks.

Ivan didn't build his CH 701 himself. He purchased it from a customer and flew it as a trike for over a year. The tailwheel conversion project took roughly 250 hours total, accumulated over the course of a year. "Would've been a lot less now knowing what I know," he laughed.

He did most of the work himself and received a lot of valuable information and advice from his "old timer" friend, Eric, who's been a tailwheel pilot the entire time he's been flying. "If I don't know something, I'm gonna ask people who've done it and who have gone through building different airplanes throughout their lives," Ivan said. "You know, that knowledge you can't get from a book."

When asked if he ran into any major obstacles, Ivan said everything was really doable; he just lacked time. He's a general engineering contractor who runs an excavation company during the week and QSP during his free time and on the weekends. QSP offers builder assistance, so Ivan's very busy overseeing that.

Ivan finished the gear conversion project roughly five months ago and went right into tailwheel training, earning his endorsement shortly thereafter. I asked how his airplane compares to the tricycle gear version of it and he said, "It's a whole different animal."

"I can't tell you differences because I haven't flown other tailwheels," Ivan said. "But it pops off the ground in 50 feet."

You could hear his smile through the phone. He's been enjoying the tailwheel life. You can see Gromala's custom taildragger in action on You Tube – the link to view it is below.

See: https://www.youtube.com/watch?v=fw9q-4Unoxw

Or Google: *Zenith STOL CH 701 "Sky Jeep" Taildragger!*

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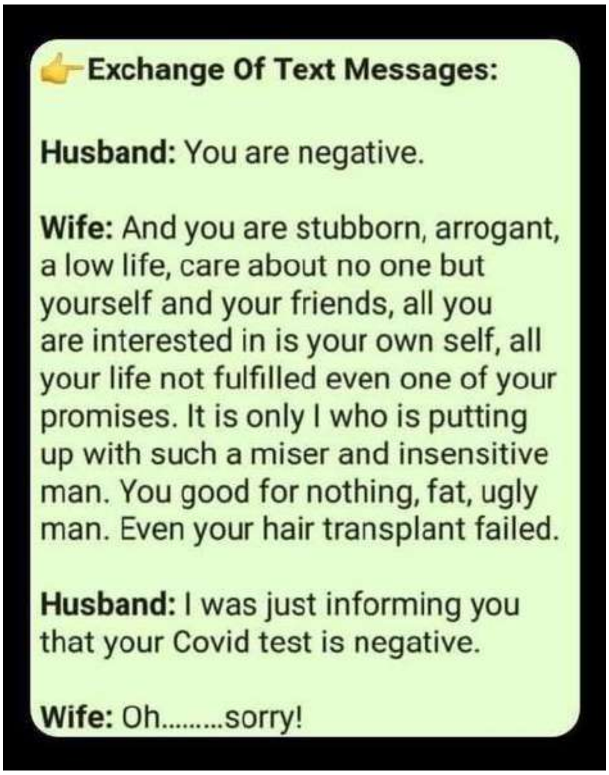

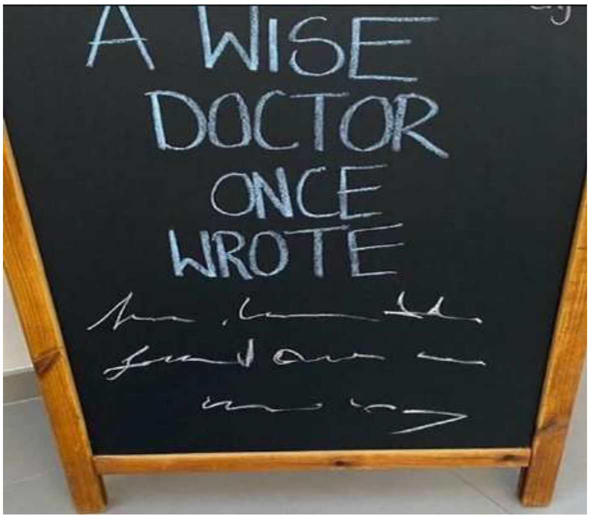

Edgar Percival's Fabulous EP9

By Jason McDowell. June 21, 2022

This short, but massive British utility aircraft was produced in limited numbers in the 1950s.

On paper, the 1950s-era Edgar Percival E.P.9 isn't so different from many types. From a technical aspect, it checks many of the same boxes; it has a high wing braced by struts, it's a taildragger, it has one piston Lycoming engine, and it has room for five seats. Fairly straightforward and unremarkable.

A British utility aircraft produced in limited numbers, the Edgar Percival E.P.9 had a look all its own. [Photo: Jason McDowell]

Walk up to one in person, however, and it quickly becomes clear that this machine is something altogether different. Despite standing only about a foot taller than a Cessna 185, the E.P.9 is massive in person, and dwarfs any single-engine piston GA aircraft in the vicinity. Additionally, the layout is vastly different from other types, with a cockpit that's elevated above and separated from the cavernous passenger/cargo cabin below.

All of these seemingly mismatched and unusual design aspects can appear random at first glance. But when the aircraft's history is explored, it becomes clear that every feature has its purpose. Together, these features support the original mission of the E.P.9: a single solution to answer freight, air ambulance, and agricultural requirements in rural, remote areas.

Viewed through this lens, the design makes sense. The raised cockpit, for example, provides fantastic outward visibility to agricultural pilots weaving their way around trees and power lines. Additionally, this opens up space beneath the cockpit for chemicals or additional fuel.

Power was provided by 270-295 hp Lycoming GO-480 variants. These produced cruise speeds of around 120 mph (104 knots), while the large flaps and drooping ailerons provided an impressively low 35-mph (29-knot) stall speed. For an airplane with a maximum agricultural take-off weight of 4,320 pounds, this was an admirable performance envelope. Later versions dedicated to aerial application utilized various radial engines for additional power.

With optional auxiliary fuel tanks, the E.P.9 had a total capacity of 154 gallons, which, at normal cruise settings, provides 8 to 10 hours of endurance. While the aeroplane was likely never envisioned to fly 1,000nm legs, it was certainly intended for operation in remote areas where fuel is scarce. Tankering fuel was, therefore, a capability that was thought to appeal to operators.

The proximity of the rear passenger seats to the clamshell door must have been fairly uncomfortable to imaginative minds. [Photo: Jason McDowell]

The bulbous passenger cabin can be outfitted for cargo, passenger, or air ambulance duties with relative ease. The clamshell door at the rear enables effortless loading and unloading of patients or cargo. And the gangly, exposed main landing gear components enable relatively smooth operation from rough, unimproved runway surfaces.

The E.P.9's unique yoke design is reminiscent of the Spitfire, but the performance envelope certainly is not. [Photo: Jason McDowell]

Finding an E.P.9 to examine in person is difficult. First flown in December 1955, only 27 examples were built. Of those, an estimated seven survive today. And of those, most are on display in museums and only one or two are thought to be airworthy and flown regularly.

Presently, two examples exist in the U.S. One is registered to a museum in New Mexico, and as it turns out, the other, in Mississippi, is in need of rescuing. It has been mostly restored and is complete but the owner, Pat Ryan, no longer has the time or desire to complete the project. He would like to sell it to someone willing to complete the restoration. If you're interested, email us and we'll put you in touch with him.

Though the E.P.9 was never considered a commercial success, it serves as a fascinating example of purpose-driven design. Individually, certain features seem randomly chosen. But collectively, they work together to serve a common overall purpose. By this measure, the engineers responsible for the airplane could feel proud of their technical achievements.

Jason McDowell

Jason McDowell is a private pilot and Cessna 170 owner based in Madison, Wisconsin. He enjoys researching obscure aviation history and serves as a judge for the National Intercollegiate Flying Association. He can be found on Instagram as @cessnateur.

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See https://www.youtube.com/watch?v=GxIAvPPG2wA and https://www.goodall.com.au/australian-aviation/percival-ep9/percivalep9.html

EP9, ZK-PWZ, in New Zealand (airworthy)

EP9, VH-DAI, in Australia, c. 1970s

Tame Your Plane

By Rob Knight

Whenever mankind operates any device, we "control" it. Any tool or machine, from throwing a spear to flying an Apollo spacecraft, requires control. This sets mankind apart from all other species on this planet.

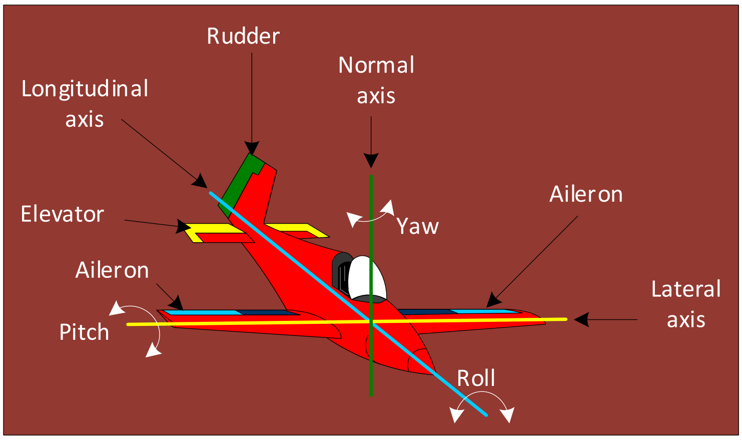
How that control is exercised, however, takes many forms and nuances, from brutal oppression to gentle and easy dominance where both the controller and the controlled benefit from a symbiotic relationship. If a farmer beats his dog excessively, the relationship fails and the dog won't work so well, and the same goes for an aeroplane – misuse, or over-control of your aeroplane will see the relationship between pilot and machine doomed, to be second rate at best. While it might be hard to stretch the imagination to visualize an emotional bond from an aeroplane as a machine, to its human pilot, the concept still exists insofar as the human pilot imagines it, and this can make it real in the pilot's mind which encourages that easy reciprocal relationship that I described above.

To develop such a relationship with his machine, a pilot must be very familiar with how that machine works, from what will provoke to what will pacify and the first step to achieving this is to clearly understand how it is controlled.

Aeroplanes must be controlled in two dimensions, forward speed and vertical speed (up or down), and to achieve this, the machine is provided with four controls – three flight controls to provide control about three axes, and the engine controls which, in simple aeroplanes is via the engine throttle control.

The Axes, and Control About Them

As the adjacent sketch provides, these axes are: the NOMAL axis running vertically through the fuselage, and about which we yaw, the LONGITUDINAL axis running long-wise through the aeroplane from nose to tail and about which we roll, and the LATERAL axis that runs from wing tip to wing tip and about which we pitch. These axes and the movement about them are fixed in concrete so to speak. Even if some other system is used to control the aeroplane, it is these three axes that must be controllable for the aeroplane to fly. Note that all three axes intersect and act about the centre of gravity of the aeroplane.



The three axes, three movements, and three controls

Whist trains, cranes, and automobiles all use the surface of the earth, with the solid stability and traction it provides as a basis for support and controllability, the fluid airmass in which aeroplanes operates provide no such solidity. Their controllability in the air requires an entirely different approach – we bend it!

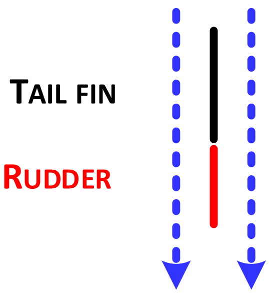
Yes, we control aeroplanes by bending the air in localised areas to provide the forces that the earth's surface affords ground-borne machines. For example, when driving your car, moving the steering wheel causes your front wheels to rotate about their vertical axes so the wheels are angled to the vehicle's direction of motion. Friction between the tyres and the road surface, provides resistance to rolling in the vehicle's current direction of travel, but ease in a slightly different direction. The car front wheels follow the line of lesser resistance and provide a sideways force that yaws the front of the car into the new direction which the car must follow. This is what every pilot knows and experiences until the time they take their first flying lesson. This new machine, not in contact with the ground, is absolutely and entirely different. Not only does the wheel look different, if it has one at all, but the feel of the wheel is like nothing they have experienced before.

The yaw control in an aeroplane is via the rudder, and, to make it even more confusing, the rudder is not used for steering in the air. More on this later when we discuss details on how to turn aeroplanes, here we are only looking at how the controls work.

Aeroplane designers use the very simple concept that if we can make a fluid bend, we will change its pressure which in turn provides a vector force – a force having both magnitude and direction of application. Hold a spoon under a running tap and change the direction of water flow after it flows around the outside of the spoon's curve. It no longer flows vertically downwards, but is angled towards the cupped (hollowed) side of the spoon. Obviously, a force provides this directional change as the water has mass.

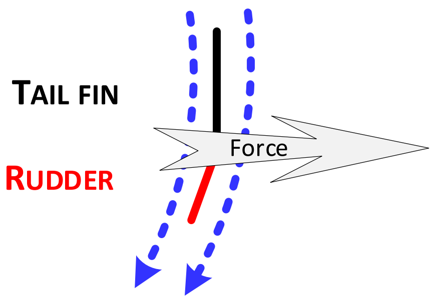
Most simple aeroplanes use flat frames and fabric covering for their tail stabilising and tail control surfaces so, for simplicity, we'll follow suit. For this explanation, the tailplane will remain vertical and the rudder will move.

The sketch on the right shows a representation of a vertical view downwards onto the tops of a **TAIL FIN** and a **RUDDER**, with a dashed **BLUE** line on each side representing airflow. Whilst both the **FIN** and the **RUDDER** are aligned, the air flows straight past with no lateral force generated.

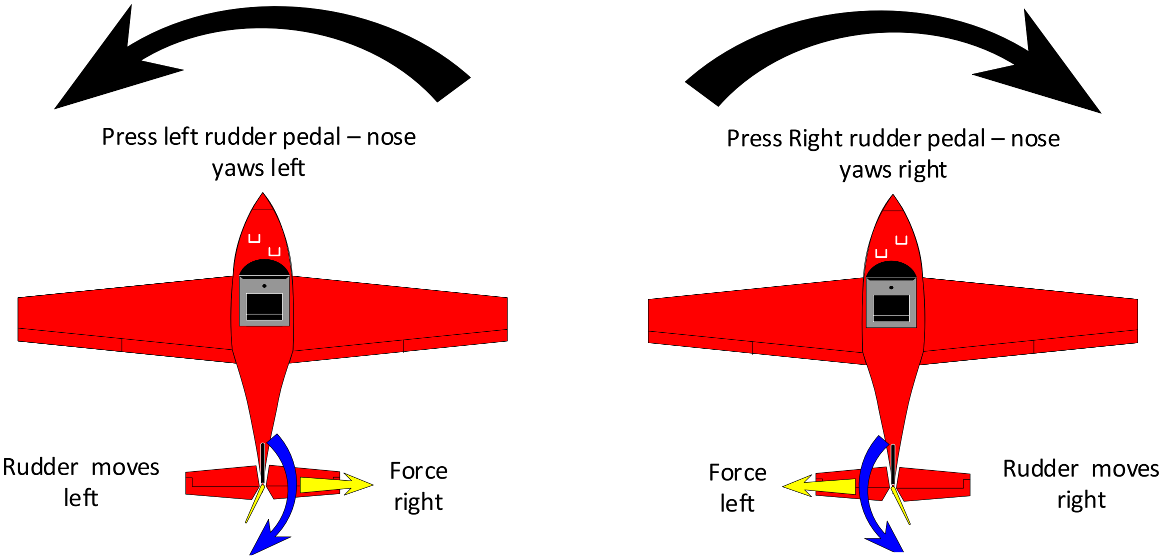


When the rudder is turned, and the airflow is forced to follow a curved path, a force is generated towards the outside of the curve.

This generated force pulls the tail of the aeroplane sideways, to the right as viewed, and it pivots about its centre of gravity so the aeroplane yaws left.



Now let's see haw that relates to the aeroplane as a whole.

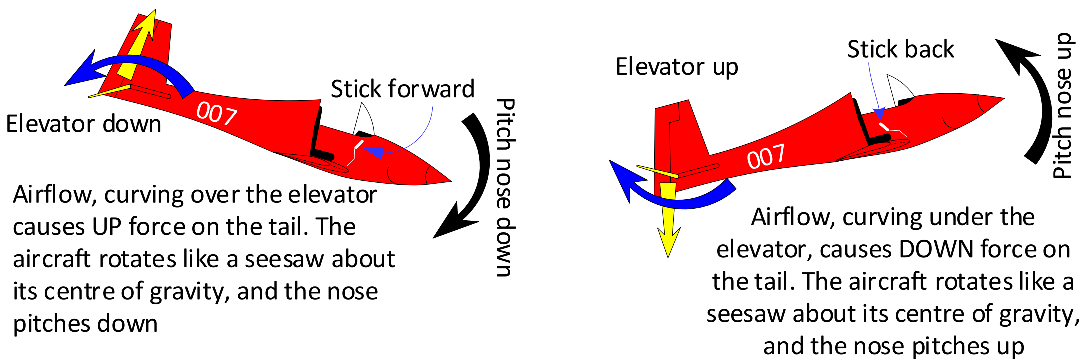


In the sketch above, pressing the left pedal moves the rudder left which provides a force right. The right-pushing force moves the tail about the centre of gravity and the nose moves left. Left pedal press moves the nose left.

In the sketch above, pressing the right pedal moves the rudder right which provides a force left. The left-pushing force moves the tail about the centre of gravity and the nose moves right. Right pedal press moves the nose right.

Remember that phrase – when we bend air, we create a force that acts in the direction of the outer-side of the bend. This concept crops up in many forms with aeroplanes, in fact, without it, aeroplanes wouldn't be flying.

The elevator, used to provide pitch about the lateral axis, that raises and lowers the aeroplane's nose against the horizon, functions in exactly the same fashion, except in the horizontal plane rather than the vertical.



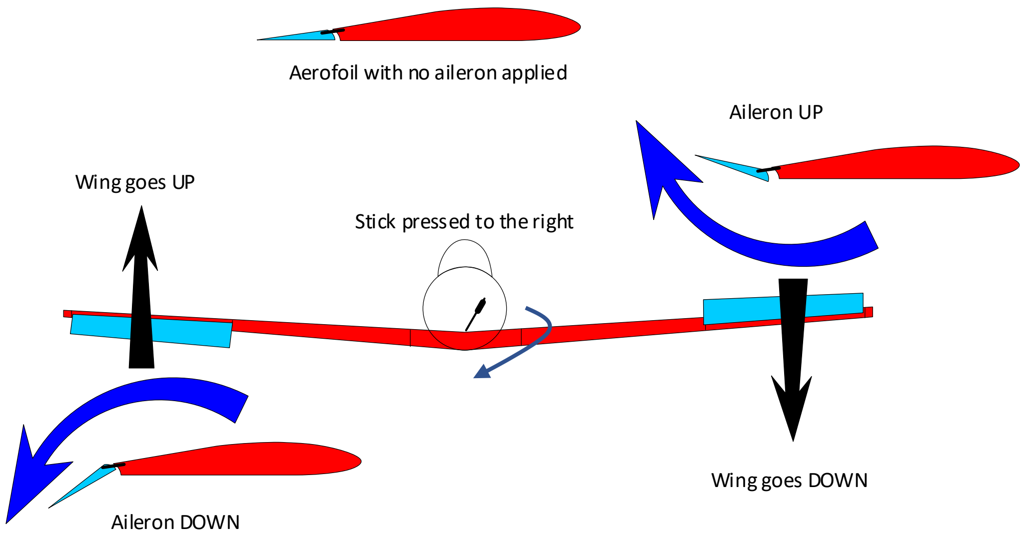
The elevator, moved by fore and aft movement of the stick, controls pitch

The third axis is the longitudinal; axis, about which we roll. Roll control is via the ailerons, control surfaces on the trailing edge of the wings

Ailerons function identically to the previous two control surfaces, by "bending" the air. However, in this case, there's a slight difference – the air is already being "bent".

We can get lift from a flat plate angled to an airflow - a simple action and reaction situation. However, we get about the same amount of lift off the plate as we get drag, and that kills the productivity of an aeroplane as we'd need too much power to fly economically. As power must be used to offset drag, we could only effectively lift what power the engine gave us. However, we humans are good at cheating and, in this situation, damned good at it. We watched birds and stole their aerofoil shape and put a curve on the top surface of our wings, too. This is where we confirmed that bending the air provides a force – we now got 10 times the lift from the curved top surface (because of that marvellous bend). Simple arithmetic will confirm that this means that we can effectively lift around 10 times the power of the engine.

This curve over the top surface of the wing was no obstacle to the use of bending the air with ailerons to provide a roll force. Aileron control surfaces are simply built into the shape of that curve so we continue to get lift as well as roll control because all the ailerons do is adjust the amount of lift that we get from that outer portion of the wings. If we use ailerons to increase lift by simply increasing the degree of curve, then we will get more lift and that wing will rise. If we use aileron to put a net effective curve beneath the wing, that wing will sink. Hey! What about putting these two thoughts together and making the ailerons work as opposites, when one goes down the other goes up? Then we'd have a very powerful combination to provide that roll control we are seeking.



Right roll. For left roll, the stick is pressed left, the ailerons reverse, and the right one going down and the left goes up. The black curved arrows depicted here reverse sides and the Aeroplane rolls left.

What should a reader get from all this? I have tried to portray that your aeroplane has three quite large controls surfaces provided to deliver control for you to exercise about the three axes necessary for flight. It is through these controls that you make your wishes and demands known to the airframe to which you are strapped. But how your aeroplane responds to you is absolutely determined by the manner in which YOU provide your instructions to the airframe through those controls.

The pilot is the master, so all instructions through the controls need to be positive. There is no way an aeroplane can be anything other than a servant. However, if you shout and yell at your servants they may rebel and you'll get a lesser response than if your instructions were easy to understand and not delivered in an abusive manner. I am not suggesting talking to your aeroplane, merely ensuring that your instructions through the controls are gentle, deliberate, and not subject to ambiguities.

In my examining days, I have sat beside budding Tarzans forcibly demanding that their aeroplanes follow their every move. Nothing subtle here. Through stress, nerves, anxiety, or just bad training, they over-control, and wave the stick about like a demented cricket bat. I have sat beside a pilot doing a flight test that was a shoving the stick from side to side, using at least half of his possible aileron control movement each way, yet his wings were level He did it as we did each stall, and he did it in the descent. He did it in turns and stuffed up his maximum rate turn exercise. He also did it on approach and it was a major failing that cost him that attempt at his license.

Controls should be kept as still as possible. The pilot example above was applying aileron, then removing it before it could take any measurable effect, and applying opposite aileron, then removing that too. He was apparently unaware of his habitual over control; it was lost on him as he was very argumentative after the test when I attempted to discuss it. He's not the only example I have seen of this, merely the worst.

They say that aeroplanes are machines and machines can't talk. I disagree. Another facet of the need to use the controls with gentleness and care, allows the aeroplane to tell you a lot about how it's feeling. For example, with increasing airspeed, the controls get heavier: with decreasing airspeed, the controls get lighter, with slip, the sideways ailerons pressures in the stick tell you that you are out of balance – the ball is not centred and this can be confirmed by pressures in the rudder pedals changing. However, to feel these somewhat delicate touch/feel sensations, the stick cannot be held in a 5kg ham for a fist. To have much stick feel, the stick needs to be held in one's fingertips.

Training in a Piper Cub, my instructor in the 1960s would express considerable invective should he "snatch" the stick in flight and not tear it out of my hand. Only two fingers and a thumb were allowed to hold the stick. But the grizzly old [redacted] was right. Throughout my flying life I have found that I could feel things in the stick that others, flying with a full-fisted, white-knuckled grip on the stick, were in totally ignorance of. As is pretty obvious, this is a very handy attribute when doing stalls. Not only do I feel the pre-stall buffet earlier, it gives me greater precision in checking the stick forward just sufficient to feel the aeroplane unstall so I don't lose excess altitude in the recovery. It also assists in feeling the edge of a stall in turns, climbing or descending, and the effects of a wind gradient on approach as the change in wind velocity changes the airspeed. I don't need to merely see it on the ASI, I only use the ASI to check what I have already been alerted to through my finger-tips.

The whole message I pose in this piece is to suggest that you lighten up on your stick handling. It will assist in reducing aggression in your control inputs, and give you feel that will serve you as an early warning system. With the size of the control surfaces available, there really is no need to do anything but provide gentle control inputs to achieve total control.

Now you have refreshed the theory of control over flight axes, use this knowledge through your intelligence to revise the manner in which you exercise control when you are flying. With practice, you can have a very rewarding conversation with your aeroplane – and it will go both ways.

There are none so deaf as those that will not hear!

Happy Flying

------ ooOOoo ------

FLY-INS Looming

Murgon (Angelfield) (ALA)	Burnett Flyers Breakfast Fly-in	**Next Planned – See http://www.burnettflyers.org/?p=508**

"You getting athlete's foot is about as ridiculous as a coal miner with sunstroke!"

"Want me to get you a shopping cart?"

US Special Forces Will Soon Get Support from a Rugged New/Old Aircraft

Kelsey D. Atherton

A common civilian aircraft design becomes a Warbird

The AT-802U Sky Warden

On August 1, Special Operations Command (SOCOM) announced that the next plane in its inventory would be a single-engine prop aircraft. SOCOM will buy up to 75 AT-802U Sky Warden planes, built by L3Harris Technologies and Air Tractor. These planes will support special operations forces, like Delta Force or Navy SEALs, as they fight irregular wars.

The name of this program is "Armed Overwatch." The contract announcement says it "will provide Special Operations Forces deployable, affordable, and sustainable crewed aircraft systems fulfilling close air support, precision strike, and armed intelligence, surveillance and reconnaissance, requirements in austere and permissive environments for use in irregular warfare operations in support of the National Defense Strategy."

Irregular warfare is a broad term that is easier to define by what it doesn't include. Regular warfare is when the uniformed soldiers of one nation fight the uniformed soldiers of another. These conflicts usually involve the whole range of conventional military forces, from rifles through tanks and artillery to fighter jets and bombers. Irregular warfare, by contrast, involves fighting against insurgencies, rebellions, and tracking down people linked to terror operations. It can also involve helping other countries' militaries do the same.

For example, in 2003, the US invaded Iraq with a conventional war, which lasted until the collapse of Saddam Hussein's military. Armed resistance afterwards to the American military and to the new government of Iraq became irregular warfare, and to this day the US deploys forces in the country to assist in training Iraq's military in irregular warfare.

For SOCOM's purposes, a plane that can support special operations forces doesn't need to survive in a sky filled with hostile fighter jets or when the enemy brings dedicated anti-aircraft vehicles to the battle. Instead, what is most important is that the plane can fly easily, shoot what it needs to shoot, as well as take off and land, if need be, on rough runways and cleared fields, instead of dedicated airbases.

Those characteristics, that rugged versatility, are likely why the Sky Warden won out over four other planes SOCOM considered for the contract last summer. The contract initially awards $170 million, or about the price of two F-25A stealth jets, with a ceiling of $3 billion for the full fleet. L3Harris said in a statement that production will begin in 2023, for the initial lot of six Sky Wardens.

"We want to deliver game-changing, modular solutions to U.S. special operators for their hardest missions, and Sky Warden does just that," Christopher E. Kubasik, CEO of L3Harris, said in a statement.

"Armed Overwatch" is a role that involves both scouting for targets and attacking enemies on the ground. While SOCOM considered planes that could also perform a transport role for the special operators, the Sky Warden is built to scout and to attack. To that end, the Sky Warden can carry over 8,000 lbs of payload while armoured. The wings can carry a range of weapons, from 500-pound bombs to small missiles to sensor pods, and the center of the aircraft can host two heavier systems as well. The wing station can fit a gun, like a .50-caliber machine gun or a 20mm cannon. With a full load of sensors and weapons, the plane can take off on a runway of just 1,400 feet, and it can land on one 1,200 feet long. The tandem cockpit seats two pilots.

The AT-802U Sky Warden

The AT-802 (note the lack of a "U," which denotes the latest variant, the AT-802U, that SOCOM is getting) first flew in 1990, where its rugged airframe and heavy payload capacity made it an ideal crop duster. As a crop duster, the plane was used to spray crops on counter-narcotics missions, an action that sometimes saw the planes shot at by farmers defending their crops. "Years of coca crop eradication missions in South America resulted in the development of lightweight composite ballistic armour for the AT-802U cockpit 'bathtub' and engine compartment", notes the Air Tractor page for the plane.

In other words, SOCOM is getting a plane with crop duster origins, and one that can be used for the military missions of special operators. The Sky Warden is armoured against attack, provided the enemy it is facing is armed mostly with small arms, like machine guns and rifles.

This was a concern 13 years ago, when the Air Force announced a plan to purchase 100 such planes in 2009. Skeptics of the Air Force's 2009 plan for a light attack plane similar to the Sky Warden noted at the time that insurgent forces could get portable and effective anti-air weapons that could threaten the aircraft. With the award of the Armed Overwatch contract this week, former Popular Science contributor Peter W. Singer, now a fellow at New America, revisited an article he wrote that year, tweeting, "And note, since writing that in 2009, the cropduster [Sky Warden-style plane] has not improved, while both the enemy capabilities and the unmanned alternative has obviously drastically improved."

As nations like Germany and the United States offload old anti-air missiles to Ukraine for use in its war against Russia, the possibility exists that some of these weapons will make their way onto the black market. While old anti-air missiles may struggle against modern jets or be overkill for modern drones, they are perfectly suited for attacking planes like the Sky Warden. As SOCOM makes a big bet on how to fight irregular wars from the sky, it is also gambling that the enemies it finds will lack anti-air weapons, even as war makes those weapons more available.

------ ooOOoo ------

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

1. How close to a cloud may a pilot fly whilst on the downwind leg at 1000 ft AGL at a non-controlled airfield?
   A. Clear of cloud because the circuit rules permit it.
   B. 1000 ft horizontally because visual flight rules permit it.
   C. Clear of cloud because visual flight rules permit it.
   D. 1000 ft horizontally because the circuit rules permit it

2. The W/V values in a GPW&T forecast are displayed as 310/20. Thus, the wind velocity actually is:
   A. 310 degrees true at 20 knots.
   B. 310 degrees magnetic at 20 knots.
   C. 310 degrees true at 20 kilometres per hour.
   D. 310 degrees magnetic at 20 kilometres per hour

3. How frequently is a GPW&T issued?
   A. Every 4 hours
   B. Every 6 hours.
   C. Hourly.
   D. Daily.

4. May an animal be carried in a two-seat aircraft, and, if so, under what conditions?
   A. No.
   B. Yes, but only on the animal's owner's request.
   C. Yes, but only with the pilot in Command's approval.
   D. Yes, but only with the Pilot in Command's approval AND the animal being secured or harnessed so it cannot constitute a hazard at any time.

5. From the following circumstances, select the one that would have the aeroplane developing the most lift?
   A. In a climb.
   B. In a glide.
   C. In straight and level flight.
   D. Lift must always equal weight in flight so none are specifically correct.

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. The Visual Flight Rules state that an aircraft at or below 3000 feet AMSL and 1000 feet AGL (whichever is the higher) must operate "clear of cloud, and in sight of the ground or water".
   See Part 91 (Plain English version) V2.0, Figure3, page 43.

2. A is correct. Wind velocities are presented in all aviation forecasts as being in degrees true and in knots.
   See (in this case): http://www.bom.gov.au/aviation/data/education/gridpoint.pdf

3. B is correct. GPW&T forecasts are issued every 6 hours.
   See: http://www.bom.gov.au/aviation/data/education/gridpoint.pdf

4. D is correct.
   An animal; may be carried in an aircraft ONLY with the consent of the Pilot in Command and the animal being secured in such a manner that it cannot constitute a hazard.
   See Part 91 (Plain English version) V2.0, Carriage of Animals **(91.620)**, page 39.

5. C is correct. In a climb, part of the weight is supported by thrust. In a glide, part of the weight is supported by drag. In straight and level flight lift is equal to weight. Option D is a absolutely INCORRECT.

------ ooOOoo ------

Aircraft Books, Parts, and Tools etc.

Books (Aviation)

Item	Condition	Price
As the Pro Flies (by John R. Hoyt)	Excellent	**$20.00**

Parts and Tools

Item	Condition	Price
VDO Volt Readout instrument	Brand New	**$70.00**
Altimeter. Simple – single hand	As new	**$50.00**
Oil Pressure indicator, (gauge and sender)	New – still in box	**$80.00**

Tailwheel Tow Bar

Tailwheel tow bar. (one left)	Good condition	**$50.00**

Propeller Parts

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**

Contact Rob Knight via either kni.rob@bigpond.com, or **0400 89 3632**.

Kitset Aircraft for Sale

Build it Yourself

$1,980.00 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,
- 16 spar webs plus the moulds,
- 2 fibreglass flat sheets for the leading edges - 4 metres long x 1.1 metres wide.
- All instruments including,
- A Navman flow meter,
- A Powermate rectifier regulator,
- A ballistic parachute,
- A 4-point harness,
- Set fibreglass wheel pants, and
- More.

Box sections and tubes

Flow Meter, Navman, Ballistic Chute, etc

A very comprehensive kit of materials

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

Or Mob: 0419 758 125

Ribs, tubes, spats, etc

Aircraft for Sale

¾ scale replica Spitfire

$55,000 neg

This aircraft is airworthy, flown regularly, and always hangared. Registered 19-1993, it is powered by a 6-cylinder Jabiru engine (number 33a-23) with 300 hours TTIS. The airframe has logged a mere 320 hours TTIS. This delightful aircraft has recently been fitted with new mounting rubber, a new alternator and regulator, a new fuel pump, and jack stands. It is fully registered and ready to fly away by a lucky new owner

Hangared at Kentville in the Lockyer Valley, parties interested in this lovely and unique aircraft should contact either:

Kev Walters on Tel. **0488540011** or

William Watson on Tel., **0447 186 336**

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**

More Aircraft for Sale

$ 2000 ONO $

Cobham Cobra

An opportunity to buy a unique aircraft.

I now have a Foxbat, and can't to afford to keep 2 aircraft. The Cobra was advertised for about a year in Sport Pilot, with many enquiries, but no resulting sale. Rather than continuing to spend on hangarage and advertising I decided to de-register it, remove the wings, and trailer it home to my shed. I don't intend to ever fly it again so, make me an offer. It provides very cheap and enjoyable flying.

It is a one-off design, a single seater with a fully enclosed cockpit. It has a 24-foot wing-span, and is powered by a VW engine that provides sporty performance and superb handling. The airframe has logged 653 hours and the engine 553 since installation. It is easy to start, but requires hand-propping.

To see it in action, go to
https://www.youtube.com/watch?v=V5Qx4csNw_A&list=PLpBv2A6hk66Tg9DiCsjEtt4o4o8ygcTju&index=1&t=22s

It cruises at around 80 kts at 11-12 litres/hr. The tanks hold 48 litres so it has a very reasonable range. For my approaches I use 50 kts on my initial approach down to 40 kts on short final. You will want a fair bit of tailwheel time.

For further details contact Tony Meggs on (02) 66891009 or tonymeggs@fastmail.fm

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AIRCRAFT for Sale - LIGHTWING GA-55.

Registered 25-0374

$25,000.00 (Neg)

Engine ROTAX 912, 80HP, 853.3 Hours

Reluctant sale of this great aircraft, I have owned her from June 2004.

Excellent fabric, Red and Yellow, always hangered, and comes with the following extras:

* 2 Radios
* Lowrange GPS
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* Aircraft Dust Covers.
* Manuals – various
* Fuel Pressure Gauge
* Extra Tachometer
* New Headsets
* Paint
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Work performed at Lightwing Ballina:

* Wings recovered, tanks resealed, new brakes, wheel bearings and hubs, new wing tips.

Other work carried out:

* Windscreen replaced, door panel replaced, choke cables replaced, ignition upgrade.

Rotax:

* Engine modifications, gearbox rebuild.

Currently hangared at Boonah in Queensland.

Contact Kevin or Natalie McDonald on 07 54638285

Aircraft Engines for Sale

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.

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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