BRISBANE VALLEY FLYER

NOVEMBER - 2018

www.wattsbridge.com.au
www.bvsac.org.au

BRISBANE VALLEY SPORT AVIATION CLUB INC

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

Rob Knight (Editor) 0400 89 3632

Brendan Scilini's Pitts at Watts Bridge

.

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The High Speed Stall

By Rob Knight

> Excerpt from email dated 07 August 2018.
>
> “Hello Rob, I got you address from the BVSAC FLYER on the Watts Bridge website, and wish to comment on your recent articles on Stalling. You say that an aircraft doesnt (sic) stall at a speed, but stalls at an angle of attack. How then can it be possible to have a high speed stall? ……… Alex [redacted]”.

Well, Alex, thanks for your timely reminder that it is, indeed, a confusing world that we live in. We are both right – aeroplane aerofoils DO stall at an angle of attack and not a specific airspeed, and aerofoils DO suffer high speed stalls. Because we generally consider stalls and stalling speed as being initiated in level flight with insufficient power, these are really slow deceleration stalls. A high speed stall is a stall at any other time when the angle of attack is exceeded regardless of the airspeed at the time. This is covered in pilot training when stalling in turns is discussed and taught. The most practiced pilots in terms of high speed stalls are aerobatic pilots where high G forces are required for the various manoeuvres.

Let’s define some basics and build from there to ensure that we are discussing the same thing.

1. The angle of attack is the angle between the relative airflow (relative wind in the USA) and the chord line of the aerofoil.
2. A stall is when the streamline air flow across the upper surface of an aerofoil breaks away and becomes turbulent air flow, because the angle of attack is too high for the mass of the air to follow the curve.
3. The quoted stalling speed of an aeroplane is the airspeed it has, in steady level flight, when it reaches its C_{Lmax} (the maximum lift co-efficient or the stalling angle of attack). Note that the C_{Lmax} is constant for a constant shaped aerofoil (no flaps or slats/slots used).

With this in mind, we can safely assume that the high speed stall is simply the aerofoil reaching its stalling angle whilst the aeroplane is holding a higher airspeed than when it does a slow deceleration level flight stall.

So how fast can an aeroplane stall? The answer to that question is the same as a length of string. There is no upper limit with the possible practical exception of the V_{NE} of that aeroplane; but that is a safety/structural issue and not an aerodynamic one.

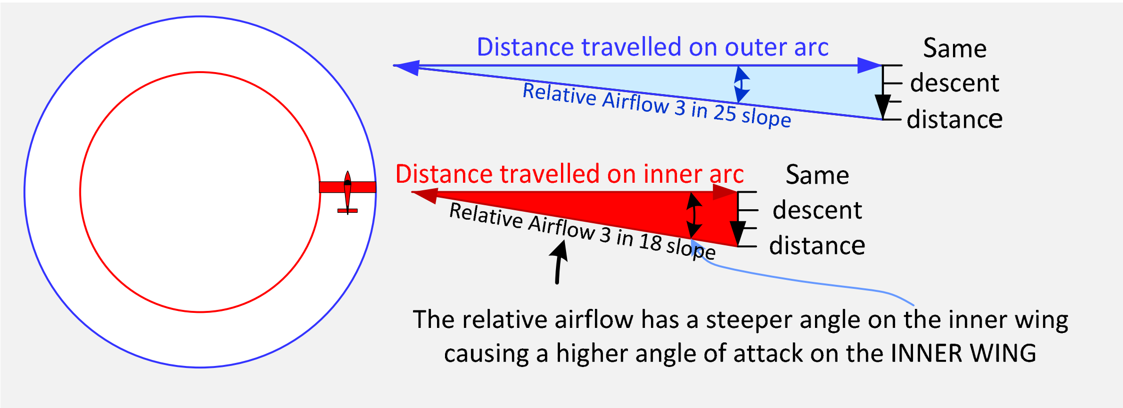
So how do we get into a situation where we can experience a high speed stall? You have done it many times. Every time you turn you are increasing that stall speed – weren’t you taught that in your own pilot training? And what about steep gliding turns? The increase in airspeed at the stall is even more pronounced there.

If you consider the training you received for you License or Certificate, the theory behind the increase in stall speed when the aeroplane is suffering a loading increase will have been carefully orchestrated. Do you remember that the stall speed increases as the square root of the load factor? Do you also remember that the load factor during turns is the resultant of the force of gravity and the centrifugal force generated during that turn. Thus the steeper the angle of bank, the greater will be the rate of change of heading, the greater will be the centrifugal force, and the greater will be the loading. The greater the loading, the more lift will be necessary to maintain height. As the aeroplane stalls at a constant angle of attack, the higher the loading the greater the speed the aeroplane will have when it reaches its stalling angle. Simple, eh!

Yes, it really is quite simple. But when other factors exert subtle influences, the resulting aeroplane response is not always so easy to predict. For example, if an aeroplane had each of its wings operating at a different angle of attack, the wing with the higher angle of attack would stall first. Correct? YES, of course it will. The wing with the higher angle of attack will stall first, before the other wing, the one with the lower angle of attack. But seriously, how can this be possible in flight.

The answer is that the angles of attack on each of your wings will not be the same anytime you make either a climbing or a descending turn. It may not sound kosher, but it is quite correct. The wings will have differing angles of attack when an aeroplane is either climbing or descending as it turns.

Descending Turns: When descending in a straight line each wing descends the same vertical distance for the forward distance that it travels. However, if that aeroplane is descending whilst it is turning, the vertical distance travelled by each wing will be the same but the horizontal distances will differ. The difference is caused by the inner wing travelling a smaller arc (a lesser distance) than the outside wing. Thus, if the wing travels a SHORTER distance than the outer but descends the same distance, its relative airflow will be at a different angle, one that will provide a higher angle of attack, Check this out in the image below.



Angles of Attack in a Descending Turn

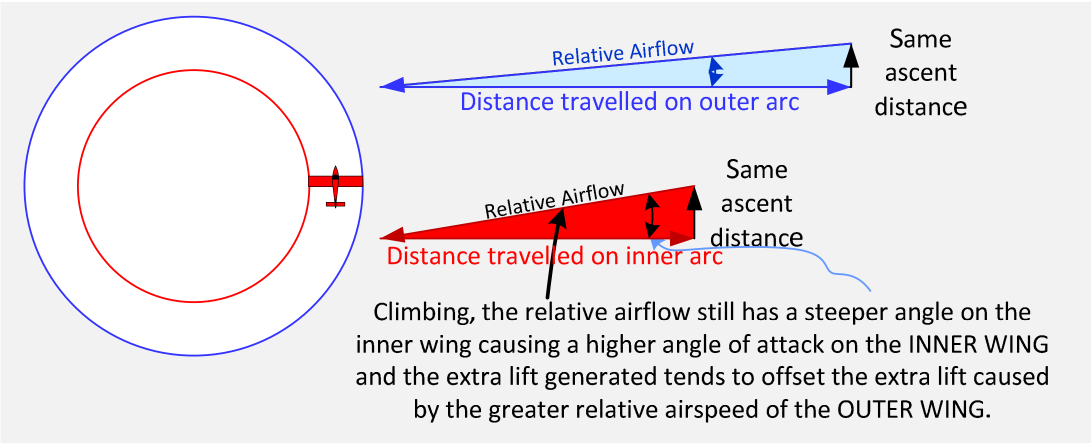
In the sketch above, the inner wing, travelling a shorter arc and so suffers a change in the direction of the relative airflow which increases the angle of attack. This discrepancy is increased by the outer wing enjoying a corresponding decrease in angle of attack. Thus the inner wing will always be closer to the stalling angle than the outer wing. Also noteworthy is the fact that, because the inner wing travels a lesser distance than the outer in the same time, its speed will also be lower.

Although there is a reduced overbanking tendency in descending turns, where it does occur, holding out of bank aileron lower the aileron on the inner wing, even further increasing its angle of attack.

But that is not all - there is propeller torque to take into account! If the aeroplane is in a left bank and has a propeller rotating clockwise from the cockpit, the force required to turn the propeller clockwise will be trying to turn the engine and its mounts anticlockwise. Because these are bolted to the aeroplane, the propeller will be trying to rotate the aeroplane in the opposite direction. To stop it, even more down aileron on the left wing is required further increasing the angle of attack.

When all these factors are considered, it is easily seen how a stall on the inner wing occurs at a higher than expected airspeed when descending and turning, hence the proliferation of high-speed stall/spin accidents on a hasty, steeply banked turn onto finals. You don't have to be going slow to stall.

In a climbing turn, on the other hand, the outer wing has a slightly higher angle of attack but has slightly more airspeed so the wings are a little more even in terms of which one will stall first. In regard to over banking, the combination of increased angle of attack and decreased airspeed gets close to balancing the relative airflow variation between the wings.



Angles of Attack in a Climbing Turn

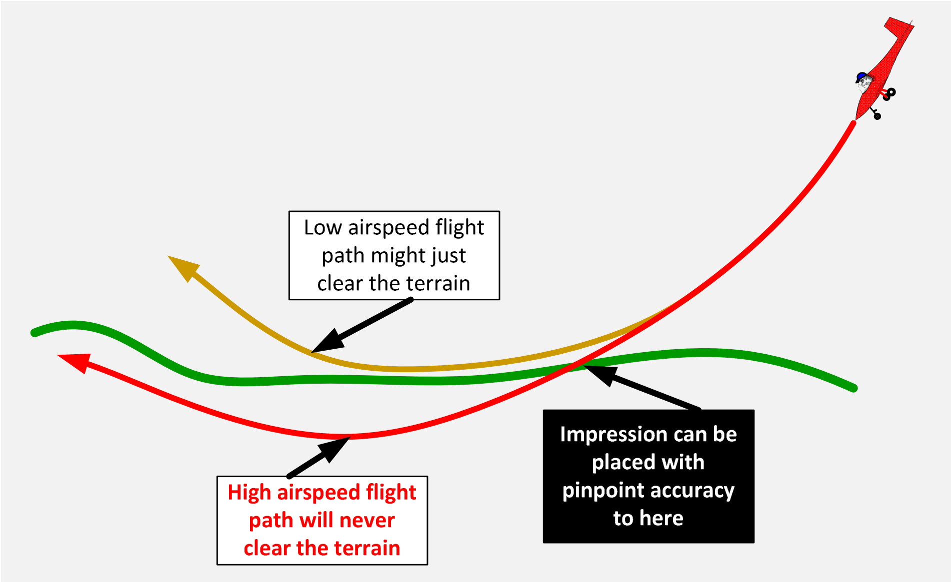
Summary: In a descending turn the inner wing has a higher angle of attack and a lower airspeed than the outer. Thus in a gliding turn, if pulled too tight, one could expect the inner wing to stall considerably ahead of the outer, causing a wing drop and roll into the turn. The airspeed would be higher than a normal, slow deceleration stall so would be a high speed stall. Also note that, if power is applied at the time of the stall, on an aeroplane with a propeller turning clockwise from the cockpit, the wing drop is likely to be exacerbated and obviously vice versa.

But turning does not give the only scenario conducing to the high speed stall. The pull up from a dive provides a far greater threat, with far greater accident statistics than turning.

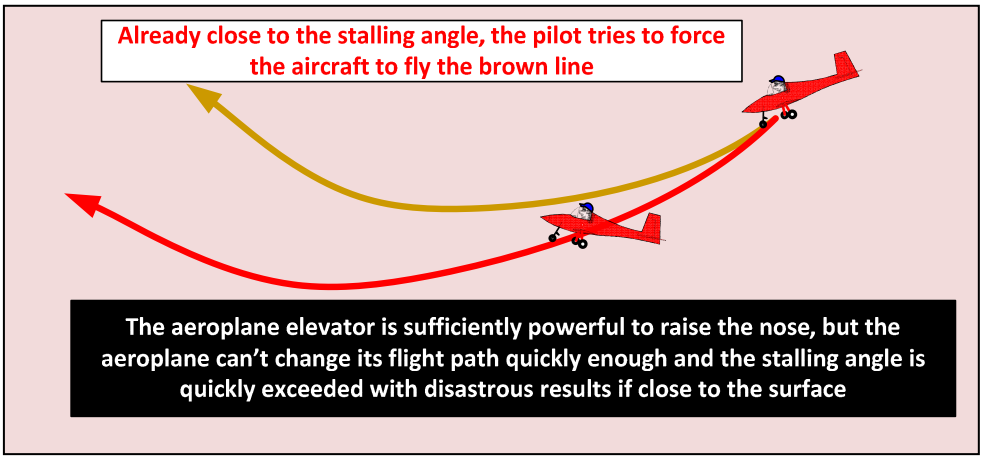
It is accepted that, when executing a turn, the higher the airspeed the wider will be the radius of that turn. It follows then, that the higher the speed the slower the rate of pull-out when recovering from a dive. The lack of this knowledge has killed a great many exuberant pilots who get carried away with their power and glory and start a high speed pull-up from a dive too late. After all, the only practice that they have probably had is flaring on landing from a descent. Here the airspeed is low and just a few feet are quite enough to change the aeroplane's flight path in perfect safety.

The human factor's aspect of the dive and pull-out are frighteningly dangerous. The pilot, in great glee pokes the stick forward and commences the dive towards his target. He wants to make a big impression so he quickly gathers speed and the earth looms larger in the windscreen. Then, when he feels he should begin the pull out, it's already too late in too many cases.

As in the turn, at high speed the radius of the pull out flight path is much greater, and the aircraft's nose doesn't pitch up as expected. So he pulls harder. The stick is heavy at the higher speed but the earth fills the windscreen and he yanks the stick back. There is a momentary and violent buffet as he exceeds the stalling angle. In a fraction of a second, the aircraft strikes the ground and disintegrates with or without a fire. Another statistic is born because the pilot changed the aeroplane's attitude quicker than its flight path could change.



The High Speed Flight Path Pulling Out of a Dive



The High Speed Stall induced by Pulling Out of a Dive

The result is, exactly as he wished; a great impression; only it's in the ground, and it's the last opportunity he will ever have to make one.

So what was a high speed stall again? It's just a stall at a higher speed than the normal slow deceleration ones we practice in level flight. When can it happen? Anytime – but it WILL happen anytime the angle of attack exceeds the stalling angle. Lesson – DON'T exceed the stalling angle of attack unless you do it deliberately and with reason.

Happy flying

Bellanca Viking: Wood, Fabric & Genius

By Bill Cox

The brainchild of an Italian designer, this classic airplane exudes a rare combination of style and substance

I

It's almost inevitable that Italian airplanes are compared to Italian automobiles. You can't look at the smooth, sculptured lines of a Marchetti SF-260 or Partenavia P68 without thinking of a Ferrari or Maserati.

But Bellancas aren't Italian airplanes. Although they're the brainchildren of an Italian-born designer, they're all-American products, designed and built in the U.S.

Still, most design parameters of the last product in the Bellanca line, the Viking 300, fit the Italian mold. Power is plentiful, handling is better than virtually anything else in the class and the interior is snug enough that you wear the airplane.

Most of all, there is that indefinable Italian characteristic—the handling, the feel. The first Viking 300s were offered in 1967, and there were some 1,700 units produced over the next 30 years. In fact, Bellanca continued in limited production right up through 2001, delivering a handful of handmade airplanes in the last few years, often as few as two a year. Under the direction of a group of seven investors, including long-time chief engineer Andy Vanno, the Alexandria, Minn., plant currently is producing parts and performing major wood overhaul work. Bellanca hopes to go back into limited production of the IO-550-powered Viking—which was introduced in 1996—within the next year or two.

Construction by hand has always been a key ingredient of the Bellancas that few other manufacturers could match. By definition, a wood-and-fabric airplane is constructed by hand. The Sitka spruce and mahogany plywood wings are lovingly assembled from 1,800 individual, pre-formed pieces, some as small as a matchbook.

In fact, the wing has always been Bellanca's primary claim to fame. A classic airfoil shape, the Viking's smooth, seamless, 34-foot, Bellanca B wing is probably the closest thing in aviation to a work of art. Ask aircraft designers who truly understand light aircraft construction and performance, and they'll tell you that, in many respects, Sitka spruce is a better material for building small- to medium-sized airframes than metal or composite materials.

Wood has no memory, as does aluminum, so it's highly resistant to dings. It's also more resilient, willing to flex thousands of times without stressing or breaking, and it doesn't delaminate under high temperature or repeated G-loads. Wood is lighter than metal (only about 250 pounds for a finished Viking wing) and offers an easily shaped, rivetless, aerodynamic surface that's ideally adapted to a small aircraft wing.

In almost 35 years of production, the wing has never changed. Back in those heady days of the late '70s and early '80s, when Bellanca was turning out one Viking a week, I toured the Minnesota factory several times, and I was always impressed with how quiet it was at Bellanca. Working in wood, glue and fabric isn't a noisy job.

Like many of us who have owned Bellancas of one type or another, Breiman is convinced his Viking is a different kind of four-seat retractable. A motion-picture executive based in Los Angeles, Eric Breiman had always wanted to fly, but like so many other busy professionals whose problem is finding more time than money, his schedule made flight training unlikely. He had been brought up with airplanes, as his father had been a B-29 flight mechanic during WWII, and Eric had inherited the bug.

Finally, in early 2000, he dove in headfirst at Justice Aviation in Santa Monica, Calif., training for his private ticket in a series of Cherokees. Breiman earned his license in only three months and immediately went looking for an airplane to buy. "I had a friend with a Viking for sale," says Breiman, "and he took me for a demo ride. He had been the only owner of the airplane since it was new, he was an A&P and he knew everything there was to know about his Viking. When I flew with him, I knew I had to have that airplane. The Cherokees were fun, little machines, but the Viking was a big step-up in performance and handling, a Corvette compared to a Corvair.

"The Viking had been very well kept when I bought it," continues Breiman. "Still, it's a fabric airplane, and the cover was original—27 years old at the time. I elected to have a complete fabric and paint job done on it, about a $20,000 expense. The good news is that the covering is now fully restored and painted in my colors, and I won't have to do anything to the fabric for as long as I own the airplane."

Like most of us who own or have owned Bellancas for years, Breiman didn't buy his airplane exclusively for looks. He bought it for the way it flies. Vikings and their predecessors have long been famous for control response and harmony that seems almost psychic in nature. Yes, Vikings do have plenty of other talents. They're quick airplanes with abbreviated climb, they scamper across country at speeds near the magic 174 knots (200 mph) and enjoy good short-field numbers, but their primary claim to fame is their excellent roll rate, fast elevator response and a seeming ability to read their pilots' thoughts.

As mentioned earlier, performance is competitive with virtually anything in the class. As you can see from the factory comparison chart, Breiman's aircraft is a 1973 Viking 300A, so we compared it to the only similar horsepower, four-seat retractable available at the time, the Bonanza. For contrast, we also included the slightly later Rockwell Commander 114 and Cessna Skylane RG, admittedly much lower-powered models. We also added the Mooney Ovation and the current Cirrus SR-22 to contrast the old and new.

If many of the performance numbers appear to favor the Viking, accommodations aren't so generous. One reality about all the Bellancas is that you definitely put on the airplane rather than merely climb into it. The horizontal dimension across the front seats is only 41 inches at the elbows, the narrowest of the lot, so even two medium-sized pilots will rub shoulders. The rear seat is even narrower, relegating the airplane to more of a 2+2, rather than a full, four-place machine.

The cockpit and panel layout are dated, but relatively conventional, although elevator trim is notably unconventional. It's mounted on the roof and rotates in a horizontal plain to move a vertical trim tab. Clockwise is up. One redeeming factor is that the majority of Vikings employ electric trim, so most of the time, pilots only have to watch the knob rotate.

The fun starts in a Viking the instant you push the throttle full forward for takeoff. Acceleration is among the best in the class (power loading is only 11.1 pounds/hp). The airplane is ready to fly in less than 1,000 feet at about 70 knots and transitions into an effortless 1,200-fpm climb, with hardly a pause to catch its breath.

Vikings retract their main wheels straightforward into the thickest part of the wood wing, and double clamshell doors close over the tires to help smooth the underwing. Looking at the airplane head-on in flight, the fairings hang down a good six inches below the bottom wing surface, but cruise performance doesn't seem adversely affected by the interruption. One benefit of the retraction system is that emergency gear extension is actually facilitated by the relative wind that helps push the wheels down and locked the second the pilot selects gear down and cracks open the clamshell doors.

Back in the days when Vikings came in your choice of normally-aspirated Continental or turbocharged Lycoming, it was possible to loft a Bellanca to 25,000 feet, but Breiman's standard Viking and the vast majority of others do their best work at 7,500 to 8,500 feet. The producer's airplane is primarily a recreational vehicle, employed more for weekend outings than business trips, so he rarely has occasion to cross the Sierra Nevada or the Rockies.

"I'm not usually in a hurry, so I come back to 60% to 65%, to extend range and reduce fuel flow. I'll typically see 165 knots or more at that setting," comments Breiman. "If I do need to hustle, I can push the power up a little and manage 170 knots or more, but the burn goes up almost 2 gph for the privilege." With 75 gallons in two wing tanks and one fuselage container, Breiman's Viking has about four hours endurance plus reserve at high cruise, five hours at lower settings.

Brieman says his Viking's best feature is simply its outstanding handling. "I love the way the airplane carves its way through a turn—you need only think about a heading or pitch change, and the Bellanca does it," effuses Breiman.

Despite the joys of ownership, the producer acknowledges a few niggles. "It's not the least expensive single to fly and maintain," he explains. "Although the spruce wing is tough and durable, the fabric does have limited life and can represent a major expense if you need to replace it. That means you almost have to store a Viking in a hangar rather than outside, if you want the fabric to last—another fixed expense. That overhead elevator trim is a little unusual and takes some getting used to, although I've come to like it. The airplane's cabin is loud in flight, but fortunately, the best ANR headsets and an inflatable door seal help solve that problem."

The Bellanca Viking also is one of the most individual of singles that are flying in the sky today. For Eric Breiman and pilots who are like him, who prefer style with their substance, there is nothing quite like a Bellanca Viking 300A.

1973 Bellanca Viking 300AN373EB

Engine make/model:	Continental IO-520K
Horsepower@rpm@altitude:	300@2700@SL
Horsepower for takeoff:	300
Propeller type/diameter:	Hartzell CS
Landing gear type:	Tri/Retr.
Max ramp weight (lbs.):	3325
Gross weight (lbs.):	3325
Landing weight (lbs.):	3325
Empty weight, std. (lbs.):	2185
Useful load, std. (lbs.):	1140
Payload, full std. fuel (lbs.):	690

Usable fuel, std. (gals.):	75
Wingspan:	34 ft. 2 in.
Overall length:	25 ft. 4 in.
Height:	7 ft. 4 in.
Wing area (sq. ft.):	161.6
Wing loading (lbs./sq. ft.):	20.6
Power loading (lbs./hp.):	11.1
Seating capacity:	4
Cabin doors:	1
Baggage capacity (lbs.):	186

PERFORMANCE

Cruise speed (kts.):	
75% power:	174
Max range (w/ reserve) (nm)**:	
55% power:	836 nm
Fuel consumption	
75% power:	60 litres/hr
Estimated endurance (65%) (hrs):	5 hrs
Vs (kts.):	66
Vso (kts.):	61
Best rate of climb (SL fpm):	1210
Service ceiling (ft.):	20,000
Takeoff ground roll (ft.):	980
Takeoff over 50-ft. obstacle (ft.):	1200
Landing ground roll (ft.):	835
Landing over 50-ft. obstacle (ft.):	1500

* estimated

** calculated

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FLY-INS Looming

03/11/2018	Warwick	Warwick Aerodrome's 60th Anniversary BBQ
11/11/2018	Watts Bridge	Watts for Breakfast – LAST ONE FOR 2018
08/12/2018	Murgon (Angelfield)	Burnett Flyers Breakfast Fly-In

Mystery Aircraft (This Issue)

What’s this?

<u>Keeping up with the Play</u> <u>*(Test yourself – how good are you, really?)*</u>

1. Aeroplane "A" is on short finals and aeroplane "B" is at the holding point ready for take-off. Who has the right of way?
   A. A.
   B. B.
   C. A if there is sufficient runway available for both to be on the runway simultaneously.
   D. B because in this circumstance A should go around to avoid confliction.

2. The reading of the hands on an altimeter depends on the relationship between which of the following?
   A. Dynamic and static pressures.
   B. Dynamic and mean sea level pressure.
   C. Ambient and static air pressure.
   D. Static pressure and the subscale setting.

3. The propeller on an aeroplane is removed and replace with one with a coarser pitch. Which option below most correctly reflects the change to the aeroplane's flight performance?
   A. Lower stall speed
   B. Higher cruise speed.
   C. Longer take-off roll
   D. Lower rate of climb.
   E. B, C, and D are correct.

4. Considering an aeroplane in a 60^{o} bank, select the most correct statement below. The bank will…
   A. Increase both the wing loading and the stall speed significantly.
   B. Cause a 2G loading so the stall speed will double.
   C. Decrease wing loading and decrease the stall speed substantially.
   D. Cause a reduction in the aeroplane's maximum manoeuvring speed (V_A).

5. Stalling speed increases if…….
   A. Aircraft weight is decreased.
   B. The load factor is increased.
   C. The angle of attack is increased.
   D. The "G" loading is increased.

ANSWERS: 1. A, 2. D, 3. E, 4. A, 5. D.

If you have any problems with these questions, call me (in the evening) and let's discuss it! Ed.

BRISBANE VALLEY SPORT AVIATION CLUB Inc

MINUTES OF OCTOBER 2018 GENERAL MEETING

MEETING LOCATION: Watts Bridge Airfield - BVSAC Clubroom

MEETING DATE: 06 October 2018

MEETING OPENED: 1007 hrs

MEMBERS PRESENT: 15

VISITORS: 1

APOLOGIES:

- Richard & Glenda Faint, Liz Cook, Dale Meyer, Kim Ralph Smith, Neal,

MINUTES:

- Minutes of the September meeting were emailed out

PROPOSED: John Innes. SECONDED: Peter Freeman. PASSED

BUSINESS ARISING: Nil

PRESIDENT'S REPORT:

- Any Proxy please bring forward.
- Thank-you to all that helped harvest vetagrass.
- New ride on mower has arrived.
- Christmas party coming up.

SECRETARY'S REPORT:

- Emails in: 8
- Emails out: 8
- Craig Lath-Wood has sold his plane and therefore there is space in hanger.

TREASURER'S REPORT: ING Acc - $7686.54

NAB Acc - $5542.86

WATTS BRIDGE REPORT: Peter Freeman

- Veta Grass has been cut, thanks to all for their help.

GENERAL BUSINESS:

- Discussion on the Christmas party took place,it was decided that it would be held on 1st December.
- Mike Smith asked for approval to buy new stepladder so as to be able to service the club house lights.
- Approval was granted for Mike to look in to what we need.

MEETING SUSPENDED FOR AGM.

- The audit was present to the members.
- The elections were conducted
- The following members were elected to our board

- President: Peter Ratcliffe
- Vice President: Vern Grayson
- Treasure: Ian Ratcliffe
- Secretary: Mike Smith

AGM MEETING CLOSED: 1048hrs

MEETING RESUMED: 1048hrs

NEXT MEETING: 3rd November at 10.00AM

MEETING CLOSED: 1103hrs

Aircraft For Sale

Whitman Tailwind $39,000

For details on hours etc contact Peter Pretorious on 0413 484 963.

View this remarkable little aircraft on www.tailwindw8.com

Sopwith Pup (full scale replica), with Lycoming 0-320

Currently hangared at Watts Bridge

$: POA

Nieuport 24 Replica, full scale with VW 2275 Redrive

Currently hangared at Watts Bridge

$: POA

Both these remarkable aircraft are for sale by Bruce Clarke. For details contact Bruce on:

0411- 786- 677
intangible12@hotmail.com

Aircraft Engine for sale

Verner

Twin cylinder horizontally opposed 4 stroke aircraft engine.

Suit many homebuilt types.

General characteristics (from Wikipedia)

- **Bore:** 97 mm (3.82 in)
- **Stroke:** 90 mm (3.54 in)
- **Displacement:** 1,329 cc (81.1 cu in)
- **Length:** 617 mm (24.29 in)
- **Width:** 736 mm (28.98 in)
- **Height:** 456 mm (17.95 in)
- **Dry weight:** 61 kg (134 lb)

Components

- **Fuel type:** 95 octane auto fuel or 100LL Avgas
- **Oil system:** oil class SH/SG 5
- **Cooling system:** air-cooled
- **Reduction gear:** 2:1 or 2.29:1 oil-filled gear box

Performance

- **Power output:** 63 kW (84 hp) at 5500 rpm for three minutes, 51 kW (68 hp) at 4200 rpm continuous
- **Compression ratio**: 9.8:1
- **Fuel consumption:** 11 litres (2.4 imp gal; 2.9 US gal) per hour at cruise settings
- **Power-to-weight ratio:** 1.03 kW/kg

This engine was originally fitted to an ultralight aircraft imported from the USA,

For inspection, price and/or other details, contact Neil Morgan via Rob Knight. Telephone 0400 89 3632.