BRISBANE VALLEY FLYER

AUGUST- 2019

BRISBANE VALLEY SPORT AVIATION CLUB INC

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

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

Rob Knight (Editor) Tel: 0400 89 3632

A Vans RTV6, airbourne on 12 when it was a single runway

.

Peter Ratcliffe (Pres.) 0418 159 429 Ian Ratcliffe(Treasurer) 0418 728 328
Vern Grayson (Vice Pres.) 0418 728 328 Jackie Bolsover (Secretary) 0438 783 740

Wheel-Barrowing an Aeroplane is NOT a Good Idea

By Rob Knight

Scene 1: A fine day with a light wind blowing across the runway at about 5 knots. A light aircraft is on short finals, airspeed is just a few knots fast and the aircraft, tracking slightly, is astride the centre-line and a bit high. The aircraft reaches the flare point further into the runway than the pilot likes so he decides to get the wheels onto the ground where he will have some braking.

Scene 2: Inside the cockpit the pilot hasn't allowed the aircraft to float as normal to wash the airspeed off. He flares just enough to let the aircraft touch down on the mains and nosewheel simultaneously.

Scene 3: From outside the aircraft the tyres squeak and the aircraft bounces gently. You can see the trailing edge of the elevator move down as the pilot pushes the stick forward to hold the aircraft on the ground. The nose is forced down onto the nosewheel wheel and the nosewheel suspension flexes as the leg shortens. The aircraft has begun to drift slightly across the runway with the crosswind

Scene 4: Inside the cockpit the pilot reaches for the brakes and applies them firmly. Too much of the runway is behind him so he presses the stick further forward and applies even more pressure on the brakes.

Scene 5: The main wheel leg lengths extend as the tail rises and the nose pitches even further down. The main wheels stop rotating as the traction diminishes; the weight has come almost completely off the main wheels. Directional control is lost – falling airspeed has robbed the controls of their effectiveness and any chance of useful differential braking is gone- the braking wheels are virtually off the ground and, anyway, the pilot is too engaged to try to use them. The aircraft continues to drift further away from the runway centreline.

Final scene: The aircraft suddenly snaps and yaws violently, yawing into wind and pivoting around the point of contact of nosewheel with the runway. The nose leg fractures and collapses. The prop strikes the ground and bends backwards as the cowling crumples and tears away beneath engine. The tail and windward wing rise and the aircraft slowly topples tail over nose to lie upside down on the runway. There is silence except for the crackle of bending metal as the wreck settles. There is a strong smell of petrol in the air……….

Wheel-barrowing is a dangerous condition that occurs when the weight of an aircraft becomes concentrated on the nose wheel during a take-off or landing roll.

On take-off, the common cause is the pilot holding the aeroplane on the ground too long, particularly when a crosswind is present. When this flawed technique is used the forward stick that holds the aeroplane on the ground by pitching the nose down unloads the main-wheels, transferring the load to the nosewheel. This extra heavy nosewheel loading compresses the nose-wheel suspension and forces the nosewheel to remain in firm contact with the runway. This is *wheel-barrowing*.

In this condition the aeroplane's centre of gravity is behind the point of contact with the runway and the aeroplane is now totally directionally unstable. Any yaw will set up a couple that quickly overtake any directional control still available to the pilot: the aeroplane will rotate around it's vertical axis and there's not a thing the pilot can do to arrest it.

In reality, there is no cause to keep an aeroplane on the ground after it has reached its V_X (best angle of climb speed), indeed, there are very good reasons to be airborne before this figure is reached. If a pilot considers that he/she should hold their aeroplane down until attaining its V_X before lift-off, then the flight should be cancelled or postponed until better conditions exist.

Wheelbarrowing is more frequently an issue during the landing phase. Commonly, it results from approaching too fast and then touching-down too flat. As the rebound from the undercarriage tries to make it fly off again the pilot takes the stick forward to hold the aircraft on the ground. The applied forward stick will pitch the aeroplane nose down, unloading the main wheels and loading the nosewheel instead. With the aircraft main wheels on tip-toe braking will be lost because the wheels have insufficient weight on the tyres to provide traction for brakes to function. The nose wheel, still in firm contact with the runway, will suffer substantial drag, and any lateral movement will create a powerful couple that yaws the aeroplane and it will pivot violently about its nosewheel.

To get a grip on this topic, it is necessary to be clear on what a 'couple' is in this sense.

> A Couple is a force acting about a point. The magnitude (power) of a couple varies with either a change in the power of the force applied, or a change in the arm of the force. A couple can ONLY be opposed by another couple.

In a 'normal' landing, when the main wheels (PW and SW) touch the runway with the nosewheel (NW) clear, two couples are generated by the contact the wheels have with the runway. The magnitude of each couple is determined by the drag force of the tire/wheel and the length of the couple arm - the distance between the point of application of the drag force and the aircraft Centre of Gravity.

Assuming the same drag applies to each wheel, when the aircraft is pointing in the same direction as it is travelling the couples are equal (red and blue couple arms are the same length) and no yaw will be caused by this interaction. This makes a nosewheel equipped aircraft easy to control on the runway because it is directionally stable and its forces try to keep its nose aligned with its direction of movement without pilot input. See Fig. 1.

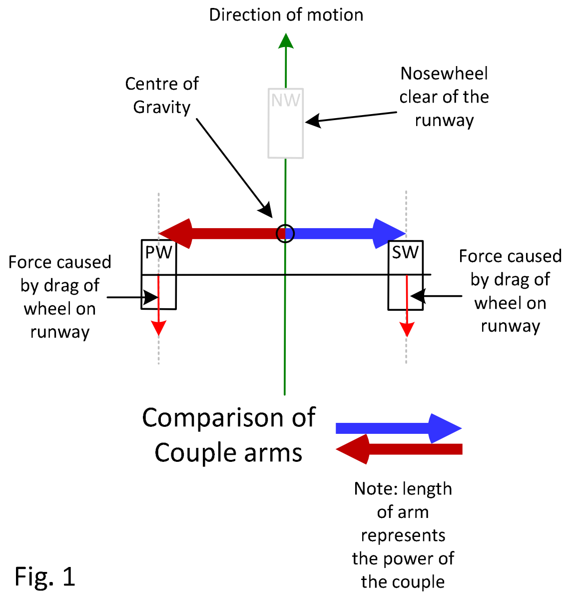
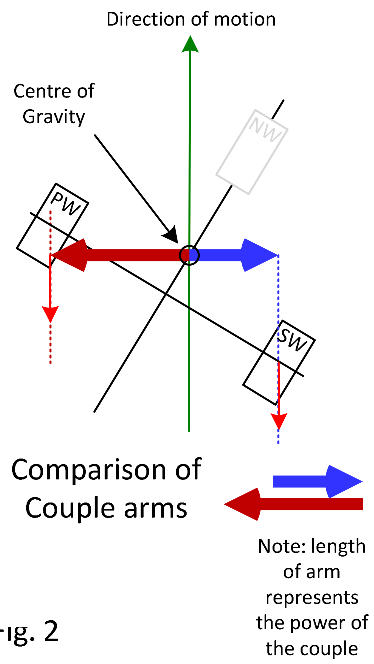


Fig. 1

Using the correct take-off and landing techniques provides a directionally stable aircraft. Drag from the wheels in contact with the runway provides a directionally corrective force.



2
Fig. 2

As Fig. 2 illustrates, this is a STABLE action because it yaws the aircraft back towards its direction of motion and as it does so the couple arm shortens, diminishing the force as the alignment completes. In other words – the aeroplane WANTS to move in a straight line. The weight and drag forces tend to keep the aeroplane moving straight

However, this will ONLY be the case while the main wheels are on the runway and have traction with it. If the main wheels are not in contact with the runway and the load is on the nosewheel, an entirely different situation exists.

If, whilst the aircraft has weight on the main wheels, the nosewheel is clear BUT the aircraft nose is NOT pointing in the same direction as the aircraft is moving, then the couples will not be equal – the leading main wheel will have a greater arm and therefore more powerful couple. This, the red couple as illustrated, is more powerful than the blue couple, and the imbalance provides a force to yaw the aircraft's nose and align it with the direction of motion.

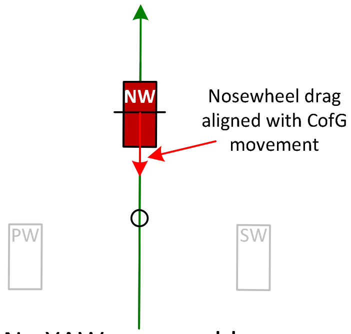
However, when the nosewheel is on the runway and the main wheels aren't, the situation becomes critical.

Fig. 3. If, in this state, the drag generated by the nose-wheel is directly aligned with the centre of gravity and the direction of motion, no couple is formed and there is no yaw force generated.

Immediately the nosewheel diverges from its alignment with the centre of gravity it will instantly create a couple that generates the unstable yawing moment. For example- See Fig's 4, 5, & 6.

Fig. 4. If the nosewheel has moved to the right, the drag force caused by nose wheel contact with the runway is now no longer aligned with the centre of gravity and direction of motion. A couple is formed.

Yaw creates an unstable condition that that quickly results in a complete out-of-control situation.



No YAW = no problem

Fig. 3

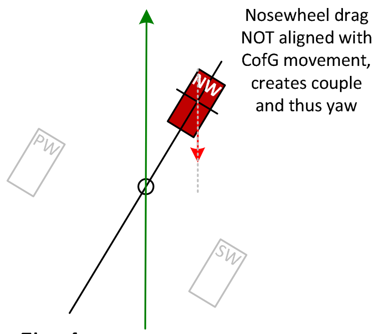


Fig. 4

Fig. 5. The grey force of the aircraft's mass acting through the aircraft centre of gravity is moving forward while the red drag force created by the drag on the nose-wheel's contact with the runway acts rearwards. This will savagely yank the aircraft into a right yaw state and, as the yaw takes effect and the angle change increases, the arm gets longer and thus very quickly more powerful.

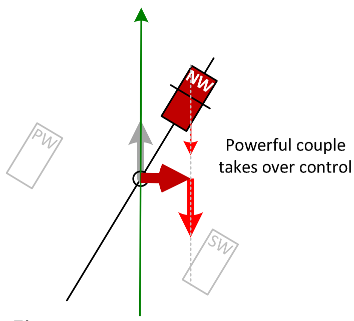


Fig. 5

Fig. 6. The magnitude of the couple has increased greatly with the changing angle. Not only is the arm longer, but the front wheel has less rolling ability and the now scuffing tire has greater drag than it initially had.

The situation is now serious. The aircraft still has just the nosewheel on the runway and the yaw forces are now beyond correction by the rudder. Removing forward pressure on the stick and then adding full power may allow the aircraft to fly off but as curative action it is doubtful at best. Effective control is lost and there are no remedial options available to the pilot at this late stage.

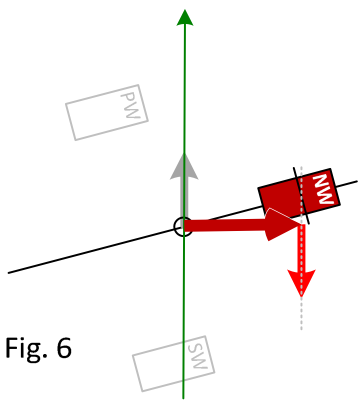
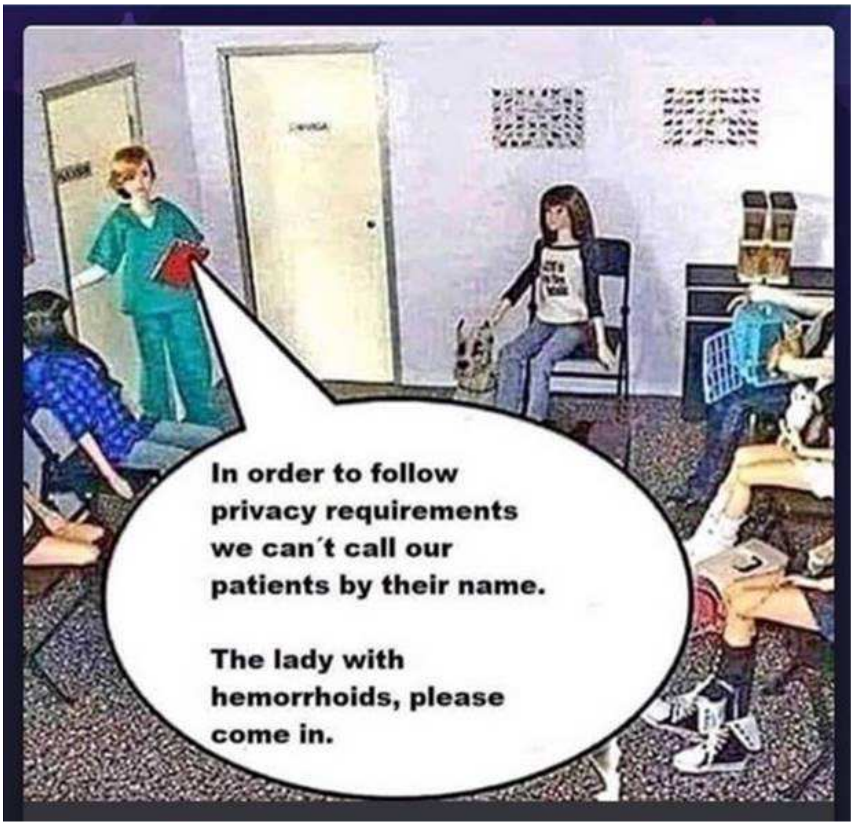


Fig. 6

This is, in effect, a ground loop condition and the side loads on the nose wheel assembly will quickly exceed their design limits. The nose leg will fail. The prop may strike the ground and disintegrate. Parts of the propeller may enter the cockpit with fatal consequences. This can ruin your WHOLE day. However, on the bright side, the landing will usually be short, and often you don't even have to taxi off the runway!

While the best correction is to never get into this condition in the first place, an immediate go-around BEFORE substantial yaw is experienced can resolve the problem – but early recognition of the pending problem is paramount. The correct landing technique has the main wheels touching first and the nose wheel settling only in such a manner that a positive load is retained on the main wheels as the speed washes off.

As you can now see, there are very good reasons for this being the accepted practice.



Your very own *Condensator*

By Rob Knight

A critical part of flying aircraft is the ongoing checks and inspections to ensure the machine remains safe for flight. Critical amongst these checks is the inspection before the first flight of the day, and after every refuel, of the fuel for water and other contamination. A carburetor bowl, or injector system with water in it, can shut your engine down as surely and as quickly as turning the mags off.

Concentrating on the water contamination issue, the question often asked but seldom answered adequately, is how did water get into the tank in the first place? There are several possibilities.

1. Water contaminated fuel deposited into the tank during normal refueling operations.
2. Leaking fuel caps and the aeroplane being out in the dew or, worse, rain, or even washing the wings.
3. Magic (water vapour in the air, condensing inside the tank).

In the first case, there are a great many filters and handling procedures to minimize the chances of this happening. However, in my 58 years of flying, I am certain of that happening at least three tmes so it is not impossible.

In the second case, fuel cap seals should be checked as part of every aircraft's ongoing maintenance schedule but, in the event water is found in the tank(s) a thorough check of the cap seals should immediately take place.

The third case does seem like magic. An aircraft parked in a totally dry hangar with no water found in a contamination check on its last flight, can, after a few days of idleness, have a noticeable amount present. It's a case of a very simple process, the same process that causes dew to form on your car in the evenings and overnight.

To understand this process, knowing how/why dew forms is a great beginning. Atmospheric air, everywhere, contains some moisture in vapor form: it is a colourless, odourless gas. One can imagine that the molecules of vapour hide between the molecules of air and, as long as there is room between these molecules, their presence is invisible. However, should these gaps between the air molecules shrink too much, this vapor cannot remain, and it will condenses out of the gas as a liquid which we see as dew. So how much shrinking is too much? The air will retain the vapour until it becomes saturated – there is no spare room but the vapour is still gaseous and therefore invisible. This is known as the *Dew Point*, meaning that there is no room at the inn, no more vapour can be added, and no further cooling can be tolerated for this situation to continue. If there is any further cooling water will appear, squeezed out like dishwater from a saturated sponge when squeezed. In the atmosphere, this is the basis for cloud formation , but when cold surfaces are to hand, as soon as any cooling occurs after saturation is reached, dew forms on the surface.

Question: "So you're telling me that dew can form inside my fuel tank?"

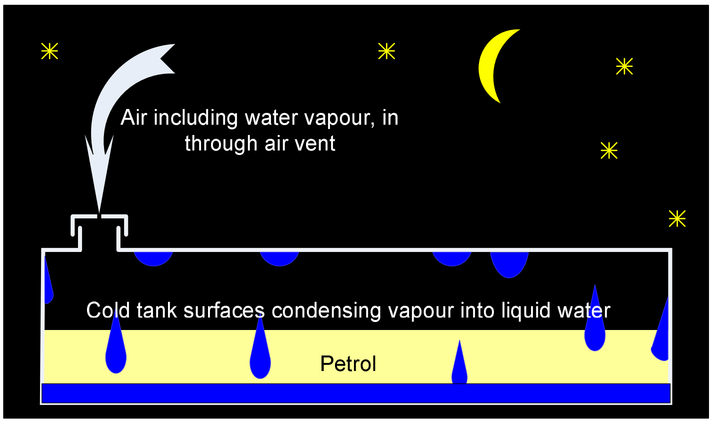
The answer is an emphatic YES!

If there is air in the fuel tank, and it is cooled to below its dew point, condensation form and the resulting water droplets either drip from the top of the tank into the fuel, or run down the sides, both ending up at the bottom of the tank because water is heavier than fuel, Once the water is under the petrol it is trapped in the tank until one of two things happen. Either the engine draws fuel into the lines, pump, and carburetor (or injector), or the pilot discharges fuel into a device to check for water and other contamination. Hopefully it is the latter BUT if the latter is not done then the water will, inevitably, pass through the system and into the carburetor bowl or injector. Sufficient water in either the carburetor bowl, or in the injector, will fail the engine. God's promise!

From the above it can be seen that to issue is the temperature to which the air inside the fuel tank falls. If the air remains above its dew point then no condensation will take place.

So why does the temperature of the air in the tank fall?

There are two fundamental reasons, one of greater significant than the other. The significant reason is heat loss through the walls of the tank to the surrounding airframe structure and atmosphere, the other is the effect of fuel evaporation. As any liquid evaporates, its change of state from gas to liquid requires heat. It steals this heat from its surroundings including the air present, and the tank interior walls, floor, and roof. Thus the more evaporation, the greater the heat drawn away and the cooler the air will become. The cooler the air, the greater likelihood of condensate forming and falling into the fuel.

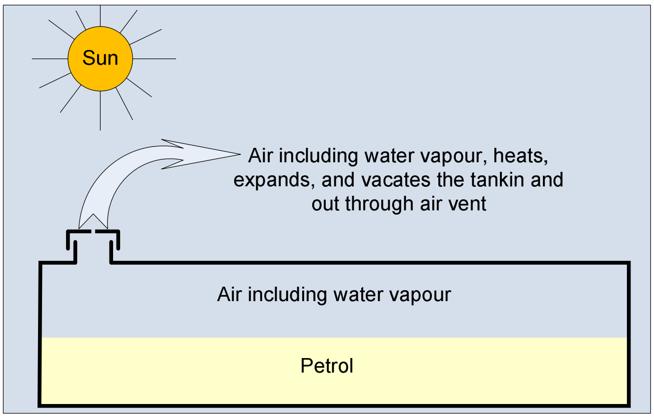


However, the majority of heat lost from the air in the tank is due to conduction from the external surfaces to the external, surrounding air. Diurnal temperature variation sees the ambient air temperature fall as the sun sinks. If the air temperature falls to below the dew point, as indicated above, the surrounding air will tend to cool the tank and the air it contains and water will be delivered into the fuel. Water thus acquired, will remain there until removed by one of the two processes previously mentioned.

The amount of water condensate that may be deposited in the fuel depends on two factors.

1. The amount of water vapour present in that particular air (the relative humidity), and
2. How far below the dew point the temperature falls. The more the air is cooled, the more it is *squeezed*.

The issue relating to 1. above, is compounded by the fact the fuel tank must be vented. Air is freely expelled from the tank when the ambient air temperature rises in the morning because the volumes of both the air and the fuel will increase. Just as freely will air re-enter the tank when temperatures fall and volumes reduce in the evening. So, each morning, after water has been condensed (squeezed) from the air, some of the air in the tank is expelled, to be replaced with a new volume of air containing a new source of condensate as the temperature fall and the volumes reduce in the afternoon and evening. Thus each diurnal cycle replenished the vapor carrying air for overnight condensation. Obviously each night will not see a massive delivery of water into the fuel, but rather a steady accumulation of fractions of a teaspoon which will, over time, become a volume that is much more significant and dangerous.

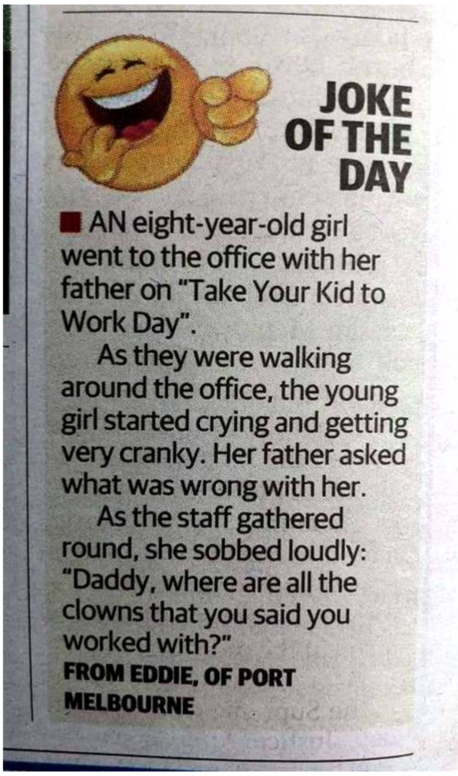


Can we stop this process from occurring? The answer is yes. The most common means is to remove all air from the tank and this happens when we fill it right up. With no air there is no water vapour and thus no condensate. Herein lies the common instruction to leave your aircraft with full fuel tanks.

Another means of reducing or, perhaps even eliminating the problem lies with the manufacturer. Most aircraft have tanks constructed from aluminium, the second most thermally conductive metal in the world after copper. It will most readily pass heat from the tank contents to the outside structure and air. However, plastic or fiberglass tanks, are far less thermally conductive and led encouragement for condensation to take place exists inside tanks made from these materials.

So remember, even with good tank cap seals, and your aircraft stored inside a dry hangar, you still have a *condensator* in your fuel tank, scrubbing moisture from the air at every opportunity and trapping it under the fuel in the tank, waiting to stop your engine if you don't remove it first.

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



JOKE OF THE DAY

AN eight-year-old girl went to the office with her father on "Take Your Kid to Work Day".

As they were walking around the office, the young girl started crying and getting very cranky. Her father asked what was wrong with her.

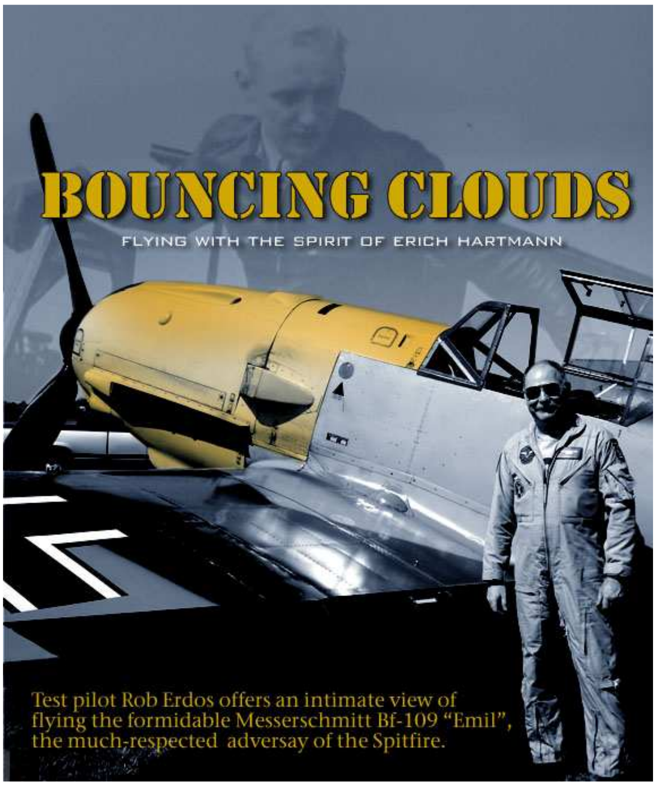
As the staff gathered round, she sobbed loudly: "Daddy, where are all the clowns that you said you worked with?"

FROM EDDIE, OF PORT MELBOURNE

Flying the Messerschmitt Bf-109E

- by Rob Erdos, Vintage Wings of Canada

"Achtung Spitfire", I heard in a ridiculous German accent. I smiled. The voice was my own. My head swivelled within the tight confines of the Bf-109 cockpit, looking for the attacker. There it was, above and behind, waiting to pounce upon me from out of the sun! This particular "Spitfire" (pronounced Schpitfire)looked like an unassuming summer cumulus cloud, but I turned to meet the attack nonetheless. An intense and terrifying dogfight ensued, as the Bf-109 twisted and turned to pursue the advantage. The enemy was cunning, but within minutes a particular southern Ontario cumulus cloud had been reduced to wispy shreds, and I had gained a much better understanding of the renowned Messerschmitt Bf-109.



May 2008 found me at Niagara South airfield, the base of the Russell Aviation Group, operators of the pristine and lovely Bf-109E, registered C-FEML, and at that time the only "Emil" flying in the world. In addition to the Messerschmitt, Russell Aviation operates a Spitfire Mk IX and Hurricane XII. The air display season was fast approaching, and the Russell folks needed maintenance test flights performed on all of their aeroplanes. As a happy outcome of my work with Vintage Wings of Canada, I was already familiar with the British fighters. The Messerschmitt was new to me, but I understandably relished the opportunity to sample the flying qualities of the "other side" of the Battle of Britain. It's a single-seater. You check yourself out. With the concurrence of the nice folks at Russell Group, I went to work.

Luftwaffe ground crew swarm a Messerschmitt Bf-109 on the ground in Europe during World War Two

The cockpit of the Bf-109 was a tight fit, even in comparison to the snug dimensions of the Spitfire cockpit. The seating position was semi-reclined, indicating either that Dr. Messerschmitt appreciated the importance of G-tolerance, or that he was trying hard to reduce my frontal area. As an outcome of both the reclined seating position and being tightly wrapped by the airframe, the forward field of view was nearly non-existent; a characteristic unfortunately common to this vintage of fighters. In stark comparison to the semi-random layout of British cockpits of this era, the Bf-109 instrument panel was arrayed in a thoughtful, almost modern manner. That was when my eyes caught upon the instruments: the airspeed indicator was labelled in kilometers per hour, oil pressure in “kilograms per square centimetre”, power was indicated in “ATA”. An apparently important instrument, devoid of other markings read, “Luftschraube Stellungsanzeige”. Hmm. This was getting interesting.

Russell Group ground crew swarm a Messerschmitt Bf-109 on the ground in Ontario during the Friendly Foes Above the Falls Air Show.

Returning to the cockpit with my German-English dictionary and a calculator, I took note of the controls. The small control stick fell comfortably to hand, although full displacement seemed to use most of the space in the cockpit. The pedals, oddly situated more ahead than below me in the reclining cockpit, incorporated a metal strap for negative ‘G’ restraint. The throttle was a small stub mounted on the left cockpit sidewall. A larger throttle would have hit my thigh as I advanced it. I scowled at the tailwheel locking mechanism mounted beneath the canopy rail directly under my left elbow. I had already knocked that lever several times, but I mustn’t do it again. Performing a take-off or landing with the tailwheel unlocked was guaranteed to have an unpleasant outcome. Wearing a parachute and helmet, I tried to close the heavy side-hinged canopy, finding that it rested atop my helmet with about two inches to spare before closing. I am 5 feet 9 inches tall. The helmet was reluctantly left behind. Have I mentioned that the cockpit was tight?

Notable in their absence were any further engine controls. Mixture was automatic. The propeller control was truly unusual, consisting of a rocker switch mounted on the inside of the throttle lever. The switch manually controlled the pitch of the propeller, via an electric motor mounted on the engine crankcase, and indicated on a clock-like instrument. (Aha! I think I know what “Luftschraube Stellungsanzeige” must mean!) I could hardly believe the implications of this installation: the Bf-109E had only a controllable pitch propeller. It did not have a propeller governor! I would have thought automated propeller speed control essential for an aeroplane with a 400 knot speed range. Indeed, such systems were fitted to later Bf-109 variants. I noticed that this particular aeroplane incorporated a small electrical switch on the floor, marked “Prop: Auto/Manual”, but it was wired to the Manual position. I was later told that this aeroplane never flew operationally with the system operative. The lack of propeller governing aroused my suspicions about the workload associated with dog-fighting in the aeroplane.

The most innovative and interesting feature in the cockpit were two large concentric wheels situated on the left sidewall, aft of the throttle. The outer wheel actuated the flaps and inner wheel controlled the pitch trim by changing the incidence of the horizontal stabilizer. Since the flaps inevitably affect the pitch trim, the pilot could ostensibly maintain trim during flap deployment by actuating both wheels simultaneously. An ingenious mechanism within the wing allowed the ailerons to droop for further lift as the flaps reached full extension. The wings incorporated roughly half-span leading edge slats. These actuated independently under the influence of aerodynamic and inertial forces. In all, this was a very complicated wing, and one designed to squeeze as much lift as possible from each square foot of area. That's good because another thing became evident about the Bf-109's wing: there wasn't much of it. The wing loading of the Bf-109E was almost 50% higher than the Spitfire. This too would be factor in air combat performance, and I would need to keep it in mind if I were ever attacked by a cumulus cloud.

Once my preparations were complete and all requisite German-English translations were made, it was time to go flying. Starting the rare Daimler-Benz DB601 engine was relatively straight forward, although the staccato note of the power plant initially took me by surprise. I have always found something reassuring in the deep sonorous thrum of the Merlin; a sound akin to standing behind a dozen self-satisfied tenors. The Daimler engine, by comparison, struck me as clattering and harsh, more like a barrel full of hammers rolling down a staircase. I flashed a look of concern at the Russell Group's Chief Engineer, Gerry Bettridge. His cheerful grin seemed to confirm that this cacophony was not unusual.

Taxiing is the Messerchmitt's opportunity to get you alone and to whisper a warning in your ear. There is a grotesquely high download on the tailwheel in the Bf-109; a situation made evident by the requirement for full rudder, hard braking, forward stick and a blast of power to effect a turn. Try that in a Spitfire and the propeller will chew dirt! While odd, it at least gave reassurance that even aggressive braking would be unlikely to result in a nose-over. Unfortunately it also meant that the centre of gravity was very far aft of the main wheels. That is not a good thing. Recalling my misadventures in once trying to steer a shopping cart backwards down a hill, I made a mental note that the tail might try to pass me during the landing.

Another advantage of main gear design was that because landing gear, retracting through roughly an 85º angle, was attached to the fuselage, it was possible to completely remove the wings of the aircraft for major servicing without the need for additional equipment to support the fuselage. It also meant that the wing structure was able to be simplified through not having to carry the weight of the aircraft and not having to bear the loads imposed during takeoff or landing. However, this had one major drawback - the wheels had to be splayed outwards and this created an extreme tendency to ground loop and/or collapse. *Photo via Rob Erdos*

The geometry of the undercarriage is perhaps the most unusual feature of the Bf-109. A digression is in order to appreciate how its characteristics would manifest themselves during take-off or landing. Some sources claim that between 15-25% of the Bf-109s ever built were damaged or destroyed during take-off or landing accidents. I find this a remarkable figure for a combat aeroplane – especially one that served on the losing side of the war! Most contemporary histories of the Bf-109 attribute this to the narrow undercarriage track, however this misses the point. (The Spitfire's undercarriage is just as narrow, and it doesn't have any of the Bf-109's quirks. It has its own quirks – but that's another story.) Dr. Messerschmitt faced a challenge in the design of his first fighter. In the interest of simplifying transport and repair of the aeroplane, it was designed with the undercarriage attached to the fuselage, such that the wings could be completely removed with the aeroplane resting on its wheels. The undercarriage struts were attached to a complicated forging at the firewall aft of the engine mount. The narrow width of the fuselage structure necessitated installing the undercarriage legs splayed outwards. This feature became the aeroplane's Achilles heel.

Imagine that you have a bicycle wheel in your hands. Roll the wheel with the axle parallel to the ground. It goes straight. Now roll the wheel such that the axle is not parallel to the ground. The wheel turns. Let's return to the Bf-109. Both of the tires are mounted "crooked", rolling with a camber angle of about 25°. Consequently both wheels want to turn inwards under the aeroplane. When the aeroplane is rolling with an equal download on both wheels, symmetry prevails; both wheels fight to a stand-off, and the aeroplane rolls straight. Now imagine that something causes the download on the wheels to momentarily become unequal. In that case the rolling friction of the tires becomes uneven and the turning tendency of the "heavy" tire asserts itself. What might do this? Well, crosswinds. Or torque from engine power. However, the most dangerous culprit is turning. With the aeroplane's centre of gravity situated high above the tires, a swerve will set loose large centrifugal forces that cause the aeroplane to try to roll over the tires. This is true of any aeroplane, but in this scenario the unusual camber of the Bf-109's tires creates strong directional instability, requiring a different type of control strategy for take-offs and landings. Tight heading control or aggressive tracking of the runway centerline can set off abrupt directional divergence. Better for the pilot to relax, merely dampen heading changes, and accept small heading errors. Funny, I didn't feel relaxed.

These thoughts ran through my mind as I taxied for take-off at the Niagara South airfield. "Don't fight with the aeroplane. Accept any heading you get and roll straight", I told myself as I took position for take-off. The Daimler engine responded by growling at me, as I applied a final stab of power to turn onto the runway centerline. Okay, pause. I checked that the flaps were set to 20°, set the trim to one degree UP, set the propeller pitch to "11:30" on the weird clock indicator, and then locked the tailwheel. Then I checked the tailwheel lock. Then I double checked. Looking straight ahead I took note of the 3-point attitude: completely blind, save for two small strips of horizon visible at the edges of the windscreen. Mentally noting the 3-point attitude wasn't enough. I would need to quickly re-establish this view when it came time to land, so I took out my secret weapon. Using a black grease pencil I drew the meagre horizon line on the inside of the windscreen.

I opened the throttle slowly. Directional control authority quickly felt quite positive, although I recalled my commitment to use it judiciously. A fairly strong push on the stick was required to gently lift the tail as the airspeed passed 60 km/hr; an act that was further destabilizing, however things were quickly improving as the airspeed increased. With a gentle skip, the Bf-109 became airborne around 110 km/hr. I retracted the undercarriage and immediately turned into a climbing orbit overhead the airfield while I confirmed that the engine indications were stable.

Power was set at 1.15 ATA (atmospheres of manifold pressure) at the recommended climb speed of 250 km/hr. Propeller speed was sensitive to airspeed changes, so a slight pitch reduction was required to stabilize at 2300 RPM. The Daimler engine sounded much smoother in flight. My initial impressions of the aeroplane were mixed. The field of view was poor, necessitating continuous clearing turns in the climb. The greenhouse canopy structure seemed to be slightly obtrusive no matter where I looked. Control response in the climb was satisfyingly light and crisp, with good harmony between pitch and roll control forces. Directional stability was clearly inadequate. Every roll input required conscious pedal coordination. The absence of rudder trim proved a considerable annoyance during the protracted climb. In the interest of "calibrating" my aileron-rudder coordination, I tried a few aggressive roll reversals in the climb and received an unpleasant surprise. The application of full aileron caused the aeroplane to shudder and buffet in a manner that, to my overactive

imagination, seemed like I was receiving machine gun fire. I rolled level and breathed. Subsequent investigation showed that the onset of buffet occurred at large aileron displacements, and was associated with a very slight lightening of the aileron control forces and a distinct high-frequency "hammering" in the stick. I had seen that before. Aileron stall! It was becoming clear to me. Dr. Messerschmitt kindly provided me with powerful mechanical leverage to actuate the ailerons against the aerodynamic forces, and that explained why the stick forces were so pleasantly light. That is certainly not the case in the Spitfire, where the ailerons stiffen terribly at high speeds. In the Bf-109 I unfortunately had enough leverage under some conditions to deflect the aileron to the point of airflow separation. The results were a bit disappointing. In spite of the light control feel, the roll rate achievable in the Bf-109 was no better than the Spitfire.

I leveled off above the airfield and went to work. My test card began with an investigation of the slow flight and stall characteristics, in order to prepare myself early for the eventual landing.

The power was reduced to just above idle, and the aeroplane decelerated for a clean stall. I was fascinated to watch as the leading edge slats automatically extended themselves into the airflow. The effect was smooth and transparent, however I noted that the rate of deceleration increased as the slats extended. I made note of this effect, intending further investigation during air combat scenarios. The clean stall occurred at 125 km/hr indicated airspeed, preceded by a 3-5 knot band of mild buffeting. That's 68 knots. I wasn't sure if I was impressed or skeptical. The stall was marked by a mild pitch and right roll break; cues so mild that they were hardly inhibiting. I continued to explore increasing angles of attack until I was happily flying along with full aft stick. No sweat. In the clean configuration, the Bf-109 retained its lateral control effectiveness without any tendency to depart - even tolerating mild sideslips at full aft stick.

Next I investigated the stall characteristics in the landing configuration. The undercarriage and flaps were extended, the power reduced to idle, and a gradual deceleration was performed. Roll control response became sluggish once the ailerons drooped with full flap selection, and it exhibited considerably more adverse yaw. Again a mild buffet preceded a gentle pitch break, this time at 88 km/hr. 88 km/hr!? That's 47 knots indicated airspeed. Now I was definitely skeptical. There was simply no way that this modest wing area was holding this mass of aeroplane aloft at 47 knots. I recalled the location of the pitot-static probe, mounted close under the left wing, and knew with certainty that it was lying. Nevertheless, the low-airspeed and stalling characteristics of the Bf-109 were extremely benign and forgiving; a highly desirable characteristic in a fighter.

While the undercarriage and flaps were extended, I took the opportunity to do a few landings – in the clear air at 6000 feet above the airfield. I did a simulated final turn to parallel the runway and flared to the 3-point attitude, with the objective of "landing" my altimeter exactly at the 6000 foot mark. The final turn in a fighter typically involves a gradual turning deceleration to the runway. I found that controlling speed and descent gradient during the turn were hardly demanding, however the forward field of view was gradually disappearing. No surprise there. Elevator response was suitably precise to capture the 3-point attitude without difficulty. Overshoot from the pseudo-landing was easy – at least for a high-performance fighter. The Bf-109E is powerful, however propeller effects were easily managed. Chalk up one advantage of having low directional stability.

Now that I felt I could land it, I was eager to pursue my curiosity about the Bf-109's qualities as a fighter. I set cruise power setting (1.0 ATA manifold pressure, 2300 RPM), stabilizing at 415 km/hr at 5500 feet. That equates to a modest 225 knots indicated airspeed, but it wasn't my engine. The aeroplane felt comfortable in cruise, exhibiting weak but positive speed stability, as evidenced by the gentle, progressive elevator forces required to maintain off-trim speeds. A gentle sustained sideslip gave evidence of both weak directional stability and weak lateral stability, at least by modern standards. The rudder forces seemed very light. The sideslip also induced a gentle nose-down pitch response, indicative of possible elevator blanking. All this talk about weak stability doesn't imply criticism of its qualities as a fighter. The flip side of low stability is often high agility. Nevertheless this wouldn't be my first choice of an aeroplane for instrument flying.

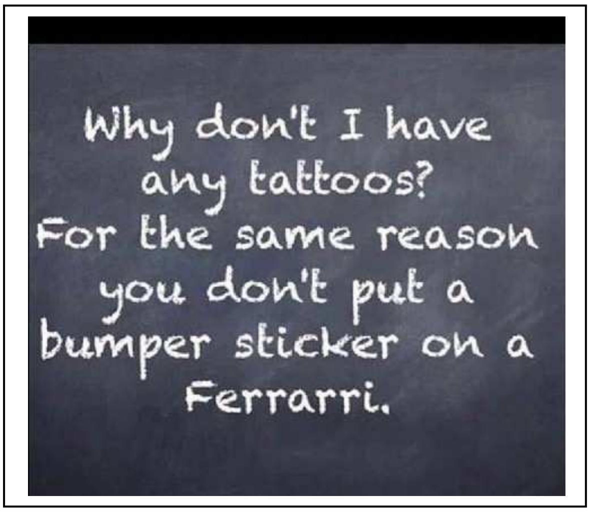
The next order of business was to become familiar with manoeuvring the machine. I performed a wing-over and was immediately reminded of the benefits of propeller speed governing. Lacking such amenities, the propeller speed on the Bf-109 decayed terribly as the speed reduced, reaching as low as 1600 RPM at the top of the manoeuvre. The result was a slightly laboured sound from the engine, as it struggled with high torque at low speed. The effect was not unlike taking your foot off your car's clutch from a standstill in fifth gear. Ouch. Not good for the engine, and not good for performance. I noted that the peak of the wing-over had been about 1700 feet above my starting altitude. I repeated the manoeuvre, this time maintaining a constant propeller speed using the rocker switch on the throttle. The engine sounded happier, if the growling Daimler could be described as "happy", and this time the top of the manoeuvre managed to achieve 2300 feet of altitude gain. Clearly any pilot wishing to obtain maximum performance from the Bf-109E would need to carefully regulate propeller speed. Unfortunately, this draws the pilot's attention into the cockpit, rather than allowing him to focus outside where the dangers lurk. I was left wondering whether the young lads who flew the Bf-109E in combat really applied that degree of finesse, or whether the circumstances of combat necessitated cruder engine handling.

Once familiar with coordination of propeller pitch with speed changes, the Bf-109 and I performed some gentle aerobatics together – strictly for technical investigation, you understand. Loops were enlightening. The low directional stability could result in comically large heading variations unless careful rudder coordination was applied. I was reminded of a long-ago instructor of mine, who remarked upon seeing my aerobatics, "Nice loop. Now do one to the right." It was easily mastered with practice. Multiple manoeuvres seemed to result in a notable decay in speed, particularly whenever the leading edge slats deployed; a stark contrast to the Spitfire, whose elliptical wings retain energy nicely under sustained 'g'. The Messerschmitt was paying the price for its high wing loading.

It was at this point that I was pounced upon by that dastardly cumulus. "Fine", I thought, "let's see what this aeroplane can do". I climbed steeply and turned to bring the guns to bear upon the target. Field of view through the greenhouse canopy was again a hindrance as I looked over my shoulder to gauge the turn. The cumulus turned and dove steeply to flee (bear with me for a moment…). A deflection shot would be required to engage from long range, however the limited field of view down over the nose would make this difficult. The Bf-109 built speed rapidly in a dive, however the necessity to attend to propeller speed proved a distraction as I closed quickly upon the target. Pulling out of the dive, I discovered that the Bf-109's elevators became distressingly heavy at high speed. I had read wartime accounts of Spitfire pilots taking Bf-109s into steep high-speed dives, knowing that the Bf-109 would be unable to pull out. This was a convincing demonstration, requiring a two-handed pull to achieve a 3.5 'g' recovery at 450 km/hour. I flashed past my adversary like it was standing still. With a gallant salute, I disengaged. After less than an hour, the fuel gauges were telling me that it was time to return to Niagara South.

The circuit procedures were familiar from my rehearsals at altitude, but this time it was for keeps. A standard overhead break was performed, but delayed until well past the upwind end of the runway. Extension of the flaps required about 30 quarter-turns of the flap wheel; a time-consuming process. The downwind leg was entered at 200 km/hour, decreasing to 150 km/hour as the undercarriage and flaps were extended. The numbers on the airspeed indicator seemed high, and I had to keep telling myself that they were “only kilometers”. From abeam the touchdown point on downwind, a continuous decelerating turn was performed to the flare. With virtually no forward field of view, a straight-in final approach leg was definitely to be avoided. I entered the flare at 125 km/hour, maintaining a trickle of power. I can’t claim to have been completely at ease, but within seconds the wheels began to gently rumble across the grass. The Bf-109 was home from another mission.

Rob and Emil after landing. Photo via Rob Erdos



FLY-INS Looming

13 August 2019	YRED Redcliffe QLD	Redcliffe Aero Club 50th Anniversary BBQ and 50th Birthday Celebration
10 August 2019	YMRG Murgon	Brekkie with the Burnett Flyers
20 August 2019	YWCK Warwick	QRAA Jumpers & Jazz Fly-in Brekky

Mystery Aircraft (This Issue)

What's this?

Mystery Aircraft (Last Issue)

The **Caproni Ca.193** was an Italian liaison and air-taxi aircraft that was offered to the Italian Air Force as an instrument flight trainer and to the Navy for liaison. Design work started in 1945 and only the prototype was built. It was the last aircraft the Caproni company designed and built in Milan.

First flew 1949

At a travel agency in Shanghai, I asked the Chinese girl behind the counter if she could escort me on a city tour, and asked her for her mobile number so I could call her to make arrangements.

She gave me a big smile, nodded her head and said, "For sex sex, wan free sex, for tonigh free."I replied, "Wow, you Chinese women are really hospitable!"A guy standing next to me overheard, tapped me on the shoulder and said, "Don't get excited. What she said was: 466 136 4293!"

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

1. Compared to a spin, a spiral dive is characterized by which of the following?
   A. A constant airspeed, increasing descent rate, and constant bank angle.
   B. Only one wing is stalled.
   C. An increasing rate of rotation
   D. Increasing airspeed, very steep nose-down attitude, and increasing descent rate.

2. The person who is ultimately responsible for ensuring an aircraft is safe to fly is?
   A. The pilot in command
   B. The registered owner.
   C. The over-seeing authority.
   D. The person who signs off in the maintenance logbook.

3. From the following four statements relating to “G” forces, select the true one.
   A. “G” forces are only likely to cause a problem in excess of 4G.
   B. They are usually a problem only in high performance aircraft.
   C. At low airspeed they cannot be a safety problem.
   D. Every individual’s tolerance is potentially different.

4. Which of the following is correct when acknowledging a radio message has been understood and will be complied with?
   A. Understood.
   B. Roger.
   C. WIlco.
   D. Affirm.

5. When must the fuel system be sample to ensure no water is present?
   A. Before every flight.
   B. Before the first flight of the day.
   C. After every refueling.
   D. B and C are correct

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

If you have any problems with these questions, See Notes overleaf or call me (in the evening) and let’s discuss it. Rob Knight.

Notes on Questions and Answers

Question 1.

Spins reach a constant speed, in Spiral dices the airspeed usually continues to increase.

Question 2

The pilot in command is the person that is responsible for ensuring the aircraft is airworthy OR they may not fly it.

This has been a bad month for Aviation people.

First we had to suffer the loss of a good friend and companion, Peter Gesler, who was tragically killed along with his passenger, Rachel Whitford, at Leigh Creek after a scenic trip over Lake Eyre. His immaculate Brumby 610 was hangared beside my aeroplane at Forest hill for most of the last four years./

Peter was part owner in a Horse stud near Warwick and also owned a Stock Feed business in Laidley. He used his Brumby to commute, virtually on a daily basis, unless the weather was inclement.

Then tragedy, fickle tragedy, struck again. Mark Smith, the Editor of Sport Pilot, and as close a friend of mine as Peter Gesler was to me, was struck by a car whilst a pedestrian near Ballarat. Alas, Mark died at the scene.

Mark's enthusiasm for things aviation set him apart. His effervescent personality was both refreshing and indefatigable and he tended to leave other trailing as he went from project to project, gathering images and articles of other peoples enjoyment in their aeroplanes.

My ever-remaining memory of Mark was him leaning about 80% of his body out the front seat of a Drifter whilst photographing me in close formation gathering images for Sport Pilot.

Aircraft Parts and Tools

Item	Condition	Price
SAAP Oil Pressure Gauge &Dedicated Sender	Brand New (in original box	**$100.00**
VDO Volt Readout instrument	Brand New	**$70.00**
EGT sensors (2 of)	Brand New	**$30.00 (each)**
Skystrobe Strobe light for Ultralight	NEW – IN BOX	**$75.00**
Altimeter – non-sensitive with subscale in "Hg.	Brand new	**$50.00**
Brand New ¼ drive Torque Wrench (SCA)	Brand New 60.00	**$60.00**

NEW Exhaust Springs for Rotax Exhaust	Brand New	**$10.25 each**

Contact Rob Knight at either kni.rob@bigpond.com, or call 0400 89 3632.

Hangarage Now Available at Forest Hill (YFRH)

Hangarage for an aeroplane is available at Forest Hill, 1.22 nm SE of Forest Hill Village in the Lockyer Valley.

Runway 03/21, grass, elevation 230 feet AMSL, with about 650 metres usable. No power, no fuel except what you bring yourself, but many friendly people.

CTAF 126.7, circuits all left hand.

Fees $130/Month.

Contact Rob Knight on

kni.rob@bigpond.com or

call - 0400 89 3632

Aircraft for sale

¾ scale replica Spitfire

Powered by a 6 cylinder engine, this delightful aircraft has good performance and low hours. Available for quick delivery.

It comes with a low flight time, excellent handling qualities, superb charisma, a brand new mechanical fuel pump and two jack stands.

For details contact Bill Watson. Tel., 0447186336

$60,000