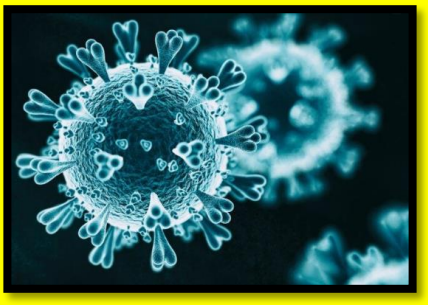
WAMASC Newsletter

July 2020

Chef des Fliegen (CFI)

Field Operations



P-Factor

Leaving the Ranks

should any individual have anything at all they would like to contribute, share or add to this newsletter, please feel free to contact the ***editor*** *through the* ***Club Secretary*** *via* ✉ ***secretary@wamasc.com.au*** *– enjoy*

Chef des Fliegen (Hauptausbilder) Feed-back

OK it is a catchy heading in German for **CFI** – but, hopefully, it caught your attention and you will continue to read this article.

So here are some words of feed-back re operations at the WAMASC field post recent observation(s) by the Committee.

Firstly, I would like to make a statement that it is impossible for one individual to police a field each and every day to ensure that all flight operations are 'done by the book' – nor would one expect that that particular requirement would ever be needed. It is not the job task of the CFI to do so. The fact is the onus is upon each and every individual person who is associated with Aeromodelling to be aware of the basic rules and comply with them thus setting a basic standard for a **safe flying environment**. That said if only it was that simple; it seems that the odd few just want to flout the norm, or just do not care for those Rules & Regulations.

The **April edition** of our **WAMASC Newsletter** purposely dealt with '**Rules & Regulations**' pertinent to our sport of Aeromodelling. As stated, these rules are not there by chance and are put in place for all and sundry to follow. They serve a purpose protecting our safety and the safety of others; they are **law**.

No one person is expected to know all the Rules & Regulations verbatim; but, should know where to find them. Those links were passed on in the April 2020 Newsletter which is accessible through the WAMASC Site.

It is not the intent of the committee to clip the wings of individuals for safety breaches. Events occur and one may be unaware of their faux pas. A simple talk and educational prompt may be all that is required.

However, continual breaches must be acted upon with action taken to ensure that it does not reoccur. We all understand that everyone just wants to have fun and fly – but that cannot be achieved without adhering to rules.

No offence or malice is directed to any member with this article and one would presume that if an individual is worth his/her salt they will agree with what is written and hopefully help educate others. I therefore must now address some of the noted observations of late and ask members to please make amends:

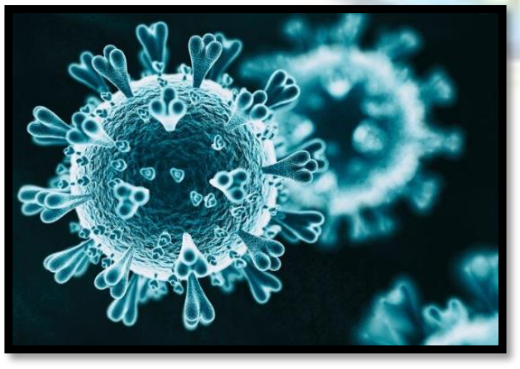
- When on the **Flight Line** please use clear and loud **verbal request(s) and notification(s).** That is signal and make obvious your intent (be aware that if you have requested to 'Take-Off' and not received confirmation – **you cannot proceed**). Call every intent for '**Landing**', '**Low Pass**' & '**Take-Off**' etc.
- Use a **Spotter** if more than four (4) pilots are Flying and please adhere to the **circuit**.
- Please remember that the **Sky** is not yours alone – other members pay their fees to use the same airspace which they may use and are entitled to do so at the same time as you.
- **Under no circumstances** should you ever be using an **alternate strip** as apposed to the **operational strip** that members are using and operating on – there can be only one (1) operational strip at a time (this offence often occurs during aircraft retrieval post landing – it does not take long to clear, please show some patience and restraint).
- **Do not ever fly behind yourself** (this includes between the **main strip** and **pit area**).
- Please remember **ceiling height** – 400' (unless CASA approval has been received (obtained) and only on the confirmation authority from Perth ATC).
- Pease do not **taxi** aircraft directly toward the pit area. Use **diagonal** approaches
- Remember that '**Fail-Safe**' settings are **mandatory**.
- Do not **arm** aircraft within the pit area.

Obviously the above are just a few, not all, but some of the required rules of our Club (WAMASC) as laid down by **CASA** through the **MAAA**. On top of this we have our own **rules** (**By-Laws**) that may be accessed via: https://www.wamasc.com.au/bylaws.

The previous April 2020 edition of our Newsletter pertinent to '**Rules & Regulations**' (in particular MOP's (Manual of Procedures) and various Forms) may be accessed via: https://d4df8149-6eb1-4549-a298-a01babeabd1d.filesusr.com/ugd/4df5fe_89a910e57ca444b487de35bbdb64aadf.pdf

No doubt you will have observed that most rules are generally just derived from plain old common sense. You are humbly asked to please be mindful of said **Rules & Regulations** – please do not take offence should one receive a reprimand of some description. You are asked to set an example to others and foster a safe flying environment for not just yourself; but, the betterment of your fellow Aeromodeller.

Doing the right thing is catching so pass it on. Most follow by example so let's set the right one.



Field Operations

In a very recent Newsletter, I passed on a message from the **MAAA** concerning the required action(s) and considerations to be taken during this uncertain and troubling time of the **coronavirus out-break**.

It would be a total understatement to say that this pandemic has seen life change very dramatically and caused us all to change the way we do and go about business. As well as we have 'tamed the beast' – the virus has not gone away, and many have become complacent. The risk of

contracting COVID-19 is still a very real possibility – the knock-on effect within our Club demographic would have devastating consequences. With the evolving situation as far back as Saturday, the 06th of June 2020 we saw further relaxation of restrictions that allowed congregations of personnel to increase from 20 to 100.

We are a little further down the track now and as of Saturday the 27th of June, further relaxations have come into effect with the 100/300 rule being scraped (removed).

What this means to WAMASC Members is that operations basically revert back to normal. We no longer have to worry about numbers at the Field hence can **remove** the requirement to register or book each time we attend.

You are further reminded that the '**Social Distancing**' protocol is still in place – the 2^2m rule remains in effect. Members are asked to continue and carry out and **safe hygiene** and **preventative practices**.

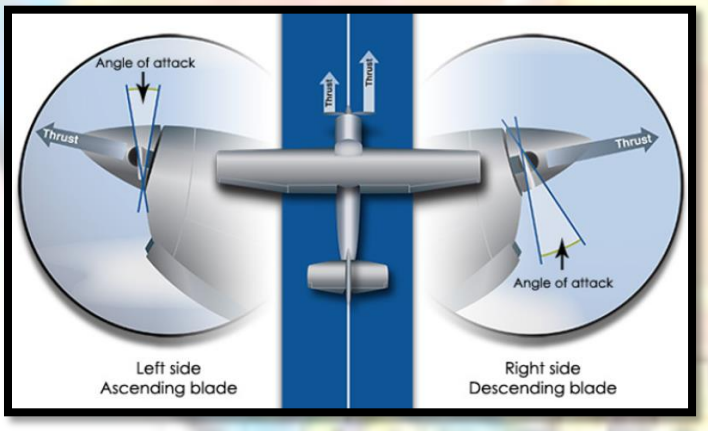
The main gate may now be left open as there is need to control public access.

The Committee request that **all** members please **wear** their **Membership Badges** (card) when in attendance at the Field – **no badge**, **no fly** (please note that as of the 01st of July 2020 should you not have procured a valid Membership you are no longer covered by insurance and will not be allowed to fly).

Vehicle parking is to be in designated areas only (i.e. no parking in the loading/unloading bays and only in the ACROD (disabled) bays with a valid permit).

P-Factor

WRT aeronautical phenomena many would have heard strange aeronautical terms mentioned such as **surge/stall**, **aeroelasticity**, **gyroscopic precession** and **ground effect** etc. I would like to rehash a topic that I have covered previously called **P-Factor**. The reason for doing so that it is not always 'dumb thumbs' that effect how your aircraft responds – it is often one of those hidden forces or phenomena at play.



Just think when climbing, you need some right rudder to keep the ball centred. If you perform a half roll and continue to climb upside-down, which rudder direction will you have to use to stay coordinated?

Why do we need right rudder in a climb, anyway? Is it because of slipstream rotation? The propeller drags some air around with it, and the airplane continually advances through this slipstream of deflected air. The fin, being behind the portion of the propeller disk where the blades are going left to right, feels a push to the right. But what about **P-factor**? When an airplane is nose-high, its propeller is tilted a few degrees upward with respect to the direction of its travel through the air, and a down going blade has a greater angle of attack than an up going one. The down going blade is on the right side, and so it tends to pull the nose of the airplane to the left. I once did some calculations that suggested the difference in blade speed that results from tilting the propeller is at least as influential as the difference in angle of attack, but that doesn't matter. The general principle remains the same.

A big problem with the P-factor explanation is that the pull to the left is felt early in the take-off roll – that is when the airplane (especially a 'Tail Dragger') is in a level attitude - but the pull is absent when the airplane holds the

same level attitude in flight. So at least some of the pull to the left has to be due to something other than the airplane's pitch attitude.

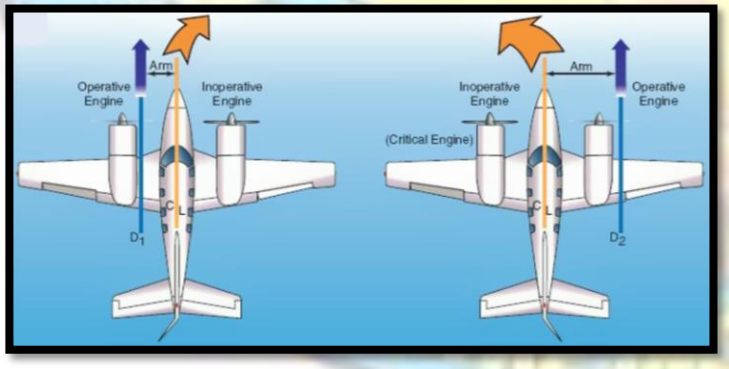
Another mysterious being is sometimes blamed: **torque**. Torque is the twisting force supplied by the engine to make the propeller spin. The natural effect of torque, if we did not do something to prevent it, would be to spin the airplane in the opposite direction to the propeller in the same way that a helicopter deprived of its tail rotor begins to rotate in the direction opposite to the main rotors. Torque and slipstream rotation are two sides of the same coin; part of the torque is imparted to the slipstream, making it rotate.

In flight, rigging, small aileron deflections, and the effect of slipstream rotation on the wings and tail cancel out torque, but at low speed on the ground most of the work is done between the tires and the pavement. Like everything else, it makes the airplane want to veer to the left. Once you're off the ground, the slight excess lift on the left side needed to cancel torque produces a small adverse yaw. Again, it pulls the nose to the left. Because all the forces at play pull to the left, it is difficult to tell which is doing what.

The beauty of the inverted-climb test is that it distinguishes between P-factor and slipstream rotation. To see why, imagine an airplane climbing, and that we are observing from a position behind and above it.

We have already seen how P-factor pulls the nose to the left and slipstream rotation pushes the tail to the right. To overcome these undesired movements, the pilot increases right rudder deflection. As the rudder deflects to the right, it produces an apposing force that pushes the tail to the left, and equilibrium is restored.

Well, almost. Actually, right rudder does neutralize the effect of slipstream rotation without producing any side effects. But when it neutralizes P-factor, the side force on the vertical fin is unbalanced. The airplane wants to slide sideways; an imperceptibly slight right bank is required to keep it going straight. This is a smaller version of the bank into the good engine that is needed when flying a twin engined aircraft on one engine.

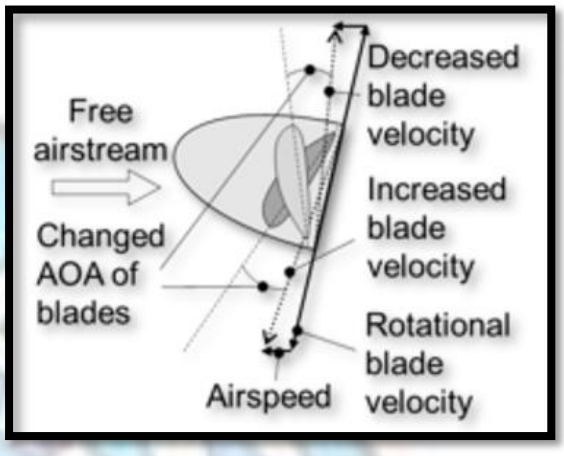


But just sticking to the big first-order effects, consider what happens when the aircraft rolls over and continues its climb inverted. The P-factor force still pulls left because the propeller looks the same when the airplane is upside-down as it did when it was upright. The rudder will still need to be deflected toward our — the observer's — right. But now the pilot (if there was one) is upside-down, and our right would be his left, so he would have to use left rudder input to compensate for P-factor. On the other hand, the vertical fin is now below the airplane, and so it is in the wake of the portion of the propeller disk in which the blades travel right to left. **Slipstream rotation**, therefore, wants to push the tail to our left, and the rudder will have to deflect to the left. The topsy-turvy pilot will have to step on his right rudder pedal to compensate.

Assuming that P-factor and slipstream rotation are the two major factors governing the need for rudder during climb, can a comparison of upright and inverted climbs reveal the size of their respective contributions? It may

be that Tail Dragger's experience an exaggerated leftward pull early in the take-off roll because both P-factor and slipstream rotation are at their strongest. Perhaps that is why so many runway lights have been flattened by P-51s.

P-factor is also referred to as **asymmetric blade effect** and also **asymmetric disc effect**. As eluded too and mentioned above, it is an aerodynamic phenomenon experienced by a moving propeller that is responsible for asymmetrical relocation of the propeller's centre of thrust when the aircraft is at a high AOA (angle of attack).



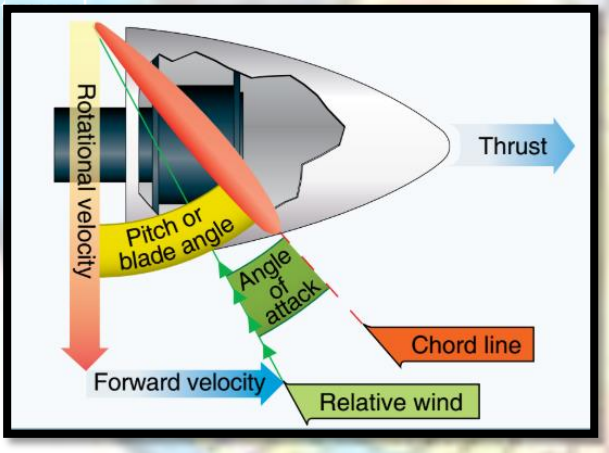
This shift in the location of the centre of thrust will exert a yawing moment on the aircraft, causing it to yaw slightly to one side.

A rudder input is required to counteract that **yawing** tendency.

Although it is not always evident it is often the cause of an aircraft traversing, or pulling, left at take-off (especially 'Tail Draggers') – it should not be associated with 'torque thrust or twist' which is counteracted at the time by the aircrafts wheels being in contact with the ground preventing roll effect. P-Factor will continue to affect the aircraft during take-off as the climb ascent angle is held – the greater the AOA, the greater the effect.

Causes

When an aircraft is in straight and level flight at cruise speed, the propeller disc is perpendicular to the relative wind. Each of the propeller blades will contact the air at the same angle and speed and thus the thrust produced is evenly centred across the propeller. As the aircraft's angle of attack increases and the propeller disc rotates toward the horizontal, the airflow will meet the propeller disc at an increasing angle. The propeller blades moving down and forward (for clockwise rotation, from the one o'clock to the six o'clock position when viewed from the front) will have a greater relative wind velocity and therefore will produce greater thrust, while propeller blades moving up and back (from the seven o'clock thru 12 o'clock position) will have a decreased relative wind velocity and therefore decreased thrust.



This asymmetry displaces the centre of thrust of the propeller disc towards the blade with increased thrust. In an aircraft with two or more propeller engines, P-Factor is what determines which engine is the critical engine. P-factor change of relative speed and thrust of up- and down going propeller blades at increasing angle of attack. P-Factor is sometimes erroneously explained with the word "**bite**", as in 'the descending blade has a bigger bite, or angle of attack, than the ascending blade'. This faulty explanation does not take into account the forward motion of the blades as aircraft's angle of attack increases. In order to better understand this concept, imagine a propeller aircraft moving forward with a 90° angle of attack (vertical). This situation is identical to what a helicopter experiences, but a helicopter can reduce or increase the angle of attack of individual blades of the rotor (decreasing the angle of attack on the advancing blade, while increasing the angle of attack on the retreating blade) in order to keep the lift of the rotor disc balanced. Because the force of the air on the blades moving forwards through the arc is

greater, they will produce more thrust than the blades that move backwards. If the blades of the rotor were unable to independently change their angle of attack, there would be a constant backwards rolling motion due to the increased lift on the side of the rotor disc with the advancing blade. In a fixed-wing aircraft, there is usually no way to adjust the angle of attack of the individual blades of the propellers, therefore the pilot must contend with P-Factor and use the rudder to counteract the shift of thrust.

Effects

Single engine propeller aircraft

The aircraft has a tendency to yaw to the left if using a clockwise turning propeller (right hand), and to the right with a counter clockwise turning propeller (left hand). The clockwise turning propeller is by far the most common. The effect is most noticeable during the climb phase after take-off and in-flight conditions with high power and high AOA.

Multi engine propeller aircraft (clockwise rotation)

As with single engine aircraft, situations where the aircraft is at high power and has a high AOA (such as take-off) will cause a slight, but noticeable yawing motion. The engine with the down-moving blades towards the wingtip produces more yaw and roll than the other engine because the moment (arm) of that engine's thrust about the aircraft centre of gravity is greater. Thus, the engine with down-moving blades towards the fuselage will be 'critical', because its failure and the associated reliance on the other engine will require a larger rudder deflection by the pilot to maintain straight flight than if the other engine had failed. For most aircraft (which have clockwise rotating propellers), this is the left engine.

Note: propeller rotation orientation is always deemed as if one was sitting in the aircrafts cockpit looking forward – hence; looking forward from the rear.

Leaving the Ranks

We all like to fly; but just turning up at a Field and being able to operate, doesn't eventuate without the dedication of some exceptionally talented and dedicated people working constantly behind the scenes – there is no magic fairy. One of those talented individuals is Roy LEWIS who has dedicated a lot of time and effort toward his fellow Aeromodeller.

The WAMASC Committee would like to pass on their sincere gratitude and thanks of appreciation to our ex Chairman, **Roy LEWIS**, who recently tendered his resignation and stood down. Some would not be aware that Roy, did, for a short time, take up the mantle of Vice Chairman, but has now decided to move on and have a well earnt rest. This move will see him somewhat relieved and freed of the burdens, workload and responsibilities required in the daily running of WAMASC thus enabling him to focus on other tasks and family matters.

In what ever endeavour you pursue in the future; we wish you well Roy – you will be sadly missed. On behalf the committee, and all WAMASC members please accept a most sincere thank you for your efforts. You have performed a most sterling job over your tenure. Roy, of course, will be staying on as a dedicated member of

WAMASC and will no doubt be able to offer and give guidance when sought. We hope that after a rest and re-charge you will consider coming back to the ranks.

It's better to be on the ground wishing you were in the air, than in the air wishing you were on the ground.