BRISBANE VALLEY FLYER

September 2023

BRISBANE VALLEY SPORT AVIATION CLUB INC

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

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Airbus concept – The World's First zero emissions commercial aircraft

See page about 14.

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See page about 14.

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Greetings members,

Still hanging around at Oshkosh!

See October's Flyer for our report.

Best wishes

Peter Ratcliffe
President BVSAC

Letter to the Editor

Hi Rob,

Firstly as a regular reader of the Flyer, thanks for taking the time to produce it. I don't know of another club here on the East Coast that has a regular newsletter that is its equal. However, I now wish to use your goodwill in providing me a platform mention my fears for the future.

As a member of the previous AUF and now a member of the RAA I am becoming increasingly concerned about the direction that our organization is taking. In short I believe we have been well and truly hi-jacked where RAA is a clone or about to become a clone of CASA. At the transition we were told or asked, wouldn't it be better to have our own organization and withdraw from under the umbrella of CASA. Sure we would have to forfeit the grant from CASA, at the time I think about $100,000. But our illustrious chairman assured us that everything would be wonderful as he sold us his new agenda. We now find that the opposite is true. It hardly seems that no decision by RAA is made without the over sight and approval of our CASA masters. Then we had the introduction of a professional CEO who had a job to do and had no interest in our recreational activity what so ever. With great gusto he proceeded to lead us into beaurocratic (sic) bliss quoting no increase in fees and no increase in staff numbers. As we know today, the opposite is true. I wonder what he is up to now. Is it true that the rot started way back, by CASA, when the Management of RAA, both operations and technical were employed by CASA to disrupt our rather privileged organization? Things started happening when the turn coats established themselves in the CASA system and were obviously coached for the disruption to come. But what is more disturbing is the deafening silence of protest by the "more than 10,000 members" Are they happy with the change in our recreational flying organization? They must be and must be prepared to pay the cost. Do we need a parallel organization that flies aircraft up to 1500kg? I believe that we established the AUF to fly aircraft up to, let's say 544kg.At minimum coast. If you want to go heavier, go GA. You will notice that every time we had a weight increase we had an increase in costs, rules and beauocracy (sic). But make no mistake, this next increase will be vastly different. It introduces the complexities of weight and balance, more glass cockpits, and more staff to administer it. If you have the resources to go bigger, heavier and more complex by all means go GA. But leave us alone. Of course if the Beaurocrats (sic) read this they will again scream "Air Safety" but they are only protecting their positions. Their over reach of administration has not made one jot of difference to the accident rate. I don't see any ultra-lights falling out of the sky either.

Please don't print or pass my name on. I am concerned I may suffer consequences for my opinions.

Atmospheric Stability Simplified
(For Dummies, Like Me)
By Rob Knight

In my early days, stability in the atmosphere was somewhat hazy topic (forgive the pun). I couldn't grasp the need for all the lapse rate issues and remembering what was what. After all – that was the forecaster's job. Wasn't it? Until, in 1974, I had a serious issue with unforecast weather on a trip to Kaitaia. After the event, the point struck me that perhaps I needed to be more knowledgeable about the conditions in which I was flying than my complacent past had led me to believe was necessary.

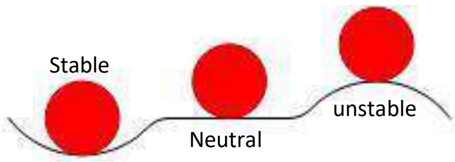
Over a period, I set out to put the theory and practical knowledge that I had acquired into a sort on quick-use mental compartment from which I could draw simplified data, information, and memory at short notice to assist in weather assessments, specifically for making quick and good decisions when I was flying and could not devote lots of effort into the topic. I developed simplified memory aids and concepts that gave me a comprehensively better operational capability than I hitherto had.

In regard to atmospheric stability, the following is the result of that exercise,

Firstly – what is a stable atmosphere? I only needed to answer that single question because an unstable atmosphere would be the opposite.

A stable atmosphere has both good and bad attributes. A stable atmosphere has little vertical air movement providing for generally smooth flight. However, by that very concept of limited vertical movement, there is little mixing in the atmosphere and haze particles can seriously limit visibility. Also, any changes will happen slowly – cloud forms slowly and changes slowly, both in vertical and horizontal extents and the over-all weather – is stable – it also changes slowly.

You can see atmospheric instability in the sky by reading the clouds. If you watch stratus clouds (St), apart from their movement across the sky in accord with the general wind direction, they don't change at all. In this case the atmosphere is stable.



How do you imagine "stable"?

But carefully watch a white, fluffy, cauliflowered cumulus cloud (Cu) for even a short time and you will notice that they change shape and height by the minute. Such clouds are in a constant state of change and thus provide a visual representation of an unstable atmosphere. If the cloud is close, even without binoculars the cauliflower bubbles can be seen to "boil" as they rise, both attributes occurring rather quickly.

Boiling water, like an unstable atmosphere

Instability relates specifically to vertical movement of the air in the atmosphere, and to understand instability we must first understand the simple concept that when a fluid (air) is heated it becomes less dense and so will tend to rise when surrounded by cooler and thus less dense fluid.

For a visual impression of what happens when a fluid is heated, consider the electric kettle on the left. We can see vertical movement in the water by the rising bubbles (call them parcels of vapourised water) which have reflected white to the camera. These parcels of water are hotter than their surroundings so are rising without any other case than the temperature/density differential. This is exactly what happens in the atmosphere with parcels of warmer air tending to rise, albeit much more slowly than the bubbles in the kettle.

In the free atmosphere, stability or otherwise is again determined by the various temperatures of the air parcels within. However, in the atmosphere, an additional compounding factor exits – further modifications to the temperature of the air caused by the expansion (or contraction) of the air as air pressure changes occur with changing heights. These changes in air pressure lead to what are called *adiabatic lapse rates.*

This is where I used to throw my hands up and look for another beer - but it's really not as bad as it looks. All we are really talking about is knowing that rising air will expand as the pressure falls and the falling pressure will cool it. Yep – that's all there is to it!

Let's grab that thought and run with it. If a parcel (bubble) of air rises (or is lifted, say over a mountain range) that parcel will expand with the decreasing pressure it experiences as it rises, and that decreasing pressure will cause it to cool.

CRUNCH –

Here is the very essence of atmospheric stability or otherwise – if the risen parcel of cooling air remains at the same temperature as the air surrounding that parcel, there will be no comparative difference in temperature/density with its surroundings and the parcel will be neutrally stable – it will retain no desire to rise or fall, go further up, or begin to descend. See sketch on the right, where T = temperature and the temperature of the parcel is the same as the temperature of the surrounding airmass.

NEUTRAL

T parcel = **T** airmass

The parcel is the same temperature as the surrounding airmass so no rise or descent follows

If the temperature of the rising parcel was always the same as its surroundings, there would be no such topic as atmospheric stability and I'd not be compiling this. But it's not and I am. The moisture content in such a parcel can modify the rate at which a parcel cools because, if the moisture content is high enough, and the parcel is cooled enough to become saturated (and form cloud) that parcel will, from that point on, continue to cool at a much slower rate than its unsaturated surroundings. This is because the moisture in the parcel contains its own heat energy which is released and slows the cooling rate of the parcel.

Perhaps some simple figures will help, Unsaturated rising air (also called "dry", and contains no cloud) cools adiabatically at 3°C/1000 feet of height rise. Therefore, a parcel starting at, say, +10°C at 1000 feet AMSL, will cool adiabatically to +07°C at 2000 feet AMSL. If the atmosphere surrounding that parcel is also at +07°C we, again, have neutral stability with no tendency for that parcel to further either rise or descend for temperature/density reasons.

UNSTABLE

T parcel > **T** airmass

The parcel is warmer than its surrounding airmass so rises and expands.

However, if that parcel is cloud filled, it be saturated and will then cool at only 1.5°C/1000 feet of height rise. Let's assume that at 2000 feet AMSL, the parcel becomes saturated and continues to rise. At 3000 feet it will be at 5.5°C. If the unsaturated surroundings have continued to fall at the same old rate, the temperature outside the parcel will be 04°C – a whole 1.5°C cooler. NOW that parcel, 1.5°C warmer than its surroundings, will take on legs of its own and rise with no further effort by anything other than its lesser density. The air, stable below 2000 feet, has now become unstable above 2000 feet, where the cloud formed. It is all a matter of comparing the

STABLE

T parcel < **T** airmass

The parcel is cooler than its surrounding airmass so sinks and shrinks (compresses) temperature within the parcel with the temperature outside that parcel. If the parcel is the warmer, it's unstable, if the parcel is cooler, it's stable.

Let's simplify this concept. There are just two basic points to note.

I. Warmer air rises and cooler air sinks. All that matters is the temperature difference (if one exists) between a parcel and its surroundings, and
II. The humidity level of the parcel (which determines the saturation temperature and thus when cloud will form and the lapse rate will halve).

Now let's look at the states of the air we need to consider. These states are the real key to an understanding of atmospheric stability.

There are just four of them.

State 1 is "DRY". The air humidity remains at less than 100% so it is unsaturated and no cloud is associated with it. The Dry Adiabatic Lapse Rate (DALR) = 3°C/1000 feet.

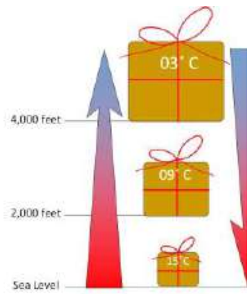
State 2 is "SATURATED". Here the air is at 100% humidity and is completely cloud. It is not associated with any air that is not cloud filled. The Saturated Adiabatic Lapse Rate (SALR) is 1.5°C/1000 feet.

State 3 is "ENVIRONMENTAL". The Environmental Lapse Rate (ELR) is not linked to the adiabatic process and so represents the general decrease in temperature with height in the atmosphere where lifting is not involved. Whilst it varies greatly around the world in light of the wide variety of climate dissimilarities, for calculation purposes it is accepted to be 2°C/1000 feet (1.98°C officially, but 2°C for easy calculations). Note that the ELR is totally variable throughout the atmosphere.

State 4 is "CALCULATED". A calculated lapse rate is a lapse rate you calculate from a GPW&T presentation from Air Services here in Australia. GPW&T forecasts provide forecast temperatures along with the wind velocities at their relevant height so you may calculate a forecast lapse rate for yourself should you wish.

DRY AIR, BEING LIFTED OR LOWERED (DALR)

As long as an air parcel is unsaturated (relative humidity < 100% so no cloud has begun to form (making this "dry" air)), the rate at which its temperature will change will be constant at 3°C/1000 feet of height increase/decrease. Remember - this drop in temperature is due to adiabatic expansion and a decrease in internal energy – not any exchange of heat with the surrounding air.



The DALR. Air loses/gains temperature at 3°C/1000 feet.

This means that a volume of air that is transparent and is not part of a cloud that is lifted 1,000 feet will expand and cool by 3°C.

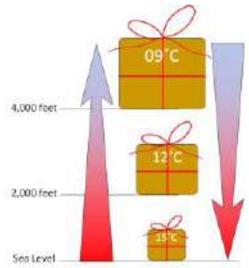
Example – dry parcel lifted 15,000 feet and not containing cloud will cool by 45°C, or, if it was 15°C when it started, it's temperature now that it is 15,000 feet higher will be -30°C (yes – minus 30 degrees celcius).

SATURATED AIR, BEING LIFTED OR LOWERED (SALR)

A parcel of air that is saturated will be cloud filled because it is 100% saturated with water vapour. The rate at which its temperature will change will be constant at 1.5°C/1000 feet of height increase/decrease. Remember again - this drop in temperature is due to adiabatic expansion and a decrease in internal energy – not any exchange of heat with the surrounding air.

Example – a saturated, cloud-filled air parcel lifted 15,000 feet will cool by 30°C, or, if it was 15°C when it started, it's temperature now that it is 15,000 feet higher will be -15°C (yes – minus 15 degrees celcius ,or 15 degrees of frost).

Alternatively, a 12°C saturated parcel at 10,000 feet that is lowered to 4,000 feet will warm by 6 X 1.5 = 09°C and will be 21°C at the bottom of its descent.

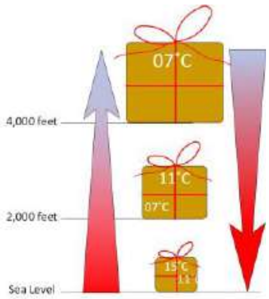


The SALR. Air loses/gains temperature at 1.5°C/1000 feet.

The Environmental Lapse rate (ELR)

Note that this does not have the word "adiabatic" associated with it so it is not a temperature change caused by expansion or compression of the air. The air is not being lifted or lowered; it is just the temperature change dictated by the proximity of the earth's surface to the air at the level being considered.

Note that the general heating of the atmosphere by the sun is only via the earth's surface. The surface receives shortwave radiation from the sun which passes through the atmosphere without effect. The earth's surface, heated by this radiation then heats the air adjacent to it. Therefore, it stands to reason that the further you are from the surface the cooler the air will be. This lapse rate accepted for the decrease in temperature as we move away from the surface is 02°C/1000 feet.

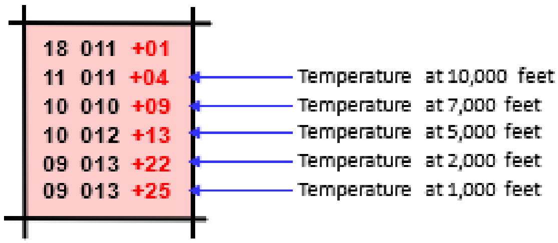


The Environmental Lapse Rate (ELR). The general atmosphere is considered to cool/warm 2°C/1000 feet.

A Calculated Lapse Rate

We can calculate a predictred ELR from a forecast. This is something that you can do for yourself should you have the inclination. Simply take the details from a GPW&T forecast and calculate them.

It's quite simple. For the exercise we'll use the box image on the right taken from a GPW&T forecast. The data lines represent the altitudes being assessed and the columns (L-R) reflect the wind direction, the wind speed, and the temperatrure at that altitude – all in that order. Note that I have negelected to refer to the top line of values – these reflect the details at FL140 which is higher than I am considering in this article.



The lowest line is the 1000 ft line where the temperature is given as +25°C. The next line above, the 2000 ft line, lists a temperature of +22°C – a decrease of 3 degrees. In that 1000 foot height band the actual calculated envronmental lapse rate is forecast to be 3C/1000 feet.

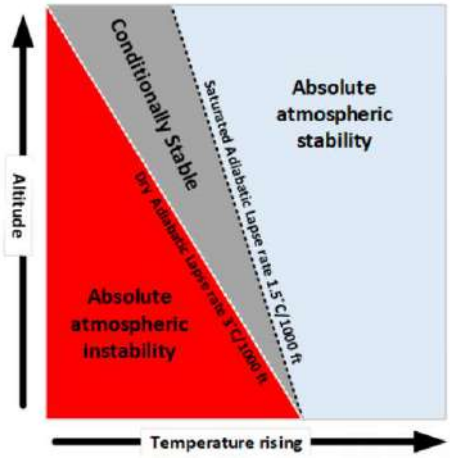
The next height band , 2000 feet up to 5000 feet, a gap of 3000 feet, , sees a cooling of 09°C. This is the same as the lower height band – 3°C/1000 feet.

Moving on up, from 5000 feet to 7, 000 feet – a band of 2000 feet – the air cools by just 04°C – a lapse rate reducing to 2°C/1000 feet.

The last height band, the 3000 feet region from 7 to 10,000, displays a drop of 05°C. 5/3 = 1.5°C/1000 feet.

These calculations indicate that this is a very stable atmosphere. Any parcels of lifted air will remain warmer than the surrounding atmosphere so there will be little or no vertical development of cloud and no instability.

Summary:
The atmosphere is said to be **conditionally stable** if the environmental (or calculated) lapse rate lies between the saturated and the dry adiabatic lapse rates – in the grey area of the graph to the left. This means that the tendency of an air parcel to rise adiabatically depends on whether or not it is saturated. In a conditionally stable atmosphere, an air parcel will always resist vertical motion when it is unsaturated, because it will cool faster than the environment at the dry adiabatic lapse rate. However, if forced to rise and it becomes saturated, it will cool at the saturated adiabatic lapse rate. In this case, it will cool slower than the environment, become warmer than the environment, and will rise.



If the ELR/CLR lies in the blue, the atmosphere is totally stable, in the red, totally unstable. In the grey, it depends on the dew point.

The atmosphere is said to be **absolutely stable** if the environmental (or calculated) lapse rate is less than the saturated lapse rate. This means that a rising air parcel will always cool at a faster rate than the environment, even after it reaches saturation. If an air parcel is cooler at all levels, then it cannot rise because of temperature, even after it becomes saturated (when latent heating will counteract some cooling).

The atmosphere is said to be **absolutely unstable** if the environmental (or calculated) lapse rate is greater than the dry adiabatic lapse rate. This means that a rising air parcel will always cool at a slower rate than the environment, even when it is unsaturated. This means that it will be warmer (and less dense) than the environment, and its continued rise is assured.

"So, where's the importance in that," I hear you ask?

Stable atmospheres change but very slowly. There are no sudden rain-storms, no surprise wind gradients or shears, no chance of gusts to upset you on short finals. The winds are generally light to very light. The downside lies in the increased tendencies for fog and mist, and haze issues. There are generally fewer amendments to GAFs and GPW&T forecasts in stable conditions.

On the other hand, an unstable atmosphere is likely to give you better visibility, but a far greater chance of encountering serious hazards such as developing storms or even super-cells, much turbulence to upset you and/or your passengers, a greater chance of wind gradients and shear on approach, or localized gusts, and willi-willies to make handling difficult during the landing phase. In the right conditions, thunderstorms can develop in just a few minutes so it's best to be able to anticipate just when those sudden change conditions might occur.

Being able to second-guess the weather for yourself is an important attribute of any practicing pilot.

Happy Flying

My Secret Forced Landing

By Bill Ballard, July23 2023 – Published in Flying Facts Journal

I am going to let you in on a story I have only recently decided it was okay to tell. It happened a long time ago at Colt's Neck Airport in New Jersey on April 3, 1971. That was the year I graduated high school and I believe all of the statutes of limitations have expired by now. I was in heaven when I was lucky enough to get to work there as a line boy. It was the very first job I landed in aviation (no pun intended).

I knew I wanted to fly when I was about four years old. I had spent my whole life preparing for the day I soloed. My dad taught me how to build and fly all kinds of model airplanes. In grade school, I checked out books like, " Eight Hours to Solo," and "Straight Up" by Henry B. Lent. I read them many times. In high school I read a book by Jules Bergman, "Anyone Can Fly." The only thing stopping me was my age. As soon as I was close enough to 16, I got a job at Friendly's Ice Cream in Matawan to pay for my flying lessons.

The J3 Cub.

Shortly after I started lessons, I was working at Colts Neck and got a discount on flying and, more importantly, got to hang around with pilots and flight instructors. I soled on my eighth lesson and just a few hours later, I got checked out in the Piper Cub. Looking at my logbook, the first thing that pops into my head is what a lousy record keeper I was and still am, not to mention my crummy hand writing. Thank goodness for word processors but, if you look closely at it, you can see that I soled the Cub on my first flight. Two weeks later I had another lesson and was officially signed off. There were no endorsements for tail draggers back then so with a grand total of two hours in the Cub, I was ready to rock and roll!

Now look at the next entry and it says, "forced landing." That was my secret. It really wasn't a forced landing because I shut the engine off on purpose. Why would I want to do such a dumb thing? I was 17 years old that's why. I was a lot smarter then than I am now. Hanging around the airport and talking to guys that were there, I would hear talk about shutting the engine off in a Cub which turned it into a "glider." One could soar like an eagle I was told. There was nothing to it! All you had to do was slow it down enough to stop the prop from wind milling. This way, the drag from the wind milling propeller would be reduced substantially and a fellow could glide just like a sailplane and ride the thermals to his heart's content.

There was one minor problem though – the Cub had no electrical system which meant no starter. To get the motor running after it was stopped was a simple matter of diving to get enough speed to make the engine turn over and it would spring right back to life. That was all there was to it so my mind was made up, I was going to fly like an eagle and drift along in the atmosphere that was rich with rising columns of air that would fill my wings with lift and off I would go where only the Gods dared to travel.

So the very next day I completed the preflight and untied the Cub, lifted the tail to spin it around, singlehandedly propped it like I was taught, hopped in it and took off for the thermals. I figured 3,000 feet would be high enough. Of , the fact that there was no sunshine at all that day and there was a stratus cloud deck above, rendering no chance for finding any lift at all, didn't bother me. Ignorance is bliss as they say.

The fact is I was clueless. I didn't know anything about thermals. This day would produce what is known as a "sled ride," because you end up at the bottom of the flight with no lift at all to keep you aloft. And even if the conditions were right for thermals, I didn't have the understanding or skill to stay in one. On top of it all, the Cub was no glider. It just came down slower than a Cessna 150 or Cherokee. I was not even slightly aware I setting myself up for failure. Oh, to be 16 again. I reached up and shut off the mags. Then I slowed until I stalled and the prop stopped windmilling. I had no idea what I was in for.

Gliders sound very quiet from the ground but that is deceiving. The first thing I noticed was that there was quite a bit of wind noise and vibration coming from various parts of the airplane. Shutting off the engine did not stop the wind from swirling around the cockpit either. Odd, but somehow this made it seem colder. I guess the noise from the prop and the engines seemed to mask the effect once they were no longer to be heard or felt.

This is when I started to think that this might not have been such a bright idea.

Undaunted, I started to circle looking for lift. This is when it struck me that I had no idea how to find lift. I started to make a few circles to convince myself I could still do this thing, but I had a sinking sensation (pun) and I was starting to regret I had put myself in this position. “Better start the engine now,” I thought. But I was about to find out things were ready to fall apart on me, real quick.

I was still close to the airport when I decided to start the dive to get the prop spinning. Again, I was clueless. I had no idea of what kind of dive it would take. I must have been around 2,000 feet above the ground (maybe less) when I pushed the nose over and started to gain speed. I was really going fast I thought which was probably about 60 mph and nothing happened. Then I made another mistake. I levelled off to think this thing over. That was a mistake.

There is nothing more dangerous than a pilot thinking and while I was, the sinking continued.

I wasn’t quite panicking when I decided what was needed was a really steep dive, so this time I pointed the nose straight down. I remember seeing my feet on the rudder pedals and the ground filling the windshield as it rushed up toward me, “damn,” I was low! My heart was in my throat as the Cub moaned loudly in protest over the way I was treating it. If it was a horse ,it would have thrown me to the ground and glided off to safer pastures once rid of me. I finally chickened out and levelled off again. Now what was I going to do?

My mind was spinning. I was in too deep to get out now and I was starting to panic! It was no use. I was not going to get the engine running as planned and my mind was racing. I needed a plan B. I came up with another dumb idea – I would try to make it back to the airport.

I thought that if I could only stretch my glide just a little bit, I would clear the fence at the end of the runway. I was up to my neck in denial. I was too green to know that I didn’t have enough energy. Heck, I didn’t even know what energy was let alone energy management. I was in a dream world that shielded me from reality. Right now, I was just along for the ride.

I was stretching my glide all right, but all the while, I was losing altitude and airspeed while I subconsciously kept pulling back on the stick – a classic pilot error. It was getting very quiet now. The wind was no longer whipping and the wires were no longer humming as I concentrated on my glide oblivious to what was about to happen.

The fence at the end of the runway was becoming quite clear in my tunnel vision. The detail revealed old wooden rails and some wire stretched along the top with tall untrimmed grass growing up through the structure. I could see all of this rising up in my field of view. I thought in and instant that I was not going to make the runway, but instead I was going to hit the fence. I pushed hard on both of the heel brakes not to stop the airplane but to brace for impact with the fence, all the while continuing to pull on the stick. I wondered if it was going to hurt.

Then the Cub quit flying. It just fell out of the sky and plopped into a farmer’s field. The soft soil not only absorbed my abrupt landing, but also stopped the airplane in just a matter of feet. The tail plopped down. It was over. I was in one piece. I didn't hit the fence and the Cub was unscratched. It was quiet, very quiet. This is the first time I experienced that sweet silence after a harrowing brush with danger in an airplane. I have been blessed with it a few times in the past, a silent reward for being lucky this time for sure.

I sat there in the cockpit for a spell as I watched a group of pilots a few yards away enjoying each other's company as they were disassembling a glider. They were talking and laughing as they did this and they didn't even see (or hear) me land there. I had to peel myself out of the Cub, hop the fence, and walk past the guys at the glider to get to the office where my boss would be. It was a walk of shame.

This is the part of the story that I am really not proud of. Not that I am proud of any of it because I am not, but it happened. As I walked toward the office, I concocted a story as to what just happened. I knew all about carburettor ice and how Cubs and Champs were very prone to it. So, before I left the airplane, I made sure the mags were on and the carb heat was on, then I jumped the fence and walked back to the airport.

I arrived in the small office and my boss was standing behind the counter. He knew I was out in the Cub and it was always tied down in front of the office. He was surprised to see me walk in and said something like, "what happened!" I put on my best shook up student demeanour and with a shaky voice, said that for some reason the motor, "just quit." As I recall the first thing out of his mouth was, "did you turn on the carb heat"? "I can't remember, things happened so fast." That was the stage I was setting.

My boss and one of the flight instructors, Dirk, set out on foot to secure the airplane. I told them it was a good landing and the airplane was not damaged. We hopped the fence, shooed the cows away, and my boss stuck his head in the cockpit to check the carb heat position. I remember him saying the fuel and mags were on, there was gas in the tank, and the carburettor heat was still in the ON position. My little trick worked.

After they talked about it, they figured it must have been some dirt or something in the fuel that caused a temporary blockage to the engine. They decided it would be alright if it ran alright and that it would be okay to fly the airplane out over the fence and onto the runway. And that is exactly what we did. It took full power and one guy on each wing strut to push it through the soft wet soil to get the thing rolling, but it did get out of the field and over the fence.

So that was the end of the story on that day, until now. As of this writing, the cat is out of the bag. It was stupid and I certainly do not advocate for anybody to go out and try this at home. It was a stupid thing to do. But because of that experience, I have survived a number of engine failures and so far, not a scratch on me or the airplane.

The bottom line is this: I share this cautionary tale with my students, reminding them that stalling an airplane during an engine failure can be a stark wake-up call. Having witnessed and read about such incidents repeatedly over my half-century of flying, I know that human factors can heavily influence our decision-making process. If faced with a similar situation, denial may cloud your judgment causing you to stretch your glide and ultimately stall the airplane. Unfortunately, practicing engine failures to a full stop landing in a field is rarely done, leaving pilots ill-prepared for such emergencies. Remember that trying to reach a runway can be much more hazardous than simply landing in a field.

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

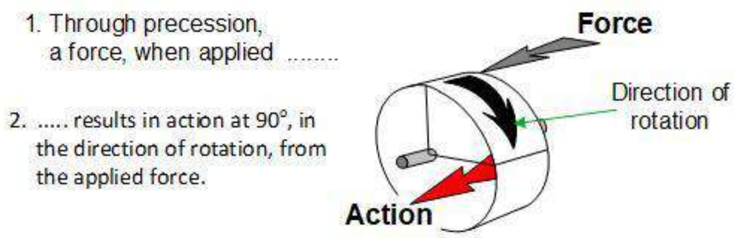
Flying Your Engine-Driven Gyroscope

By Rob Knight

Recently we've looked at several propeller-generated, undesirable forces, and the hidden reactions to those forces. To date, these have included slipstream effect, torque effect, and the notorious P-factor. In this piece, I will now look into the last remaining and important force issue with propellers on single engines aeroplanes.

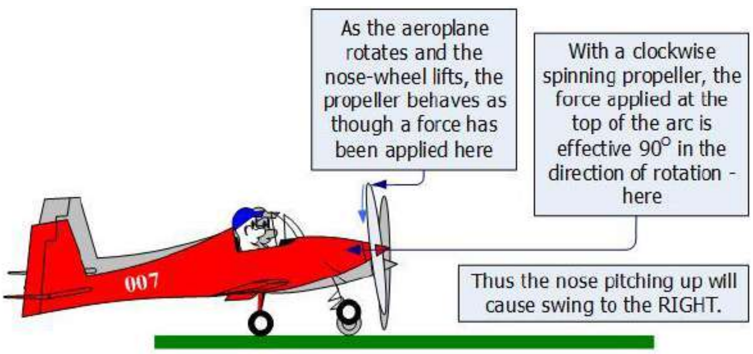
I refer, of course, to the gyroscopic force produced by a spinning mass (the propeller in this case) acting on an aircraft with an engine attached to its nose. Gyroscopic force (aka gyroscopic motion) is perhaps best defined as, *"a rotating object's tendency to maintain its orientation"*, and by orientation we are referring to any displacement of its plane of rotation, or its axis of rotation

A propeller is no different to any other spinning mass and once it is rotating it will resist changes to its plane of rotation. Note that, because the propeller is fixed to the airframe, its plane of rotation will change if the aeroplane is pitched or yawed. Rolling does not change the propeller plane of rotation as it acts only about the centre of rotation.



if a force is applied to a propeller's plane of rotation, it will not respond as we might expect. Pushing forward on the top of a plane of rotation will not tilt it, instead it will cause the plane of rotation to turn sideways. Instead of a tilt, the action precipitated by the force applied will manifest itself AT 90 DEGREES in the direction of rotation and cause a twist, or turn.

To explain this effect on an aeroplane, let's assume that the propeller is rotating clockwise from the cockpit and the nose is pitched up. If we now imagine that the propeller arc is a flat disc, pitching the nose up is the same as applying a force backwards against the top of the disc.

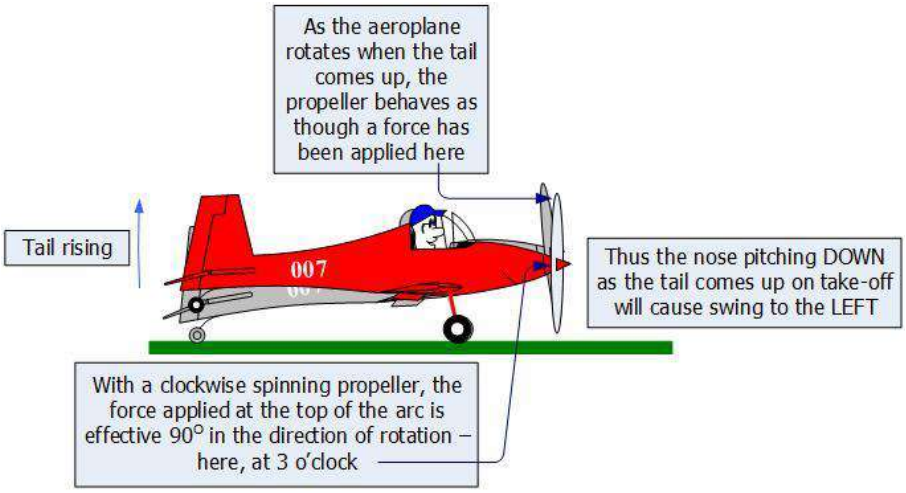


Nose-wheeled aircraft rotating on take-off suffers a noise yaw RIGHT because of precession.

The force pushing backwards at the 12 o'clock position on the disk will, because of precession, ultimately act at the 3 o'clock position, and push backwards at that point on the disk so causing a yaw to the right. Sounds weird, I know, but a push backwards on the top, results in a push backwards on the side. But that's precession for you!

Precession will always act in this fashion, at any stage of a flight, and the lighter the aircraft is for its power and propeller mass, the more discernible the effects will be. I used to own a Colby 503 with a MTOW of 300 kg and powered by a 48 hp Rotax 503 2-stroke engine swinging a sizeable three bladed Brolga propeller. In flight, if I yawed the nose left, precession pitched the nose down, yaw right and it pitched up. And if I eased the nose up, the precession yawed the nose left and vice versa. The propeller rotated anticlockwise from the cockpit. These gyroscopic reactions were amusing, they constituted no control issues.

Taking-off in a taildragger with the propeller turning clockwise will see a substantial yaw LEFT as the tail is raised. Here the force is pushing forward at the 12 o'clock position as the nose pitches down so will manifest itself as a forward pushing force at 3 o'clock as is shown in the following illustration.



The nose yaws left under precession as the tail is raised with a clockwise turning propeller

Note that the precessional effect of raising the tail on take-off is much more significant and creates substantially more yaw than rotating the nose on take-off on a nose-wheeled aircraft. This is <u>because the change in attitude in raising the tail is much greater than when rotating nose-up to lift off.</u>

Gyroscopic precession is also a factor when carrying out aerobatics. In low powered aeroplanes such as Victa 100s, 115s Cessna 150s and 152 and their ilk, it can be pretty much ignored except for spin recovery.

However, this is not the case in aircraft that have larger engines and thus propellers with greater mass. In these aircraft, when carrying out display aerobatics and working to finer limits, the elevator and rudder must also be used to counter precessions at any time the attitude is changing especially when the rate of change of attitude is high or substantial yaw is involved in a manoeuvre. This is especially important when carrying out a spin recovery – gyroscopic forces with power on may leave insufficient control authority to recover obviously with dire consequences if not corrected PDQ. Even PA38s and Cessna 152s can be slower to recover if power is left on, depending on which direction the aircraft is spinning. This very fact is so important that, in the standard spin recovery technique, pulling the throttle fully closed is the very first item. With power left on, and the aeroplane both pitching and yawing in autorotation, precession will provide additional forces the controls must overcome to stop the yaw and pitch the aircraft nose down to unstall.

Propellered aeroplane pilots have to live with precession. It's an integral part of an aeroplane's design and its effects are both predictable and inevitable. Your job as the pilot is to be knowledgeable about it, recognise it when it occurs, and control it when it causes uncommanded flight path or directional issues.

In conclusion, it's the precessional force that allows a bicycle to be ridden with no hands. Once riding, the wheels are turning and precession is waiting. Leaning sideways will provide a force at the top of the wheel that precession moves to the front of the wheel and will cause the front of the wheel to yaw automatically. So, no hands are actually needed.

Happy flying

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

What's New in EV Aviation

Engineers at MIT say they have developed a new motor that could be used to electrify large aircraft, significantly reducing their carbon footprint with the help of innovative new electric propulsion technology.

The 1-megawatt motor has already undergone design and testing of its primary components, which the MIT team says helps demonstrate that its power generation is comparable to current small aircraft engines.

Every year, pollution from carbon dioxide in excess of 850 million tons is produced by the aviation industry. If left unmitigated, those levels could increase by as much as three times by mid-century, concerns that have prompted caps on the carbon dioxide emissions of international flights that have been instituted in recent years.

Due to its massive carbon footprint, electrification has long been viewed as the most viable path toward helping to make the aviation industry more environmentally friendly.

Since the middle of the 19th century, electric machines have operated on the general premise that the amount of power generated relies on the size of the copper coils and magnetic rotor used to power the machine's motor. Proportional to the power a machine can produce is the heat it generates, which at such large scales requires cooling mechanisms which increase the space requirements for their operation.

Because of these factors, currently only smaller aircraft feature entirely electrical power generation, since requirements for electrifying commercial airliners and other larger aircraft require motors that can produce power at the megawatt scale.

Producing such large amounts of energy is no small task, however, and in terms of feasibility would require hybrid turbo-electric systems that combine electric engine components with gas turbine propulsion.

Zoltan Spakovszky, leader of the MIT project and university's T. Wilson Professor in Aeronautics and the Director of its Gas Turbine Laboratory (GTL), calls the megawatt-class motors his team envisions "a key enabler for greening aviation," regardless of whether the resulting system relies partially on batteries, hydrogen, ammonia, or a variety of eco-friendly aviation fuel.

By tapping into electromagnetic force to produce motion, electric motors function by generating magnetic fields using copper coils, near to which a magnet spins in the same direction as the field, which can then be used to power spinning instruments like a fan or, in the case of an aircraft, a propeller.

Spakovszky and his team say the motor they are currently developing could be combined with battery or fuel cell sources of electrical power, which would then be funnelled into mechanical work that could drive an aircraft's propellers.

Another possible hybrid design might incorporate a conventional turbofan jet engine which would generate electrical power during certain flight stages.

Ultimately, what Spakovszky and the MIT engineering team believe will truly be required to make the aviation industry green enough to meet current environmental goals will be the development of unique and innovative aircraft designs that combine hybrid electric propulsion with "smart" fuel systems, as well as the construction of unconventional 21st-century planes using advanced materials.

"This is hard engineering, in terms of co-optimizing individual components and making them compatible with each other while maximizing overall performance," Spakovszky said in an MIT press release.

"To do this means we have to push the boundaries in materials, manufacturing, thermal management, structures and rotordynamics, and power electronics," he added.

Fortunately, that's precisely what Spakovszky and his team have managed to do, in designing an electric motor consisting of a high-speed rotor fitted with an array of magnets of varying polarity orientation, weighing less than an adult air traveller and no larger than a suitcase.

The innovative new motor also provides cooling with a heat exchanger—a device that transfers heat from one area or medium to another—as well as a distributed power electronics system that manages the currents supplied to the motor's copper windings at high frequencies.

"This is a high-speed machine," Spakovszky said, adding that high-switching capabilities between the motor's 30 circuit boards help to facilitate continuous rotation while generating torque, all of which requires very quickly moving magnetic fields.

Spakovszky says their invention is believed to represent "the first truly co-optimized integrated design" of its kind, and in the years ahead, could help to make larger-scale electric aircraft a reality, potentially signalling a revolution in helping to make aviation greener.

The MIT team plans to present its findings to the American Institute of Aeronautics and Astronautics at the Electric Aircraft Technologies Symposium (EATS) event later this month.

Micah Hanks is the Editor-in-Chief and Co-Founder of The Debrief. He can be reached by email at micah@thedebrief.org. Follow his work a micahhanks.com and on Twitter @MicahHanks.

FLY-IN Invites Looming

WHERE	EVENT	WHEN
Murgon (Angelfield) (YMRG)	Burnett Flyers Breakfast Fly-in	**Find Next Planned EVENT Sunday 15 October. Confirm details at: http://www.burnettflyers.org/?p=508**

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

Far-Out Flyers Fly-In to Coominya

By Rob Knight

It was all Vern Grayson's fault. He started feeling a bit left out so he decided to invite a few friends along to Coominya for a cuppa and improve his social life somewhat. To everyone's surprise, it really worked, and the best attended fly-in Coominya has seen for twenty years was all on.

Two residents, (Lightwing and Zodiac on right) 5 Savannahs, and Bob Burns delightful Jodel D118. It's the biggest line up of RA aircraft seen at YBCM for nearly twenty years,

Vern arranged for us to meet at the YBCM Bali Hut, at around 10am on Sunday 13th August. In spite of the inauspicious date (the 13th) and right on the dot of about 10am, John Nooyen from near Watts Bridge arrived, followed closely by a contingent of four Savannahs inbound from Kilcoy. They all landed, and lined up alongside the southern Taxiway giving a clear indication that Savannahs rule the world. In no particular order, the list of Savannah owner/drivers included Graham Roberts, Ken Wright, Phil Venditti, Jim Nooyen, and John Gilpin. Bob Burns Jodel D118 brought him along from Helidon, whilst Vern managed the show and I was the resident Gopher.

Vern's well recognised close association with the weather gods assured us of only the best kind of weather. At 10am we had surface wind of about 2 knots from the South, gusting upwards of maybe 3 knots. It was well recognised that the light winds and magnificent visibility made things unusually hazardous for attending pilots as such great conditions have been virtually unknown for some time. However, with skill and trepidation, all aircraft landed and parked safely.

John Gilpin's Savannah.

John Nooyen's Savannah.


Vern Grayson's Zodiac 601.

Phil Venditti's Savannah S.


Rob Knight's ALW GR-912.

Bob Burn's Jodel.

Ken Wright's Savannah.

Graham Roberts' Savannah.


A lot of fat being chewed in the Bali Hut.

--- ooOOoo ------

Flying a WWI SPAD.

By Rob Knight

The SPAD S.XIII C.1 was a single-seat, single-engine, two-bay biplane constructed of a wooden framework with a doped fabric covering. Sheet metal covered the engine and cockpit. Designed by *Société Pour L'Aviation et ses Dérivés* Technical Director Louis Béchéreau and manufactured by SPAD as well as eight other companies, this was an improved and slightly larger version of the earlier SPAD S.VII C.1. It used a more powerful Hispano-Suiza 8Ba engine instead of the S.VII's 8Aa, with an increase of 50 horsepower. Note that later versions used 8Be engines. For these, armament was increased from a single .303-caliber Vickers machine gun to two.

First Lieutenant Edward V. Rickenbacker with his SPAD XIII C.1, 94th Aero Squadron, American Expeditionary Forces, France, 1918. (U.S. Air Force)

The S.XIII was first flown by René Pierre Marie Dorme, 4 April 1917.

The McCook Field test aircraft, designated P-154, was built by *Société Pour L'Aviation et ses Dérivés.* Its manufacturer's serial number was 17956, and it was designated A.S. 94101 by the U.S. Air Service. It was surveyed 14 January 1924.

The SPAD was faster than other aeroplanes of the time and it had a good rate of climb. Though a product of France, it was used by both the Royal Flying Corps and the U.S. Army Air Service. In France, the aeroplane type now considered a "fighter" was called a *chasseur* ("chaser, or hunter") . The letter "C-" in the SPAD's designation reflects this. The "-.1" at the ending indicates a single-place aircraft.

<u>Pilot Report on SPAD 13</u>

This aeroplane taxies very easily even in high wind, and has no tendency to turn in either direction on the ground. It should be taxied with the control stick held forward to lessen the weight on the tail skid. The tail skid is too straight and has broken on two different occasions while taxying over rough ground.

It is a difficult aeroplane to take-off because of a tendency to swing to the right immediately upon opening the throttle, and if given left rudder too fast will swing to the left. In order to make a good fast take-off it is necessary to push the control stick slightly forward to raise the tail from the ground. This feature is noticeable after having flown other pursuit plane of approximately the same power.

In flight the aeroplane is very steady, but requires a good deal of left rudder, as the engine torque is very pronounced. It is tail heavy flying level, and also climbing with wide-open throttle, but this tail heaviness is not so pronounced above 15,000 feet.

The cockpit is very roomy, although the rudder bar is too close to the pilot and tires the legs in a long flight. It is a very warm and comfortable aeroplane to fly at altitude or on cold days, but not on warm days or low flying with wide-open throttle, such as contact patrol.

The aeroplane manoeuvres easily and shows no tendency to spin in very tight banks. The visibility is good to either side and above the top wing, but is blind straight ahead and below.

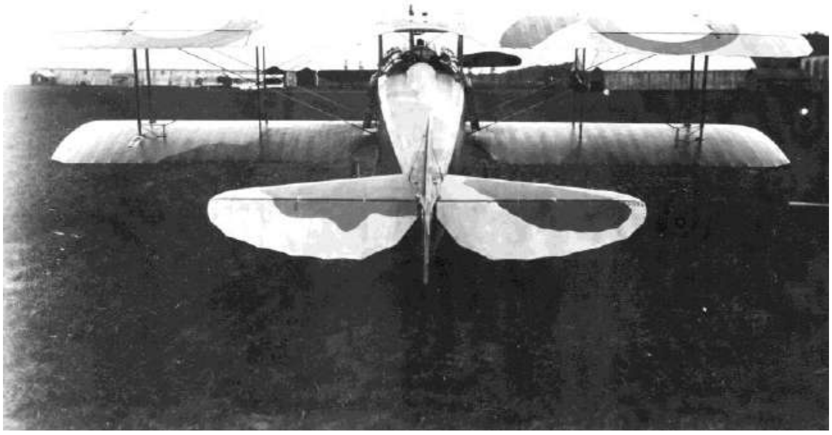
The constant noise of the geared engine is very annoying and at altitudes above 16,000 feet the engine operates badly. The engine is very susceptible to temperature changes in a glide and cools quickly, so the pilot must control his shutters constantly in changing altitude.

The engine is not very accessible for maintenance, and the installation could be improved.

This aeroplane lands easily, shows no tendency to turn on the ground, and stops short owing to the heavy tail. Even when landed tail high or on a rough field it does not show any tendency to nose over.

Louis G. Meister,

Test Pilot.



Rear view of a SPAD S.XIII C.1 at Air Service Production Center No. 2, Romorantin Aerodrome, France, 1918. Note the aeroplane's serial number, 5524, on the right elevator. (Air Service, United States Army)

—***AIR SERVICE INFORMATION CIRCULAR***, Vol. III, No. 286, October 1, 1921, Page 3

The S.XIII was 20 feet, 4 inches (6.198 meters) long.[1] The upper and lower wings had equal span and chord. The span was 26 feet, 3¾ inches (8.020 meters) and chord, 4 feet, 7-1/8 inches (1.400 meters). The vertical spacing between the wings was 3 feet, 10½ inches (1.181 meters), and the lower wing was staggered 1¼° behind the upper. Interplane struts and wire bracing were used to reinforce the wings. The wings had no sweep or dihedral. The angle of incidence of the upper wing was 1½° and, of the lower, 1°. Only the upper wing was equipped with ailerons. Their span was 7 feet, 3½ inches (2.222 meters), and their chord, 1 foot, 7½ inches (0.495 meters). The total wing area was 227 square feet (21.089 square meters).

The horizontal stabilizer had a span of 10 feet, 2 inches (3.099 meters) with a maximum chord of 1 foot, 8¾ inches (0.527 meters). The height of the vertical fin was 2 feet, 7/8-inch (0.876 meters) and it had a maximum length of 3 feet, 11¼ inches (1.200 meters). The rudder was 3 feet, 10-5/8 inches high (1.184 meters) with a maximum chord of 2 feet, 2 inches (0.660 meters).

The SPAD S.XIII C.1 had fixed landing gear with two pneumatic tires. Rubber cords (bungie cords) were used for shock absorption. The wheel track was 4 feet, 10¾ inches (1.492 meters). At the tail was a fixed skid.

The aeroplane had an empty weight of 1,464 pounds (664 kilograms), and gross weight 2,036 pounds (924 kilograms).

2nd Lieutenant Frank Luke, Jr., 27th Aero Squadron, with his SPAD XIII C.1, 19 September 1918. (Photograph by Lt. Harry S. Drucker, Signal Corps, United States Army)

Initial production SPAD XIIIs were powered by a water-cooled, 11.762 litre (717.769-cubic-inch displacement), *La Société Hispano-Suiza* 8Ba single overhead cam (SOHC) left-hand-tractor 90 V-8 engine. It was equipped with two Zenith down-draft carburettors and had a compression ratio of 5.3:1. The 8Ba was rated at 150 *cheval vapeu* (148 horsepower) at 1,700 r.p.m., and 200 *cheval vapeur* (197 horsepower) at 2,300 r.p.m. It drove a two-bladed, fixed-pitch, wooden propeller with a diameter of 2.50 meters (8 feet, 2.43 inches) through a 0.585:1 gear reduction. (The 8Be engine had a 0.75:1 reduction gear ratio and used both 2.50 meter and 2.55 metre (8 feet, 4.40 inches) propellers.) The Hispano-Suiza 8Ba was 1.36 meters (4 feet, 5.5 inches) long, 0.86 meters (2 feet, 9.9 inches) wide and 0.90 meters (2 feet, 11.4 inches) high. It weighed 236 kilograms (520 pounds).

A Wright-Martin Model E, licensed version of the Hispano-Suiza SOHC V-8 aircraft engine, in the collection of the Smithsonian Institution, National Air and Space Museum. (NASM 2014-04437)

The aeroplane had a main fuel tank behind the engine, with a gravity tank located in the upper wing. The total fuel capacity was 60 litres, sufficient for 2 hours endurance at full throttle at 10,000 feet, including climb. There was also a 17-litre lubricating oil tank.

The SPAD S.XIII had a maximum speed of 114 knots at 6,500 feet, with the engine at 2,040 RPM., and a service ceiling of 18,400 feet. The aeroplane could climb to 6,500 feet in 6.5 minutes, to 15,000 feet in 23 minutes, and to the service ceiling in 42.5 minutes. Its absolute ceiling was 20,000 feet. The SPAD stalled at 52 knots.

The *chasseur* was armed with two fixed, water-cooled, .303-caliber (7.7 mm) Vickers Mk.I machine guns with 400 rounds of ammunition per gun, synchronized to fire forward through the propeller arc. Because of the cold temperatures at altitude, the guns' water jackets were not filled, thereby saving considerable weight.

SPAD S.XIII C.1 4377 (F-AZFP) in flight. (Laurent Quérité)
Kellner et ses Fils serial number 4377 is the oldest SPAD S.XIII in existence, and the only one in flyable condition. It is at the Memorial-Flight Association at L'aérodrome de La Ferté-Alais (LFFQ).

It was reported that the SPAD XIII had the most favourable power loading of any of the aircraft considered and a high (for its day) wing loading. These characteristics coupled with a relatively low zero-lift drag coefficient and low drag area gave the SPAD the highest speed of any of the aircraft listed in the table. Also, the climb characteristics of the SPAD were bettered only by three of the Fokker produced aircraft.

General characteristics (SPAD S.XIII)

- **Crew:** 1
- **Length:** 6.25 m (20 ft 6 in)
- **Wingspan:** 8.25 m (27 ft 1 in) late examples had a span of 8.08 m (26.5 ft)
- **Height:** 2.60 m (8 ft 6 in)
- **Wing area:** 21.11 m^2 (227.2 sq ft) late examples had a wing area of 20.2 m^2 (217 sq ft)
- **Empty weight:** 601.5 kg (1,326 lb)
- **Gross weight:** 856.5 kg (1,888 lb)
- **Powerplant:** 1 × Hispano-Suiza 8Ba, Bb or Bd Water cooled 8-cylinder vee-type, 150 kW (200 hp)

Performance

- **Maximum speed:** 211 km/h (131 mph, 114 kn) at 1,000 m (3,300 ft)
    - 208.5 km/h (129.6 mph; 112.6 kn) at 2,000 m (6,600 ft)
    - 205.5 km/h (127.7 mph; 111.0 kn) at 3,000 m (9,800 ft)
    - 201 km/h (125 mph; 109 kn) at 4,000 m (13,000 ft)
    - 190 km/h (120 mph; 100 kn) at 5,000 m (16,000 ft)
- **Endurance:** 2 hours
- **Service ceiling:** 6,800 m (22,300 ft)
- **Time to altitude:**

  - 2 minutes 20 seconds to 1,000 m (3,300 ft)
  - 5 minutes 17 seconds to 2,000 m (6,600 ft)
  - 8 minutes 45 seconds to 3,000 m (9,800 ft)
  - 13 minutes 5 seconds to 4,000 m (13,000 ft)
  - 20 minutes 10 seconds to 5,000 m (16,000 ft)
- **Wing loading:** 40 kg/m^2 (8.2 lb/sq ft)

Armament

- **Guns:** 2 x .303 in (7.70 mm) Vickers machine guns or on USAS Examples, 2 x Marlin M1917 or M1918 machine guns
- **Bombs:** 4 x 25 lb (11 kg) Cooper bombs.

With around 6,000 units produced, the SPAD S.VII was a crucial asset for Allied pilots during the First World War. The sturdy fighter was controlled by several famous flying aces, including Italy's Francesco Baracca and France's George Guynemer. It was the country of the latter pilot that manufactured the high-performance biplane.

-------- oooOoo -----

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I wonder how this marriage turned out

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

1. A pilot makes a logbook entry depicting, in ignorance, a flight which is technically illegal. Can that logbook be called in by CASA for review at which time that pilot could expect prosecution?
   A. No. A pilot's logbook is private and cannot be examined unless he/she releases it
   B. Yes. A pilot's logbook can be called in for examination at any time an appropriate authority (such as CASA) demands it.

2. If the wind speed decreases, is the direction from which it is blowing likely to change?
   A. No. Wind speed and direction are not linked.
   B. YES. Because of Coriolis force.
   C. No, unless the isohyet pattern is tight indicating a tight isobaric pattern.
   D. Yes, because decreasing wind speed indicates a shallow pressure gradient.

3. If the ELR lies between the SALR and the DALR, what is likely be the situation?
   A. Atmospheric stability will be conditional.
   B. It is likely that frost will occur unless there is a wind around 6-8 knots.
   C. A clear night, and light or no wind.
   D. A cold front is approaching.

4. A pilot in flight mis-sets his altimeter subscale by setting 1015 hPa, instead of the actual 1025 hPa. If the elevation when he lands is 375 feet AMSL, what is his altimeter most likely to read when he shuts down?
   A. 75 feet.
   B. 357 feet.
   C. 450 feet.
   D. 675 feet.

5. What colour is the port side navigation light required to be an on aeroplane?
   A. Red.
   B. White.
   C. Blue
   D. Any of the above.

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. B is correct.
   CASA can legally demand access to any person's logbook that holds a pilot license or certificate issued by an Australian authority. Any logbook entry that indicates the illegal operation of an aircraft can result in charges being laid.

2. B is correct.
   In the Southern Hemisphere, Coriolis force will cause a wind to veer if the its speed decreases.
   See: https://en.wikipedia.org/wiki/Coriolis_force and
   https://education.nationalgeographic.org/resource/coriolis-effect/

3. A is correct.
   Atmospheric stability will be conditional on the saturation state of the air mass. If the air is dry (no cloud) then the atmosphere is stable, but when the air is saturated and cloud has formed, it will be unstable and lend itself towards the development of Cu and CB clouds and storms.
   See page 8 in this Flyer – Issue 117

4. D is correct.
   Each hPa (hectopascal) of error will cause the altimeter to err by 30 feet (30 feet per hectopascal error in setting). 10 hPa error therefore = 300 feet of error. As the pressure set is lower than actual, the altimeter will sense that as a higher altitude so will read high by 300 feet. At an elevation of 375 feet, in this case the hands will indicate 300 + 375 = 675 feet.

5. A is correct.
   The PORT side colour is always RED.
   Remember – "There is some **RED PORT** wine **LEFT** in the bottle".

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

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,
- 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

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 & furl 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 784 019

AIRCRAFT for Sale - LIGHTWING GA-55.

Registered 25-0374

$25,000.00 (Neg)

SOLD

Engine ROTAX 912,

Reluctant sale of this great 2004.

Excellent fabric, Red and Yello the following extras:

* 2 Radios
* Lowrange GPS
* EPIRB
* Aircraft Dust Covers.
* Manuals – various

*

* E

* New

* Paint

* Oil

Work performed at Lightwing Ballina:

* Wings recovered, tanks resealed, new brakes, tips.

Other work carried out:

* Windscreen replaced, door panel replaced, choke ca

Rotax:

* Engine modifications, gearbox rebuild.

Currently hangared at Boonah in Queensland.

Contact Kevin McDonald on 0419 607 637

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**

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.

$POA

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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