BRISBANE VALLEY FLYER

December - 2022

www.bvsac.com.au

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Should've Gone to Specsavers

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From the Club

Hi all,

Well, the festive season is well upon us. What a year.

The club held it normal monthly meeting this month and after the meeting closed the AGM was conducted. The audit report was issued and discussed and the club is still sitting in a very health position.

During the AGM there were no new nominations the board positions only the sitting members re nominated. A vote was called and all of the members were re-elected unanimously and re turned to their positions.

As there was no nomination for the position of Secretary the President will assume this roll until a secretary can be appointed.

I would like to thank all of the board members for their dedicated service over the last 12 month.

Our next get together will be held on the 3rd December and this will be our Christmas party. (No normal meeting will be held on this date)

Please join use for a great day of fellow ship for the festive season. Member's family and friends are welcome. Please Rsvp for numbers so we can make it a good day.

Best wishes for the festive season

Peter Ratcliffe, President BVSAC

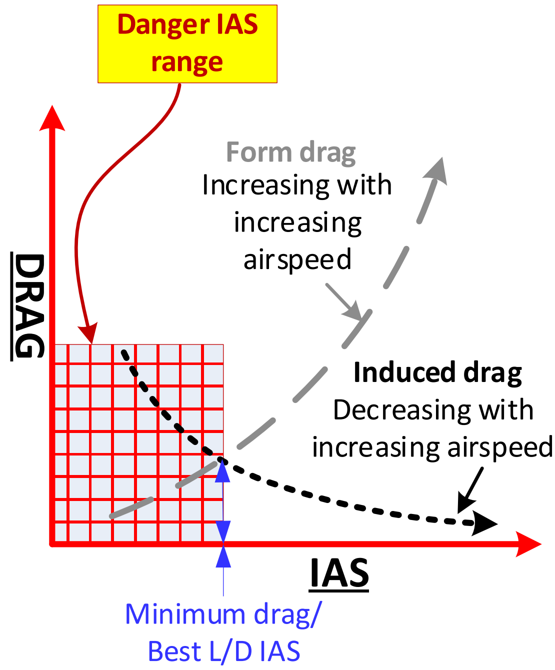
Stay Ahead of The Drag Curve

By Rob Knight

You're on final, and descending towards your selected flare point. The tree-tops before the threshold are dancing as they loom larger and get closer. The selected flare point rises up the wind screen indicating that you are beginning to undershoot. It's clear that your present approach path will now see you arriving short of the runway. The runway is short but you need to slow the descent so you add power and raise the nose a fraction to prevent a rise in airspeed.

Not a good move. You see that you are still sinking too quickly to clear the tree tops. Your airspeed is a tad low and you add more power until you have full power applied, but you are still sinking too quickly and still can't clear the trees you ease the stick back a tiny fraction to help but it only increases both the sink rate and your angle of descent. Welcome to what's commonly known as the back side of the drag (or power) curve, or also called the "region of reversed command." It's a place guaranteed to make you very unhappy so it's worth an over–view of the basic flaw that got you into this mess so you can avoid it. Let's look over the nitty-gritty relationship between drag and power.

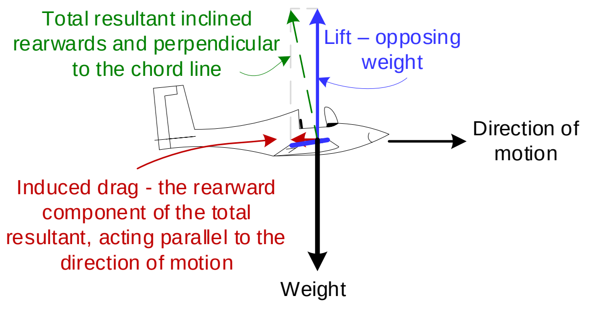
Remember that there are two main types of drag. Form drag is the drag created by the airframe's resistance to motion through the air. Sticking your forearm/hand out of your car window whilst travelling gives a perfect illustration of form drag. Note that the faster you are driving the greater will be that form drag force against your arm/hand, and also notice that it changes as the square of the speed i.e. double the speed and quadruple the drag. Also, halve the speed and experience only ¼ of the original value of that form drag. However, on approach airspeeds are low and so form drag is not the issue. Looking at the drag curve we are examining, it is the effect of induced drag that is the real enemy.



The individual drag curves – Form drag increasing with increasing IAS, and Induced Drag decreasing with increasing IAS.

Induced drag is a side-effect of producing lift, and it's greatest at high angles of attack, which, in turn, are usually encountered at low airspeeds. Lift is the vertical component of the total reaction – the reaction to the airflow air that extends upwards (at right angles to the chord line) and backwards. At high angles of attack (steeper chord angles) the total reaction inclines further backwards. As it is the backwards leaning of the total reaction that equates to induced drag, the higher the angle of attack the greater the induced drag value, the greater the resistance to the direction of motion (or flight).

So when form drag is greatest at high airspeeds, induced drag is lowest, and when flying at low airspeeds, induced drag is highest and form drag lowest. At low airspeeds, the angle of attack is highest so the slower you fly, the more you'll suffer from induced drag. Grab an instructor and try slow flight at minimum controllable airspeed. It'll give you a good introduction to how your aeroplane will behave with lots of induced drag.



Induced drag – highest at low speed such as when on approach with a high angle of attack

As we said previously, the lift needed to support the aircraft weight is the vertical component of that rearwardly inclined total reaction, while the induced drag is the measure of that rearward inclination of that total reaction. Drag acts parallel to the direction of motion of the aircraft and the relative airflow is exactly opposite in direction to that direction of motion.

With this in mind, the two sketches below depict the components of lift and induced drag at two differing angles of approach. The attitude is maintained as constant so the only change to the lift and drag values is the angle of attack change caused by the steepening approach angle.

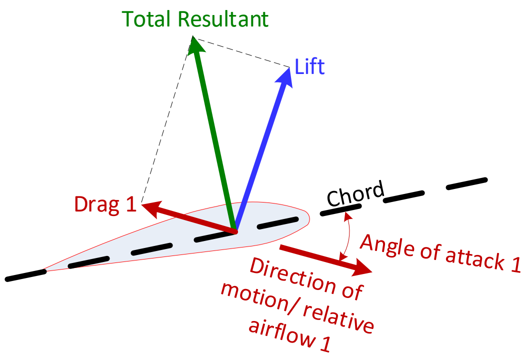


Fig.1. Note the length of the Drag1 line and its angle

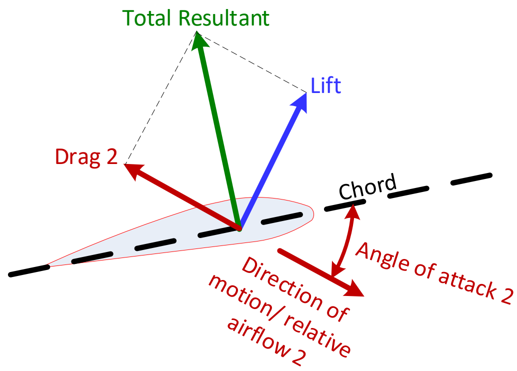


Fig. 2. Compare the length of line and angle of Drag 2 with Drag 1 in Fig. 1.

Fig. 2 shows the aerofoil at the same attitude as is depicted in Fig. 1, but the change in the direction of motion as shown is the cause of the increased induced drag indicated by the length of its dark red Drag 2 line. Now the important question is, what force opposes drag? Basic principles of flight theory concepts immediately scream **POWER**.

And quite rightly so. Power does, indeed, oppose drag. But think about this for a minute! What if the drag value exceeds the total power available value? But what if you haven't got enough? What if applying full throttle alone WILL NOT BE ENOUGH TO STOP THE DESCENT, regardless of how much noise your engine can make? Getting into this situation when low on finals is a bit like tumbling off a waterfall in a kayak. Once you're over the edge you can't get back. When low on finals, the only measure a pilot can take to prevent such a catastrophe it is not to paddle too close to the edge of the water fall. In other words, don't set up a situation you can't escape from: DON'T GET TOO SLOW or your drag will get too high and you won't recover your lost airspeed and you won't make the runway. You'll be a total loser!

Obviously, this "*behind the drag curve*" issue can be avoided if more power is available than can be gathered through the engine and prop system. The clue is HEIGHT. Height is a source of energy. As potential energy, height can be exchanged for speed by simply diving to gather it. But if you haven't got any spare height, go back to, "You'll be a total loser!" In other words, don't get LOW AND SLOW on approach.

If you're low – DON'T GET SLOW

Therein lies the answer. If you are in a position to lower the nose to regain airspeed, the induced drag will diminish and there is no issue to combat. With that little more speed the aircraft's descent profile is again controlled, and the aeroplane's appropriate flight path may be re-established by the pilot.

BUT, be warned. This recovery from an uncontrolled undershoot can ONLY be achieved if sufficient height is to hand. If it happens toooo low, when you get toooo slow, you have paddled off the waterfall and are no longer in control of your fate. You must just sit, wait, and watch the inevitable unfold before your very eyes.

But wait. There's more. I have only mentioned how a pilot might get into this irretrievable situation. The environment can also put you firmly in the same place under certain circumstances. Encountering a phenomena know as a wing gradient (aka wind shear), can see your aeroplane robbed of airspeed with no change in attitude. The effect is that the aeroplane steepens its approach angle which, in turn, increases its angle of attack. Again, the induced drag value will grow and, if it exceeds the power available, you are back over the waterfall. It's for this reason your instructor demanded you maintain a constant appraisal of your airspeed on approach. Even with a constant attitude and power, a wind gradient can set you up for a bloodied-nose short of the runway if you haven't the height to restore the airspeed by diving.

Low on short finals - Runway 10 at YCDS Childers.
WARNING*: Getting low AND slow on finals may be detrimental to your health*

If, when low on approach, you find that you are applying full power to arrest an excessively steep descent angle, and if you manage to break out of the drag curve issue, to go around is an ideal option. Trying to land after an approach requiring full throttle to achieve your desired approach angle can be very trying and may set you up for another, quite unrelated disaster.

In such a case, on your next approach, use a higher speed – maybe 55 knots instead of 50, or even 65 knots instead of 55, to give you a speed edge. Otherwise, fly to another field and return when the wind either changes direction or reduces its speed/gust/gradient issues.

The drag curve's biggest lessons shout loudly to pilots flying too low on final. Use all the available vertical guidance available when approaching the runway. Fly at the correct airspeed and in an appropriate approach configuration. Watch your planned touchdown spot carefully for any movement up or down the wind screen. If, with a constant nose attitude, it is moving down the screen, you're getting too high to reach it; if it's moving up the screen, you're undershooting and you'll land short of that desired spot. Neither result will make your day if you allow them to exist so use POWER, and use it EARLY, to fix it!

Happy flying

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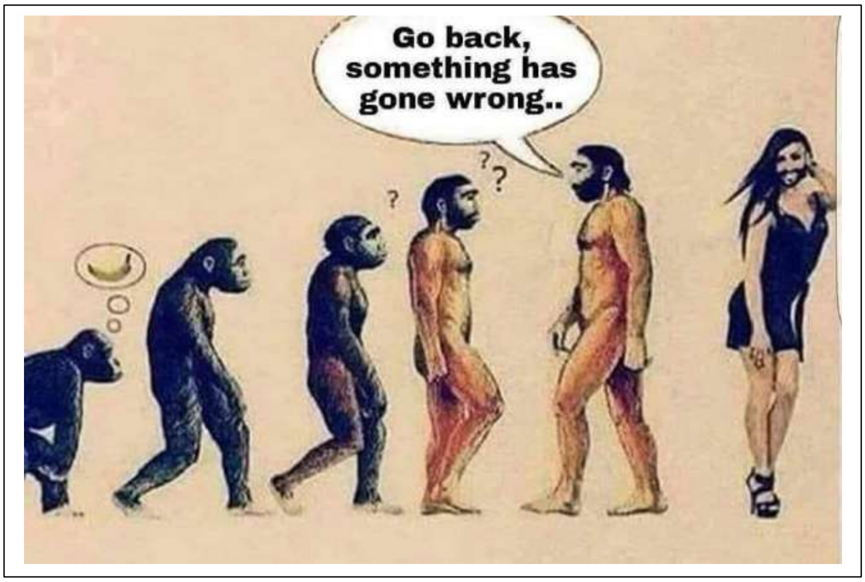

The Mirocopter SCH-2A

– The Cheapest Production Helicopter on Earth

By Ben Branch. August 23rd 2022

The Mirocopter SCH-2A is almost impossibly small, weighing only 249 lbs. Each one costs $35,000 USD, which makes them (by far) the cheapest production helicopter in the world. You can buy one on eBay right now if you're in the mood.

Rather than the traditional helicopter arrangement of one main rotor overhead and a tail rotor in the rear, the Mirocopter SCH-2A is a coaxial helicopter – that is, it has two counter-rotating overhead rotors and no tail rotor.

Fast Facts – The Mirocopter SCH-2A

- The Mirocopter SCH-2A was developed in Slovenia and subjected to a 10+ year testing regimen to finalize the design for production.
- As the smallest coaxial helicopter in the world, the SCH-2A weighs just 113 kgs (249 lbs). It's powered by a two-stroke Fiate MZ202 engine, and it has a maximum speed of 54 knots (100 km/h 62 mph).
- The MSRP of the Mirocopter SCH-2A is $35,000 USD, making it by far the cheapest production helicopter in the world. It's also listed as having low operational and maintenance costs.
- Because the Mirocopter is compliant with US FAR Part 103 Ultralight Vehicle rules the process of getting a license to fly it is far simpler than getting a standard helicopter license.

The Mirocopter SCH-2A was developed in Slovenia over a period of over a decade, from the outset the plan was to build the cheapest and one of the lightest helicopters in the world.

Despite its small size, the SCH-2A is a true helicopter with standard helicopter command inputs. Vertical thrust is achieved by collective blade pitch control of both overhead rotors.

Cyclic blade pitch control of both rotors provides directional control, and yaw control is provided by the moving tail plates. Because there is no tail rotor the SCH-2A is said to be able to lift more weight and operate out of a smaller area.

The Mirocopter SCH-2A appears almost impossibly small, particularly for a coaxial helicopter.

The list of potential uses for the ultralight helicopter include cattle mustering and roundups, surveying, police and fire department use, and of course, personal leisure. The company has distributors in the USA, Korea, China, France, Belgium, Luxembourg, and Slovenia.

Mirocopter SCH-2A – Specifications

- With a weight of just 113 kgs (249 lbs) the SCH-2A is incredibly lightweight, it can accommodate a pilot with a maximum weight of up to 124 kgs or 273 lbs for a maximum take-off weight of 250 kgs or 551 lbs.
- The maximum speed is 54 knots (62 mph or 100 km/h), and the cruising speed is 44 knots (50 mph or 80 km/h). The fuel tank has a capacity of 5 US gallons or 19 litres, which, given the fuel use of 4.5 gallons/hour or 17 litres/hour, gives a maximum flight time at cruising speed of 1 hour.

The Mirocopter uses standard helicopter control inputs, making it relatively easy to fly for experienced pilots.

- The SCH-2A has a length of 14.3 ft (4370 mm), a width of 4.9 ft (1500 mm), and a height of 8.0 ft (2450 mm).
- The engine is a Fiate MZ202 dual ignition, twin cylinder, two stroke gasoline engine that produces 60 hp at 5,800 rpm.
- It has a Smarteh 7" LCD colour resistive touchscreen instrument panel. Pilots can choose to display either imperial or metric units.

Video Clip: [This Is The Mirocopter SCH-2A – The Cheapest Production Helicopter On Earth (silodrome.com)]

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How Not to do Aircraft Maintenance

By Rob Knight

Here are the things you really should not do when maintaining an aeroplane

The trend of creating top five lists is all the rage these days. In light of this, it's perhaps timely to look at the top 5 possible issues with maintaining an aircraft as safely as possible, being timely and accurate in all relevant aspects, to ensure that the best job possible is done.

The following is a list of my ideas pertaining to the 5 most important traps that an aircraft maintainer can fall into whilst carrying out maintenance work on an aircraft. In essence, these are the things that you really should not do when maintaining an aeroplane.

A good tool control program has a place for every tool, and every tool in its place

1. NEVER Assume

How do you spell assume? There is a lot of truth in that somewhat inappropriate statement. The first trap that can get you in hot water is to assume anything. If a question of serviceability hangs in the air, always play it safe and assume the part is faulty until you check it appropriately and deem it otherwise.

Let me tell you a story about an aircraft mechanic who assumed the bolts he removed from a windshield were the approved part number, and therefore he re-installed the same ones he pulled and signed off the aeroplane.

The shift maintenance manager justified this omission by saying that he was quite satisfied that the bolts that he had removed were the correct bolts and that it would take so much time to find the correct numbers in the illustrated parts catalogue (IPC) that he did not feel justified in using the IPC in the circumstances of the job in question.

Thankfully there were no fatalities on British Airways Flight 5390, in which that improperly installed windscreen panel separated from its frame, causing the captain to be sucked out of the aircraft. The captain has an incredible story to tell at the pub now, but I don't think it was worth it.

Another dangerous assumption occurs when a mechanic is disturbed during a check-listed inspection. No-one, but no-one, can ever safely assume that they can pick up exactly where they left off a checklist when disturbed. For safety's sake, either the whole checklist must be re-started from the beginning, or some other position identifier is used. Such an identifier would be having a roll of cheap surveyor's tape in one's kit (hardware shops including Bunnings stock such tape). When the process is interrupted, tear off a length of tape and write on it with a marker pen, stating exactly what the last item checked was. This length of tape can then be tied to, or close to the item, and will remind the mechanic when they return exactly where they left off.

Another issue with assuming is that, when a duplicate inspection of work is required, the duplicate mechanic/engineer will know exactly what is to be duplicate-inspected. The same tape as depicted above can be used in small lengths, each fixed/tied to items requiring that second check for precision and added surety that nothing requiring that second check is missed.

2. NEVER Execute a Task from Memory

Some mechanics swell with pride when spouting off torque values from memory as they grab a torque wrench from the rollaway, and strut up to the task in hand. Should you be impressed? Nay says the International Civil Aviation Organization (ICAO).

In 2003 the ICAO published the Human Factors Guidelines for Aircraft Maintenance manual. As a testament to the thoroughness of this study, this first edition remains the latest and greatest. Section 4 addresses “Internal Factors Influencing Performance,” specifically highlighting memory failure as a “psychological error mechanism” and contributing to the failure.

Not only is boasting about memorizing aircraft data points, measurements, and values uncouth, it is also illegal. Remember, even if time doesn’t fade your memory—and it will—values vary between specific models, and sometimes manufacturers update technical data. Although rare, it does happen, and you do not want to be the one that risks your career, or another’s life so that you can show off.

Always consult the appropriate documents for specific details. Even if you are convinced that you can recall an important detail, check and CONFIRM your memory is exactly correct. This will not only perhaps assist in preserving your and others longevity, but also serve you well in keeping a self-check on your own cognitive processes for everything else you rely on it for in your life.

Anecdotally, there are many reports of surgeons failing to check specifics before an operation. A woman has successfully sued a hospital and its surgeon in the USA for many millions for removing her right leg, when it was her left leg that had the malignant-tumour the amputation was required to eliminate.

Such an error would deserve to be career ending!

Another memory issue lies in ensuring that nuts/bolts when torqued, for example, are identified so none are missed in error. A small bottle of bright paint, or make-up nail varnish can be used to mark each completed nut/bolt. This process can also be extended by painting the joint between a fixing nut or bolt. Should there be any movement of that fixing, the paint/varnish will crack and clearly mark an issue requiring checking.

3. NEVER Fail to FIND a Missing Tool

Tool Control can be a critical part of any maintenance process. Just as surgeons have been known to leave medical instruments inside surgery patients in operating theatres, so have mechanics been known to leave tools in cars, trucks AND AEROPLANES The simplest and perhaps the most effective means of tool control and accounting is a tool set as displayed in the image at the previous page or a shadow board. This allows an accounting at a glance to check that all tools have been retrieved.

A well laid out shadow board and tool rack

The mantra for a good tool control program is a place for every tool, and every tool checked to me in its place.

If you're a private owner and maintaining your own recreational aircraft, then you still should exercise tool control within your tool box if it contains loose tools. For safety's sake, you should always know how many screw-drivers the box contains, and how many ring-open-enders, ring-spanners, shifters, and pliers your box contains as well as any other items. These should be checked as present after any work has been carried out on your aircraft.

In my own experience, the very first crop-dusting Fletcher I was allocated was old, tired, bent and twisted, and produced a rattle in my port wing when operating off rough surfaces. I mentioned that it sounded like a small spanner was loose, to the engineer in charge. His response was to curse me as a "big-head" for suggesting that one of his engineers was lax and had left it there. But when I presented the aircraft for its next 100hr, a 7/16ths ring open-ender really was found in the same bay as the aileron control linkage. Worse, the spanner was colour-coded with orange bands around it which indicated that it was actually HIS spanner. He never subsequently mentioned it, and went out of his way to avoid me. I should have forced the issue at my first mention but I was too new, and his attitude was too overbearing. My silly mistake: it could easily have had fatal consequences for me.

On the same topic, in New Zealand in 2012, a loose screwdriver became jammed in the elevator control of a Yak 52 while it was doing aerobatics near the town of Feilding. The resulting crash killed a Palmerston North doctor and his passenger friend.

A re-enactment of the screwdriver's positioning before the crash

A Civil Aviation Authority report into the accident was released which found that the crash was the result of design flaws in the aircraft that allowed a screwdriver, previously left in the aircraft, to jam the elevator controls during a slow roll. The crash was not survivable.

4. Succumb to PERSONAL TIME, or OWNER, or MANAGER Pressures

I honestly cannot believe I even need to highlight this, but here we are. When maintaining your own aircraft, you have every opportunity to take as long as necessary to complete the process of the specific inspection or maintenance issue. If you are qualified and are working for another party, you expect them to pay you for your work, and they expect, no – DEMAND - that you carry out the process in the correct manner. A job will take as long as it takes. With what's at stake, it can't be done quicker than that.

Issues relating to this trap are well covered in the TV productions relating to aircraft accidents. These documentaries have presented a large number of fatal accidents resulting from time pressures encouraging aircraft to be signed off as serviceable when the appropriate maintenance checklist had not been fully covered, or, in some cases, not even consulted.

5. Falsify Aircraft Maintenance Logs/Records

OK, gang, we saved the worst for last. You guys know the drill by now. CASA's official stance on the matter is absolute - "Maintenance records: Falsification, reproduction, or alteration." Allow me to summarize it for you: DO NOT DO IT.

Seriously folks, if I have to explain this, or provide examples of how bad this is, then we have no hope. Everyone has heard horror stories of pencil whipping, selective inspections, and drive-by annuals. Not even temptation is allowed. I am aware of hearsay relating to offenses but not evidence. The potentials of this issue lie well beyond a state of mere misdemeanor.

Happy flying

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Breaking News – North Pole Flight Command

A crash of a test flight of Santa's sleigh has been reported by **North Pole Flight Command**.

The long-range test flight was underway over the South Pacific. Santa, the pilot, and the reindeer went down in the water but thanks to ex-President Trump's tweets to emergency services, and dear old Joe Biden's influence with the American coastguard, the crew of the SS Jingle Bell, which was also involved in test flight programme, provided life preservers and all personnel were picked up.

All are safe and well.

This is a developing story. As soon as further information comes available, we will share it.

Tune to North Pole Radio for further news details and reports.

Elf Harold Star

FLY-INS Looming

WHERE	WHAT	WHEN
Murgon (Angelfield) (YMRG)	Burnett Flyers Breakfast Fly-in	**December 11 2022 BUT check at http://www.burnettflyers.org/?p=508 before departing to ensure it is ON!**

"According to your performance review, you don't follow orders, you follow odors ..."

"I hacked into the boss's salary and benefits package. His net is gross!"

The English Electric Lightning – a Physics Defier

From an article by Henry Kelsall

The P.1 English Electric Lightning

In Britain, in the mid-1950s, the Royal Air Force needed a new, fast, high-altitude interceptor that could protect its own V-bombers from enemy fighters, while also attack incoming Soviet bombers before they could drop their deadly loads. At the time, Britain had no Mach 2 capable jet fighter.

That changed in April 1957, when the English Electric Lightning took to the skies for the first time. The Lightning would become the first, and only, British made jet fighter that could reach speeds of Mach 2, and would remain in service from 1960 right up until the late 1980s. Right to this day, it remains the fastest British made fighter aircraft in history.

The Lightnings Origins

The Lightning was born out of a need in the late 1940s to supply Britain with a supersonic fighter aircraft. A swept-wing aircraft design was clearly required, but to prove the concept worked some test aircraft were first needed. In 1949, the project to develop a research aircraft for what would become the Lightning began and this would spawn three prototype aircraft, all under the English Electric P.1 umbrella. Two of them would be airworthy aircraft while one would remain a static airframe. These would be initially powered by Armstrong Siddeley Sapphire turbojets, and the engines mounted one above the other at the back of the aircraft. However, production Lightnings would have Rolls-Royce Avon engines.

English Electric Lightning F6 (Image by Alan Wilson)

The P.1 design would prove that the Lightning design was viable, and P.1 WG760 would achieve a maximum speed of Mach 1.51, thought the two prototypes would never achieve Mach 2. Following further testing, the first prototype Lightning, XA847, was duly presented in October 1958 with the name Lightning now official. On November 25th that year, XA847 would reach Mach 2 for the first time. Officially, XA847 was a P.1B but much closer to the actual Lightning in its final form. The first version of the Lightning would be the F.1, and it would enter service with the RAF in May 1960.

Operational Service

The Lightning finally entered service with the RAF in 1960, and it would enter frontline service with 74 Squadron that year. Amazingly, the Lightning would become just the second Western European-built combat aircraft with supersonic capability to enter service, after the Swedish Saab 35 Draken entered service in March that year. The Lightning quickly gained a reputation for being easy to fly and its weapons radar systems proved very effective. However, the RAF initially struggled to get more than 20 flying hours out of each aircraft per month.

An F.6 Lighning, the sharp end!

Another issue with the Lightning was its short range, as it could only be airborne for a short period of time before needing to land and refuel. Later versions of the aircraft such as the F.6 would rectify this with a larger, underbelly fuel tank, and drop tanks were also made available to the Lightning. One of the Lightning's greatest achievements came in April 1985, when Concorde was actually offered as a target for NATO fighters during British Airways trials. The F-15 Eagle, F-16 Fighting Falcon, F-14 Tomcat, French Mirage and F-104 Starfighter all took part. But only the Lightning was able to overtake Concorde on an intercept.

In Royal Air Force hands, the Lightning would never see combat service. As the decades wore on, the aircraft would need ever-increasing maintenance and its short range and small weapons payload would still prove a problem. But it soldiered on in service, ever faithful to its crews and those who worked on them. It wowed crowds at airshows, its two Rolls-Royce Avon 301R engines propelling it to a speed of Mach 2.27 and over 1,500 mph. The fastest any British made fighter has ever gone. But all too soon, the end approached.

The End of the Lighning

The aircraft was slowly phased out of service from 1974 to 1988, and by that point the aircraft needed huge levels of maintenance, due to how many hours had accumulated on the airframes. The final act for the Lightning would be a series of airshows at their spiritual home, the famous RAF Binbrook. Formations of nine Lightnings, an homage to The Firebirds display team of 1963, flew to bid farewell to the type. The final flight took place in June 1988 as a Lightning flew to a new home as a museum piece. And so ended the career of the fastest British fighter jet to ever grace the skies. What is perhaps most remarkable is that the Lightning was only supposed to have a service life of 10 years. That it flew for nearly 30 years of service is a testament to the capabilities of this rockstar of the skies.

Addendum

A unique feature of the Lightning's design is the vertical, staggered configuration of its two Rolls-Royce Avon turbojet engines within the fuselage. The Lightning was designed and developed as an interceptor to defend the V bomber airfields from attack by anticipated future nuclear-armed supersonic Soviet bombers such as what emerged as the Tupolev Tu-22, but it was subsequently also required to intercept other bomber aircraft such as the Tupolev Tu-16 and the Tupolev Tu-95.

The Lightning had an exceptional rate of climb, ceiling, and speed; pilots have described flying it as "being saddled to a skyrocket". This performance and the initially limited fuel supply meant that its missions are dictated to a high degree by its limited range. Later developments provided greater range and speed along with aerial reconnaissance and ground-attack capability. Over-wing fuel tank fittings were installed in the F6 variant and offered an extended range, but the maximum speed of the configuration was limited to a reported 875 knots (1,000 miles per hour, 1,600 km/h).

An F.6 variant fitted with the unique over-wing tanks for additional range

Until 2009, three Lightnings were kept flying at "Thunder City" in Cape Town, South Africa. In September 2008, the Institution of Mechanical Engineers conferred on the Lightning its "Engineering Heritage Award" at a ceremony at BAE Systems' site at Warton Aerodrome.

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The Emperor's Best

Collated by Rob Knight

The Nakajima Ki-84, code-named "*Frank"* by the Allies, or Hayate (Gale) to the Japanese, was the fastest single-engine fighter used by the Imperial Japanese Army Air Force in World War II. It marked the evolution of the series of fighters produced by Nakajima starting with the Ki-27 Nate, continuing with the Ki-43 Oscar, and the Ki-44 Tojo. It outperformed the F6F Hellcat, the P-51 Mustang, and the P-47 Thunderbolt.

The Nakajima Ki-84 Frank

It was a powerful high-altitude fighter that combined the nimbleness of the Ki-43 with the heavy firepower of the Ki-44. It was used to intercept B-29 Superfortresses and was armed with two 12.7 mm machine guns above the cowling and two 20 mm cannons located in the wings.

It made its inaugural flight in April 1943 and from the drawing board to the production line was only ten months. However, with the material restrictions to which the Japanese manufacturers were tied. total production was only 3,382 aircraft.

The Ki-84 design requirements were as follows:

- A range of 250 miles.
- A maximum speed of at least 388 mph.
- An endurance of 1-1/2 hours minimum.
- Pilot armour protection, and
- Self-sealing fuel tanks.

The Ki-84 was designed to replace the Ki-43 Oscar which was just entering service at the time. The new requirement called for an aircraft that would match the performance of any Allied fighter. This called for greater power and manoeuvrability than the Ki-43 and unlike previous aircraft, such as the infamous Mitsubishi Zero, it would have armour protection for the pilot and would be equipped with self-sealing fuel tanks.

The Ki-84 was a cantilever low-wing monoplane with fabric-covered flight controls. It had a slender and graceful looking fuselage, terminated at the rear by a somewhat smaller vertical fin and rudder than might be expected for the engine power. This slim fuselage and minimal tail profile contributed to its excellent aerodynamic performance.

The early models were all-metal, but due to the scarcity of precious aluminium, the rear fuselage and other components were constructed of wood with the last three models being constructed of wood entirely. The smooth outside surface of the wooden models was surfaced with a thick coat of lacquer.

A well-designed cowl covered the 1800 hp Homare Ha-45, 18-cylinder radial engine

The cockpit provided very good visibility and the windshield utilized armoured glass for pilot protection. As well as protecting the pilot, steel armour was also used to protect the centrally located fuel tank and the methanol-water tanks used for engine emergency war power.

It was powered by an 1,800 hp (1,342 kW) fuel injected Homare Ha-45, 18-cylinder radial engine. It was a very powerful engine, very much the equivalent of the 2,000 hp (1,491 kW) Pratt & Whitney R-2800 engine. However, the engine was rushed into production and suffered from fuel starvation which was eventually modified with a low-pressure supply system. Other problems included a faulty hydraulic system and an undercarriage inadequate for the operating loads which had a propensity to fail during hard landings or rough surfaces. Partly to blame for this flaw was the metal from which the landing gear components were manufactured, they were brittle due to a shortage of appropriate steel alloys, and the aeroplane was plagued with inferior workmanship due to a shortage of skilled workers.

The Nakajima Ki-84 Frank – a very capable fighter in its day

The Ki-84 reached a maximum level speed of 387 mph (624 km/h) and in a dive was able to reach a top speed of 496 mph (687 km/h). It had an endurance of 90 minutes, and had a range of 250 miles. It could climb to 5,000 m. (16,405 ft.) in 6 minutes and 26 seconds and had a ceiling of 12,400 m. (40,680 ft.). It was also considered to be a relatively easy plane to fly, reducing time for training new pilots.

The first batch of 83 aeroplanes was completed between August 1943 and March 1944. They were equipped with a centreline fuel tank and external bomb wing-racks to carry a total of 250 kg (551 lb.) of bombs. Service tests were conducted under operational conditions in October 1943. A second batch of 42 aircraft was started in April 1944. For this batch, added wing racks could carry either 44 litres of fuel or a total of 250 kg. of bombs.

Total production was 3,382 aircraft in only 17 months and continued right up to the end of the war. This was no mean feat since production was constantly being disrupted by continual bombing from B-29 Superfortresses.

In late August of 1944, the Ki84 first entered combat over China with the 22nd Air Regiment (this Regiment had been involved in the testing/training period of the new fighter). Initial results were excellent, catching the American Army Air Force pilots completely off guard. While a skilled Ki-84 pilot was evenly matched with the best US pilots and equipment, the majority of Ki-84s lost in the

Philippine battles were destroyed on the ground. Overwhelming numbers of US planes controlled the skies and as time went on, the Japanese were soon fighting a losing battle.

Specifications: Nakajima Ki-84-Ia "Hayate" (Frank).

Dimensions:	Wing span:36 ft 11 in (11.23 m) Length:32 ft 7 in (9.93 m) Height:11 ft 1 in (3.38 m)
Weights:	Empty:5,875 lb (2,665 kg) Loaded:7,972 lb (3,616 kg)
Performance:	Maximum Speed:427 mph (687 km/h) Service Ceiling:34,450 ft. (10,500 m) Range:1,339 miles (2,155 km)
Powerplant:	One 1,990 hp (1,485 kW) Nakajima Ha-45-21 Homare 18-cylinder radial engine
Armament:	Two 12.7 mm Ho-103 machine guns in nose, two 20 mm Ho-5 cannon in wings, plus two 100 kg (220 lb) or two 250 kg (551 lb) bombs

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

1. On a TAF, a pilot sees the abbreviation "BR" Which of the following does this indicate?
   A. Fog.
   B. Mist
   C. Falling/decreasing OAT
   D. Turbulence.

2. Upon which of the following does an aeroplane's rate of climb (Vy) depend?
   A. Surplus lift.
   B. Surplus thrust.
   C. Surplus horsepower.
   D. Surplus airspeed.

3. Which of the following will minimise an aeroplane's adverse yaw?
   A. Frise ailerons.
   B. Differential ailerons.
   C. Correctly applied rudder.
   D. All of the above.

4. A balloonist is suspended between two large cloud formations at his altitude, one to the north, and one to the south of his position. The northerly formation is 3 nm closer than the one to the south. If the W/V is 360/15, which cloud formation is he most likely to enter?
   A. The southerly formation.
   B. The northerly formation.
   C. Neither, the balloon will not enter cloud as long as the situation remains unchanged.

5. The METAR at 2330 zulu provides that the surface wind is 120/25, and the 0000 zulu METAR states a surface wind change to 140/25. How would the directional change to this W/V be correctly described?
   A. As a veering wind.
   B. As a backing wind.
   C. As a keening wind.
   D. None of the above as the wind speed is unchanged.

See answers and explanations overleaf

If you have any problems with these questions, See Notes below or call me (in the evening) and let's discuss them. Rob Knight: 0400 89 3632 (International +64 400 89 3632), or email me at kni.rob@bigpond.com.

1. B is correct.
   MIST, a precipitate suspension in the air, at or near the earth's surface, of microscopic water droplets or wet hygroscopic particles which reduce the horizontal visibility to less than 5000 metres but not less than 1000 metres. In aviation forecasts and reports it is coded as BR.
   See http://www.bom.gov.au/aviation/data/education/taf-reference-card.pdf.
   And: http://www.bom.gov.au/aviation/data/education/glossary.pdf

2. C is correct.
   An aeroplane's rate of climb depends surplus horsepower, i.e., that horsepower available above and beyond that necessary to equal aerodynamic drag.
   See: https://www.flightliteracy.com/aircraft-performance-climb-performance/

3. D is correct.
   Adverse yaw is always created when aileron is applied but the force causing adverse yaw is minimised by the design features of frise ailerons and differential ailerons. However, when rudder is correctly applied to counter it when aileron is applied any/all residual adverse yaw is eliminated. Thus options A, B, and C are all correct
   See: https://www.youtube.com/watch?v=D9clof2O6Mc

4. C is correct.
   As both cloud formations and the balloon have the same ground speed (they are at the same altitude), the wind will be the same velocity for them all. Therefore, they will remain in their positions relative to each other as they drift across the landscape below and will not get nearer of further from each other. The balloon will enter neither cloud formation as long as the current situation exists.

5. A is correct.
   VEERING A clockwise shift in the wind direction.
   A backing wind occurs when the directional change is anticlockwise, and a keening wind is one that is extremely cold and penetrating so does not reflect any change in direction
   See: glossary.pdf (bom.gov.au)

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You have to attend classes – you just can't follow me on twitter

Aircraft Books, Parts, and Tools etc.

Contact Rob-on mobile – 0400 89 3632

Books (Aviation)

NEW Item	Condition		Price
Flight Briefing for Pilot ***By Birch & Bramson***	**Excellent**		**$25.00**
Mechanics of Flight ***By A. C. Kermode***	**Little used**		**$25.00**

Books (Aviation) (Selling on behalf)

NEW Item	Condition		Price
RA-Aus Pilot Certificate **Ground Training Manual (102)** ***By Dyson-Holland***	**Brand new**		**$49.00**
RA-Aus Pilot Certificate **Ground Training Manual (103)** ***By Dyson-Holland***	**Brand new**		**$49.00**

Tow Bars

Item	Condition	Price
Tailwheel tow bar.	Good condition	**$50.00**

Handheld Radios (Selling on behalf)

Item		Price
ICOM VHF Transceiver, Model: IC-A22E With • Battery, • Cigarette lighter power source, and • 240V battery charger.		**Open to Offers**
ICOM VHF Transceiver, Model: IC-A6. With 240V charger but no dock to recharge battery *(available on EBay)*		**Open to Offers**

Cockpit Electronics (Selling on behalf)

Item		Price
TRANSPAK GPS Personal Navigator Complete with • Carry bag, cigarette lighter power pack, • AA battery power pack, and • User manual.		**Open to Offers**
MAGELLAN GPS Model 315/320 With • Cigarette lighter socket power pack, and • User manual.		**Open to Offers**

Other Electronic Units (Selling on behalf)

Item		Price
PALM, model Z22, complete with • CD software, • 240V charging unit • Linking cables etc., • Still in original box.		**Open to Offers**

Other Electronic Units (Selling on behalf)

Flight Cell 2GO. Mobile phone to Headset interface • With user guide, and • Includes cable etc. See: www.flightcell.com for details		**Open to Offers**
NAVMAN. Model MY 50T automotive GOPS system With • CD, and • Cigarette Lighter socket power supply.		**Open to Offers**

Aircraft Magnetic Compass (Selling on behalf)

Item		Price
Wired for lighting • Top of panel mount, • Needs fluid replenished.		**Open to Offers**

Propeller Parts

Item	Condition	Price
Propeller spacers, Assorted depths, all to fit Rotax 912 UL/ULS propeller flanges	Excellent	**$100.00 each**
Spinner and propeller backing plate to suit a Kiev, 3 blade propeller, on a Rotax 912 engine flange.	Excellent	**100.00**

For all items, Contact me - on mobile – 0400 89 3632

Or email me at:

kni.rob@bigpond.com

Kitset Aircraft for Sale

Build it Yourself

$1,980.00 neg

DESCRIPTION

All of the major components needed to build your own aircraft similar to a Thruster, Cricket or MW5.

- Basic plans are included, also
- Hard to obtain 4" x 3" box section, 2 @ 4.5 metres long.
- Wing spar & lift strut material - 6 tubes of 28 dia. x 2 wall.
- 20 fibreglass ribs plus the moulds,
- 16 spar webs plus the moulds,
- 2 fibreglass flat sheets for the leading edges - 4 metres long x 1.1 metres wide.
- All instruments including,
- A Navman flow meter,
- A Powermate rectifier regulator,
- A ballistic parachute,
- A 4-point harness,
- Set fibreglass wheel pants, and
- More.

Box sections and tubes

Flow Meter, Navman, Ballistic Chute, etc

A very comprehensive kit of materials

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

Or Mob: 0419 758 125

Ribs, tubes, spats, etc

Aircraft for Sale

¾ scale replica Spitfire **$55**

SOLD

This aircraft is airworthy ... Registered 19-1993, it is powered by a 6-cylinder Jabiru eng... TIS. The airframe has logged a mere 320 hours TTIS. This deli... with new mounting rubber, a new alternator and re... nds. It is fully registered and ready to fly away by a lucky new ...

Hangared at ... interested in this lovely and unique aircraft should co...

Kev Walters on Tel. ...

William Watson on Tel., **0... 36**

Single Seat T84 Thruster, disassembled and ready for rebuild.

I have a T84 single seat Thruster project in my hanger at Watts bridge.

The fuselage is on its undercarriage, the wing assemblies are folded up and the skins are with them.

Included is a fully rebuilt Rotax 503 dual ignition engine and propeller.

And, most importantly – the aircraft logbook!

Asking price $5000.00

Contact John Innes on **0417 643 610**

MORE AIRCRAFT for Sale - LIGHTWING GA-55.

Registered 25-0374

Engine ROTAX 912, 80HP, 853.3 Hours

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

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

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

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

Other work carried out:

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

Rotax:

* Engine modifications, gearbox rebuild.

Currently hangared at Boonah in Queensland.

Contact Kevin McDonald on 0419 607 637

Aircraft Engines for Sale

Continental O200 D1B aircraft engine

Currently inhibited but complete with all accessories including,

- Magneto's,
- Carburettor,
- Alternator,
- Starter motor,
- Baffles and Exhaust system, and
- Engine mounting bolts and rubbers.

Total time 944.8 hours. Continental log book and engine log are included.

Phone John on 0417 643 610

ROTAX 582 motor.

Ex flying school, TTIS 600 hours, and running faultlessly when removed from aircraft for compulsory replacement.

No gearbox, but one may be negotiated by separate sale if required.

Interested parties should contact.....

Kev Walters on Tel. **0488540011**

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