BRISBANE VALLEY FLYER

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BRISBANE VALLEY SPORT AVIATION CLUB INC

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From the Club

The club is still active but no material for inclusion in this issue has been received by the editor by the closing date.

Weather to Have an Accident

Part three of "VFR into IMC Won't go".

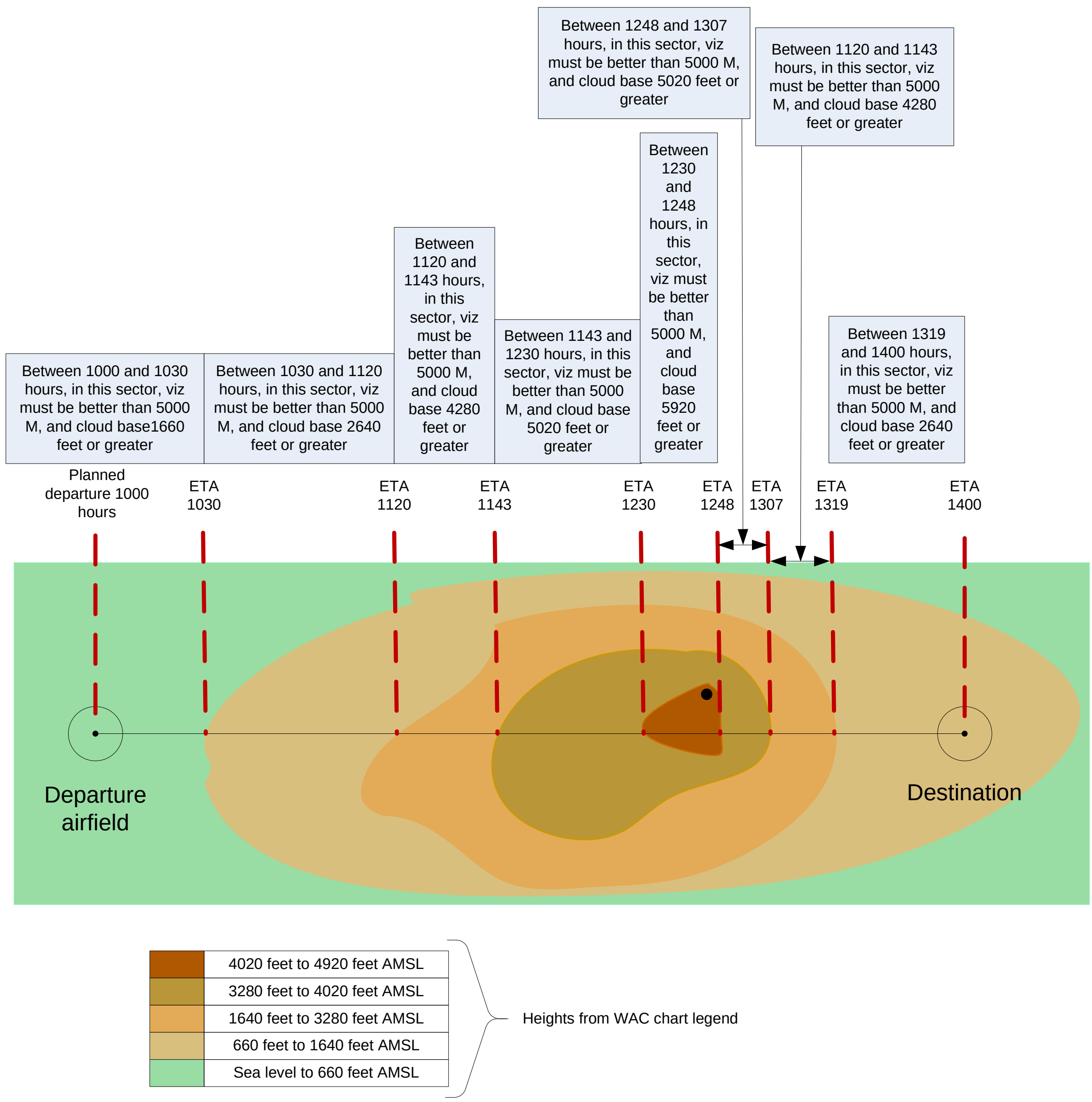
By Rob Knight

Assessing "weather related accidents" leads one to conclude that, fundamentally, there really is no such thing. They are, instead, *"poor pilot-decision accidents"*. The weather will be there regardless, but the cause of the accident is the pilot not deciding to remain clear of sub-minima weather in the areas and at the times that it exists. If the pilot was not at the location of that bad weather at the time it exists, that bad weather could not influence his/her longevity in the same way. The bad decision is in being there, in the wrong place at the wrong time. It is the pilot-in-command's legal duty to not be in the wrong place at the wrong time where it is foreseeable, and it almost inevitably is foreseeable.

Perhaps it might help to view the exercise from a different standpoint: a pilot's best weapon in prevent *poor pilot-decision accidents* would be to plan, not to get to the destination, but, instead, to plan to remain in VMC until the destination can be reached.

It's not just a question of accessing the appropriate weather forecasts and reports, but competently assessing them as well: it is vital that all relevant information in the assessment must be accurate and comprehensive. The minimum list of weather documents required would include the area forecast (GAF) for the track/area in which the flight is to take place, and the GPWT (Grip Point Wind & Temperature forecast) relevant to the flight. Also, all relevant TAFs (Terminal Aerodrome Forecasts), and available METARS (Meteorological Terminal Air Reports) for airfields along the desired or planned route. Note that METARs are reports, not forecasts or prediction for the future weather. METARs state what's happening at a location usually within the last 30 minutes and are used to check against forecast conditions as well as a means of getting existing weather at any point in time.

From the forecast details, the pilot must ascertain the height of the cloud-base likely to be faced and compare it to the terrain height along the desired route. In general, the minimum safe height above terrain for most non-professional pilots is 1000 feet so the cloud base must be at least that height (terrain + 1000 feet) *for the entire length of the track* for the flight to safely proceed. Herein lies the first serious decision. If this criterion of cloud-base height equaling or exceeding the terrain height + 1000 feet for the entire track length cannot be met, either a different track with either lower terrain or a higher cloud-base must be considered, or the flight delayed until more clement weather appears. Note that this a time-line issue as the sketch below illustrates.



Flight Planning Theory
Time line of a proposed flight in the planning stage

From the sketch above, it's a no-brainer to see that the forecast weather activity must be related to the time the aircraft is expected to be in locality of that weather. For example, assessing the destination weather at the culmination of the four-hour flight, departing at 1000 hours, the only relevant weather conditions for consideration are those anticipates at the destination at 1400 hours. Conditions before or after that time have no relevance insofar as this flight is concerned.

Now here's the test, considering the data contained in the sketch above, what is the lowest visibility and cloud base under which the flight can be undertaken. The answer lies at the end of this piece

Given that due care, attention, and expertise has been given, and the flight can be planned with adequate met minima for the flight on that track, it is also possible to be caught in IMC if operating close to a cloud base. Dew point is the temperature at which a parcel of air becomes saturated: any further cooling is likely to cause cloud to form in that parcel. So, if a pilot is hugging the cloud base and further cooling of the air takes place, cloud will form around the aircraft before the pilot can exit the area. This is definitely non-habit forming. Obviously this is not the same as a deliberate act of trying to find the way through weather worsening below minima, but the results are just as lethal: the forecast alone is no protection against this predicament.

Another factor that is often not considered is that the appearance of the weather can have a profound influence on a pilot's decision to continue or not. If the weather looks scary, the decision is easy, but serious weather issues can be disguised with trick of light and shadow and conditions that are seriously at odds with the required minima can appear benign and the seriousness of the weather ahead lost on the pilot. It's a case of pilot beware – what you see is not always what's there or what you will get if you continue. Gathering in-flight weather reports and data is a better source of information than just what is visible from the cockpit.

Evans Bay, Wellington, New Zealand. Wind northerly, gusting to 85 knots. Extremely safe weather for pilots because they leave their aeroplanes in the hangar and grab a beer instead

Whatever the cause, once encountered, being VFR in IMC has no panacea, no way out; the point of no return has been passed. The pilot and any passengers are now most likely to die because the pilot has made poor decisions and allowed the situation to deteriorate to this state. He or she, as Pilot in Command, should have followed some other course of action to ensure that a workable horizon was not lost and spatial orientation was continuously maintained. Before the conditions got this bad the pilot should have carried out an off field precautionary landing so he or she and any passengers might survive. No-one survives a spiral into the ground after spatial orientation is lost. Loss of life is inevitable

It is with this condition in mind that pilots are taught bad weather low flying/precautionary landing in New Zealand and the Precautionary Search and Landing training under RA- AUS in Australia. Having taught the New Zealand syllabus for 30 years plus, and experienced the Australian equivalent when re-qualifying in Australia, they both target the same emergency situation. Faced with deteriorating weather conditions to find a suitable field and put the aircraft on the ground. It is better to land on a place too short and stop from 20 knots with the wheels, legs and wings absorbing the impacts as the aircraft slows on it belly (that's eminently survivable) to spiral in, in a near vertical dive ,at 120 knots with the spinner impacting first (that's not survivable). The difference lies in that the pilot is still in control in the former, and not in the latter.

Setting the Aeroplane up for Emergency Bad Weather Flight

The setup for an aircraft to be in a "bad weather flight" configuration is absolutely simple. Some flap lowered (1 notch down in a 2 notch system, 2 notches down in a 3 notch system, or 15° with most electric systems), the normal approach airspeed maintained on the ASI, sufficient power applied to maintain level flight and the aeroplane trimmed for the required attitude. This gives several advantages, the nose attitude will be lower giving better forward visibility – a great advantage in low visibility flight, your turn radius will be reduced if you have to dodge an obstacle you see with your now improved low nose attitude, and, should a suitable field appear, easing the power will set the aeroplane in a normal approach situation. Believe me, such procedures may be life-saving in the real event because they all add to the safety of the aircraft which is also YOUR safety. Go and practice it. You don't need an instructor for such a basic exercise. Failing that, come to Forest Hill (YFRH) in the Lockyer Valley and let me demonstrate to you how simple it is. I will even use my own aircraft for the demonstration.

Selecting A Safe Landing Area

New Zealand abounds in farm airstrips and Australia is equally endowed in this respect. Carved out of the ground for use in the topdressing/crop dusting industries, all are eminently suitable for light and ultralight aircraft operation. The take-off requirements for agricultural aircraft operating under heavy take-off loads mean the runway lengths are perfectly adequate for any single engined light aircraft operation. They look different, they usually have no windsock, and they will slope uphill (if you see one downhill then you are landing the wrong way). There will be no welcoming committee and you will have to organise transport and make arrangements to get the aircraft out when the weather improves, but at least you can do that. It's an immeasurably better outcome than your next-of-kin having to arrange that as well as your funeral. If you have any doubts contact an instructor. If not - call me and I'll arrange an instructor (at your expense) if you want to log it, or demonstrate it for you in my aircraft, it's all absolutely simple and safe.

The greatest obstacle to this emergency landing exercise is the very common pilot reluctance to do it – to carry out a forced landing due to weather. I was spoiled – learning to fly in a rural area I flew in and out of unlicensed airstrips as part of my training – it was all just the way it was done in that area in those days. But I have seen City airfield trained pilots, some even very senior instructors, who refused to fly into any place without it being level, with a wind sock at each end, and a fence around it. This experience, in my opinion, should be a part of every pilot's basic training. It should not lie on the pilot's shoulders to do this for the first time under the stress of a real emergency, not ever have done it before. If you have never landed on an airstrip, find an instructor and get some dual. If not, again, I feel so strongly about it that I'll take you into some strips in my aircraft. The experience could save your live because you will have a workable alternative to follow and not have to ad lib. Ad libing in aviation is all-too-often terminally fatal.

Summary

1. Don't fly into worsening weather. Look around and turn around, and go home whilst you are still in VMC.
2. Don't continue to fly into worsening weather hoping conditions will improve. Hope is not listed as an exercise in any training syllabus.
3. Don't fly into worsening weather. Continuing on is stupid when you consider the statistical results of others making that decision.

4. Plan not to fly into weather that even approaches the applicable met minima for each sector of the flight. The flight should be over when you land, not when you crash.
5. Don't continue to fly into worsening weather.
6. Start making your 180° turn in VMC and go home: don't wait for IMC to decide for you, VFR pilots in IMC have grave difficulty carrying out turns of 180°. They are likely to become 1000° turns and stop only when impact with the surface occurs.
7. Don't fly into worsening weather. The flight may take the rest of your life and you still won't get to your planned destination
8. When experiencing worsening weather that doesn't allow a return to departure point, set the aeroplane up in its bad weather flight configuration and find a place to put it down whilst YOU can still make the decisions.
9. Don't continue to fly into worsening weather, what advantage does it have – there are no bragging rights, except who made the largest or deepest hole in the ground.
10. The only advantage in continuing flight into worsening weather is that your funeral might be low-cost – it could either be a cheap cremation, or little left to bury.

Note that if this summary doesn't suit you, please advise your next-of-kin of your choice of funeral service music, and whether you want flowers or a monetary gift to charity. This information could be a comfort to them in the near future.

The only person that can save you from all this is YOU. Make the right decision at the right time. Keep in mind that no pilot that has already succumbed to this fate was as good as he/she thought they were – and you will merely be further proof of that adage if you attempt it.

I rest my case against weather related dumb decision making causing death.

YOU are the only one that can save your life.

Test minima from page 5 – clear of cloud, in sight of the ground, with 5000 metres visibility. Thus the minimum cloud base would have to be 5920 feet. This might be legal, but in reality quite imprudent, the ground is too high and the cloud is too low

This bloody weather is no good at all; the ground is too high and the cloud base too low
To which I must add, it's obviously sad, but stay on the ground, the weather's too bad

Happy Flying

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Screaming Bird of Prey: How the Ju-87 Stuka exceeded its life span and carried the Luftwaffe through WWII

Stephan Wilkinson, Aviation History Magazine – June 2018

A Junkers Ju-87 begins to roll in on a target in the Balkans during the invasion of Yugoslavia in April 1941. The "little bomber" was considered outdated before WWII even began, but it wound up serving the Luftwaffe for five and a half years of nonstop combat. (Sueddeutsche Zeitung)

Never has a warplane so obsolete, vulnerable and technologically basic wrought so much damage to its enemies as did the Junkers Ju-87 Stuka. Even as Germany invaded Poland and triggered World War II, its Ministry of Aviation (ministerium, or RLM) was hard at work on a replace-Reichsluftfahrtment for its dive bomber, and the early Ju-87B was intended to be the last model made.

No surprise, since typically an air force begins development of the next-generation aircraft the instant the current machine goes into service. But hard as they tried, the Germans never came up with a Stuka successor, so the angular, archaic “little bomber,” as the Luftwaffe called it, was the airplane that on September 1, 1939, dropped the first bombs of the war, and on May 4, 1945, flew the final Luftwaffe ground-assault mission.

The very last propaganda film made by the Luftwaffe showed Stukas attacking Soviet tanks on the outskirts of Berlin, smoke streaming from their big antitank cannons. That’s 5½ years of nonstop combat by an airplane adjudged by some to be too primitive, too slow and too vulnerable before the war even began.

Granted there have been inexcusably ugly aircraft, but like so many designed-for-a-mission utilitarian airplanes — the Consolidated PBY comes to mind—the Ju-87 looks better the longer you consider its rugged lines. One Stuka admirer calls it “a flying swastika,” thanks to its angularity and coarseness.

But that same straightforwardness made the Stuka easy to manufacture, repair and maintain. Who needs elliptical wings, stylish P-51 radiator doghouses or retractable landing gear on a bomb truck intended to fly to a target little farther away than its pilot can see, do a job and rumble back home again?

It's hard to cast a kindly light on any bomber, but the Ju-87 was designed to attack and destroy specific military targets, not civilians. Had Stukas been used to bomb the important bridge that was the primary target of the raid, the world would have long ago forgotten Guernica.

The Spanish war did make it plain that the Ju-87 would be a useful weapon. When Bf-109Bs arrived on the scene, the Nationalist rebels soon claimed control of the air. Republican anti-aircraft artillery was pretty primitive, so the Stukas bombed at will—as they were intended to—and even the worst drops typically landed within less than 100 feet of the target. Good hits were either on target or no more than 15 feet off-centre.

The Rolls-Royce Kestrel-powered Ju-87 V-1 prototype first flew on September 17, 1935. (SDASM/Alamy)

Dive bombing was by no means a German invention, though they refined the tactic to a degree never seen before—or since. The British were the first to try moderate-dive-angle attacks, during World War I, and both the U.S. and Japan experimented with diving delivery between the wars. In fact, it was Japanese interest in the tactic that led them to commission Heinkel to design a dive bomber to rival the American Curtiss F8C Helldiver, which became the He-50 biplane.

The Japanese actually bought and tested two Ju-87s before WWII, but placed no further orders—probably because their own Heinkel-influenced Aichi D3A1 "Val" dive bomber was already excellent, as Pearl Harbour would prove.

Legend has it that when WWI ace Ernst Udet, then a civilian, attended the 1935 Cleveland Air Races, he saw some U.S. Navy Curtiss F11C-2 Goshawk biplane dive bombers and was dazzled by their performance. Hermann Göring, who wanted to entice Udet back into the reborn Luftwaffe, imported two export-version Hawk IIs for the ace's use. Udet did dive bombing demonstrations during airshows in Germany, the myth continues, and convinced the Luftwaffe that it would be a useful tactic. Thus the Stuka was born, with Udet thereafter credited as its "father."

Well, not exactly, as the rental car commercials used to say. The Stuka design had already been finalized and was in mock-up form when Udet became enamoured of the Curtiss, and he never did air show bombing, just enthusiastic aerobatics. But Udet certainly was a vertical bombing proponent, and his one important role in the Stuka's development was that when RLM Technical Director Wolfram von Richthofen (the Red Baron's cousin) cancelled the Ju-87 program— Richthofen thought that a slow, cumbersome, diving Stuka would never survive the anti-aircraft guns toward which it was necessarily pointed—Udet happened the next day to be given Richthofen's job. His first move was to countermand that order, so the Stuka survived.

"Stuka" became the Ju-87's popular name, but it's actually a generic term. Stuka is short for one of those German freight-train words, Sturkampfflugzeug, which translates as "diving combat aircraft." So to call a Ju-87 a Stuka was just like naming the P-51 "Fighter" or the B-17 "Bomber." Nobody cares: The Ju-87 will forever remain the Stuka.

Popular accounts of Ju-87 raids invariably mention the airplane's sirens, wind-driven devices on the front of each landing gear leg that the Germans called Jericho's Trumpets. The simple wooden props that drove them could be clutched and de-clutched electro-hydraulically— a typical example of German over-engineering. What did they sound like? Well, forget fire engines, the noise was exactly like the sound in every classic Hollywood movie's approximation of an airplane's final dive to destruction—the rising, grinding wail of an over-revving engine. The noise was apparently as annoying to Stuka pilots as it was to troops being bombed, so many units dispensed with the extra drag and complication of the trumpets, though reports of their occasional use persevere into 1943.

The Germans eventually preferred to mount wind-whistles on the fins of Stuka bombs, another development beloved of the film business. In movies, bombs all whistle. In real life, the only bombs that whistled were some dropped from Stukas.

It's not widely known that the peace-loving Swedes, those professional neutrals during Europe's wars, were contributors to the development of the Stuka. To circumvent the punishing provisions of the Versailles Treaty, Hugo Junkers established an aircraft factory in Sweden. The facility was no secret, but it allowed operation free of pesky oversight by treaty inspectors, who had no authority in Sweden. There, Junkers developed the K.47, a heavily strutted and braced radial engine monoplane (other dive bombers of the time were all biplanes) optimized for diving and equipped with both Junkers dive brakes and what would become the Ju-87's automatic pullout mechanism.

It was the Stuka's ability to perform (and recover from), a near vertical dive that gave it the ability to place its bombs directly on a specific target. (National Archives)

Though the K.47 contributed only in the broadest sense to the prototype that became the Stuka, Swedish test pilots enthusiastically performed hundreds of dives with it and refined diving procedures and methods. Hermann Pohlmann designed the K.47 under the direction of Karl Plauth, a WWI fighter pilot, and Pohlmann went on to engineer the Ju-87 after Plauth died in the crash of a Junkers prototype.

The sole benefit of dive bombing is accuracy. Imagine running across a golf green as fast as you can while trying to drop a ball into the cup from eye level. Now imagine standing directly above the cup and sighting from the ball to the cup, then dropping it. The former is classic horizontal bombing, and its accuracy depends on a bombsight that can calculate a variety of parameters to create the proper parabola from bomb bay to target. The latter is dive bombing, and if the dive is truly vertical, the flight of the bomb will follow the path of the bomber to wherever the airplane is pointed—at a tank, a ship, a bunker, a building.

The Ju-87 was one of the only dive bombers that could actually perform a vertical dive without surpassing V NE— never-exceed speed. Most dive bombers couldn't put the nose more than about 70 degrees down, though the Vultee Vengeance was also said to be a truly vertical bomber. The Stuka's under-wing dive brakes, a Hugo Junkers invention, were remarkably effective despite their small size and simplicity, and apparently the airplane's bluff chin radiator, large wheel pants, upright greenhouse and general avoidance of drag reduction sufficed to maintain a 375-mph vertical dive speed. (Later models could dive at up to 405 mph.)

Some Stuka pilots entered a dive by half-rolling the airplane onto its back and then pulling positive Gs to dive, others simply bunted from level flight into the dive. Standing on the rudder pedals to keep from doing a face-plant into the instrument panel is difficult enough, even with the help of a shoulder harness, but trying to aim at a target while simultaneously ignoring anti-aircraft fire must have been truly challenging.

British test pilot Eric "Winkle" Brown spent an hour flying a captured Ju-87D and later wrote: "A dive angle of 90 degrees is a pretty palpitating experience, for it always feels as if the aircraft is over the vertical and is bunting, and all this while terra firma is rushing closer with apparent suicidal rapidity. In fact I have rarely seen a specialist dive bomber put over 70 degrees in a dive, but the Ju-87 was a genuine 90-degree screamer…the Ju-87 felt right standing on its nose, and the acceleration to 335 mph was reached in about 4,500 feet, speed thereafter creeping up slowly to the absolute permitted limit of 375 mph, so that the feeling of being on a runaway roller coaster experienced with most other dive bombers was missing. I must confess that I had a more enjoyable hour's dive-bombing practice than I had ever experienced with any other aircraft of this specialist type. Somehow the

Ju-87D did not appear to find its natural element until it was diving steeply. Obviously the fixed undercarriage and large-span dive brakes of the Junkers were a highly effective drag combination." Ju-87s had "Stuka-vizier" gyro-stabilized bombsights developed by the famous German optical house Zeiss; they were basically gun sights modified for vertical guidance. Stuka pilots also had half a protractor's worth of angle lines etched in red into the right-hand canopy window, which when matched to the horizon gave them their dive angles. Another unusual Stuka feature was a large window in its belly, between the pilot's feet, so that he could keep the target in view as he prepared to roll into his dive. Unfortunately, it was usually useless, covered with a thick film of engine oil leakage streaming aft.

One of the Ju-87's advanced features, at least for that era, was an automatic pullout mechanism, to avoid the possibility of pilots being overcome by target fixation or rendered unable to fly by the effects of high-G pullouts. It was a simple hydraulic device. Once the pilot had trimmed nose-down for the dive and to counteract the increased airspeed, it released the trim setting when the ordnance was pickled and reset the tab to command a pullout that typically ran to between 5 and 6 Gs. In those days long before G-suits and abdomen-tightening yells, only the strongest Stuka pilots and gunners avoided at least briefly graying out, but the Stuka did the flying for them.

If they trusted it to do so, that is. Many Ju-87 pilots were leery of the automatic pullout feature and preferred to do the flying themselves. During training dives against a floating target in the Baltic soon after the automatic pullout mechanism was introduced, at least three Stukas went straight into the sea, which certainly didn't endear the device to pilots.

The pullout was also the point at which a Stuka was most vulnerable, its speed paying off rapidly as it clawed for altitude, following a predictable course and unable to maneuver. Allied pilots who opposed Stukas didn't bother trying to catch them in a dive; they waited until the Germans released their bombs and pulled out. Ju-87s were intended to operate only where the Luftwaffe had complete air superiority and could make bomb runs with impunity. Nobody ever meant for them to go head-to-head with eight-gun Spitfires and Hurricanes.

During the Battle of Britain, Stukas were downed by the dozens while trying to do a job—strategic rather than tactical bombing—for which they were never intended. They were ground- support airplanes, designed to work in tandem with tanks. Yet at the classic tank battle of El Alamein, in the North African desert, Stukas were never a factor, since RAF and South African Air Force Kittyhawks, for the most part, had by that time gotten the upper hand over fuel-starved Luftwaffe Me-109s and Italian Macchi MC.202s.

There were Ju-87s in North Africa nonetheless. “Apart from a few improvised fighters, we had no dive bombers at all, ”wrote Alan Moorehead in The Desert War. “It is useless for the military strategists to argue, as they will and fiercely, that the Stuka is a failure and very vulnerable. Ask the troops in the field. Its effect on morale alone made it worthwhile in the Middle East as long as we had insufficient fighters.”

After the Battle of Britain, the RAF proclaimed that the Stuka was finished as an offensive weapon, beaten bloody by Spitfires and Hurricanes. That myth has become part of Stuka lore and is one reason why, as a British historian put it, “More crap has been written about the Stuka than about any other airplane in history.” During the five years after the Battle of Britain and the RAF’s haughty pronouncement, the hundreds of thousands of tons of merchant shipping and warships sunk, and thousands of Soviet tanks destroyed, made it obvious the Ju-87 could still get the job done.

Like the Slow-But-Deadly Douglas SBD, the Stuka turned out to be a superb anti-shipping weapon. Stuka pilots quickly learned to attack from astern, so they could easily follow a ship’s evasive actions. They often dived on a ship at a 45- degree angle and fired their machine guns as a telltale.“When the first of our…bullets were observed to be hitting the water in front of the ship’s bow, we pulled the bomb release,” said one former Stuka pilot quoted in Peter C. Smith’s book Junkers Ju 87 Stuka. “There was very little chance for a merchant ship of any size attacked with this Stuka tactic,” Smith wrote.

While the RAF was dismissing the Stuka as irrelevant after its poor showing in the Battle of Britain, Ju-87s essentially destroyed the Royal Navy’s Mediterranean fleet. RAF Air Marshal Arthur Tedder said, “Our fighter pilots weep for joy when they see [Stukas].” At the time, he was reassuring Royal Navy Admiral Andrew Cunningham, whose armoured-deck aircraft carrier HMS Illustrious, and its support ships, would soon be battered so badly by Stukas off Malta that it was out of action for nearly a year. Stukas also thoroughly chased the Royal Navy out of Norway’s waters.

Yet Tedder wasn’t far off the mark. Luftwaffe Messerschmitt and Focke Wulf pilots called Ju-87s “fighter magnets,” and depending on whether they preferred to die in bed or collect Iron Crosses, they feared or enjoyed being assigned to Stuka-escorting missions. Two Ju-87 tactics were used to great effect in the Vietnam War. One was employing forward air controllers (FACs), a concept developed by the Germans during the Polish blitzkreig. Stuka UHF radios were mounted in tanks or other armoured vehicles, and were manned by Luftwaffe officers schooled in ground-support tactics. They directed strikes by Stukas overhead against any targets impeding the panzers’ advance.

The other was what has come to be called the daisy-cutter—a bomb that explodes several feet above the ground rather than penetrating the earth and dissipating its energy in making a crater. A belt-high blast wreaks terrible damage on personnel. The Germans approached fusing the bomb to go off at this height in the simplest way possible: They attached a 3-foot-long metal rod to the impact fuse in the bomb’s nose, to set it off when the rod touched the ground. At first, the rods penetrated soft ground without setting off the bomb, so they learned to weld a 3-inch-diameter disk to the tip. The same technique was used 25 years later by the U.S. Air Force.

Many assume that because the Stuka was a bomb truck, it must have flown like one. Untrue, according to former Ju-87 pilots who have talked and written about what a delightful, light and responsive airplane it was to fly—easy to handle, a piece of cake to land and one of those rare flying machines without a vice. The Ju-87 was nose-heavy by design, and Allied pilots who flew captured Stukas said the airplane felt "just right" when dived vertically. One RAF pilot described its handling as "so light that there was a marked tendency to over-control." Perhaps it was a function of the unusual Junkers-design floating ailerons (and flaps). Further proof that the Stuka was not just a manly man's airplane was that a surprising amount of the preproduction testing of all models was carried out by two women pilots— the famous Hanna Reitsch, whose specialty was dive-brake testing, and Countess Melitta Schenk von Stauffenberg, the sister-in-law of anti-Hitler conspiracist Claus von Stauffenberg.

Ju-87s were produced in several successive variants, inevitably requiring more power, more range, more bomb-lifting ability. The Ju-87B was the classic—the one with the big wheel pants, squared-away greenhouse and vertically louvered, overbite chin radiator. It's the version that flew during the early-war blitzkreigs and the Battle of Britain, and it could carry a 1,100-pound main bomb. It had been preceded by the Ju-87A, the first production series, but the underpowered "Anton" really wasn't a combat-ready design.

The later Ju-87D, the "Dora," was an up-engined, more aerodynamic version with a streamlined canopy, a twin-gun rolling turret rather than the"Bertha's"single gun pivoting on a hole through the aft canopy, and only an oil cooler under the nose, the engine-coolant radiators having been moved to under-wing positions. The Dora could carry a bomb weighing almost 3,900 pounds, which the Luftwaffe felt it needed to penetrate major fortifications.

Between them came "the Stuka that never was," the Ju-87C. It was to be a tail-hooked, folding-wings navalised version, back when Germany was still working on its potent new carrier, Graf Zeppelin. Flown in prototype form, the C was cancelled when work on Graf Zeppelin stopped. Though legend has it that Leroy Grumman invented the Wildcat's twist-and-fold wings while playing with a paperclip, the Ju-87C also had wings that folded straight aft with the leading edges pointing down. The Wildcat's first flight preceded that of the folding-wing "Caesar" by almost nine months, but it's doubtful that either company was aware of the other's development work.

One of the Ju-87C's most unusual features was landing gear struts that could be blown off with explosive bolts, to allow the airplane to ditch without the fixed gear digging in and flipping it. This feature was carried over to the Dora, assumedly to clean the airplane up for a belly landing on rough ground. The Caesar also had four air-filled flotation bags—two in the fuselage, one in each wing—that supposedly would have allowed it to stay afloat for up to three days after ditching.

Armed with powerful 37mm Panzerknacker anti-tank cannons, the Ju-87G traded the role of dive bomber for that of a potent tank killer. (National Archives)

The Ju-87R (the R stood for Reichtweite, or range, rather than being part of a normal alphabetic progression) was a longer-legged version of the Ju-87B, and its extra wing tanks, which increased range from a supposed 340 miles to 875, were incorporated into most succeeding Stukas. Some Ju-87Rs were rigged to tow gliders—not to carry troops but to lug a Stuka unit's own supplies, tools, spares and other maintenance stores.

The Ju-87G, one of the most effective Stuka models, was no longer a dive bomber and didn't even have dive brakes. The G was armed with a huge 37mm, 12-round anti-tank cannon under each wing. The cannons used the barrels and receivers of a cumbersome flak gun that dated back to World War I, but they were potent against Soviet T-34 tanks. Firing one tungsten-cored explosive round at a time required a precise gunner. T-34s were most vulnerable from astern, where there was little armour and lots of gas. Good shots such as Hans-Ulrich Rudel, who claimed 519 Soviet tanks destroyed (see "Eagle of the Eastern Front," July 2011), could put a round into the unprotected space between the bottom of the turret and the top of even the most heavily armoured T-34's hull and blow the turret off. The top 58 Stuka pilots on the Russian Front eliminated some 3,700 Soviet tanks. But the Soviets were building that many new T-34s every three months in 1943, so Stukas were a small finger in a big dike.

Not all Eastern Front Stukas were tank-busters. Filling what must have been one of the most unusual military occupation specialties in any armed force, Sergeant Hermann Dibbel was one of several special Stuka skywriters. Every clear day, Dibbel would go over the Soviet lines in his Ju-87 and spell out in augmented exhaust smoke appeals to the Russians to surrender. Dibbel had already been credited with sinking a British cruiser and destroying 30 Soviet tanks, and he later flew similar missions over Yugoslavia entreating Tito's partisans to surrender. Whether or not his smoky appeals worked, they led him to a new career. After the war, he became a skywriting instructor.

The Stuka was finally reaching the end of its useful life. At the beginning of WWII, a Ju-87 had a life expectancy of 10½ months. By 1941, it was little better than half that, and as Soviet fighters found their groove after the disastrous first months of Operation Barbarossa, a Stuka could expect to live for just over four days of combat.

Only two intact Stukas remain—one in the Chicago Museum of Industry and the second in the RAF Museum at Hendon. Neither is flyable, though when the 1969 film Battle of Britain was in production, plans were laid to restore the Hendon Ju-87 to flight for use in the movie. A pilot from the film company, Vivian Bellamy, reportedly climbed into the museum Stuka, cranked it through three blades and the Jumo V-12 lit off and idled perfectly. But the project turned out to be too rich even for a film studio's mega-million budget. Instead, three Percival Proctor light planes were modified to resemble Stukas and were thereafter known as "the Proctukas," suggesting some fearsome medical instrument. They were also thereafter known as some of the most dangerous and barely airworthy aircraft ever approved for flight. Obviously unable to endure even the most gentle of dives, they were scrapped, and radio-controlled models were used instead.

It was either divine justice or a bad joke that the last operational Ju-87s in the world were two survivors flown as trainers after the war by one of the Reich's first conquests—the postwar air force of Czechoslovakia, which by then had become a Soviet satellite.

For further reading, frequent contributor Stephan Wilkinson recommends: The Junkers Ju 87 Stuka, by Peter C. Smith; and Junkers Ju 87, by Eddie J. Creek. Additionally, read about the legendary Stuka Pilot Hans-Ulrich Rudel's final mission, from the March 2015 issue of Aviation History Magazine.

Screaming Bird of Prey was originally published in the September 2013 issue of Aviation History Magazine.

Trimming with a Fixed Trim Tab

By Rob Knight

I was surprised recently to overhear (but not from less than 1.5 metres) a discussion regarding issues with correcting a yaw problem in level flight cruise. The issue was that at cruise RPM and cruise speed in an A22 Foxbat, the slip/skid ball was half a ball out. Neither of the conversation participants displayed any real knowledge of the purpose or principles of aerodynamics behind the device except that adjusting it might fix the issue.

For the record, the purpose of a fixed trim tab is to eliminate (or at least, reduce) the need to hold stick pressure to control small amounts of roll, pitch or yaw in flight. Generally, on all but the smallest ultralights, the elevator has an in-flight adjustable tab fitted because pitch control forces of the stick or yoke vary so much during a flight. However, roll and yaw suffer far less trim variations so a fixed tab on the ailerons or rudder respectively can be set and forgotten (at least in theory). In more powerfully-engines aeroplanes, nominally powered in excess of 180 horse power, an adjustable rudder trim is provided because the differences in yaw with different power settings and airspeed are more powerful. Some even have in-flight adjustable aileron trim as well, particularly if tip tanks are fitted and the variable mass of the tip-tank fuel quantities, being so far out from the aeroplane centre of gravity, create roll problems.

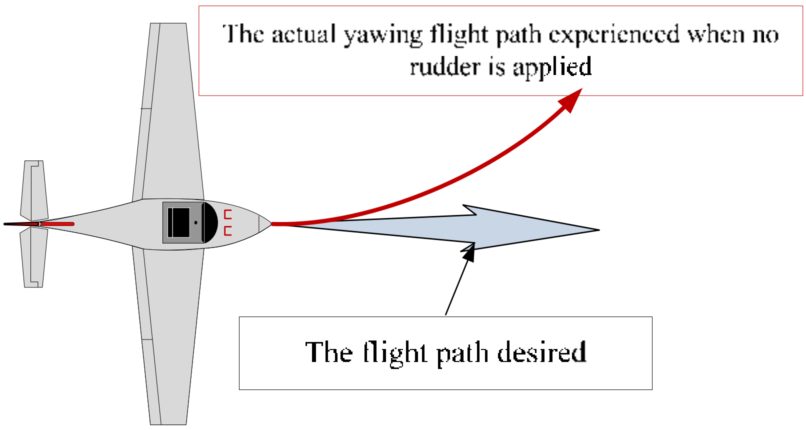
But here we are focusing on fixed trim-tabs, those very simple pieces of thin aluminium plate attached to the trailing edge of a control surface. Correctly set, they remove the need for aching limbs to keep your aeroplane flying straight or flying wings level.

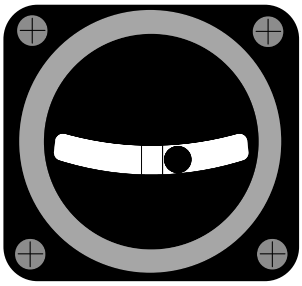
What does it look like -

The trim tab is a specially shaped piece of flat metal attached to the trailing edge of the control surface it is to aid. The image to the right shows a classic example.

Fixed rudder trim tab

To function, the tab will need to be bent slightly, in the case of the rudder, to the left or the right. This bend will provide a localised curved airflow that will utilise the latent power in the airflow to hold the control surface in a required position to ease pilot load.





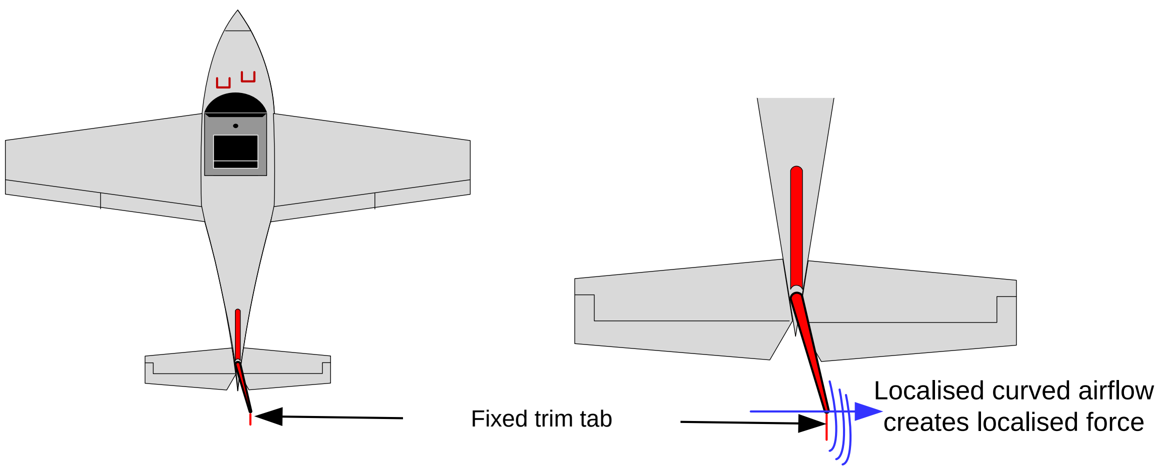
Slip/skid ball not centred. Indicates aeroplane not in balanced flight

The previous sketch displayed the aeroplane in level cruise at cruise power, tending to yaw to the left and not in balanced flight. To fly straight, directly towards a selected reference point on the horizon, the pilot will need to apply some right rudder. Remember the adage –

Balanced flight is no stress at all
If it's not in the middle – step on the ball

The cause of the imbalance is a force exerted at some point along the fore and aft axis of the aeroplane. If it is acting at a point ahead of the centre of gravity it will be FROM the right (starboard) or aft of the centre of gravity, from the left (port). A common cause is slipstream effect caused by the propeller creating a spiral slipstream flow which strikes more on one side of the aeroplane keel surface that the other. Whether the slipstream effect provides a force from the left of the right depends on the direction of propeller rotation and whether it is a tractor arrangement or a pusher.

The application of RIGHT pedal (because the ball is out to the right) will move the rudder surface out to the right and thus stop the yaw so the ball can return to the centre. The aeroplane will then be in a state of balanced flight, i.e., no slip or skid. However, a three plus hour flight holding right rudder is worse than tiresome – when it happened to me I couldn't walk when I landed and got out of a Tecnam P96, my right leg muscles were in lockdown.



Correctly set, the tab holds the control in position for the pilot

Now how simple is that? Once you determine which pedal needs to be pressed, the fixed tab needs to bent THE OTHER WAY. This is clearly indicated in the sketch above – the application of right rudder to balance the aeroplane indicates a yaw to the left. To correct left yaw requires right rudder so the tab needs to be bent left so the pedal load required to hold that left rudder is held by the action of the fixed trim tab.

We set fixed trim tabs to hold stick pressures for us when the aeroplane is set up for the longest flight condition period which is level flight. For most operations aeroplanes spend more time in straight and level flight than they do climbing or descending.

When an adjustment of a fixed trim tab appears necessary, always consider the whole airframe before the reset takes place. Check and ensure there are no issues that could cause added drag on one side, especially along the wings. In 1967, doing a check-ride in a PA28 Cherokee, I found considerable right rudder necessary to keep straight and keep the ball in the middle. The instructor huffed and puffed and complained about hangar rash and how I should have seen the tab was bent during the pre-flight inspection. After landing he was extremely rude to the engineer on duty and demanded an explanation. The engineer looked at the fixed rudder trim tab, and then walked around the aircraft. He bent down under the port wing and moved an apparently normal port wheel spat. The front of it cocked up, nearly vertical above the wheel. On releasing it, the spat sat neatly parallel with the longitudinal axis of the aeroplane – to all intents and purposed absolutely normal. The attachment had failed and there was no sign of its failure whilst on the ground. Fixing the wheel spat did remedy the problem.

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"Bad news, its curiosity"

FLY-INS Looming

(Assuming current antivirus legislation has been rescinded, of course)

04 July 2020	YWSG Watts Bridge	Brisbane Air Show
19 July 2020	YWCK Warwick	Jumpers and Jazz Brekkie Fly-In

Mysterious Aircraft - Tacit Blue

Tacit Blue.

In some situations the need for stealth outweighs aerodynamic concerns. Tacit Blue (see above) was created in the 1980s for such scenarios. It’s bubbly and boxy body allowed it to fly undetected by radar.

Tacit Blue, nicknamed "the whale" (and sometimes also called an "alien school bus" for its only slightly rounded-off rectangular shape), featured a straight tapered wing with a V-tail mounted on an oversized fuselage with a curved shape. It was the first stealth aircraft to feature curved surfaces for radar cross-section reduction.

The aircraft made its first successful flight on February 5, 1982, in Area 51, at Groom Lake, Nevada, flown by Northrop test pilot Richard G. Thomas. The aircraft subsequently logged 135 flights over a three-year period.

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

1. Under which circumstance below would an aeroplane's stall speed be lowest?
   A. Pulling out of a dive.
   B. In a turn.
   C. In straight and level flight.
   D. In a low speed steep climb.

2. Which of the following options is the most correct?
   A. Induced drag is caused by the pressure differential between the upper and lower surfaces of the wing.
   B. Decreasing weight increases glide range at best L/D.
   C. A higher density altitude allows the engine to develop more power because the less dense air provides less propeller drag.
   D. All the above are correct.
   E. A and B are correct.

3. Which of the following options is the most correct?
   A. An aeroplane has a smaller radius of turn at higher airspeeds because there is a greater airflow over the wings to provide lift.
   B. An aeroplane suffers a reduced glide range if flown at its best L/D ratio at an increased weight.
   C. The slipstream effect on take-off is greatest at the rotate for take-off point.
   D. Engine power applied will influence "P" factor on take-off

4. Overfilling your aeroplane engine with oil is likely to cause which of the following?
   A. The excess oil to overflow and become a fire hazard.
   B. Aerated oil and engine damage – perhaps failure.
   C. Increased hot oil in the galleries and thus leakage at the main seals.
   D. A high oil temperature indication on the cockpit instruments.
   E. A and D are correct

5. Spanwise flow, causing induced drag, is reduced when?
   A. The wing is tapered.
   B. Washout is used.
   C. Wash in is used.
   D. The angle of incidence is reduced.

See answers overleaf

Answers: 1, C, 2, A, 3, D, 4, B, 5, A

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.

1. Pulling out of a dive or turning both increase the aeroplane loading so the stall speed with increase
   A low speed, steep climb has no effect on the stall speed whatsoever. The aeroplane is merely closer to the stall,.

2. Gliding at the best L/D will give the same range regardless of weight provided that the airspeed for that best L/D ratio at the higher weight is used.

3. Agreed, there is less drag on the propeller at any given RPM, BUT the reduced combustible charge from the lower density atmosphere is the real issue. Flying higher DOES NOT provide more power. Otherwise we'd all be cruising around at 30,000 feet in ultralights

4. All options except option B are concoctions and false.

5. Spanwise flow (that part of the net airflow that moves outwards towards the wingtip in flight) is heavily influenced by the size of wing tip – the length of it's chord, if you like. The bigger the wingtip the more spanwise flow, and the more induced drag is experienced.

   A classic example is the different wing forms on the early PA28 and 32 series of Piper light aircraft compared with their Cessna counterparts and their flying characteristics.

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

Aircraft Parts and Tools

Item	Condition	Price
VDO Volt Readout instrument	Brand New	**$70.00**
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Contact Rob Knight at either kni.rob@bigpond.com, or call **0400 89 3632**.

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