BRISBANE VALLEY FLYER

July 2025

Watts Bridge Memorial Airfield, Cressbrook-Caboonbah Road, Toogoolawah, Q'ld 4313.
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CAUTION- WAKE TURBUILENCE. See page 13.

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Our website - **bvsac.com.au**

Greetings Members,

We are now half way through the year; the winter solstice has passed and the days we can expect to begin getting longer (at last). All is going well with the Club, and it has been yet another quiet month for us at the BVSAC, with no major issues or events.

At our next Club meeting, to be held at 0830 hours on the 5th of July next, we intend carrying out some more work on our clubroom extension. All comers would be most welcome and, remember, we have our widely renowned lunch available.

NOTE: Just a friendly reminder than Club memberships are now due for renewal and we would appreciate your attention to this.

Also please note that the BVSAC account details have changed. Please use the following when making your remittance:

NAB
BSB: 084-034
Acc: 309258034

See you all on July 5th.

Best wishes

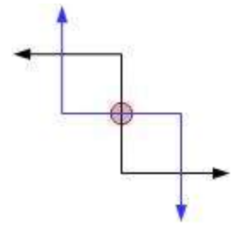
Peter Ratcliffe
President BVSAC

A failsafe way to become a Statistic,
(Or Stalling with the Centre of Gravity Aft of the Limit)

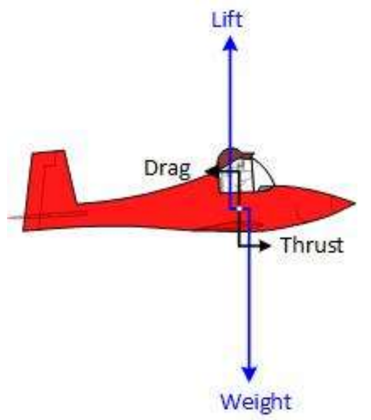
By Rob Knight

In recent months, an accident report from the USA stated that an aircraft operating under IFR[1] in IMC[2] stalled after a power reduction when entering a holding patten. How could this happen? Was the pilot so inept that he failed to control his attitude and thus his angle of attack? No-one would knowingly get anywhere close to a stall when in a holding pattern, even in VMC, let alone when there was no horizon available. Maybe there's something else acting here. Wait, there's more! Let's look at the probable scenario

First, some principles of flight. There are four forces acting on any normal aeroplane in flight; two are fixed. Weight, which acts through the Centre of Gravity (CofG), and the thrust line which is fixed because the engine(s) and propeller(s) are fixed to the airframe. The remaining two (drag and lift) may change their points of application. Drag, because flaps/undercarriage may be raised/lowered, and lift, because the Centre of Pressure (CofP), the point through which the lift force acts, moves forward and back along the chord line[3] as the angle of attack varies. These four forces are combined to make two couples, a lift/weight couple and a thrust/drag couple, each couple acting in opposition to the other: the lift/weight couple trying to pull the nose UP, and the thrust/drag couple pushing the nose DOWN.



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



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

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

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

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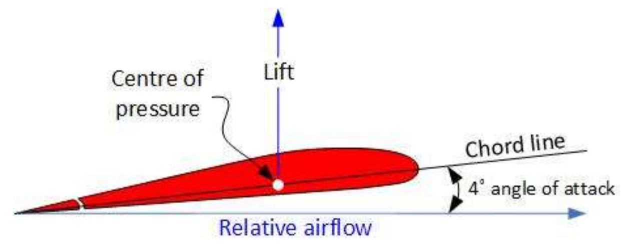
[1] *IFR = Instrument flight rules.*
[2] *IMC = Instrument meteorological conditions.*
[3] *Chord line – A straight line joining the leading edge of a wing and its trailing edge.*

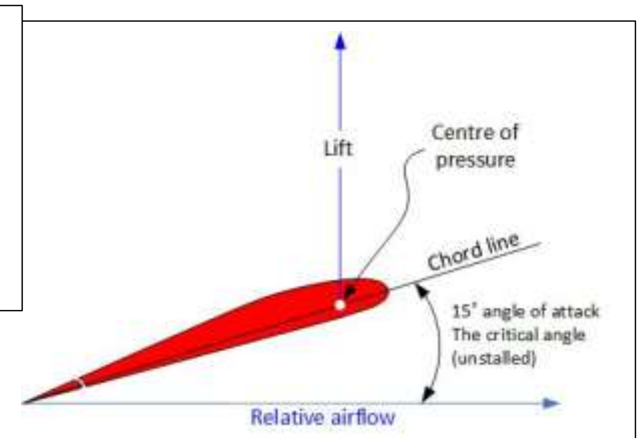
In the previous sketch, the point of action is the white dot where the two couples' arms intersect, and about which the couples will always act. Note that the lift and weight forces combine to make the lift/weight couple that pulls the nose down, while the drag and thrust forces combine to form the thrust/drag couple that pushes the nose up. If the moment of the nose up couple equals the moment of the nose down couple, we have equilibrium.

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

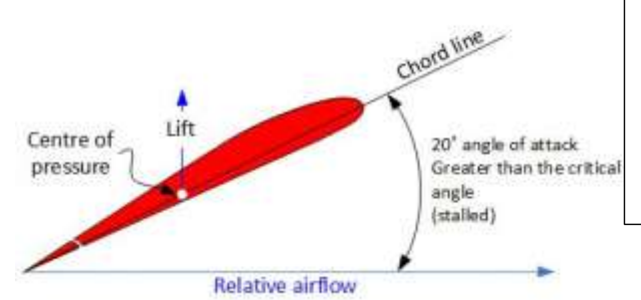
As stated, the CofP, that spot on the wing's chord through which the lift acts, is only stationary on the chord line when the angle of attack is unchanging. Increasing the angle of attack on an unstalled wing will result in the CofP moving forward, towards the leading edge and vice versa. This is an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



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



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



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

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

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

The aircraft takes off with its CofG a little aft of the designer's aft limit[4]. With the high slipstream, the elevator is still able to maintain sufficient authority to hold the nose attitude and maintain the correct climb airspeed. The signs that something is wrong are missed by the pilot. These signs would likely include lighter than usual elevator control pressures, and the indicator for the trim tab position

[4] *Aft limit – the POH or Flight manual stated maximum aft CofG position, usually expressed as a distance aft of the datum used for Weight and Balance calculations.*

would be well into the nose down part of the position indicating scale, close to, or even at, the end stop.

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

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

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

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

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

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

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

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

Happy flying

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The Westland Whirlwind

By Rob Knight

The Westland Whirlwind

In the mid-1930s, aircraft designers around the world realized that increased fighter aircraft airspeeds were forcing shorter firing times on fighter pilots in combat. This implied less ammunition was hitting the target so it was harder to destroy targets. Instead of two rifle-calibre machine guns, six or eight were required; studies had shown that eight machine guns could deliver 256 rounds per second. The eight machine guns installed in the Hurricane fired rifle-calibre rounds, which did not carry sufficient mass to deliver enough damage to quickly knock out an opponent, and were dispersed at ranges other than that at which they were harmonised. Cannon, such as the French 20 mm Hispano-Suiza HS.404, which could fire explosive ammunition, offered more firepower and attention turned to aircraft designs which could carry four cannon. While the most agile fighter aircraft were generally small and light, their meagre fuel capacity limited their range and tended to restrict them to defensive and interception roles. The larger airframes and bigger fuel loads of twin-engined designs were favoured for long-range, offensive roles.

The first British specification for a high-performance machine-gun monoplane was Air Ministry specification F.5/34 for a radial-engined fighter for use in the tropics which led to four aircraft designs but the aircraft produced were overtaken by the development of the new Hawker and Supermarine fighters. The RAF Air Staff thought that an experimental aircraft armed with the 20 mm cannon was needed urgently and specification F.37/35 was issued to British aircraft companies in 1935. The specification called for a single-seat day and night fighter armed with four cannon. The top speed had to be at least 40 mph greater than that of contemporary bombers – at least 330mph (287 kn) at 15,000 ft.

The ultimate result was the production of the Westland Whirlwind. Unlike the other contenders for the spec, this was the first single-seat, twin-engined, cannon-armed fighter produced for the Royal Air Force.

The clean lines of the Whirlwind aided its performance, and it's four nose cannon meant it could hit hard

When it first flew in 1938, the Whirlwind was one of the fastest combat aircraft in the world and, with its four nose-mounted 20 mm Hispano-Suiza HS.404 autocannon, the most heavily armed. However, built around the newly designed Rolls-Royce Peregrine engines, development issues delayed the project and only 114 Whirlwinds were ultimately produced. During the Second

World War, only three RAF squadrons were equipped with the aircraft and, despite its success as a fighter and ground attack aircraft, it was withdrawn from service in 1943.

In size, as a twin engined aircraft, the Whirlwind was quite small, only slightly larger than the Hurricane but with a smaller frontal area. The landing gear was fully retractable and the entire aircraft had a very clean finish with few openings or protuberances. Radiators were in the leading edge on the inner wings rather than below the engines, which contributed to the overheating problems. This careful attention to streamlining , the two 885 hp Peregrine engines powered it to over 360 mph (312 kn), the same speed as the latest single-engine fighters, However, as a side-effect of its small size, the aircraft had short range, a less than 300 nm combat radius, which created for it the same limitation margins as were found in the Spitfire and Hurricane.

By late 1940, the Spitfire was scheduled to mount 20 mm (0.79 in) cannon so the "cannon-armed" requirement was being met and by this time, the role of escort fighters was becoming less important as RAF Bomber Command turned to night operations. The main qualities the RAF were looking for in a twin-engine fighter were range and carrying capacity (to allow the large radar apparatus of the time to be carried), in which requirements the Bristol Beaufighter was more cost-effective than te Whirlwind as it could carry with ease the bulky radar equipment now desired.

Although the air Ministry was impressed by the concepts, the highly experimental design needed careful examination. Delays caused by over 250 modifications to the two prototypes led to an initial production order for 200 aircraft being held up until January 1939, followed by a second order for a similar number, deliveries to fighter squadrons being scheduled to begin in September 1940. Earlier, due to the lower expected production at Westland, there had been suggestions that production should be by other firms (perhaps Fairey or Hawker) and an early 1939 plan to build 800 of them at the Castle Bromwich shadow factory was dropped in favour of Spitfire production; instead a further 200 would be built by Westland.

Despite the Whirlwind's promise, production ended in January 1942, after the completion of just 112 production aircraft (plus the two prototypes). Rolls-Royce needed to concentrate on the development and production of the Merlin engine, and the troubled Vulture engine, rather than the Peregrine. Westland was aware that its design – which had been built around the Peregrine – was incapable of using anything larger without an extensive redesign.

After the cancellation of the Whirlwind, Westland campaigned for the development of a Whirlwind **Mk II**, which was to have been powered by an improved 1,010hp Peregrine, with a better, higher-altitude supercharger, also using 100 octane fuel, with an increased boost rating. This proposal was aborted when Rolls-Royce cancelled all work on the Peregrine. Another factor to take into consideration was the fact that manufacturing the Whirlwind consumed three times as much alloy as a Spitfire.

An aspect of the type often criticised was the high landing speed imposed by the wing design. Because of the low production level, based on the number of Peregrines available, no redesign of the wing was contemplated, although Westland did test the effectiveness of leading-edge slats to reduce speeds. However, when the slats were activated the airflow forces were greater than the design could cope with and were ripped off the wings. As a result, those aircraft with the modifications had their slats wired shut.

But many pilots who flew the Whirlwind praised its performance. Sergeant G. L. Buckwell of 263 Squadron, who was shot down in a Whirlwind over Cherbourg, later commented that the Whirlwind was "great to fly – we were a privileged few. In hindsight, the lesson of the Whirlwind is clear... A radical aircraft requires either prolonged development or widespread service to exploit its concept and eliminate its weaknesses. Too often in World War II, such aircraft suffered accelerated development or limited service, with the result that teething difficulties came to be regarded as permanent limitations". Another 263 Squadron pilot said "It was regarded with absolute confidence and affection". In contrast, the test pilot, Eric Brown, described the aircraft as "under-powered" and "a great disappointment".

The Whirlwind's cockpit.

General characteristics

- **Crew:** 1
- **Length:** 32 ft 3 in (9.83 m)
- **Wingspan:** 45 ft 0 in (13.72 m)
- **Height:** 11 ft 0 in (3.35 m)
- **Wing area:** 250 sq ft (23 m^2)
- **Empty weight:** 8,310 lb (3,769 kg)
- **Gross weight:** 10,356 lb (4,697 kg)
- **Max takeoff weight:** 11,445 lb (5,191 kg)
- **Powerplant:** 2 × Rolls-Royce Peregrine I V-12 liquid-cooled piston engines, 885 hp (660 kW) each at 10,000 ft (3,000 m) with 100 octane fuel
- **Propellers:** 3-bladed de Havilland-Hydromatic, 10 ft (3.0 m) diameter variable-pitch propellers

Performance

- **Maximum speed:** 360 mph (580 km/h, 310 kn) at 15,000 ft (4,600 m)
- **Stall speed:** 95 mph (153 km/h, 83 kn) flaps down
- **Range:** 800 sm (1,300 km, 700 ni)
- **Combat range:** 150 sm (240 km, 130 nm) as low altitude fighter, with normal reserves[43]
- **Service ceiling:** 30,300 ft
- **Time to altitude:** 15,000 ft in 5 minutes 54 seconds, 30,000 ft in 20 minutes 30 seconds
- **Wing loading:** 45.6 lb/sq ft (223 kg/m^2)

Armament

- **Guns:** 4 × Hispano 20 mm cannon with 60 rounds per gun
- **Bombs:** optionally 2 × 250 lb (115 kg) or 500 lb (230 kg) bombs

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

Pilot breached regulations with Bathurst 1000 flight in damaged plane, ATSB finds

From the ABC, by Tim Fookes and Lani Oataway.

An investigation has found that a pilot who damaged a light aircraft during a Bathurst 1000 motorsport event and then flew over spectators breached safety restrictions.

The aerobatic Extra EA 300-LT aircraft touched down on the track on the morning of the race in December last year to deliver the trophy, but the tail hit a concrete barrier while the aircraft was reversing.

The Extra EA 300-LT aircraft sustained tail damage after landing on the race track on Mt Panorama in 2024. *(Supplied: Australian Transport Safety Bureau)*

A report from the Australian Transport Safety Bureau (ATSB) released on Thursday said the pilot did not externally check the damage despite being made aware of it.

"The pilot reported not feeling the impact, but a media helicopter pilot immediately alerted them to the issue and recommended checking the aircraft's tail before taking off," transport safety director Stuart McLeod said.

The report found the pilot chose not to turn off the aircraft to get out and inspect the damage or ask a team member to conduct an inspection.

The damage to the tail was visible to nearby spectators and to those watching the event on television.

The report said the pilot did not experience problems controlling the aircraft before the plane taxied along the race track and took off in the opposite direction.

No-fly zone

The report found the aircraft's landing and take-off occurred in no-fly zones occupied by spectators.

"This did not comply with the Civil Aviation Safety Authority's required spectator safety heights and distances for an air display," Mr McLeod said.

"The pilot did not conduct an external inspection after striking the barrier and the take-off and return flight to Bathurst Airport were conducted with the damaged tailplane."

The report said the pilot had previously been advised about flying restrictions at motorsport events.

"The pilot's application for the Bathurst 1000 did not describe how the landing or take off on Mountain Straight would occur," Mr McLeod said.

The report found that the Civil Aviation Safety Authority (CASA) approved the flight despite the limited information provided and the constraints of the no-fly zones.

"Due to obstacles on the southern end, the take-off and landing could only have been conducted from the north, over the no-fly area, which was clearly specified in the pilot's submitted diagram but wasn't specified in the application process," Mr McLeod said.

A spokesperson for CASA said in a statement that any air show must meet "rigorous" approval standards before it is approved.

They said those standards include aviation risks and spectator safety.

"This accident is a reminder of the need for pilots to follow aviation safety rules," the spokesperson said.

The ATSB report said the pilot held a recreational licence issued in 2019 and had 800 hours of flying experience at the time of the incident.

Note: there is a caution point in this for me. It relates to the competence of the reporting.

At the end of the second paragraph, the report authors state the aircraft was reversing*. The aircraft was turning on the ground, but it was not reversing - in this case, that is impossible.*

Rob Knight

Stay Wide O' Wake

By Rob Knight

Wake Turbulence – that trailing issue that can be a problem ahead or Stay Wide o' Wake.

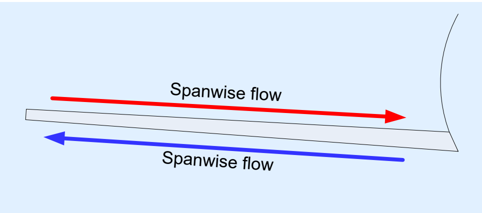
When relative motion exists between a body and a surrounding fluid the fluid will be disturbed. This disturbance is easily viewed when the fluid is visible such as a boat moving across water. Everyone has seen this, from the gentle ripples of a slow-moving sailboat, to the white spray from a speeding boat pulling water skiers.

Wakes also exist in the air; why not – it's fluid? In fact, the atmosphere is full of wakes. Mechanical turbulence is mostly the wakes from upwind obstacles. The downdraft in the lee of a hill, the rotor behind a range of hills, and the standing wave in the lee of a mountain range. These are all natural events cause by a disturbed wake trailing downwind of a geographical obstacle.

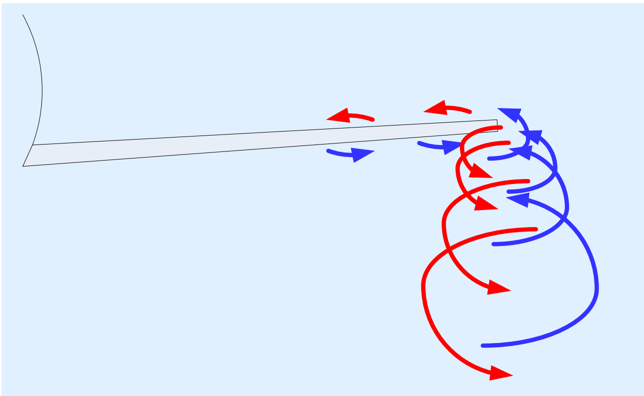
Aircraft also have wakes, in exactly the same way as boats. But boat's wakes are visible whereas aircraft wakes cannot be directly seen as air is invisible. Only when an additional medium such as smoke or water condensate is introduced into the part of the atmosphere where wake is present can an aircraft's wake actually be seen. However, once felt, it is seldom forgotten.

In our training we have all experienced flying through a wake. The instructor watches as we haul our aeroplane's around in a steep turn and comments favourably when, as we roll out, we get the quick rattle and roll as we pass through the air disturbed at our entry point. Whilst this is often termed slipstream, and while propeller wash will be a part of the air disturbance we experience, most of it is wake from our wings that gives us this signal of a turn well carried out.

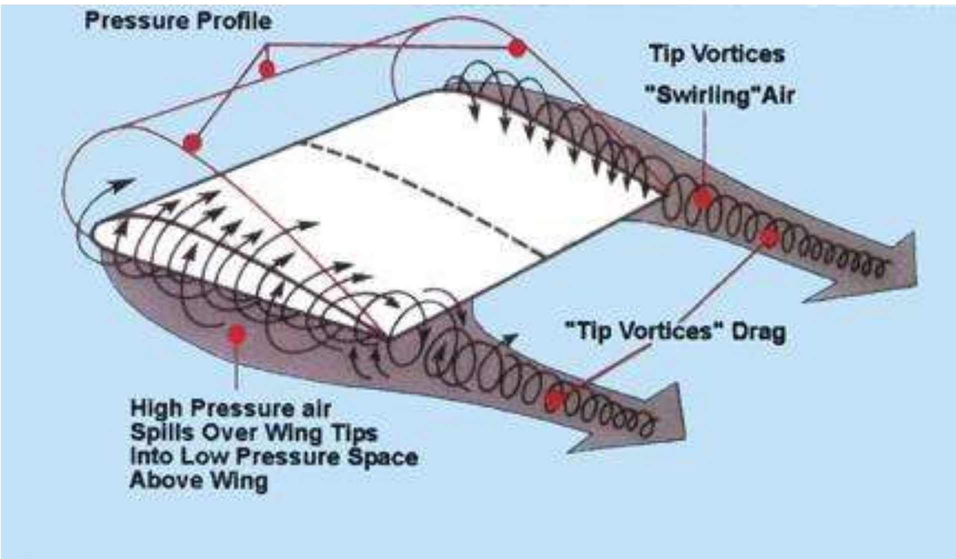
So where does this "wake" come from? As with most things – it's really quite simple. Our wings generate lift using a relatively high-pressure region area beneath, and a relatively low pressure region on top. At the tip of the wing, air is free to spill from beneath the wing to the top surface – a direct result of this pressure differential.



If our wing could experience this pressure differential whilst stationary, there would be a constant spanwise flow, from wing root to wing tip on the underside, and from wing tip to wing root on the top side. But our wing is not stationary. As it travels forward, the wing advances but the air does not and the spillage at the tip becomes a horizontal whirlpool or vortex. The air still flows outwards towards the tip along the underside of the wing and inwards from the tip on the top, but the great significance to us is that swirling of air at the tip, the vortex, that is both the cause of induced drag and the cause of wake turbulence. The sketch on the left is designed to display the concept of general air movement about the wing and tip during flight, but it in no way clearly depict the magnitude of the revolving mass of air behind the wing tips. To illustrate this better, see the images following.



The image below illustrates the effects of wing-tip spillage on both wings. In both cases the air spills from beneath to the top surface so the two vortexes rotate in opposite directions.



Several factors can modify the amount of wing tip spillage and therefore the amount of spanwise flow. Obviously if there was no wing tip there could be no spillage, so the plan form of the wing is a major factor in the wake vortices developed. In this I mean the size of the tip compared to the wing area. Another name for this is aspect ratio and aeroplanes, such as gliders, that have very high aspect ratio wings (large span/short chord) will have a very small tip for their wing area. Thus there is little wake behind a glider. Another factor is wing loading. The greater the wing loading the greater will have to be the pressure differential and, as it is the pressure differential that causes the spanwise flow, heavier aircraft tend to create far more wake turbulence. That does not mean to say that the wake behind a light aircraft is puny – the wake behind a light twin or a heavily loaded single can easily roll another light or ultralight aircraft inverted, in a fraction of a second.

Another primary consideration is the angle of attack of the wing of the aircraft forming the vortices. The greatest pressure differential between the two wing surfaces on any given wing is at the critical angle. In other words, the higher the angle of attack, the greater will be the magnitude and power of the tip vortex.

The two vortices that trail behind the wing tips don't remain at the same level as the aircraft that formed them. They grow larger in diameter, and descend slowly, at perhaps around 100 feet per minute. They also drift apart, at about 5 knots.

The image on the left shows a Boeing 737 leaving a wake that can clearly be seen behind and below the aircraft in the cloud formation which is faithfully displaying the massive power of the two counter-rotating vortices. Keeping in mind that the aeroplane is coming towards you, note how large the vortices must be because they are much further away from the camera than the aircraft. Note how the vortices have descended. The power in these two horizontal whirlpools of air can be quite sufficient to break another aeroplane up in the air. It needs little imagination to see why this phenomenon is potentially so dangerous. Even large aircraft have suffered structural damage encountering the wake of another "heavy" ahead.

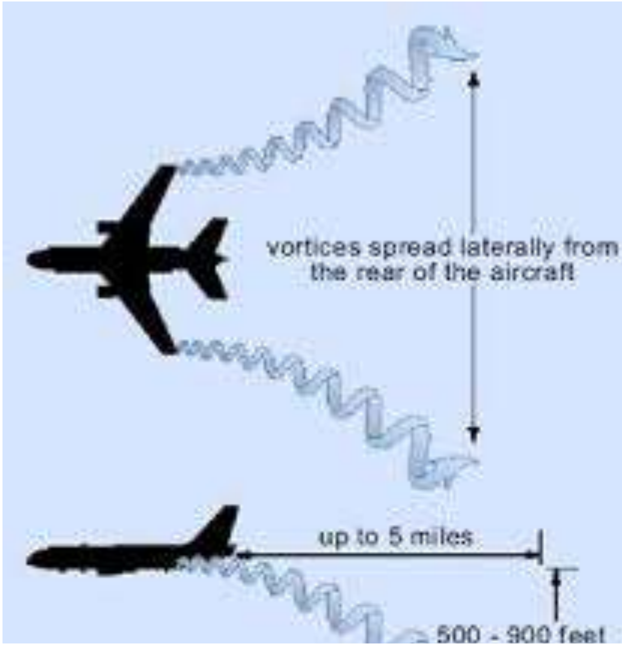
Previously I mentioned that wing tip size was an important factor in the power of the vortices generated . Shape, too, is a factor – the squarer the tip for the wing area, the greater will be the magnitude of the vortex and thus the magnitude of the wake. The elliptical wing on a Spitfire has a very small effective tip for the wing area and this was a major point in its superiority over other similar aircraft. Another means of substantially diminishing the tip size is to fit winglets (or sharklets). Their effectiveness is depicted in the image below.

This image depicts a comparison of winglet versus no winglet using a heavy aircraft with a clean tip on its starboard tip and a winglet fitted to the tip on the port side. The vortex behind the starboard wing tip is far larger and far more powerful than that on the port side, behind the winglet. The same will go for light and even ultralight aeroplanes. Winglets reduce induced drag which increases cruise speed for any given fuel consumption; this improving economy and/or range on aeroplanes of all sizes. Jabiru fit winglets to their manufactured aeroplanes, and many Morgan designed homebuilt aeroplanes are equipped with similar tips. Whilst not fitted specifically to reduce wake turbulence, this is a beneficial side effect of the drive for efficiency and economy.

Morgan Cheetah. Note the black winglet

In the same light, turned down wing tips also hinder spanwise flow and will also therefore reduce both induced drag and tip vortices. These tips are now so common as to be almost ubiquitous. Again, fitted to reduce induced drag, their spin-off is to reduce wake turbulence generated by that aeroplane.

So where behind the wake generating aircraft is the likely danger area? As stated, behind each wingtip a vortex forms: a horizontal whirling dervish of air. The size of each vortex grows with time, each vortex descending behind the forming aircraft, and spreading sideways as is shown in the image of the military C17 transport aircraft above.



In this image, the water behind the aircraft is lifted and swirled by the two counter-rotating vortices, wider than the wingspan of the aircraft that formed them.

The next image to the right clearly displays the sink and spread of the vortices, and the distance behind an aircraft in which danger exists. Although these images depict heavy aircraft, don't think for a moment that the little ultralight aircraft ahead and above is too light to leave a noticeable wake. Sure, the wing-loading might be miniscule in comparison, but then, if you, too, are in an ultralight – SO IS YOURS and the effects can be dramatic indeed.

Exciting, eh!

However, and notwithstanding the above, the greatest danger by far is being in a light or ultralight aeroplane and encountering the savage forces in the air being left by heavy aircraft ahead. This is especially so when on approach where you share the same runway as heavier aircraft. It can also be an issue when flying a downwind leg when a heavier, faster aeroplane flies the same leg at a higher altitude. The potential for disaster is so great in this case, too, that minimums are prescribed as listed overleaf.

To assist in minimising the opportunity for following aircraft to encounter wake turbulence, there are standard time separations for the various classifications of aircraft. The table below was produced by ICAO (the International Civil Aviation Organisation based in Montreal, Canada) as a standard set of time separations between the various classifications of aircraft. Ultralight aircraft are not mentioned.

MINIMUM DISTANCE SEPARATION FOR LEVEL FLIGHT:

Minimum distances apply whenever:

an aircraft directly follows another at the same altitude or less than 1,000 ft below it, or if both aircraft are using the same runway or parallel runways separated by less than 760 m or

an aircraft is crossing behind another aircraft, at the same altitude or less than 300 m (1 000 ft) below.

Preceding Aircraft	Following Aircraft	Minimum Separation
HEAVY	HEAVY	4.0 NM
HEAVY	MEDIUM	5.0 NM
HEAVY	LIGHT	6.0 NM
MEDIUM	LIGHT	5.0 NM

Minimum Time Separation: Successive Landings or Full Length Take Offs

Minimum time separation for arriving aircraft not radar-separated is 2 minutes for a MEDIUM aircraft behind a HEAVY aircraft and 3 minutes for a LIGHT aircraft behind a HEAVY or MEDIUM aircraft.

Minimum time separation for departing aircraft which are using:

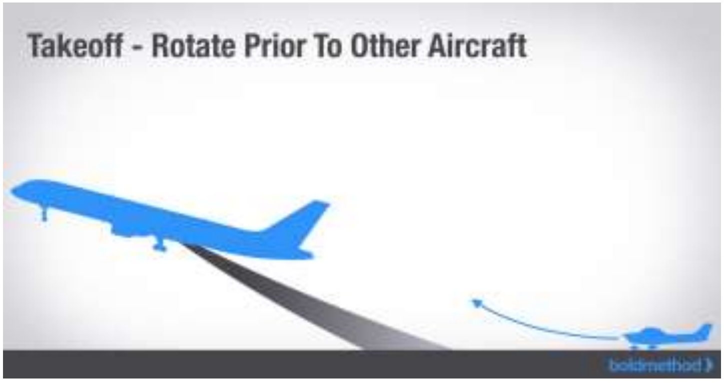
the same runway or

parallel runways separated by less than 760 m (2 500 ft) or

crossing runways if the projected flight path of the second aircraft will cross the projected flight path of the first aircraft at the same altitude or less than 300 m (1 000 ft) below or

parallel runways separated by 760 m (2 500 ft) or more, if the projected flight path of the second aircraft will cross the projected flight path of the first aircraft at the same altitude or less than 300 m (1 000 ft) below.

is 2 minutes between a LIGHT or MEDIUM aircraft taking off behind a HEAVY aircraft and a LIGHT aircraft taking off behind a MEDIUM aircraft.

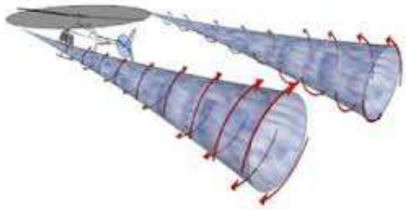


Take-off technique when following a heavier aircraft (even after the standard time separation has elapsed). The recommended technique is to ensure that the following aircraft should rotate and fly clearly above the path and thus the wake of the aircraft departing ahead. At busy airports, Air Traffic Controllers are usually sympathetic to pilot’s requests relating to wake safety because the law does not allow them to insist another aircraft begins its take-off if there is a chance of wake turbulence ahead.

But wake turbulence is not restricted to fixed wing aircraft. Helicopters are just as bad. The image on the right, was taken in New Zealand of a Bell 47G on spraying operations. Note the wake displayed in the swirling swathe. If you were to fly through that in a light aircraft your world would be turned upside down as they say. In an ultralight, with its usually lighter wing loading...... well – I'll let you be the judge of that.

Helicopter wake when moving forward.

In general, whilst moving, helicopter wake is just as severe as any comparably weighted fixed wing aircraft. The trailing wake from the rotor disc follows the same counter-rotating, spreading, and descending traits, and is just as predictable as long as one considers that the helicopter wake is not always behind the aircraft's longitudinal axis as the machine can fly in any direction. Rather, the wake trails the helicopters direction of motion.



In hover, the helicopter has no wake; instead, it has a very heavy downwash equal to the weight of the aircraft. This is a great danger to aircraft (especially light or ultralight ones) that may pass beneath a hovering chopper. Obviously, the closer beneath the helicopter the lighty passes, the worse the effects of the turbulence and down-blast will be, and the heavier the helicopter, the more severe the downwash and turbulence consequences will be. When hovering close to the ground, the rotor wash can be disastrous. The heavier it is, or the slower it is travelling, the greater the potential to damage or overturn aircraft or other vehicles beneath. Rotor down-blast is dangerous up to 3 times the total rotor span.

Pretty, isn't it, but also deadly!

With all these examples relating to heavy aircraft, does this mean that light aircraft and ultralights flying around small airfields as we do are unlikely to suffer a wake event. The answer is an emphatic - NO. I personally have been rolled inverted in a Victa 100 at 300 feet AGL when overtaken by a Cessna 207, heavily loaded on approach for a parallel runway. Initially there was no issue but when the pilot slowed her 207 and extended full flap, a very powerful rotating vortex developed. It sank slowly and drifted across directly into our flight path and my student flew straight into it. Sadly, that student never continued their training.

Be aware of the propensity for wake behind any other aircraft ahead and above, flying a similar track. If you run into it, you will likely have difficulty maintaining roll and/or pitch control of your aircraft for the time that you are in the grip of the vortex.

It's far, far better to dodge a bullet than try and fix the hole after you are hit!

Websites that will interest the interested are:

https://www.skybrary.aero/index.php/Mitigation_of_Wake_Turbulence_Hazard#ICAO_Prescribed_Separation_Minima.

www.airservicesaustralia.com/wp-content/uploads/wake.pdf

You Tube

https://www.youtube.com/watch?v=qMpNThOKTuE

https://www.youtube.com/watch?v=s6K1ArSyiuI

https://www.youtube.com/watch?v=WXjbVLgK-fU

Happy Flying

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

Fly-Ins Looming

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

Caloundra Air Museum Trip.

On Saturday, 17 May, the BVSAC group-tripped to the Caloundra Air Museum with seventeen members and friends attending.

The weather gods were generous and the day went well. The attendees enjoyed the museum exhibits, especially including where the special access permission the group obtained allowed entry to vistas not open to the public, and see rarer exhibits normally obscured from the eyes of the general un-washed masses.

After the museum, the group made its way to the Caloundra RSL for an excellent lunch.

Pix from the Event:

The BVSAC group.

A site of classics or a sight of Classics?

Ah! A DC3 Captain at last!

Where's my Co-pilot?

Do up your seatbelts.

Lunch at the RSL.

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

If you spell the words "absolutely nothing", backwards, you get "gnihton yletulosba".

Is it pure coincidence that this, too, means absolutley nothing.

The Days of Our Lives (From a Flying Instructor's perspective).

By Rob Knight

I recall his name as being "John". I never met the man personally although he has caused me considerable self-searching and checking of my training tropics and standards over the many years since I heard him speak over the radio.

Frankly, the weather conditions at Ardmore in New Zealand on the day were deplorable. A cold north-easterly wind, gusting to about 25 knots, was sweeping the runway whilst showers of rain, some heavy enough to reduce visibility to below VFR requirements, some just drizzle, but still enough to make VFR ops marginal, hung around the airfield. These conditions were not just local, there was a slow-moving occlusion crossing the North Island and these conditions were petty general throughout this part of the country.

I was instructing in ZK-CHF, one of Waitemata Aero Club's Victa 100s (Airtourer AT-1), with a PPL in the late stages of our CPL course and making good some moulding work in bad-weather ops.

We were cleared to join right base for 03 grass, operating under Special VFR[5], when I head a Cessna 150 call for taxi, one POB[6], heading for Rotorua. After the tower had replied with his clearance, I chipped in and gave a PIREP[7] on the appalling conditions. ATC conformed my report and asked the 150 what his intentions were having received my advice.

The 150's pilot replied to ATC that he had been flying for long enough to know his limitation and that a bit of bad weather was not something he was afraid of. He said he owned the aeroplane and that, as I didn't know him or his history, I would be better served minding my own business. He trained in Rotorua and had an intimate knowledge of its environs so he would continue as planned.

Less than 90 minutes later, the aircraft was on the ground, in a fire-blackened area of tea-tree, the pilot impaled on a fire-hardened tea-tree stalk where he survived about another 48 hours in the horrendous weather, too bad for serious searchers to locate him.

The later accident report suggested that, after departing Ardmore, he headed north into the Hauraki Gulf, before turning south east and tracking down the Hauraki plains before attempting to slip through a gap in the Mamaku range to Rotorua. The result was inevitable as the cloud base across the whole area seldom exceeded about 700 feet AGL and Rotorua sits at 936 feet AMSL.

The report made grim reading. Whist slowly dying of internal injuries, and suffering both a broken arm and a smashed femur, still strapped in in the leaking cockpit, the pilot had scrawled a diary on the pages in the aircraft's flight manual, parts of which featured in the official report.

Where did he go wrong? In a sense he didn't. He just had no experience in the ambient conditions which were so far outside his general experience he had no ability to recognise that his abilities were so low as to make him completely vulnerable in regard to such weather conditions. Instead, he took offense at my PIREP and considered my comments a slight on him personally.

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[5] *Special VFR (SPVFR) – a special clearance from an airfield ATC unit that allows a specific aircraft to operate(within limits) in controlled airspace under conditions below normal VFR met minimums.*
[6] *POB – person on board.*
[7] *PIREP – a weather report issued by a pilot (usually in flight).*

WTF - The World's Worst Aircraft – The Messerschmitt Me 210 - 1939

By Rob Knight

Disaster struck in 1939, on its first test flight. It immediately became apparent that, despite its impressive specification on paper, the new Me 210 aircraft flew like a brick.

The overall design of the 210 was a re-vamp of the Bf 110. It still had two engines, a mid-wing and twin vertical control surfaces in the tail. In common with the 110 it retained the two-man crew housed under the same type of glazed "greenhouse" canopy. However, the new aircraft would also feature some notable changes over its predecessor, the three primary ones being the cockpit being placed further forward in the fuselage to give the pilot improved visibility, new engines - a pair of 1,300 hp Daimler-Benz DB 601F engines would replace the 1,150 hp DB 601B engines in the Bf 110, and a small enclosed bomb bay capable of holding a pair of 500 kg bombs instead of the external bomb racks on the Bf 110. The new aircraft would have a top speed of around 340 knots, a useful improvement on the top speed of the Bf 110 and equivalent to the top speed of many current single-engine fighters. In eager but flawed anticipation, an order for 1,000 new Me 210s was placed before the prototype had even flown.

The first prototype flew with DB 601B engines in September 1939, and the test pilot's reports were damning. The reports gave that the aircraft, in its prototype state, was completely inoperable as a Luftwaffe aircraft. The design was now unstable in yaw when turning, and it was inclined to wander in pitch, even while flying level. Initially, the designers focussed on the twin-rudder arrangement that had been taken from the 110, and replaced it with a new and much larger single vertical stabilizer. But this effected almost no improvement, and the aircraft continued to "snake".

The Messerschmitt Me 210. Note the twin fins have been replaced by a single vertical unit.

The Me 210 also suffered from appallingly bad stalling characteristics fuelled by its most serious flaw – its centre of gravity was, by design, too far aft, and serious longitudinal instability ensued. Fitted with automatic leading-edge slats triggered by the angle of attack, with the nose up or in a turn, with the C of G so far aft, stalls whipped into instant fast and steep rotating spins when the automatic slats became deployed. The second prototype, the Me 210 V2, was lost this way in September 1940, when the pilot could not get out of the resulting spin and had to jump and use his parachute to survive. The chief test pilot commented that the Me 210 had "all the least desirable attributes an aeroplane could possess".

Even after 16 prototypes and 94 preproduction examples, not all the issues had been resolved. But the German authorities, desperate to replace the now obsolete Bf 110s currently in service, ordered full production in early 1941. However, the 210-type continued to exhibit grossly inadequate handling characteristics, and as a result, several elements of the airframe were further redesigned, including lengthening the rear section of the fuselage by 92 cm, the aircraft so modified being designated as lang ("long"). The Me 210C was built with DB 605 engines, as well as incorporating the substantial changes to the airframe.

The Me 210 was eventually abandoned by the Luftwaffe and the design was developed into the Messerschmitt Me 410, with DB 603 engines.

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

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

1. If a pilot plans to fly a track of true north (360°T) in a locality where the magnetic variation was 15° east, what would the compass need to read if it had no deviation?
   A. 315°
   B. 360°
   C. 345°
   D. 015°.

2. When must an aircraft be checked for fuel contamination?
   A. Before the first flight on any day.
   B. After every refueling exercise.
   C. Once (on a DI) if a gascolator is used to identify contamination.
   D. When the pilot decided there is a risk of fuel contamination.
   E. A and B are both correct

3. Given the following data from a TAF, what time is it valid until?
   TAF YCCA 211832Z 2106/2118
   A. 21st day, 1832 Zulu.
   B. 18th day, 0200 zulu.
   C. 21st day, 0600 zulu.
   D. 21st day, 1800 zulu.

4. Two light aeroplanes are exactly 1.5 nautical miles apart, and on a collision course. If they are each doing 90 knots, how long before they collide.
   A. 30 seconds.
   B. 60 seconds.
   C. 90 seconds.
   D. 120 seconds.

5. A red navigation light for an aeroplane would be fitted where?
   A. The tail.
   B. The PORT wing tip.
   C. The STARBOARD wing tip.

If you have any problems with these questions, call me (in the evenings on 0400 89 3632) and let's discuss it. Ed.

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 +61 4 0089 3632), or email me at kni.rob@hotmail.com.

ANSWERS

1. C is correct.
   When calculating from TRUE to MAGNETIC, easterly variation and deviation values are subtracted from the TRUE

TRUE	Variation	Magnetic
360	15E (-)	345 degrees magnetic (360-15=345)

2. E is correct.

3. D is correct.
   Check the interpretation details for a TAF

4. A is correct.
   Aircraft are each doing 1.5 nm/minute so it will be just 30 seconds (half a minute) to collision time.

5. B is correct.
   Remember the mantra – There's some **RED** **PORT** wine **LEFT** in the bottle.

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

Aircraft Books, Parts, and Tools etc.

Contact Rob on mobile – 0400 89 3632

Books

Title	Condition	Price
PPL Navigation, by Trevor Thom	Good condition	**$15.00**
PPL Basic Aircraft Technical Knowledge, by Trevor Thom	Excellent	**$15.00**
Manual of Aviation Meteorology, by the BOM	Excellent	**$15.00**
Human Factors in Flight, by Frank Hawkins	Excellent	**$15.00**
Aviation Medicine and Other Bhuman Factors, by Dr Ross L. Ewing	Excellent	**$15.00**

Aircraft Magnetic Compass (Selling on behalf)

Item		Price
Magnetic compass: Top panel mount, needs topping up with baby oil.		**$45.00**

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@hotmail.com

Aircraft Grade Bolts for Sale

<u>Aircraft AN Bolts - $500</u>

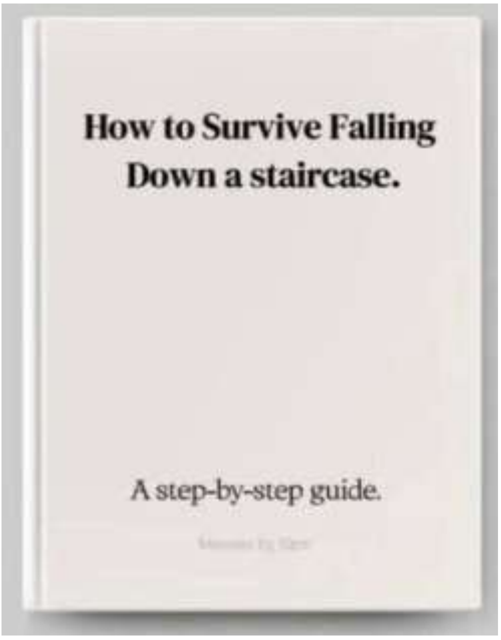
AN3, AN4 & AN5 bolts, all bagged
- 500 bolts in total.

Today's cost – approximately **$5,500**

A list can be supplied if required

Contact Colin Thorpe –

0419 758 125



Morgan Cheeta Aircraft for Sale

- Registered 19-1502 and paid up until July 2025.
- Power Plant: Jabiru 2200 with the cold start kit & 1.2kw starter motor.
- Propeller: Sensenich 68" ground adjustable.
- Icom radio, 2 headsets, Sigtronics intercom.
- Flight Instruments: Airspeed indicator, altimeter, vertical speed indicator, slip/skid indicator.
- Strobe lights.
- Fat beach tyres & Matco. Brakes.
- 93 litre fuel tank.
- Leather seats.
- 100 Knots cruise.
- TTIS – 32.0 hours engine & airframe.

NEW PRICE - $36,000

Contact Colin Thorpe
Ph. 0419 758 125

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**

2000 Parker Teenie Two for sale

NEW PRICE$9,500

- ✓ TTIS 70 hours airframe.
- ✓ Engine: 1835 cc Volkswagen with dual ignition and dual spark plugs, Slick mag, and 12-volt electronic ignition.
- ✓ Built by original L.A.M.E. owner.
- ✓ Price includes weatherproof storage/transport trailer so no hangarage is required.

I purchased the aircraft in 2020 intending to enter Recreational flying, but due to work and study commitments, it never eventuated.

The aircraft last flew in 2017. I start the engine every three months and have serviced it yearly. It really needs to go to someone who can enjoy her.

Contact me, Jared Tucker, at jaredtucker1998@gmail.com,

or call me on **0450 233 263**.

See you next month