Waikato Aviation

Safe Operating Practices

Manual

(SOPM)

WAIKATO AVIATION

Go Beyond

Rev 0 - 1st Sept 2023

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Record of Revisions

Revision No	Revision Date	Incorporated by
0	1 Oct 2023	W Nicol

Summary of Latest Changes

Page	Comment

1. Introduction

The Waikato Aviation Safe Operating Practices Manual (SOPM) is provided to guide the decision making and actions of students and instructors by outlining safe operational principles and practices. The purpose of this manual is not to teach basic flying techniques, rather, it is provided to help frame and guide the way pilots should think and manage their flight.

Within the context of this manual, a practice is more principled and practical in application than a procedure. That being said, the guidance provided in this manual **should be followed** unless an alternative approach is considered more appropriate due to the lower risk and greater safety margin that it provides.

As with any new skill set learnt within an unfamiliar environment, ab-initio pilots often suffer from focusing in on the detail of how they should replicate a specific technique well. This can narrow one's attention from considering how to best operate the aircraft to optimise the overall safety, effectiveness, and efficiency of a flight.

Taking an overall safety approach to flying requires experience and learning.

Therefore, the purpose of this SOPM is to help accelerate and consolidate that experience by brining focus on those practices that will assist a training pilot become more confident and competent in operating with a broader mindset of managing their flight in consideration of risk and do so in an effective and efficient manner.

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Waikato Aviation

1st October 2023

Part A – Preparation and planning

2. Understanding yourself and others.

Aim

Know yourself and more importantly your limitations. Accept that you will make mistakes and the best you can do to develop yourself is to be open to feedback correction and self-directed improvement.

To communicate with people politely and respectfully. To develop positive working relationships with people that are collaborative and not competitive or counterproductive.

Risk

The risk is deciding not to address personal defence mechanisms. This will inhibit an openness to learn and take correction. Defence mechanisms normally rationalise and project onto others an error. At worst, a pilot might flatly deny any responsibility. A defensive worldview significantly restricts a pilot's personal development or an ability to positively collaborate with others.

Poor understanding of others leading to disharmony and if unresolved emotional tension, can hijack effective decision making and put at risk a flight operation.

Practice

During your training ask yourself the question, "what makes you learn and perform well"? Pilots learn differently and it is important that you understand your learning style. You may be a visual learner (pictures), an auditory learner (listening), prefer understanding through reading and writing or learning through practice (doing).

It is also important that you understand how you behave under stress. There are three main types of stress, physical, physiological, and psychological stress. When under stress, certain hazardous attitudes can manifest. These are anti authority, impulsivity, invulnerability, machoism and resignation. Different pilots will display different hazardous attitudes in the same situation. You will need to counter this by understanding your inclination and then make a definite decision to counter it with a better response and course of action.

Hazardous Attitude	Description	Antidote
Antiauthority	Don't tell me	Be compliant, there is a reason for the procedure
Impulsivity	We must do this now	We should take our time on this decision
Invulnerability	It won't happen to me	It could happen if we are not careful.
Macho	I can do this easily	I'm not competent to do this at the moment.
Resignation	What is the use?	This is not hopeless, there is another solution

Wisdom is about understanding the importance of what you do now is **critical** for the future benefit of yourself and others. If you are defensive and resist opening yourself up for improvement and taking responsibility for your errors, you will not improve as a pilot. If you do not work collaboratively with others, you will not improve as a pilot. Change does not just happen as a result of you being trained. Meaningful and holistic change only happens from the inside out.

The behavioural markers of a maturing professional pilot are.

- Understands personal limitations, open to correction and feedback.
- Comprehensive preparation and procedurally disciplined.
- Adaptive, flexible, and principled in practice.
- Inquisitive and open to learning, growing, and adjusting perspectives.
- Sees the big picture and thinks ahead pre-emptively.
- Safety and risk referenced.
- Collaborates well in a team, has a team first approach, understands the other perspective first and seeks to learn from others.

3. Understanding threats and risks.

Aim

To observe and comprehend prior to flight your operational environment so that you are well attuned to any threats. Whether you are carrying out a local training flight or a cross country flight, your consideration of the flight should start well before you walk out to the plane and your understanding of the flight environment must be comprehensive and multi-dimensional.

Risk

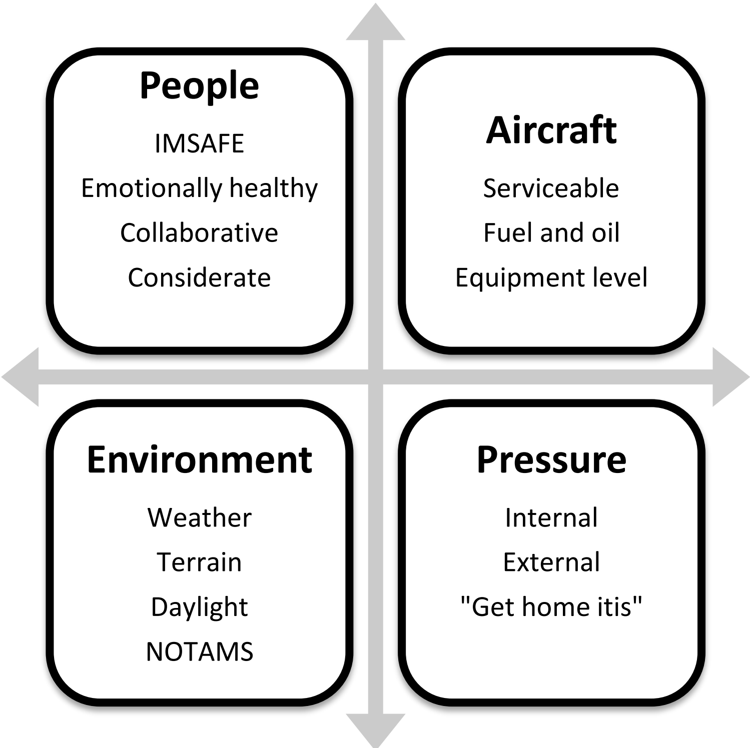
If you don't have a comprehensive understanding of the flight environment, you will have limited awareness of present and future threats. A degraded awareness elevates risk and when an unanticipated deviation from the norm occurs, safety margins are quickly compromised. As a result, less options are able to be considered and generated due to poor situational awareness.

Being attuned to possible threats cannot be limited to a snapshot in time. You need to place your flight within a **timeline** that is impacted by both past and future events, e.g., the maintenance check just completed, or future poor decision making due to emotional fatigue you are presently feeling.

Practice

Start your flight well before you get to the aircraft. Build a comprehensive picture of your flight and all of the factors that will influence it. Start big picture and work to the details. e.g., with the weather using go-preflight, start with the mean sea level charts, then GRAFOR etc before looking at the TAFS and METARs. Become skilful in interpreting the big picture first and carefully consider the **trends.** Become skilled in using all of the information e.g., cloud imagery as this can help develop and frame the big picture and assist with trending cloud/frontal movement.

When we consider all the elements that comprise a flight, we should always be framing our understanding against the **risks** that we must manage and mitigate in the four areas outlined below; As with the weather example, start big picture and consider each of these areas across the timeline of the proposed flight. What has happened and what do I anticipate will happen.



With numerous threats present, an effective mitigation strategy is ALWAYS to have a **PLAN B** option, that is carefully considered and planned before flight and updated during the flight. This is a **critical safety consideration.**

4. Understanding the importance of the B7 authorisation form.

Aim

To not disregard and become complacent when completing the B7 authorisation form.

Risk

Deciding that the B7 form is burdensome because of familiarity. This will likely detune a pilot to the purpose of the form which is to focus attention on key operational considerations and risks that are critical to safe flight.

Practice

The B7 form is a tool for gathering important information and focusing a pilot's attention on those areas of the flight that are safety critical.

When completing the form, you should use it to

- ensure you are compliant with all requirements to ensure safe outcome.
- prompt your thinking across the four areas of risk i.e., people, aircraft, environment, and external pressures.
- use the form to build a picture of the flight, the threats perceived, and mitigations planned with redundancy (plan B) options considered.

Are you happy to go without flight following? If the wind changes as forecast, will the cross runway be long enough? What emergency equipment should I have onboard for flying across the Southern alps? What is my last take-off time from Masterton if I am to be back in Hamilton before night and what margin should I include? Is there fuel at Dargaville? Should I be concerned with strong mountain waves up the Kaikoura coast etc? Should I really go, I have not slept well the last 4 nights, the weather looks challenging, the options limited?

Use the B7 form to both focus and mature your risk management skills. These are skills that need to be developed through careful consideration and review. *Did I have appropriate mitigations in place. Was my plan B appropriate or should I have considered a plan C?*

While the B7 form may present as being a box ticking exercise, **you can't afford to think of it that way**. It is there to guide your thinking and have you develop an awareness and competence of managing risk effectively.

Part B – Pre-flight and taxi

5. Patterns and structure.

Aim

To apply a structured approach to a flight and operate with repeatable memory-based patterns so that both situational awareness and safe operations are maintained.

Risk

Without structure and clear operational patterns, when a distraction occurs during flight, whether during the pre-flight or in the air, a pilot will be more prone to missing critical checks or procedural items. A breakdown with a procedure due to a distraction without a clear memory-based structure/pattern can very quickly limit a pilot's situational awareness and cause a pilot to channelise their attention.

Distractions are a risk to any operation and can occur during your planning stage, the aircraft pre-flight or in flight when completing a checklist or briefing. Many accidents occur either due to a distraction in the first instance or because of a pilot's inability to complete a flight safety critical procedure due to workload saturation.

Practice

First, understand the reason for a procedure so that the practice has meaning., *e.g., why is it important to carry out and instrument check during taxi? Why do we carry out an emergency brief prior to take-off?*

Second, place the procedure within the broader operation of the overall flight so that its value is seen not in part but contributing to the overall safety of the flight. *e.g., after take-off checks ensure that after take-off, that the aircraft is configured for the climb and that under full power stress, the engine is indicating stable readings, and the aircraft can be seen with the appropriate lights on. This gives confidence that you are safe to leave the aerodrome of departure with an aircraft that is performing normally.*

Third, come to understand the importance of establishing memory based clear structures and patterns of operation.

Key phases of a flight that should be structured and subject to repeatable patterns are,

1. Planning phase
2. Aircraft pre-flight
3. Pre-take-off checks and procedures
4. In flight checks and procedures

Operating with defined patterns aids memory recall and enables a pilot to stop a procedure if required for safety reasons and the re-enter it with clarity and consistency.

6. Checklists and SOPs.

Aim

To operate in accordance with a checklist and procedural methodology that is appropriate for the aircraft type and operational complexity.

To understand the importance of applying a consistent method of carrying out checks and operating procedures so that safe operations are maintained during all phases of flight.

To be compliant with the Aircraft Flight Manual procedures, especially with respect to safety critical procedures.

Risk

The main risk is having an attitude of disregard or ambivalence towards checklists and procedures and not understanding the important place they have in being the interface between the human and the system.

This can lead to the inconsistent application of a checklist and/or procedure, which introduces risk when a pilot is placed in a complex and time critical situation.

Practice

Light non-complex single engine aircraft e.g. C172 can be safely operated using both geographic flow and memory checks that are prompted by acronyms.

More complex single/multi engine aircraft i.e., DA42, or operations i.e., IFR, should incorporate checklists that are consulted to ensure a checklist item have been completed. An effective method for complex single pilot operations is for the pilot to complete the checklist items as part of a geographical memory flow but then refer to the checklist to confirm all items have been completed.

Waikato Aviation checklist philosophy for single engine VFR operations is either by a geographical flow or by memory items that are based on an acronym.

A checklist folder is provided in each aircraft, and these should be consulted when a pilot is not confident in their memory recall due to a lack of operational currency.

Pilots prior to solo operations must be competent and consistent in the flow and recall of all checks as per below.

Flight Phase	Checklist Method
Pre-fight - first walk around check	Flow
Pre-fight - cabin check	Flow
Pre-fight - instruments and lights check	Flow

Pre-fight - outside inspection check, fuel and oil	Flow
Pre-start	Flow
Start	Flow
After start	Flow
Taxi	Flow
Engine runup	Flow
Pre-take-off	**TTMCPFFIIHC**
Emergency and Departure Brief	Flow
TEM Brief	**TWOP**
After take-off	**F**lap**I**nst(**F**uel pump)**L**ights
Climb	**SADIE**
Cruise	**SADIE**
Approach plate brief	Flow
Pre-landing	**BUMPFHL**
Finals	**F**lap**M**ix**S**table
After landing	Flow
Shutdown	Flow

When under training or when flying solo, pilots should **confirm verbally** that the particular checklist is complete e.g. *"runup checks complete", or, "after take-off checks complete"*, *"cruise checks complete".* This informs both the instructor and confirms with the pilot that the checks are completed.

Be **practical and appropriate** with your briefings so that they have contextual relevance, e.g., TWOP check. Only highlight those items on the list that are relevant on the day. If the weather is blue sky, light winds and good visibility, move on and only address those TWOP items that require review due to an elevated risk.

Teach yourself always to be contextual and relevant and not robotic in your assessment and response.

7. Planning.

Aim

To develop a mindset of arriving for a flight at Waikato Aviation with a pre considered awareness of the conditions and appropriate planning and preparation strategies. This approach promotes foresight and assists in helping pilots make informed decisions and navigate uncertainties with greater situational awareness and confidence.

Risk

Poor planning introduces significant risk to a flight primarily due to the negative impact it has on a pilot's situational awareness. This hinders the ability of a pilot to assess, comprehend, and respond to the environmental changes in a timely manner, increasing the likelihood of errors, and or, undesired outcomes.

Practice

Whether your flight is a local training flight or a cross country flight you should arrive prepared and in good time before your flight as per the requirements outlined in the Waikato Aviation SOR Manual.

You should review your previous flight(s), consolidating and refreshing your understanding of the techniques and procedures learnt. If you are aware of a new procedure to be covered in your next flight, e.g., going to a new aerodrome, or new airspace, then brief yourself on these procedures to enhance your understanding and situational awareness. Basically, get ahead of the game and commit information to memory, even if it is information that you are required to brief e.g., instrument approach.

If you are preparing for a cross country flight, apply a logical and structured approach to reviewing the required information so that information is not double handled. Establish your own pattern of preparing for a navigation flight that is reliable in ordering you thoughts and providing you with the required information.

A. Is the plane and the pilot good to go?

1. Aircraft serviceable, pilot serviceable IMSAFE

B. Is the weather good to go?

2. Weather suitable big picture to small picture, then actual weather and trends

   Synopsis > GRAFOR > AAW > SIGMET > METER > TAF

C. Is the airspace and aerodromes and ATC system good to go?

3. NOTAMS applicable, airspace and aerodromes suitable

D What is my Plan B or mitigation strategies based on the conditions and risks?

E. Do I have the information to complete the flight?

4. Charts and plates available

F. What are my navigation (track/alt), fuel, payload and performance calculations?

5. Flight log completed.
6. Fuel requirements
7. Payload available
8. Take-off and landing requirements

Once you have been trained to prepare for a flight, the expectation is that are to you present to the sign out instructor in logical order your flight planning information. The **student should lead the instructor through the process logically outlining their planning**, thinking and risk mitigation strategies similar to the process above A-F.

8. Aeroplane pre-flight.

Aim

To carry out the aircraft pre-flight in a consistent and logical pattern without distractions covering all required items so that the aircraft is assessed as being airworthy and therefore safe to fly.

Risk

Inconsistent and unreliable un-patterned approach to pre-flighting an aircraft with distractions is a risk. The risk is an unairworthy aircraft, which can be due to a physical unserviceability or an expired item on the tech log.

A comprehensive pre-flight should occur after the aircraft has just come out of a maintenance check, or, if it has been inactive for a long period of time. Water contamination can be a risk and so a comprehensive check of the fuel system should occur if water is observed in a fuel sample.

Practice

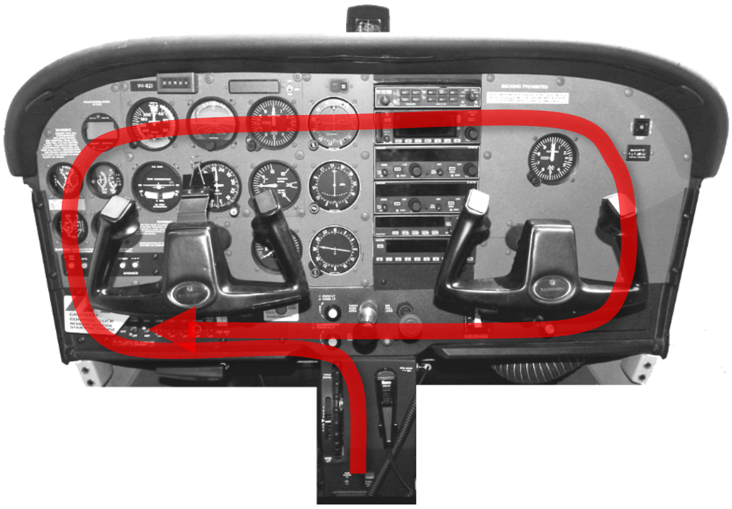
1. Initial walk around.

First place your flight bag and equipment in the aircraft and check that the control locks are removed. Walk around the aircraft once to check that the aircraft is not tied down, that all covers and blanks are removed, windscreen is clean, all doors and lockers are unlocked, and that the aircraft looks to be serviceable e.g., nothing observed to be unusual with the condition of the aircraft.

2. **Internal cabin check.**

   Carry on an internal cabin check, starting from the back and moving forward to make sure that the aircraft is tidy inside (remove rubbish), nothing in the baggage lockers, seat belts stowed, and that all documentation and emergency equipment is correctly located e.g., AFM, checklist folder, local map, first aid kit, fire extinguisher and axe.

3. **Instrument power OFF flow check**



   Staring between the seats, carry out first an **electrical power off check** of the engine and instrument systems as per the diagramme above . During the first flight of the day, exercise the mixture, throttle, ventilation/cabin heating levers as well as the alternate static vent.

4. **Instrument power ON flow check**

   Now select the battery on and select the flaps down and check all the lights that are legally required for the flight **or** will be using as part of the flight.

   Once you have checked the lights, turn off the battery switch.

5. **External pre-flight check**

   Carry out the external pre-flight check in accordance with the checklist which follows the AFM.

   Pay special attention to lose or "smoking" rivets (which have a residue around them), the security of all bolts and nuts, and safety-wired devices. Two basic nuts are used on airplanes: self-locking nuts have internal features that keep them from unscrewing, so they do not need safety wiring; and non-self-locking nuts need an external locking method. They may use lock washers, be drilled for a safety wire, or have castellations (a "castle" nut) designed for use with safety wire or cotter pins.

Regardless of the type used, ensure that the locking method is in place, because it is designed to keep the nut from working loose in flight.

Check the security of control hinge fasteners, especially on piano hinges. Some aircraft have airworthiness directives (ADs) requiring periodic inspections or maintenance of piano hinges with centre wires, which have been known to fall out.

When checking control surface movement, check for rubbing metal by looking for wear or chafing marks on the paint. Feel for any hesitation or binding in the movement and listen for rubbing sounds. Any unusual indications require further investigation by maintenance.

Make sure that the windscreen is clean inside and out. Your eyes tend to focus on something close. Dirt and bugs on the windshield can lead you to miss things in your traffic scan.

6. **Fuel and oil checks**

Normally you can combine the fuel and oil checks with the external pre-flight. If the aircraft has been inactive for a while and you are concerned about water contamination, it is better to drain the fuel before moving/rocking the plane to not disturb any water from away from the pick-up drain points.

When checking the oil, make sure you take a **"mental picture"** of the oil dipstick in its proper closed position such that you can recall by memory prior to start that the oil dipstick is in position.

If you need to increase the oil level as part of the pre-flight, the safest option is to relocate the dipstick in its closed position prior to topping up the oil. **It is critical** that you are not distracted when topping up the oil and you complete the process without interruption.

9. Final walk around.

Aim

To ensure that between the pre-flight checks and aircraft start, that the aircraft with passengers onboard is in a ready state and no items have been missed.

Risk

Often the period between the pre-flight and startup for departure can be busy, managing people and completing last minute tasks etc. Also, between flight sectors on the same day, you will not carry out a full pre-flight. Therefore, it is possible that without a structured final walkaround check, items may be missed that could introduce risk e.g. baggage door left open, engine blanks left in place, persons jacket left on the horizonal tailplane.

Practice

Just prior to entering the aircraft and after securing passengers in their seats (instructors in position) a final walk around check shall be carried out to ensure the aircraft is in a ready state. The final walk around should be in the same direction as the external pre-flight inspection.

This final walkaround inspection also provides a natural break between the business of preparing to depart and the focus that now needs to be directed towards flying. It provides a transition time for the pilot to focus on flying the aircraft.

10. Passenger Brief.

Aim

To carry out a consistent and clear passenger brief that follows a logical sequence in assisting passengers in their memory recall when under stress of a real emergency.

Risk

Providing an inconsistent and poorly structured passenger brief confuses passengers degrading memory recall therefore elevating risk.

Practice

The passenger brief should cover two key areas, (a) **comfort items** and (b) **safety brief.**

What follows is an example

Welcome on this flight to Whitianga, flight time is 45 minutes, and our route is direct, and the weather is forecast to be smooth.

For your comfort, *the air vents are positioned above you and can be turned on by turning the knob clockwise.*

Sick bags are in the seat pocket in front of you located inside the blue paper bag.

Please tap me on the shoulder during flight if you need to ask me anything.

For your safety, *seat belts should be on and firm for take-off and landing and can be loosened during the cruise. No smoking at any time and cell phones can be used during flight. (VFR flights).*

In the unlikely event of an emergency landing, first

- *Stow lose items down at your feet.*
- *Make sure your seat belts are firm and brace just prior to landing.*

Once we have landed.

- *Release your seat belt by lifting the latch.*

- *Vacate the aircraft by the front door, open that door by moving the door handle up and back and pushing it open.*
- *Vacate to an area in front to the aircraft.*
- Once it is safe to return to the aircraft (no fire), we can do so re retrieve emergency equipment and personal items.

Any questions?

Maximum safety impact will occur if during the emergency descent, you are able to **repeat the safety component of this brief**. Repetition aids memory and clarity especially when operating under stress.

11. Aeroplane pre-start procedures.

Prior to starting the aircraft engine, a flow check is to be carried out to determine that the aircraft is prepared for start. The same flow as the instrument power off check shall be followed (excluding exercising the levers).

Once the flow check is complete the battery (and alternator) shall be turned on, lights selected on as required and the engine primed for start see flow above.

Just prior to starting, a good lookout is required in front, to the sides and behind the aircraft checking that the slipstream will not impact anyone.

12. Aeroplane start procedures.

Aim

To start the aircraft in accordance with the AFM procedure and best practice and not to exceed any starter motor limitation and ensure that once started that the aircraft is not moving forward and the engine systems are indicating correctly.

Risk

In the process of trying to start an aircraft, damage to the aircraft starter system can occur due to overloading (too long start cycles) or by reengaging the starter motor when engine is running. Additionally, and more serious is the possibility of an engine fire due to over priming.

Practice

If you are not confident with starting the aircraft engine, under various conditions, then ask an instructor to teach you again. Different techniques are required depending on whether the engine is carburettor or fuel injected, hot or cold.

Some aircraft have primers, and these can be troublesome if they are worn, and struggle inject the right amount of fuel with each prime.

Follow the AFM procedures for a cold and hot start. If you are unsure how "hot" the engine is, follow the hot start procedure initially.

Normally you should prime the engine with the throttle set 2 cm in. Then when starting the engine, start with the throttle in the minimum idle position and slowly increase the throttle as the engine is cranking to slowly open the air butterfly valve to the idle position i.e., 2 cm in. The engine is more likely to start with the throttle approaching the 1000-1200 rpm idle position.

If you think the engine is about to start, then release the start switch. This can be all that is required for the engine to start. DO NOT keep cranking the engine thinking that you cannot release the starter motor until the engine has starter and is idling. Releasing the starter motor is often all that is required to unload the engine from the starter, to allow it to start.

Do not, continue to crank the engine more than six seconds. Do not reengage the starter with the engine turning. Do not continue to crank the engine once the engine has started.

Once the engine has started, your priority is to check that the aircraft is stationary with the brakes holding and then bring your eyes inside to check oil pressure rising into the green. Piston engine manufacturers require that the oil pressure indicates in the green after 20-30 seconds.

Once the engine is idling smoothly and engine instruments are indicating correctly, you can select the Avionics Master ON and select the appropriate VHF frequency. While the taxi to the runup area at Hamilton is not controlled, it is good practice to have the tower frequency open to be in contact with the tower if required.

13. Aeroplane taxi procedures.

Aim

To taxi the aircraft away from the apron area with maintaining a safe lookout, following a predictable path and at a constant speed and power incorporating all required taxi checks.

Risk

Taxiing around a busy apron is a high-risk activity. People can easily become complacent and distracted when on an apron. The greatest risk is more likely to come from a taxiing aircraft where the pilot becomes distracted and has the eyes inside for far too long. A high level of vigilance is required when taxiing, especially when coming back to the apron after a flight as the pilot may be tired and have lowered their concentration. Anytime an aircraft is taxing on an apron and close to other aircraft and activities, eyes MUST be out front and NOT inside.

Practice

Prior to brake release, have a good lookout and think about what might happen? *Will those passengers from that aircraft walk towards the club house in front or behind your aircraft?*

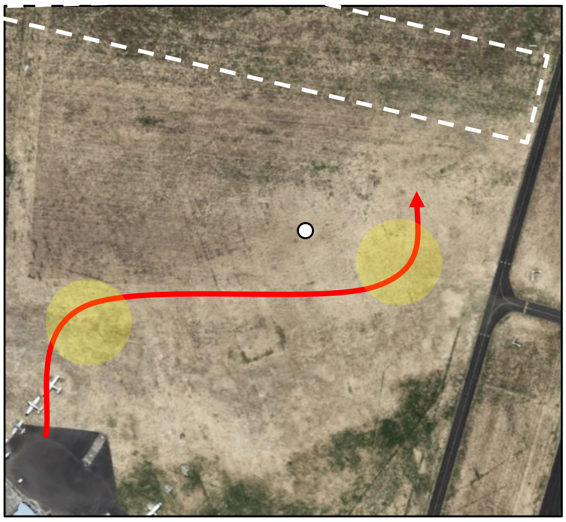
After releasing the park brake, roll forward and within 2 metres, carry out a brake check. It is better if this can be completed on the concrete pad before the grass as more power will be required to move the aircraft again on the grass especially when wet and soft.

Priority when taxiing away from the apron is eyes outside and no instrument checks shall be completed before you are positioned well away from the apron.

Taxi in a predictable manner (straight lines). The aim of taxiing is to taxi at a **constant speed while using a constant power** and to resist large and sudden increases of power while at a slow taxi speed. Large increases in power can suck stones up into the propeller arc.

Normal taxi speed is a fast-walking pace. To come to a stop, reduce the power to min idle and then brake. Normally we should not apply brakes against power, i.e., "dragging the brakes".

When taxiing to the runup area, try to limit the number of turns you make. Turn right hand through 90^0 heading east to track towards taxiway Charlie, and then turn 90^0 to the left heading north to taxi into the runup area. Turning through a reasonable arc provides more time to observe your instruments during the instrument check and limits the "S" turn method which can be unsettling for passengers.



When the wind strength is > 10kts, position the flight controls in accordance with the AFM guidance. Make it a habit when taxiing on a sealed taxiway to taxi just off the centreline of the taxiway and always try to taxi accurately when on a taxiway.

After landing and before taxiing into the apron area, a brake check should be completed to confirm brakes are serviceable.

14. Aeroplane run-up procedures.

Aim

To complete engine run-up checks as per the AFM procedure, observing all engine indications carefully to assess serviceability of the engine and systems prior to take-off.

Risk

Disregarding abnormal readings or sensations or rushing engine runup checks. e.g., magneto drops, engine vibrations, abnormal smells etc. This can lead to marginal engine performance, engine damage or engine failure.

Practice

Aircraft should be parked into wind, or with light wind, away from the sun.

Do not rush the checks.

Before running up the engine, the engine should be adequately warmed. Refer to the specific aircraft AFM.

For the Lycoming IO-360 engine, the following principles should be followed.

If the engine has been idle for more than 2 hours in ambient temperatures less than 10^{0}C (Cold), after starting the engine, the engine RPM should initially be set to 1000 RPM max for at least a minute and then increased to between 1000 and 1200 RPM for smooth running. The engine and oil will be at temperature for runup after 4 minutes from start up. Furthermore, as a check that the engine is at temperature for both the runup and subsequent take-off, when increasing the power for runup, the engine should accelerate smoothly and then decelerate smoothly to minimum idle and maintain an idle of between 650-750 RPM.

If the ambient temperature is greater than 10^{0}C (Warm), after starting the engine, the engine RPM should be set between 1000 and 1200 RPM for smooth running. The engine and oil will be at temperature for runup after 3 minutes from start up. Furthermore, as a check that the engine is at temperature for both the runup and subsequent take-off, when increasing the power for runup, the engine should accelerate smoothly and then decelerate smoothly to minimum idle and maintain an idle of between 650-750 RPM.

Pilots shall avoid prolonged idling at 1000-1200 RPM for longer than is necessary as this practice may result in fouled spark plugs.

Check area is clear around and behind for slipstream effect. Smoothly and slowly increase the power to AFM stated RPM.

Check first brakes are holding then check that temperatures and pressures remain in the green under higher RPM.

Carry out remaining checks as per AFM including carb heat check, magneto check, electrical load and voltage check, vacuum system check, annunciator panel checks followed by min idle RPM check.

Take your time and select power settings smoothly and slowly and use all your senses to ascertain that the engine and the aircraft's systems are serviceable i.e. visual indications, vibrations, smells and sounds.

15. Aeroplane emergency, departure and TEM brief.

Aim

To confirm the departure procedure, identify potential risks and refresh emergency drills and actions so that the departure is compliant, and all risks are minimalised.

Risk

A loss of situational awareness on the departure due to poor procedural understanding or threat identification.

Catastrophic outcome in the event of an emergency due to poor planning, suboptimal decision making and timely actioning of emergency checks.

Practice

The accident error chain often starts on the ground with poor threat awareness and decision making.

Be clear on the departure briefing. It is not ideal to ask for a "18 east departure". Rather request a departure to the East and have ATC determine what the departure should be. This may mean that you are cleared to climb to 2000ft which provides more time to action checks in the situation of the engine failure.

As per section 6, when it comes to applying the TWOP acronym to identify risks, apply in contextually and practically. Focus in on the real and present threats that are apparent and consider carefully and brief how you will mitigate them.

The emergency brief is important. Carry out the brief as per the checklist and combine your memory items with **physical touch drills**. Motor memory is extremely helpful in providing timely responses when you are under shock e.g. When you verbalise, *"I will lower the nose, power to idle, and select a landing area in front"* actually action lowering the nose by moving the control column forward and reducing the power etc.

Brief all three scenarios, (1) abort on the runway, (2) abort airborne runway remaining (3) abort airborne with no runway remaining.

Finally, review and state from previous observation where the best landing sites are located so that in the event of an engine failure climbing out, you are primed with possible options depending on point of failure during the climb out.

Part C – Take-off, departure, and local flight operations

16. Take-off.

Aim

To carry out a take-off accurately adjusting for conditions and in accordance with the planned performance parameters.

To accurately assess the take-off performance so that if poor performance is determined, an aborted take-off can be carried out safely.

Risk

Poor situational awareness with respects to local conditions and their effect on take-off performance risks a reduction in safe operating margin.

Practice

On entry to the active runway, i.e., crossing the yellow hold line, aircraft strobes and lights should be selected on. Once aligned the runway centreline, check DI, windsock and reference points.

The most effective performance check is based on the calculation that at 70% of Vr (54kts) the aircraft will achieve 50% of its TORR (ground roll). Under standard conditions, nil wind at Hamilton and at a AUW of 2400lbs, the C7172's TORR is 250m. Therefore, at a distance of 125m, the airspeed should read approximately 38kts. A verbalisation of "speed check" when taking off recognises that the aircraft has achieved 38kts at or before the 125m distance (about two runway white edge lights).

As the aircraft accelerates through the speed check, back pressure should be applied to take the weight off the nose wheel and then the aircraft should be rotated in accordance with the AFM specified loft off airspeeds.

Once airborne, select the visual nose attitude for the initial climb airspeed (75kts C172), check wings level and aircraft in balance and then the focus should be out the front of the aircraft maintaining the required climb attitude and a lookout.

When selecting flaps up, coordinate holding the nose to maintain the attitude and the airspeed will accelerate slowly to 80kts. Once speed is stable at 80kts carry out the after-take-off checks by memory. Confirm flaps are up, indicator and visual, engine temperatures and pressures stable, fuel pump off (if on) and lights off as required.

When selecting fuel pump off (PA28) at the same time check the fuel pressure gauge to ensure pressure us being maintained by the mechanical fuel pump.

It is important to take your time to properly assess that the aircraft is configured and operating within normal parameters before you fly too far away from the point of departure. That is the reason for the after take-off checks.

17. Departure.

Aim

Departure safely from an aerodrome ensuring that the aircraft aviates safely, navigates accurately and the pilot communicates appropriately and maintains a listening watch on all frequencies that boarder the frequency zones i.e., CTR/CFZ.

Risk

Poor workload management with a focus on the wrong items to the detriment of following the Aviate – Navigate – Communicate procedural cycle. High density traffic presence around aerodromes is a risk. It is important that vigilance is high (workload low), lookout effective (nose attitude appropriate) and communication clear and accurate (in terms of stating position and intentions).

Practice

Maintain a good rate of climb until 1000ft agl after take-off. It is generally better to be higher, than faster in the event of an engine malfunction/failure after take-off.

Passing 1000ft agl (FLWOP low key point) when a high rate of climb is no longer required, it is much safer to then transition to a cruise climb. The cruise climb attitude should position the nose on the horizon line so that the horizon can be easily referenced by the pilot. An airspeed closest to the nearest 5kts should then be selected. This airspeed will vary between 90-100kts depending on the aircraft AUW and environmental conditions, but the pilot should nominate an appropriate airspeed based on experience. This should provide at least a 500ft/min climb rate.

When climbing to moderate altitudes (5000ft) at a mid-weight, cruise climbs should always be utilised as they provide,

- safer lookout
- better engine cooling
- better flight stability
- reduced trim change when transitioning to the cruise.

When approaching the border of two frequencies, **both frequencies** should be open for the period approaching **and** passing the border, e.g., 123.25 and 126.8 on an east departure or arrival from Hamiton. While ADSB is effective in locating other ADSB aircraft, not all aircraft in Glass G airspace will have ADSB. Therefore, it is important not to become complacent with a visual lookout or listen out.

ADSB is also not able to locate birds. So, always remain vigilant with your lookout.

The standard airspeeds selected for the take-off and climb out represent a compromise in performance and lookout and are appropriate to training weights i.e., 2200-2400 lbs in the C172 and PA28. If operating the aircraft at MAUW, you should reduce these airspeeds by approximately 5 kts and operate at Vx, Vx10 and Vy. Adjust your attitude/airspeeds to maintain safe margins and this normally requires operating at Vy etc when at MAUW under higher density altitude conditions.

18. Transit.

Aim

To transition from the training area back to the departure aerodrome (or visa versa) applying effective non-technical skills therefore enhancing safety

Risk

To relax your vigilance en-route is risky. It is easy to have a complacent attitude especially when you have completed the same short transit leg many times before. Navigating overhead built-up areas or flying at low altitudes unnecessarily can place the aircraft in a vulnerable position if something were to go wrong.

Practice

Always transit at the highest altitude possible on the day. Flying for a long time at 1000ft or below is risky and you should weigh up the risk/benefit of such an operation.

If you can, depart and arrive from/to Hamilton at 2000ft. You should ask for this higher clearance altitude it if you observe there to be limited traffic in the vicinity.

Plan your transits on routes that provide you with an adequate forced landing option. When you fly your transit routes, note where the optimal landing areas are located, e.g., along the Waikato River on the east arrival etc. You should resist flying over the centre of Cambridge or Hamiton city without complying with CAR 91.311, i.e., at an altitude from which you are able carry out a forced landing into a suitable area without hazard to persons or property.

Ideally the minimum safe height is when after an engine failure, there is time to trim the aircraft for Vglide and search for a landing area before commencing the glide descent from the 1000ft low key position.

19. Local training operations.

Aim

To maintain safe separation and adequate situational awareness while attention is focused on a flight exercise.

Risk

To be distracted by the lesson objective and training process to the detriment of maintaining appropriate levels of separation, situational awareness and listening watch.

Practice

You might consider that giving your full attention to the lesson and the training provided is the only objective. It is not. Maintaining situational awareness and safe separation is.

Situational awareness not only relates to your position in relation to other aircraft, airspace and terrain. It also concerns your awareness of the aircraft you are flying, the operational environment you are flying in, the pressures influencing you, and yourself.

To maintain your SA with regards to the aircraft, you should make sure you are completing a SADIE check **every 15 minutes** checking that the aircraft's systems are stable and operating within their normal range and that the calculated fuel remaining is approximately indicated on the gauges.

Gaining a higher level of awareness comes from not just observing your temperatures and pressures to be in the green range, but where in the green range. Having this level of awareness will provide you with an awareness of any trends or abnormal indications. Similarly, you should attune yourself to the normal amperage that the alternator provides in charging the battery under normal load.

Fuel is a critical commodity, as is daylight and your health. Maintain a close eye on all of these critical commodities to make sure that you guard them with your life.

If you are under training and a radio transmission is made by another aircraft in your vicinity, stop any discussion or patter with/from the instructor to prioritise your listen out. This is important. Never rely on your ADSB readout to confirm traffic. Keep making frequent radio calls on the local area frequency, **every 15 minutes** and manage your radio selection and listen out to optimise your situational awareness. This might also include only having one frequency open when operating in controlled airspace limiting the possibility of radio interference.

Use all of your lookout tools in your toolbox, these include, eyes, ears and instruments (ADSB), normally in that order.

If you are feeling fatigued or dehydrated, you should stop the lesson to reduce the physiological and physical load on yourself and consider returning to base.

Finally, you MUST maintain a constant, comprehensive, and active lookout. This is not to be limited to the lookout you carry out prior to an exercise, e.g., medium turn (lookout in the opposite direction and then in the direction of the turn). Rather, a constant and comprehensive lookout MUST be applied before you change the direction (left or right) and flight path (up and down) of the aircraft by any amount.

Part D– Emergency Handling

20. Emergencies.

Aim

To be proficient in handling emergencies due to a comprehensive level of situational awareness and the timely application of checklist responses that results in the safest outcome achievable.

Risk

Lack of familiarity and competence in responding to an emergency can significantly increase risk beyond the initial level. Both technical and non-technical skills need to be active and effective in providing a pilot with a response framework that carefully considers and implements the lowest risk option.

Practice

It is important that you are able effectively recall the emergency checklists by memory for all of the key emergencies that can occur in light aircraft, these being,

- Engine failure - after take-off
- Engine failure cruise - low level (1000-1500ft agl) or high level (3000ft agl+)
- Engine – rough running
- Engine Fire – on start and in the cruise
- Electrical fire
- Cabin/Wing fire
- Electrical fault
- Inadvertant flight into cloud

Key to responding proficiently is having an effective memory recall of the checklist items but with broad understanding of why the response sequence is important, e.g., with an electrical fire, the broad principle is to stop what's feeding the fire, i.e. electricity and airflow (close vents), wait and see if the fire goes out, and if not, then apply the fire extinguisher noting that the cabin will need to then be ventilated.

The same approach can be applied to most emergencies, e.g., rough running engine or electrical fault etc. Review the checklists in the AFM to deepen your understanding of the required responses at a principled level. This will then guide your actions more effectively as you apply the checklist items.

One further example is the EFATO. The key principles are to ensure that the aircraft keeps flying, lower nose to V_{glide}, then select the most suitable landing area with glide range/profile and turn towards that area. These are the priority actions.

Then carry out initial reaction checks, (fuel pump/carb heat) and apply flaps as required to position the aircraft onto finals profile.

Then once you are on profile, select V2 on, and if you have the time turn off fuel, mixture, ignition and masters.

A lack of experience makes it difficult to determine the level of response that is warranted by the emergency. A common response is to treat the emergency with less urgency than what the potential risk requires.

Golden rule: If you experience any abnormality where the outcome is ambiguous and indeterminable, **get the aircraft on the ground as soon as possible**. It is always better to be on the ground even if you have overreacted than continue flight with the possibility of a deteriorating situation. Light aircraft these days are very reliable. Therefore, on sensing an unusual situation, you should get the aircraft on the ground as soon as possible. Some examples of this are, trending oil pressure and temperature away from a stable reading, smell of fuel in the cabin, oil smear on the windscreen, slight electrical smell, engine vibration etc. Rather than flying past Matamata when returning to Hamilton, divert immediately land at Matamata!

21. Scenario based training (SBT).

Aim

To be placed in a dynamic and immersive learning experience that closely simulates real-world situations that requires simulated by comprehensive and real responses.

To apply non-technical skills effectively under pressure and manage complex situations, whereby the safest option is prioritised.

To develop competence and confidence so that you are well-prepared to handle unexpected challenges that may arise during an actual flight and are able to frame your responses on previous training scenarios.

Risk

Approach SBT with half-hearted and truncated responses that do not provide opportunity for comprehensive and effective learning. The result can be missed learning opportunities and ineffective skill development that increases risk if an actual emergency were to happen.

Practice

When training under a scenario, your mindset should always be to treat it like a real event. All actions and responses must be modelled on what you would do if it was a real emergency, e.g., Mayday call in full, actions and responses in full as you would have to do in a real situation.

Scenarios should not be terminated prematurely, rather, they should be allowed to continue to a conclusion that models a real-world outcome.

As an example, you are flying from Tauranga to Hamilton and just past the Kamais you notice an oil smear on the windscreen and a slight increase in oil temperature and slight decrease in oil pressure. What follows is guidance outlining what you should **do** under this scenario?

- Reduce power to the V_{glide} airspeed and maintain altitude.
- Divert to Matamata straight away.
- Look for suitable landing areas en-route in case the engine fails and try and ascertain wind velocity on the ground.
- Monitor your instruments and look for worsening trends.
- Make a Pan Pan call on the most helpful frequency (Hamilton tower), push V2. (Verbalise but do not transmit).
- Change to 122.25 and broadcast your intention to NZMA traffic.
- Inform any passengers of the situation and plans.
- From overhead the airfield descend onto finals following a glide descent profile so that if the engine should fail at any point, or if you are required to shut it down, you can glide in to land on the active runway.

The above decision-making process above follows the acronym A-B-C-D-E-F-G that will be expanded in section 22 below.

Key decision-making points.

- Stabilise the aircraft's situation as best you can.
- Get the plane on the ground asap.
- Never give away altitude.
- Monitor the situation to see if there are worsening trends and react accordingly (adjustment)
- Ensure you inform people of what is going on (external) ATC or other aircraft, (internal) passengers.
- Try and position the aircraft so that if the most catastrophic situation occurs you can safely get the aircraft onto the ground.

22. Two stage emergency model.

Aim

To respond to a non-time critical evolving emergency with a decision-making model that resources the pilot by providing a logical process to managing the emergency.

Risk

A poor structured and undefined response to an evolving emergency can introduce additional risk.

Single Stage - response

An effective response model is A-B-C-D-E-F-G.

A = **A**irspeed – appropriate for the situation e.g. Vglide or Vendurance

B = **B**est landing area into wind with 1500/1000ft agl key point selection

C = **C**ause/trouble checks – F-M-I-I-P

D = **D**istress communication – other aircraft or ATC

E = **E**mergency brief - passengers

F = **F**inals checks – off checks

G = **G**et out – ensure resourced on the ground with suitable equipment

This acronym is obviously logical and simple to apply and while it frames the standard FLWOP, it can be used to guide the decision making of the pilot in other similar emergency scenarios whereby the aircraft is not able to maintain altitude.

A = **Airspeed**
Speed to height
Initial Reaction checks
Trim for Vglide attitude

B = **Best Field**
Select Wind
Select Landing area
Select aiming 1000ft 1500ft

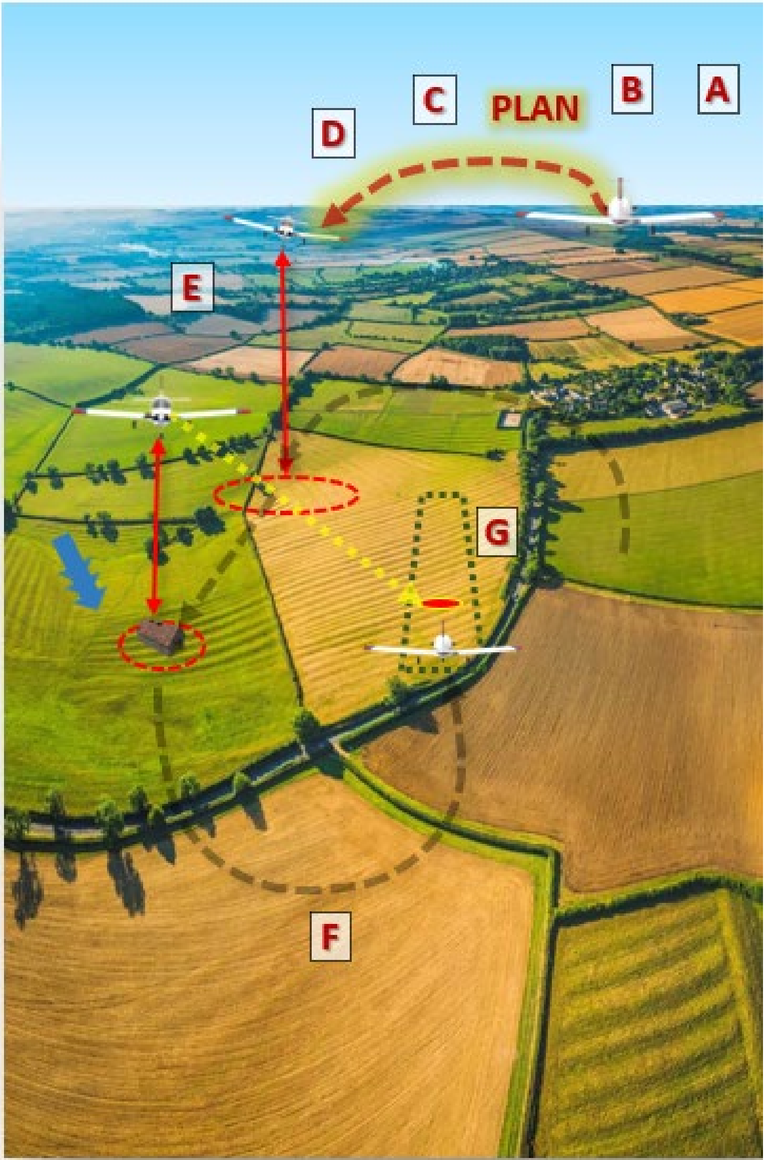
PLAN your descent to 1500ft

C = **Cause/Trouble Checks**
F M I I P
Assess → TRK 1500ft

D = **Distress Call**
Mayday V2 ELT 7700
Assess → TRK 1000ft

E = **Emergency Brief**
Secured Exit Return

F = **Finals Checks**
F M I M H



G= **Get out** … return if safe for emergency equipment

Two Stage - response

The two-stage response is better applied to non-time critical responses whereby the pilot has more time to consider options and the risks associated and come up with the best plan to execute.

In the situation of a non-time critical situation the A > G model should be applied twice, firstly to guide the response of the pilot to prepare for the possibility of an off-field landing while continuing to monitor the situation and consider other options as the emergency continues.

Two stage scenario.

You are flying from Ardmore and to Hamilton and south of Lake Waikare you reduce power to descend from 4500 to 2500ft. As you reduce power the engine starts to run rough.

Applying the **two stage** model your response should be as follows.

Stage 1

A= you decide to maintain the power at 2100 RPM but level out to conserve altitude and the **airspeed** stabilises at 90kts. You carry out initial reaction response (carb head on and fuel pump on) as applicable to the aircraft type.

B= you then look for a **best landing area** below orientated for a light southerly wind. You select some long darker green fields and take your time to determine your 1000ft and 1500ft agl key points and decide to circle around slightly upwind of the area so that if the engine fails, you will be able to make your 1500ft key area.

C = you try to determine the **cause** of the rough running and action the rough running checklist. You adjust/check, fuel, mixture, carb heat, ignition and check T's and P's. You are not able to remedy the situation, so you continue circling making sure you remain upwind and always within gliding distance of the 1500ft agl point.

D = you contact Hamilton tower, with a **Pan Pan** call and provide them with your position, what the issue is and your plans and ask Hamilton to inform Bay that you may enter the 2500ft area. You activate the V2 emergency button so that Waikato Aviation is informed.

E = you inform your **passengers** of what the situation is and what your plans are at this stage and remind them that they should stow lose items, tighten seat belts and provide instructions on how to vacate the aircraft and where the emergency equipment is located.

Time passes and the engine runs rougher and to maintain altitude you note that your airspeed is reducing to V_{glide}. While you have some time, you look for other landing areas that would be more suitable (closer to help) and consider whether you could continue to Hamiton.

You conclude that the landing area you have is suitable and to continue to Hamilton would be riskier. You now consider whether you should make a descent into the landing area under a controlled and partial power descent. The engine instrumentation is not indicating anything unusual so you think that the issue might be a fuel or air induction issue. You decide to start your descent to the 1500ft area and reduce power slightly. At that point the engine stops.

You commence **Stage 2** of the decision making model.

A= trim for V_{glide} **airspeed**

B= you have your **best landing area** and because you have been circling upwind, you adjust your track to make your 1500ft key area.

C = having tried to determine the **cause** previously you decide to move onto the next check

D = you now contact Hamilton tower, with a **Mayday call**. They already have your location on radar and have sent emergency services to your location. ELT ON and transponder to 7700.

E = you complete the **emergency brief** and inform your **passengers** of what the situation is now and if you have time confirm them that they should stow lose items, seat restraints should be firm and provide instructions on how to vacate the aircraft and where the emergency equipment is located.

F = approaching base leg to **finals,** turn off the fuel selection, mixture lean, mags off and masters off once electric flaps are down.

G = **Get out** and walk away from the aircraft upwind. Consider the situation and whether it is safe to return to the aircraft to retrieve emergency equipment and phones etc.

Key points

- Allow the two-stage model to provide you with a framework to (a) guide your actions, (b) decision making and (c) risk-based option generation.
- Remain adaptable, if you have time and altitude and see a more suitable landing area, then as long as our can reach one of the key points, replan your response.

- Learn from memory and understand this model and the principles of application. A solid understand will allow you to apply it in a number of different scenarios.

Part E – Approach and Landing

23. Approaching the aerodrome to land.

Aim

To have planned your workload requirements effectively and be situationally aware of the environment so that all risks are anticipated and mitigated.

Risk

When returning to land after a flight or training lesson, it is easy to relax and switch off. Aerodromes elevate risk by the mere fact that they intensify flight activity. That can be in the form of the number physical aircraft present or the pilot's increased workload requirement.

Practice

Manage your workload so that you are able to receive the ATIS and complete your approach and pre-landing checks. Do not carryout these checks sequentially as you will need to pace and space your tasks to remain situationally aware as you approach the aerodrome.

Try not to plan your workload when you are approaching reporting points e.g. St Peter's when coming out of the L464. Your workload should be completed prior to this point e.g., ATIS received from within L464 so that you remain situationally aware as you approach high density reporting points

As with your departure, have two radio frequencies open as you operate close to a frequency zone but when established within a CTR / MBZ consider only having the one frequency open to limit interference.

Take time to perceive and comprehend the aerodrome environment and what impact this will have on your approach and landing.

- What direction are aircraft coming from, what do I anticipate their joining pattern to be and projected plans i.e., missed approach and onwards flight path, land and taxi in etc.
- What do I assess visually the environmental and meteorological conditions to be. Wind gradient or shear? Turbulence due to local obstructions? Sun glare? Slippery grass surface due to dew? Any applicable NOTAMs to recall? Remember, ATIS does not include a number of other conditions that can introduce significant risk. You need to recognise these risks yourself and mitigate their impact.
- Based on the conditions, how should I plan my circuit join so that I can stabilise my approach from base leg and turn onto finals at the correct distance and altitude? Do I need slightly more power (windy) or less power (light winds).

- If I am asked to extend downwind at circuit altitude, when should I start my descent from circuit altitude so that I can intercept the same approximate 3º profile. Halfway on base leg or even on finals?

If you are not sure of your clearance from ATC, or not sure about the plan and intentions of another aircraft, clarify with ATC or other aircraft. A lack of clarity or misunderstanding elevates risk.

24. Pre-landing brief.

Aim

To assess accurately the landing conditions, mitigate any risks and be clear of your margins and options.

Risk

To many aircraft run off the end of runways or suffer from a landing excursion. Section 29 on Situational Awareness highlights some of the barriers to maintaining situational awareness. Poor perception, task overland, misplaced motivations or even one's theory of practice are all very real factors that distort a pilot's accurate assessment of a (landing) situation.

Practice

Be aware of the barriers to maintaining situational awareness. Develop your assessment skills and critical thinking skills so that you are able to assess and mitigate risk.

As part of the pre-landing brief, once you have completed the **physical** BUMPFHL **checks**, then it is time to apply your **threat checks**. Make a threat assessment of the conditions and mitigate the risks you observe.

<u>Threat assessment</u>

- Gusty, increase your approach speed by ½ the gust factor. Decide on a go around point if your approach is not stable.
- Crosswind, land with a reduced flap setting, or, land on the cross runway, or, divert.
- If the wind is calm, don't land into a low and setting sun, land with the sun behind you.
- If the wind is calm, anticipate a flatter descent profile due to higher ground speeds and adjust your position on base/finals and power settings to make sure you are not high on approach.
- Anticipate known areas of up/down drafts on final under certain conditions.

- Recognise areas of mechanical turbulence and adjust your approach airspeed accordingly.
- Assess if you are under pressure, rushing workload or are operating under bias. Go around if need be.

Decision Point 1 – Stable approach 200ft agl

- If I have not completed my checks and I am not stable, I will go around. Stable = configured, on centreline, on profile (3-500 fpm), on airspeed (+/- 5kts)

Decision Point 2 – Down and Braking by 50%

- If I am not down and braking by 50% of the runway length, I will go around, e.g., this point is located abeam taxiway E landing on 18L.

Part F – Taxi in and Post Flight

25. Taxi in and post flight.

Aim

To taxi in safely and complete all operational and administrative tasks effectively.

To return the aircraft to the flight line and secure it appropriately for the next flight ensuring that the aircraft is either fit for purpose, or any issues regarding its airworthiness have been effectively administered and communicated to the appropriate person responsible.

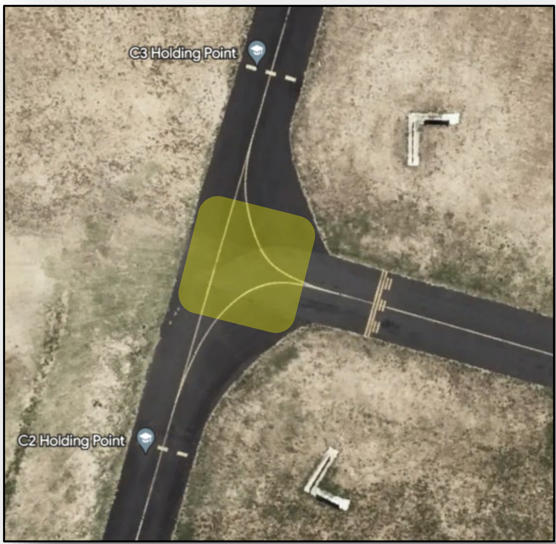
Risk

Distractions when taxiing an aircraft back to its parking area introduce risk.

Incomplete handover of the aircraft back to the operations desk elevates risk especially if the aircraft's airworthiness condition or the reporting and recording of important information is not accurately completed.

Practice

After landing, taxi clear of the active runway and bring the aircraft to stop before completing the after-landing checks. Ideally this should be completed on a sealed surface i.e., Taxiway Charlie and not on the grass.



This stop should also be used to confirm that the brakes are operating effectively prior to taxiing into the Waikato Aviation apron area. If you stop on the grass in winter, you may require additional power to get moving again and the brake check might not be as effective than stopping on the sealed taxiway.

When taxiing into the apron area, taxi in straight and predictable paths. Your eyes must be outside the whole time looking for the potential of conflict.

Try and maintain the aircraft's momentum onto the parking blocks by coordinating power with use of brakes and turning to maintain a reducing but still steady taxi pace i.e., don't slow to a stop just prior to the parking area requiring a large increase in power to move forward.

Once in position, check that the park brake is on, and that the aircraft does not move forward with feet off the brake pedals. Select 121.5 to check that there is no transmission on the emergency frequency. Complete shutdown checks.

With the aircraft scheduled to fly again, the control lock should be installed, and the cabin and seat belts left in an orderly and tidy condition. All documentation should be in their stored location.

Normally the wing tie downs should be attached as the wheels are not chocked.

Walk around the aircraft to check for any abnormalities e.g., flat tires, oil leaks/stains, signs of bird strike etc.

On returning to the club house, complete all paperwork tasks immediately and communicate with maintenance control and/or operations if there are any issues to report.

Part G – Cross Country Navigation

26. The navigation technique.

Aim

To navigate accurately by applying a simple but reliable methodology that can be applied when operating with limited features and in poor visibility situations while maintaining positional and situational awareness during the flight.

Risk

To rely solely on GNSS information or hope for unrestricted visibility and recognisable geographic features to facilitate navigation safely.

Practice

The NZCAA has specified appropriate navigation techniques. These include dead reckoning (DR) with the application of the 1/60 rule to provide corrections to intercept the original track and recalculate arrival times, if after a period of time, the aircraft deviates from the planned track.

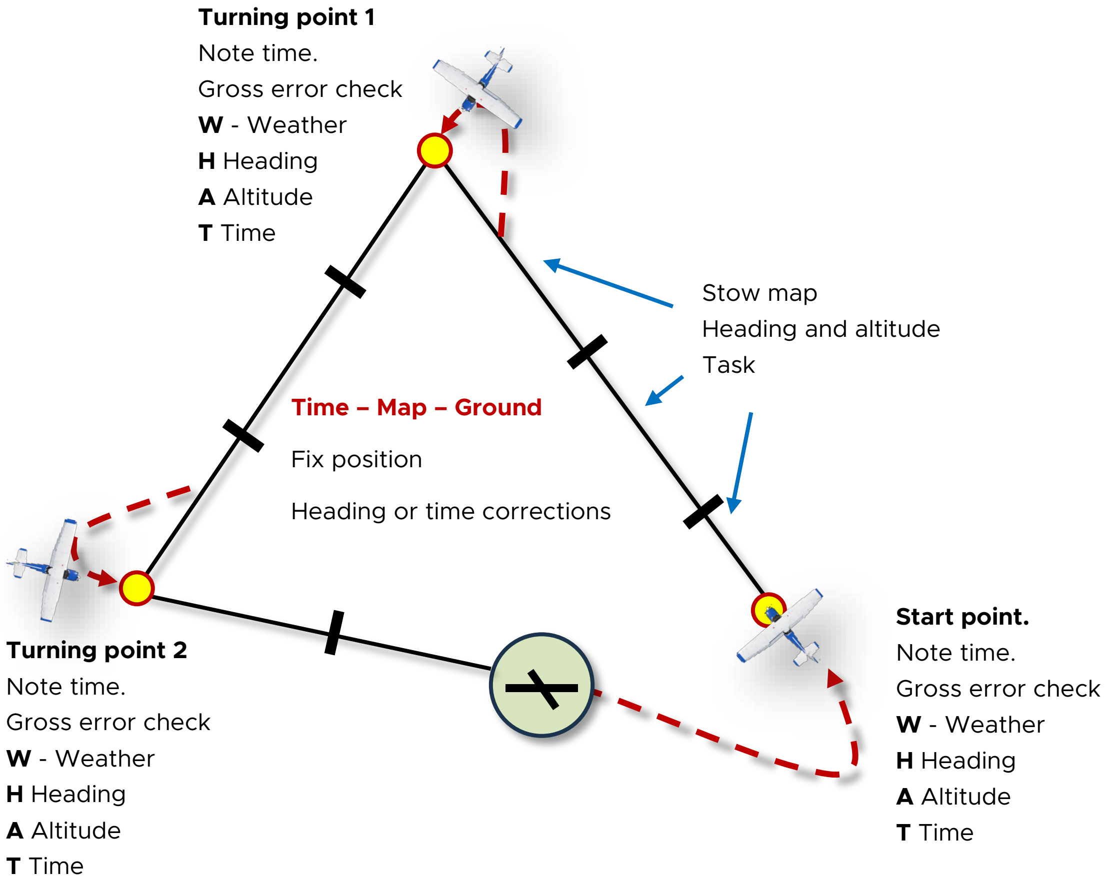
When visibility is reduced and you are flying over a featureless landscape, it is important that you are skilled in DR and can determine your position by reading from map to ground rather than ground to map.

Reading from map to ground means that your pre-flight navigation planning information is put to use, and you are able to closely estimate your position by holding your calculated heading and then after a period time at your calculated ground speed (=distance) you are able to ascertain an approximate location on the map.

From this approximate map position, the actual position of the aircraft can be determined visually by reading from ground to map and the pilot can then calculate the aircraft's deviation from track in (nm) and corrections to ETA in (min). Corrections can be applied using the 1/60 standard closing angle (SCA) calculation.

This is an important technique because it gives the pilot the skills to revert to basic navigation techniques.

The methodology is applied more as a work cycle, and this helps the pilot to navigate with repeatable time-based functions.



27. Flight management.

Aim

Carry out a cross country flight applying effective non-technical and threat and error management skills so that the safety of the flight is optimised.

Risk

Under high workload and in an unfamiliar environment, the risk is that safe margins and situational awareness are significantly compromised.

Practice

Preparation is critical to establishing an acceptable level of situational awareness. This preparation shall be comprehensive in accordance with the B7 authorisation form.

During preparation, the **critical commodities** must be considered and calculated. Fuel – fuel log, Daylight – last take-off time, pilot wellbeing – IMSAFE check.

All **cockpit resources** required for the flight shall be ordered and accessible with minimal disturbance required during flight. i.e., maps properly folded, flight logs completed with VHF frequencies stated in order of use, landing plates easily reference in order of use.

Poor resource management is observed by an over focus on organising resources in the cockpit during flight to the detriment of maintaining SA.

After **departure**, take-off time and set heading times should be noted and the aircraft positioned to the departure point or a key feature located on track that is outside of the CTR. At this point the gross error check and WHAT checks re carried out.

- Gross error - looking at my track and the features along my track, I confirm I am heading in the right direction.
- Weather – the weather is suitable for this leg in the direction of travel. No diversions required.
- Heading – My heading is 165º. I will check my DI and compass and then set a heading of 165º.
- Altitude – I will climb to 3000ft and then 4500ft.
- Time – I have noted down my take-off time. My set heading time is 1422 and my next route way point will be at 1435.

  Map now stored until 1433.

The aircraft should be flown at a **minimum altitude** (weather permitting) that would allow time for the aircraft to glide from a 1500ft high key position. Normally the aircraft should be flown just below TMA airspace e.g., min 3500-4500ft amsl. Lower altitudes should only be flown as a result of restrictions due cloud. When flying over mountainous terrain, higher altitudes should be flown, and controlled VFR obtained to permit additional glide time in the event of an engine failure.

On longer legs, **weather updates** should be obtained, either through onboard devices or FIS, especially when the weather forecast and trends indicated deteriorating weather conditions.

Two frequencies should be monitored, the primary frequency being the ATC, MBZ, CFZ or unattended frequency, with the secondary frequency being the FIS or TMA. It is important to monitor FIS frequency in case there is an issue of a speci weather report or special broadcast. Both CFZ or CFZ/MBZ frequencies shall be open when approaching frequency zone boundaries.

Priority must be placed on the close **monitoring of critical commodities**, e.g. fuel, daylight and pilot wellbeing.

Fuel endurance logs should be completed so that at any point the pilot is aware of the fuel remaining in time. This is important when a diversion is required, and additional unplanned distances are flown.

Redundancy considerations and a **plan B option** should always be running in the background thinking of the pilot. The question "What if" should permeate all decisions to ensure that an adequate level of redundancy is available through the continued generation of options.

The **next event** is an important consideration for the pilot. What is the next significant change in flight and when will it happen and what needs to happen before it, e.g. top of descent etc.

All **arrivals into aerodromes and airstrips shall be briefed** in full normally before top of descent. This shall include NOTAMs and any **Hazards** noted on the aerodrome plate. The pilot should already have considered what runway will be in use and review the direction of the overhead rejoin. The local frequency should be monitored from at least 25 miles out to build of picture of aircraft in the vicinity.

The **top of descent** position shall be calculated so that the aircraft is planned to reach the overhead altitude just before the aerodrome. Flying level at overhead rejoin altitude for miles before the aerodrome is to be avoided. It is better to descend into the overhead so that altitude is preserved at all times. With an accurate ETA, TOD can be calculated as altitude to lose divided by 500 which equals TOD time in minutes prior to arrival. The aircraft should then be descended at 500ft/min at the cruise TAS as long as the conditions favour descent at the higher IAS.

Pre-landing checks shall be completed before entering the circuit.

The landing plates should be aligned to the runway direction/DI to aid familiarity and orientation.

The aircraft should be slowed down and configured prior to the overhead as per downwind configuration to facilitate safe integration with other traffic when overhead.

The **standard overhead rejoin** should normally be carried out. The aircraft should approach the aerodrome do that it is on the left of the aircraft and the aircraft continue to circle overhead in a left-hand direction until the landing runway selected. If the runway is a right-hand pattern, the aircraft continues to circle left hand until on the non-traffic side of the RH pattern at which point is should descend and start a turn in the right-hand direction of the circuit.

Standard radio calls shall be made. Radio calls should be repeated if the pilot is concerned that effective communication has not taken place.

Part H – Non-Technical Skills

28. Workload Management.

Workload management means completing a task competently in the time available. If the workload is high and many tasks have to be completed, they must be prioritised in a logical and efficient sequence, and some may have to be shed for the time being.

The brain is a single-channel processor (linear) and humans can normally only manage one activity at a time. Humans are limited in their ability to:

- process an increasing amount of information.
- work for an extended period of time under increased workload
- face constant variations of stress level and
- cope with different environments.

Many things that experienced pilots take for granted must be pointed out and explained to the student pilot as being fundamental for supporting effective workload management practices.

Workload management is supported by sound situational awareness. Comprehension of the trainee's environment in flight leading to a projection forward to the next key event should trigger appropriate actions to ensure that workload requirements do not peak at critical points. The student should routinely consider the next event and then pace and space required tasks required leading up to the next event.

It is important to prioritise tasks to ensure that the important and safety critical actions are dealt with first. 'Aviate' or establishing a safe climb performance should be prioritized before navigation, i.e. departing a remote airstrip via the correct routing, followed then by communicate, inform aircraft in the area or ATC of your position and intentions.

To improve your workload management skills, you might want to challenge yourself. *"Is there anything else we should/could be doing now?'* or *"What is more important?"* These questions may prompt you to prioritise correctly. Achieving an optimal work rate is critical during navigation flights.

If the workload increases to a point whereby task saturation occurs, the student should be guided on the importance of shedding the least important tasks to ensure the safest possible outcome is achieved.

One of the keys to workload management is the ability to recognise factors that adversely impact a pilot's ability to operate efficiently. A non-comprehensive list of factors that can reduce a pilot's work efficiency follows.

- lack of preparation: (confusion, disorganisation);

- distraction: (diverted attention – resistance to revert to raw data);
- level of arousal: (increased or decreased work cycles);
- overload: (fixation, tunnel vision, broken work cycles).
- discomfort: (distraction, fatigue);
- stress: (inefficiency, distraction);
- fatigue: (poor decision making, errors);
- ineffective use of automation: (increased work);
- destination or task obsession: (poor decision making, press-on-itis);

Warning signs indicating that your workload management practices have broken down are.

- Failure to respond to inquiries (hearing goes)
- Frequent minor errors
- Failure to complete tasks
- Deviations from established SOPs
- Flying becoming less accurate
- Over reliance on automation
- Impulsive decision making
- A strong tendency to fixate
- Losing Situational Awareness

When dealing with a major system malfunction at the same time as Air Traffic Control (ATC) is requesting information the choice is simple: deal with the malfunction first. Unfortunately, our response to 'authority' can dominate and time might be wasted with a long communication with ATC. This would be an example of incorrect prioritisation.

Summary of Key Points

- To ensure that competent WM practices become well ensconced, students must commence WM training from the very first lessons.
- WM practices must be trained e.g. use of checklists and procedures
- WM practices are founded on sound SA and the "next event" procedure to ensure tasks are spaced and paced and do not peak at critical times.

- An appropriate question to ask oneself to improve workload management. *"Is there anything else we should /could be doing now?" "What is more important"?*

29. Situational Awareness (SA).

Simply defined Situational Awareness is, 'knowing what is going on around you, and being able to predict what could happen' Another definition states that Situational Awareness is the difference between your perception of reality and reality itself!

A more comprehensive and technical definition proposed by M. R. Endsley, is:

'The perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future'.

An Awareness of what?

What do you have to be aware of? The answer is yourself, the aircraft and environment. The "environment" includes, (a) Airspace (b) Weather (c) Terrain (d) ATC (e) Traffic

Understanding Situational Awareness

As you gather and interpret appropriate information from both inside and outside the aircraft you develop an awareness of your surroundings. This continual monitoring assists perception (mental model) of what is happening and what is likely to happen in the near future, which is the basis of SA. Visual information is the greatest source for building and maintaining SA.

Although SA is an ongoing process, it is also bounded by time and space. Timely information gathering and interpretation is essential to good SA.

As your training progresses, it is important that you become familiar with (1) the barriers to maintaining SA, (2) indicators pointing to a loss of SA, (3) how to enhance SA, and finally (4) how to regain SA.

Barriers to maintaining Situational Awareness

There are a number of barriers to you maintaining an effective level of SA in flight.

- Task Saturation – too many tasks at the same time
- Information overload - due poor workload prioritisation
- Misplaced Motivation – e.g. taking a short approach when not ready
- Wrong Perception – due lack of experience and understanding.
- Theory of Practice – strong mindset due to experience

Indicators pointing to a loss of Situational Awareness

Pilots should recognise the signals pointing to a loss of SA. They are,

- Confusion or that gut feeling that something is not right.
- Unresolved discrepancies and ambiguity.
- Basic of primary duties are not being carried out.
- Departure from SOPs.
- The feeling of being rushed.
- Failure to meet planned targets.
- Communication is vague or statements are incomplete.

Enhancing Situational Awareness

To enhance SA during a navigation flight, the following practices should be evident.

- Preparation and Planning.
- Develop robust routines and patterns.
- Know the aircraft's systems.
- Project the Flight to the next event
- Be aware of and protect your critical commodities – fuel, daylight, health,

Regaining Situational Awareness

The following is a list of actions to be followed to assist in regaining Situational Awareness

- Aviate, Navigate, Communicate
- Reduce your workload, unnecessary distractions
- Remove yourself from what caused the loss of SA
- Beware of any services available to you
- Step back and take a look at the big picture.

Summary of Key Points

- SA is the perception of what is going on around you within a fixed time frame, comprehending the meaning and impact and projecting this forward in time.
- A key component of SA is that your perception of the environment around you is accurate.
- There are barriers to SA as well as indications of a loss of SA

- To maintain a SA you should operate with adequate planning, patterns and projection protecting your critical commodities
- It is helpful after a flight to review when a breakdown and loss of SA may have occurred and for what reason.

30. Decision Making.

Decision making is the process of reaching a judgment or choosing an option.

Decision making naturally flows out of a pilot's SA whereby a pilot has developed an awareness of a number of options of 'what could happen', and the next step is to make a decision that achieves the safest outcome.

The generic decision making process includes the following steps

- Gathering information through situational awareness
- Processing the importance of that information
- Making a decision based on the options and risks associated with each option.
- Acting on the decision
- Reviewing the decision

This general process can be assigned an acronym to aid recall

D = Define the issue

E = Establish the criteria

C = Consider all options / Risks

I = Identify the best option

D = Decide to carry out the option

E = evaluate and monitor

Decisions will sometimes be required to be made in situations that are dynamic, variable, emotive and subject to bias. These aspects of decision-making make the process more difficult and susceptible to errors. The result could be an incorrect or 'non' decision. To practice this type of (more complex) decision-making, pilots may have to experience scenarios for different stages of flight training to provide opportunities to practice (and learn) decision-making. In such scenarios it is important to review the dynamic, variable and emotive elements and provide guidance on how best to manage such events.

An effective comparative emergency scenario that should be used to highlight a dynamic decision-making process is a simulated engine failure versus a worsening partial power loss. The first is a relatively clear outcome that requires well-rehearsed decisions, checklists and actions to set up a forced landing. The latter is more subjective, potentially offers more time and provides the pilot with a larger number of options from which to make a final decision. This latter type of scenario is a richer training environment for decision-making as it leaves the pilot with a number of options that can be reviewed.

Errors in the Evaluation Process

The evaluation process may still result in the pilot taking a decision that in hindsight was not the most ideal. There are four main reasons for this.

- **Ambiguity**: Ambiguity can be present in the decision-making process because the cues that signal a problem are not always well defined and conditions may change gradually, e.g. flying into gradually deteriorating weather or suffering a partial vacuum failure.
- **Underestimating the risk**: A pilot will often underestimate the risk of a situation if he has encountered it before and successfully dealt with it.
- **Goal conflict**: Social factors are influential: peer pressure between pilots may encourage risky behaviour. Meeting organisational and social expectations can outweigh safety goals, especially in ambiguous conditions.
- **Consequences not anticipated**: As situations degrade, the available time to make a decision and the associated risks will probably increase when consequences are not anticipated.

Managing decision-making scenarios

Under training, instructors should ensure that training sequences consider pilot familiarity and look for opportunities that expose the pilot to new situations with which they may not be as familiar, in order to consolidate and assess their ability to manage the flight, maintain situational awareness and make sound decisions.

The key point here is to be sure that the pilot is not over stretched by the decision-making process. Complex scenarios beyond the capability of a low hour pilot simply degrades the learning potential by placing the trainee too far behind the aircraft.

Pilots should be introduced to scenarios that provide them with scope to keep applying the taught emergency procedure but with some real-life exposure, e.g. rough running engine. When pilots become advanced and more competent in their DM, it is also important to expose the pilot to scenarios that may require common sense to obtain the safest outcome and to which there might not be a checklist e.g., strong fuel smell in the cabin.

Summary of Key Points

- PDM is a cognitive skill and will require verbal elucidation of the various stages, by the pilot. Therefore, the pilot should process verbally,

  What is the problem (diagnosis)

  What are his/her options / What risks are involved?

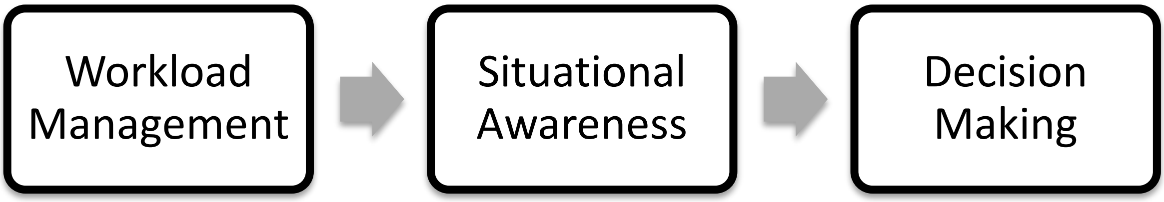
  What is their decision and time frame of implementing the decision?

  What priorities are being assigned?

  Are you reviewing your decision?

31. The non-technical process.

The simple non-technical process that facilitates greater capacity in a pilot during flight operations is



If a pilot paces and spaces their workload, then more time will be available to the pilot to maintain a sound level of situational awareness i.e an accurate perception of reality. Situational awareness is best utilised when it is projected forward to ensure that all important tasks and critical commodities are carried out/maintained. With this level of situational awareness, a pilot is then able to generate more effective risk referenced options and if an issue arises, can quickly determine the safest option to follow in the event of a abnormal or emergency situation.

32. Threat and Error Management.

TEM is the process of detecting and responding to threats (such as powerlines or faulty equipment) and errors (such as selecting the wrong radio frequency, or missing a checklist item), to prevent safety being compromised. Left unmanaged, these threats and errors can lead to 'undesired aircraft states'- the last opportunity to avoid a serious incident or accident. TEM can be considered an extension to airmanship, providing a structured way to help people maintain safety margins during everyday operations.

Threats can be defined as a situation or event that has the potential to have a negative effect on safety. Threats can be classified as internal and external. Internal threats are related to the individual. Examples of **internal threats** are:

- fatigue
- experience
- attitude lack of recency and proficiency
- health and wellbeing.

External threats can relate to the context of the operation and therefore can be different depending on the situation.

- adverse weather
- high terrain or obstacles (wire, etc.)
- night operations
- other traffic
- equipment faults r
- emote strips/landing sites
- weight and balance

Threats can also be categorised as anticipated, unanticipated, and latent threats, and all three can reduce safety margins. **Anticipated threats** are those that can be predicted, such as thunderstorms, congested airports, and complex or physically demanding tasks. **Unanticipated threats** are those that occur unexpectedly, such as unforeseen turbulence or unexpected equipment malfunctions. **Latent threats**, however, are those that may not be directly obvious or observable and may need to be discovered through formal safety analysis. These may include sociopsychology and/or organisational factors such as organisational culture, operational pressures and normalised behaviours.

Errors

As humans we are fallible, and errors are to be expected. Even the most experienced and well-trained person can make an error. Errors can be defined as actions or inactions which can lead to:

- a deviation from individual or organisational intentions or expectations

- reduced safety margins
- increased probability of undesirable events on the ground and/or during flight.

Errors can be classified as **slips, lapses, or mistakes**, and are generally always considered unintentional. Slips are actions that do not go as planned, or where we find ourselves doing something we never mean to do. For example, selecting flap instead of landing gear. Lapses are memory failures or leaving out a step that we intended to carry out. For example, forgetting to check the aircraft was sufficiently refuelled after the tanks were drained. Mistakes are when we carry out the actions as planned, but what we had planned to do was not right for the situation. For example, fuel calculations were performed, but the fuel burn figure used was for the de-rated engine, which had much lower fuel burn compared with the actual engine fitted.

When the action is an intentional or deliberate deviation from rules or procedures, it is classified as an intentional non-compliance (or violation). Violations can occur when we try to complete the task in the most efficient way, and they often involve shortcuts or workarounds. For example, cutting across the apron to get to the 6 aircraft, as this is the most direct route, even though the rules require the designated walkways be followed.

Typical errors may include:

- incorrect calculations or input errors
- inaccurate planning or scheduling
- non-standard communications or handovers
- mishandling the aircraft/equipment
- incorrect systems operation or management, i.e., selecting the wrong switch.
- procedure or checklist errors

Undesired states

Threats and/or errors not detected and/or not managed correctly can lead to an ‘undesired state’. Undesired states are generally defined as an unintended situation resulting in a reduction in safety margins. They are usually transient in nature, only existing for a limited time until the state is either recovered or becomes an adverse outcome, such as an incident or accident.

Pilot-related undesired states-

- aircraft unstable on approach due to a failure to observe the wind direction changing to a tailwind on approach.
- loss of external load inflight due to ground crew not having the equipment, training, or experience for the type of operation

- aircraft enters an unusual attitude after an evasive manoeuvre to avoid an inflight collision due to inappropriate or ineffective scan.
- aircraft running low on fuel due to diversion around adverse weather not identified during preflight planning.

Managing Threats and Errors - Mitigation Strategies

How well threats and errors are managed is determined by the individual's ability to detect them in time. If threats and/or errors go undetected, they can lead to undesired states, and if left unmanaged can lead to an accident or incident,

Error is an unavoidable part of being human, but certain threats, such as fatigue, can affect an individual's decision-making ability, increasing the likelihood of errors. When managing a threat such as poor environmental conditions, individuals can become distracted, leading to additional errors being made, these can be considered 'threat-linked errors'.

If an undesired state is encountered, it is important to apply the correct solutions to manage/resolve the situation, restoring the safety margins.

Using TEM, individuals can plan and apply appropriate countermeasures to identify and then manage threats and errors, to prevent them leading to an undesired state compromising the safety margins. Therefore, responding quickly and applying the appropriate actions to manage and/or resolve the threat and/or error ensures safety is maintained.

Countermeasures used in TEM include many standard aviation practices and may be categorised as follows:

Planning countermeasures:

- briefings
- handovers
- planning and mental simulation
- contingency planning.

Execution countermeasures:

- Monitoring (including self-regulation)
- Checklist discipline
- Cross/rechecks o Duplicate checks
- Maintaining situational awareness

- Information management
- Task/workload management.

Review countermeasures:

- Evaluating and modifying plans
- Inquiry and questioning.

TEM is therefore a continuous process; the practice of ongoing planning, appreciating, and controlling the progress of events to ensure a safe outcome.