RECREATIONAL AVIATION AUSTRALIA

RAAus Flight Instructor Reference Manual

Dedication

This Manual is dedicated to all those flying Instructors, past and present, who have given their knowledge and skill to those aspiring pilots known as Student Pilots.

Flying Instructors have welcomed novice Student Pilots and mentored them to that momentous occasion where they rise aloft in flying machines and by careful and disciplined use of the flying controls, alight again upon the ground.

These Student Pilots can thus join that selected band of intrepid aviators who have successfully severed the bonds that hold lesser mortals earthbound.

And, they can be forever be grateful to their Flying Instructor.

Copyright information

This manual is for general information purposes only. Where an aircraft manufacturer provides specific information via aircraft Flight Manual or Pilot Operating Handbook, the manufacturer's requirements, procedures or techniques must take precedence. All RAAus Flight Training Schools and Instructor Trainers must operate in accordance with the RAAus Operations and Technical Manual requirements and with reference to the RAAus Syllabus of Flight Training. These documents remain the primary reference document for minimum training requirements for issue of a RAAus Pilot Certificate, Instructor ratings and higher Approvals.

The regulatory requirements of the Civil Aviation Act 1988, Civil Aviation Regulations (CAR) and Civil Aviation Safety Regulations (CASR) and any relevant Civil Aviation Orders (CAO) must likewise be referenced and complied with.

Additional relevant publications produced by the Civil Aviation Safety Authority (CASA) and Airservices Australia include the Visual Flight Rules Guide (VFRG) and the Aeronautical Information Publication (AIP). Information in this publication is subject to change without notice and has been produced with the intention of providing standardisation of training for RAAus Instructor rating and higher approval holders.

Please provide feedback or corrections relevant to this document to the Operations Manager ops@raa.asn.au or 02 6280 4700.

Acknowledgements

This manual is also dedicated by the authors to the memory of John Cresswell and Graham White, experienced Chief Flying Instructors, Pilot Examiners and Instructor Trainers. The inspiration and insight offered by these two individuals will never be forgotten and is sorely missed.

Special acknowledgement must also be made to RAAus Life Member David Eyre for his dedicated input and insight. The experience, insight and patter in Chapter 5 would not have been possible without his valuable contribution. This manual is the creation of the RAAus Operations and Assistant Operations managers, Jill Bailey and Neil Schaefer with invaluable collaboration from individuals within the wider community of dedicated RAAus Instructor Trainers, Pilot Examiners and experienced Chief Flying Instructors.

The information provided represents the commitment and passion to flight training excellence by many instructors, past and present, who had the vision and determination to work tirelessly towards a professional reference that would benefit all pilots who ventured to turn their flying dreams into reality. While there are many worthy of mention, the following instructors had the vision, commitment and persistence to envisage and shape an Instructor reference manual for recreational sport pilots. Recreational Aviation Australia recognises and thanks those below for their assistance; Colin Appleton, John Cresswell, David Eyre, David Ford, Dick Gower, Tony Hayes, Douglas Heath, Graeme Hutchinson, Kelvin Hutchinson, Robert Keen, Rob Knight, Gordon Marshall, Paul McKeown, Brett Pearson, Peter Reed and Ed Smith. We are also grateful to the Civil Aviation Authority New Zealand (CAANZ) who provided permission to use and adapt their Instructor Training Manual which provided the basis of much of this document.

Any errors or omissions are the author's sole responsibility. Content in Chapter 3 is gratefully acknowledged as based on information provided by the Australian Parachute Federation. Permission for use of photos in this manual was received from the original owners including CFI Dan Compton from Wings Out West, Brett Anderson from Anderson Aviation and CFI Chris Stott from Central West Flying.

John Cresswell

In memory of John Cresswell and Graham White

Graham White with daughter Rebecca

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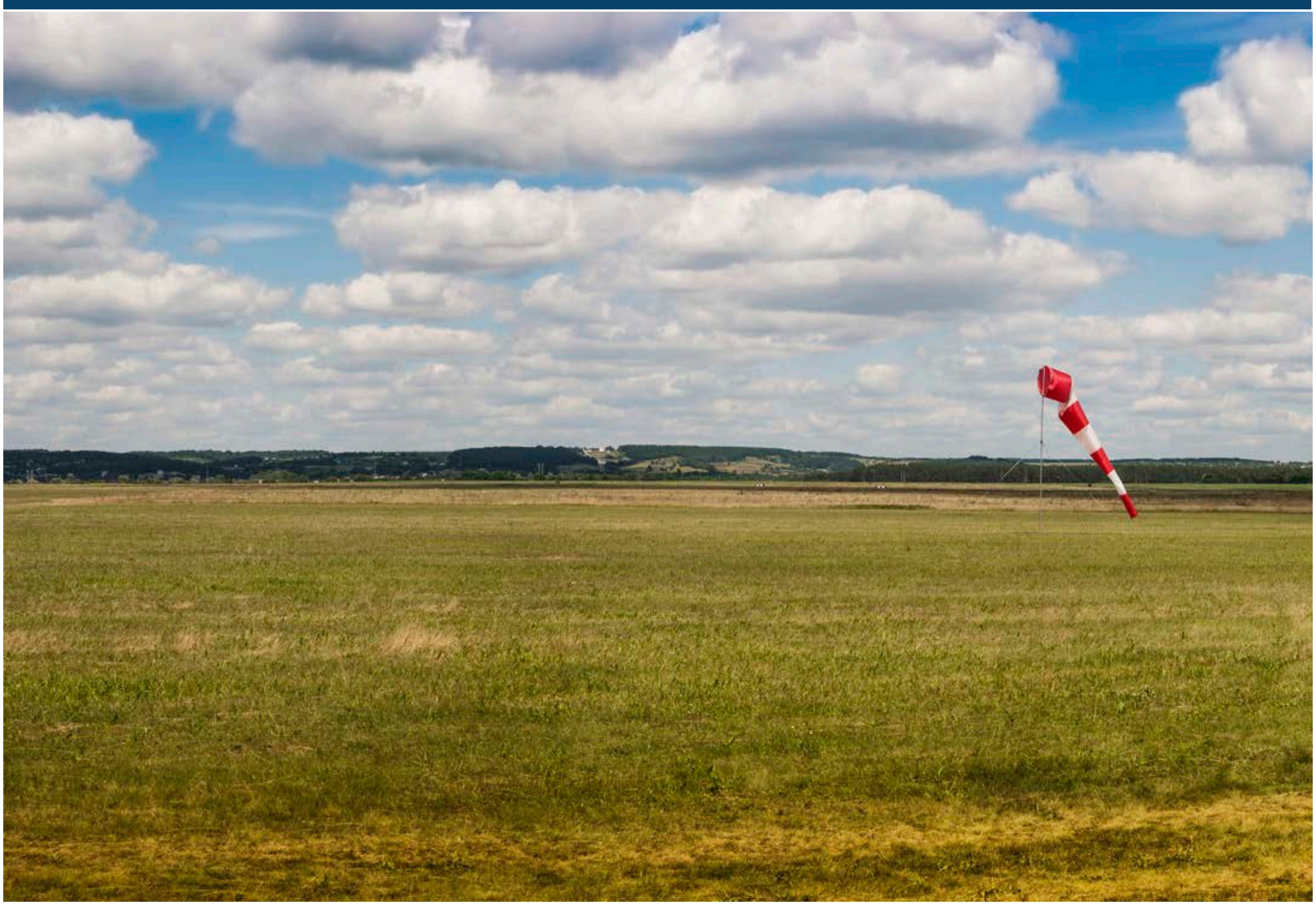
Definitions, Abbreviations and Checklists

Additional definitions and abbreviations are in the RAAus Operations and Technical Manual

Note: The abbreviations, definitions and checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.



Definitions

3 Axis (Group A)

A RAAus aircraft which is controlled via inputs by the pilot around 3 axis of movement - lateral, longitudinal and normal.

CFI Procedures Manual

A document intended to provide guidance material to assist CFIs to interpret Operations Manual requirements.

Competency

The candidate demonstrates consistent ability to perform a task within specified parameters and requirements without external input or correction. Further, the candidate effectively applies previous knowledge and skills to achieve safe outcomes in a range of controlled and uncontrolled situations.

Direct Supervision

The supervisor personally provides surveillance, assessment and mentoring development of persons providing ground and flight training to ensure it meets the training and safety requirements of this Manual and the RAAus Syllabus of Flight Training.

Flight Training School

A location, including satellites approved by RAAus for the purposes of delivering flight training for a RAAus Pilot Certificate.

Horizon

The average line where the sky meets the earth and observed visually by the pilot for Visual Flight Rules.

Indirect Supervision

The surveillance, assessment and mentoring development of persons providing ground or flight training and associated operations by a means other than the physical presence or personal surveillance of the supervisor to ensure it meets the training and safety requirements of this Manual and the RAAus Syllabus of Flight Training. Such indirect supervision is provided as deemed appropriate by the RAAus Operations Manager.

Long Brief

A briefing provided as part of ground theory information for a specific subject, not provided as part of a flight exercise. This brief may be up to an hour in length.

Maximum Take Off Weight

The maximum weight at which the pilot is permitted to attempt to take off due to structural or other limits including the aircraft's Basic Empty Weight, pilot, passenger, fuel and any additional baggage or ballast.

Monitor

The Instructor observes the student conducting practical aspects of the flight exercise, and provides corrective information as required.

Operations Manual

A Manual approved by CASA which provides information about the conduct and requirements for flight training in aircraft registered with RAAus.

Patter

The verbal delivery of consistent in-flight information intended to assist the student to practically apply the elements of the Short Brief.

Recreational Aviation Australia

Means the organisation delegated by CASA to administer pilot training, operations and aircraft under specific Civil Aviation Orders.

Short Brief

A pre-flight briefing provided prior to commencing a specific flight exercise. The Short Brief provides clarity about the aims and objectives of the flight exercise and is recommended to be no longer than 20 minutes.

Temporary Approval

An Approval issued by RAAus Operations as stipulated in the Operations Manual for the purposes of meeting a requirement as an interim measure.

Trike

A weightshift controlled aircraft. May also be referred to as a microlight.

Visual Flight Rules

Refers to minimum visual requirements and limitations for flight with primary reference to the horizon.

Weightshift (Group B and D)

A RAAus aircraft which is controlled via inputs by the pilot using weightshift around two axis of movement. This may include aircraft known as trikes and powered parachutes.

Abbreviations

AGL	Above Ground Level
AIP	Aeronautical Information Publication
BFR	Biennial Flight Review
CAO	Civil Aviation Order
CAR	Civil Aviation Regulations
CASA	Civil Aviation Safety Authority
CFI	Chief Flying Instructor (RAAus)
FTS	Flight Training School (RAAus)
GYFTS	Giving Young Pilots Flying Training (a scholarship program operated by RAAus)
GSP	Generic Student Progress Record
IMSAFE	See Useful Mnemonics
I	Instructor rating (RAAus)
IT	Instructor Trainer (holder of a RAAus Instructor Training Approval)
L2	Level 2 Maintenance Approval
LMS	Learning Management System
MTOW	Maximum Take-Off Weight
PMI	Principles and Methods of Instructing
PPC	Powered Parachute

POH	Pilot Operating Handbook (Aircraft Flight Manual)
RAAus	Recreational Aviation Australia
RAAP	Recreational Aviation Advisory Publication
RPC	Recreational Pilot Certificate (issued by RAAus)
RPL	Recreational Pilot Licence (issued by CASA)
SI	Senior Instructor rating (RAAus)
TEM	Threat and Error Management

Checklists

BUMFISH

Brakes
Undercarriage
Master
Mixture
Fuel (taps, contents, pump), Instruments (normal parameters)
Switches
Hatches and Harnesses

CLEAROFF

Compass
Log (time)
Engine
Altitude
Radio
Orientation
Fuel
Forced landing options

Note: The checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.

CFMOST

Carburettor Heat-Hot
Fuel (pump, tank(s), quantity)
Mixture (fully rich)
Oil (Temperatures & Pressures)
Switches (CDI/Magnetos on, circuit breaker)
Throttle (cycle)

HASELL

Height
Airframe (configured as required)
Switches
Security
Engine (Temperatures & Pressures)
Location
Lookout

TMPFISCH

Trim
Master
Mixture
Primer (Choke)
Propeller (if adjustable)
Fuel (taps, contents, pump)
Flaps
Instruments
Switches
Controls
Hatches and Harnesses

Note: The checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.

Pre Take-Off Safety Brief

If an emergency occurs while on the ground, I will close the throttle and maintain directional control with rudder, bring the aircraft safely to a halt using brake.

If an emergency occurs on this take-off upwind, I will set best glide attitude to maintain XX knots and if insufficient runway remains land straight ahead. If runway doesn't remain, I will select an area to land within 30 degrees either side of the aircraft.

If the engine fails on crosswind, I will set best glide attitude to maintain XX knots, and select an area within safe gliding distance ahead. If I have time I will do emergency checks and make a MAYDAY call.

Weightshift (Group B) checks

Pre Start check
STAIP

Security (Brakes and control bar released)
Throttle (Closed)
Area (Clear)
Ignitions (On)
Prop (Clear)

Pre Take Off check
CHIFTTWAP

Controls
Harnesses
Helmets
Instruments
Fuel
Tags (Zips and pins)
Trim
Wind
Area
Power check

Note: The checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.

Powered Parachute PPC (Group D) checks

Pre Landing check
FAWNT

Fuel
Airfield
Wind
Nose wheel (Straight& Brakes off)
Trim

Pre Take Off check
CABSECC

Canopy
Area
Base
Security
Engine
Clear & Communications

Pre Landing check
FAWNT

Fuel
Airfield
Wind
Nose wheel
Toggles (Steering)

Note: The checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.

Useful Mnemonics

I.M.S.A.F.E.

Illness
Medication
Stress
Alcohol
Fatigue
Emotion

O.N.U.S

Overshoot
North
Undershoot
South

P.U.F.F

Prop (Fine)
Undercarriage (Final check)
Fuel (Mixture rich)
Flaps set + (Cowl flaps if fitted)

W.O.S.S

Wind
Obstacles
Size
Surface (Emergency landing area check) or alternative

6 S Best remembered as Success.

Size
Slope
Surface
Situation
Surroundings
Services

Note: The checks provided are intended as guidance only and may vary according to the type of flight operation or aircraft operated.

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CHAPTER ONE

The Flight Instructor

In the 1980's, the first Instructors were drawn from the longest surviving ultralight pilots. They received little formal training or assurance of standardisation. RAAus has significantly evolved as an organisation since those early days. Survivability and aircraft handling skills which may have been appropriate in early ultralight instruction are now insufficient. Instructing is a skill that can be taught but teaching is an art that must be developed.

Only by acknowledging and integrating recognised teaching methods can we really start to address the requirements that denote a good Instructor in any aviation organisation.

A natural or highly skilled pilot does not necessarily make a natural Instructor. So often, "good pilots" or those with extensive experience and currency find their way to the cockpit as an Instructor. In many cases these naturally gifted or developed pilots arrive to this point from drive, determination, singularity or pure focus and not only have their methods never been dissected, they are simply "intuitive" about what they do and how they achieve it.

Many sporting champions have often been asked what it is that makes them so successful and the response is "I don't know I just do it!" These traits are not necessarily complementary with the more subtle and less intuitive attributes of a good teacher.

In many cases the pilot who has had to labour, analyse and dissect their own journey with the humility and understanding of their own humanity provides a far more appropriate means of imparting learning. It was once said that a truly "mature" pilot must have three key attributes; they must be **humble, approachable and creditable**. These attributes are just as vital for the Instructor.

The true Instructor is always acting from 'conscious competence'; always operating in the deliberate 'here and now', their teaching is evident even when not actually teaching and as a result they are always displaying the characteristics of an appropriate role model.

The instructor must be a team player, even if it's just a team of two! The instructor and pilot share the responsibility of ensuring the appropriate level of pilot competency and airmanship is achieved by the candidate whilst under instruction. The integrity and strength of this training inevitably shapes the future behaviour of the pilot in the majority of cases.

The role of the flight Instructor

This is borne out through accident investigations, where deficiencies in training or behavioural primacy have often been identified as the catalyst for the ‘accident waiting to happen’.

The instructor fulfills a pivotal role in the training process and is therefore the cornerstone of the training standard for all pilots. This underlines the importance of an appropriate reference standard and accompanying resource material, unique to RAAus, to assist Instructor standards continue to be maintained to the highest level.

Potential Instructors understanding the philosophies above is almost as critical as meeting the appropriate aeronautical minimums set out in the Operations Manual. The motivation for becoming an Instructor, whilst worthy on its own, should also be considered based on the applicants desire to educate, motivate and shape potential pilots.

It should not be viewed as a mechanism to gain standing in the flying community, accrue command hours or for increasing self-worth. Instructor recommendations by CFIs should also be carefully considered on the same lines, as the commitment to the teaching process should outweigh any other personal motivations. It has been noted that a candidate only really starts to learn about flying when charged with the responsibility to teach it.

It could be said that the role of the flight Instructor is not necessarily for the pilot who loves flying, but for the person who loves to teach. The reward is not in the delivery of the knowledge, but knowing the knowledge has been imparted in the clearest and most effective method for each student. With this in mind, clear understanding and application of accepted Principles and Methods of Instruction (PMI, see chapter four) is the key to delivering effective learning. In essence the role of an Instructor is to facilitate learning through the delivery of appropriate knowledge, skills and demonstration of attitude and airmanship.

Further consideration for PMI delivery must be given to the learning environment. The dynamic, noisy and mobile classroom of the cockpit is a far cry from the quiet, controlled and sterile environment of a classroom or normal learning environment. Included in these considerations is heightened elements of fear, uncertainty and concentration as additional challenges for the student and Instructor. The importance of clear, simple and well developed instruction is imperative in the airborne classroom where workload, focus and understanding of foreign concepts are regularly challenged.

Instructor development

Instructor development is an ongoing process provided in stages by the RAAus Operations Manual. Candidates move from Flight Instructor to Senior Instructor and possible approval to the position of Chief Flying Instructor (CFI). The role of CFI is not an eventual outcome for all Instructors, as it includes significant responsibilities including effective management of the flight school. These responsibilities should be referenced from the relevant Sections of the Operations Manual.

It is critical therefore that the development of the flight Instructor be appropriately mentored and monitored by the CFI. The baton for this development phase passes from the Instructor Trainer (IT) once the Instructor rating is issued to the training environment. Practical development must be cemented with “direct supervision” by the CFI. This can often present challenges for the CFI who now takes on a dual training role over and above the school management. This role must be considered by both parties in ongoing training reviews if the newly approved Instructor is to develop and mature effectively within RAAus. The 90 day check is only a small part of this imperative and interactive phase of Instructor development.

The CFI needs to ensure time is available to monitor and develop new instructors, which has the added benefit of ensuring standardisation is also maintained if a school operates with a number of instructors. RAAus Operations has released further guidance material via a Recreational Aviation Advisory Publication (RAAP) on instructor supervision.

This is available on the website for Instructor Training Approval holders and CFIs wishing to gain a better understanding of mentoring and development for new instructors.

Understanding the role of the flight Instructor is further explored in Chapter 3 Choosing An Instructor Candidate of this manual.

Whether you are a veteran instructor or a potential candidate reading this for the first time, we commend you on taking the first step to self-improvement as a Flight Instructor, confirming concepts that you have already developed, refreshing your knowledge base or considering the most rewarding of pursuits that is the role of the RAAus Flight Instructor.

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CHAPTER TWO

The Recreational Student Pilot

The most important part of any flight training operation is the student, as without them we are just a bunch of experienced pilots looking for someone to share the joy of flight with. This chapter looks at the recreational student in some detail, with the aim for instructors to understand how our students will differ.

Some students may have further career aspirations for military or flying jets, or they may be the person who has always wanted to fly just for fun. For instructors starting out, this chapter will explore how to deliver an effective method of training across a broad range of age and personality types. Additionally we will further explore the modern training environment and the social and cultural pressures that beset the student pilot.

Motivations

The RAAus training environment is fundamentally different to other areas of aviation training. The students' motivation to learn to fly may be based on the desire to fly purely for recreational pleasure. Changes to the sporting and general aviation landscape now offer a broad scope for utilisation of the Recreational Pilot Certificate, ranging from 3 Axis types, Weightshift microlight and Powered Parachutes and home built variations.

These types can be operated with significant additional privileges rivaling the traditional Private Pilot License and may be further integrated into private or commercial licensing under new CASA regulations. Our approach to training the recreational pilot needs to address this diversity and intent appropriately.

It is important that the instructor gain a clear understanding of the potential student's motivations for learning to fly as well as gain an insight into any background exposure to flight, and any factors which may be influencing the desire to undertake flight training.

The instructor should be aware of the student's personal, work and family circumstances and discuss these openly in terms of commitment, influence and the practical aspects of learning to fly.

Industry fit

The general recreational social environment is changing also as society now looks to different leisure activities for fulfillment. Traditional sports and activities exist and compete alongside a vastly different array of recreational pursuits. Cultural activities, physical programs, adventure sports and more now blur the lines between sports, fun and work.

The choices available to the general public are far greater today than even twenty years ago and the aspiring recreational pilot may be torn between numerous pursuits and the enjoyment they receive from other different interests. It is important to establish the priorities of the student particularly in the learning phase where currency and recency have a big impact on learning and progress.

Pilot demographics

The different backgrounds of students bring a vast array of student types, and these students are not filtered through pre-selection or vocational guidelines as for military or commercial candidates. Additionally, through our GYFTS program recreational flight training is seen as a safe, accessible and fun way for young ambitious pilots to start their flying career. Names such as Matt Hall, Ryan Campbell, Joseph Masters, Lachlan Smart and Holly Adams are just a few of the personalities who built their foundations in recreational flight through RAAus and continue to leave their mark on the aviation landscape.

The door is open far wider for recreational pilots, from hard working parents, professionals, career pilots, baby boomers and retirees. The student who presents with the motivation and desire to fly will have their own unique abilities and level of commitment.

The successful RAAus instructor must understand and tap into these motivations to ensure success. The students' style of learning, underpinned by their learning styles may also include complex layers of socialisation that need to be understood.

Young students are often immune to consequence and may be highly goal motivated, while mature students may be less focused and be more aware of their mortality and may struggle to understand new concepts. These are just some of the unique challenges facing the recreational flight instructor.

Medical requirements

A defining difference in training requirements for the Recreational Pilot Certificate (RPC) is the required medical standard. For students under 75 this is a self-declared equivalency to the Australian Driver Licence health standard as required in the RAAus Operations Manual.

It is imperative that instructors are familiar with Operations Manual requirements, and notifiable medical conditions. Any existing medical conditions or medications must be discussed, assessed and disclosed prior to starting flight training. Of particular note in this area is the use of reading correction glasses and the impacts on depth perception in flight environments.

Other items such as vertigo, obesity, allergies, cognitive degeneration or other degenerative conditions may impact on the performance and or suitability to undertake flight training. Ongoing fitness using part of a daily preflight assessment checklist such as IMSAFE must also be integrated into training and standardised student behaviors.

Weight and ergonomics

Our recreational aircraft vary significantly as both classrooms and ergonomic cockpit layouts. Whilst RAAus 3 axis aircraft may have relatively similar cockpit layouts to other general aviation aircraft, RAAus weight shift aircraft such as trikes and powered parachutes offer relatively limited seating and structures.

All aircraft have restrictions on a variety of factors including seat weight limits and physical restrictions that may hinder or prevent effective and safe flight training. These elements need to be carefully and fully explained to potential student pilots and explored appropriately to ensure suitability for training.

"There is no sport equal to that which aviators enjoy while being carried through the air on great white wings." Wilbur Wright

Training schedules

In most cases the recreational student pilot flight training schedule will often be juggled in between work, education, family and social commitments.

These represent a substantial barrier to training processes in contrast to other general and professional aviation training environments. Consideration must be given to these limitations in regard to scheduling training appointments with considerations including school operating times and instructor availability.

It is also becoming evident that the time commitment given to training by students is changing with social trends towards 'drive in-drive out' solutions with flight training competing for other ventures in busy lifestyles, where in the past the enthusiastic student would mingle and absorb addition learning spending the whole day at the airfield.

Efficient planning, structuring of lessons and professional commitment by the instructor are key ingredients to help delivery of an effective flight training plan. Appropriate scheduling must be provided to give the student maximum learning potential in any environment.

Learning in the age of electronic media

In today's modern world information flows like water through the web and the majority of candidates are tapped into technology.

We can no longer ignore the enormous amount of influence that information will have on the student pilot.

Web based training resources like video how to guides and online forums can provide freely given advice and recommendations with little care or consideration as to accuracy or application.

The opportunity to be influenced with information has never been greater and while this creates enormous opportunities for pilots it also presents real and present threats.

Schools and instructors aware of the possibilities of the information age can prepare controlled online presentations to support school based learning. Careful scrutiny may be required for any unsanctioned learning channels.

As RAAus develops its Learning Management System (LMS) and training resources the ability to direct effective learning support through web based resources will improve.

For now, instructors should carefully review any information or resource material that the student uses and ensure that the primary teaching role still rests with the instructor and not the World Wide Web.

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CHAPTER THREE

Choosing An Instructor Candidate

The RAAus Instructor is the fundamental link between the dream and the reality of achieving personal recreational flight. The Instructor is the cornerstone of the skills, behaviours and attitudes that any aspiring pilot should achieve on his chosen path in aviation.

Approved Instructor Trainers and CFIs should look very closely at the applicants they recommend to undertake Instructor Training programs. Thought should be given to the applicants developed skills, attitude to flying and leadership in the local flying community as just some of the key ingredients to evaluate. Being a great pilot is not the only criteria, but few Instructors will be truly successful if they do not have well developed skills in the cockpit and a varied experience to call on in the dynamic and demanding role that is flight instruction.

The RAAus Operations Manual outlines the duties and responsibilities for RAAus Instructors with specific paragraphs addressing the requirements and behaviours expected from all professional Instructors in carrying out their duties. While it is difficult to categorically define a fit and proper person for the role of an Instructor, the candidate should have clearly demonstrated the highest level of airmanship and observed behaviours, an uncompromising safety culture and a willingness to assist and share pertinent knowledge and skills. A calm and level head and willingness to work with others to ensure safety is never compromised is also vital. Instructor Training Approval holders and CFIs nominating candidates for Instructor training should also review the RAAus Member Charter and RAAus Constitution.

Recommended traits for an Instructor

When recommending an applicant for any Instructor rating these questions should be considered:

- Is the candidate willing to devote significant hours most weekends to instructional duties?
- Is the candidates' family circumstances conducive to the time required to be devoted to instructing?
- Is the candidate willing to learn as much as his or her eagerness to teach?
- Does the candidate interact well with others socially and adapt to different personality types in interactions and communications.
- How does the candidate resolve conflicts and maintain respect?
- Is this effective?
- Is the candidate emotionally and physically fit for the role of a flight Instructor?
- Does the candidate take responsibility for their actions or do they attempt to deflect blame and responsibility?
- Is the candidate constantly looking for personal improvement and do they have a measure of adaptability in their attitudes and behaviours?
- Does the candidate have an appropriate level of confidence, yet remain humble regarding their abilities?
- Does the candidate really want to instruct as a means of helping others or is it status seeking?
- Has the candidate demonstrated an appropriate flying history of professional, compliant and safe operations?

Considerations for upgrade to Senior Instructor

When considering upgrading applicants to a Senior Instructor rating, the following additional questions should be considered:

- Is the candidate willing to make difficult decisions in the interest of safety and compliance?
- Can the candidate withstand commercial pressures to ensure safety is not compromised?
- Can the candidate effectively manage the demands of lesson planning, booking schedules, telephone calls, training records, customer interactions, the range of endorsement training, BFRs and operating different aircraft types?
- Can the candidate manage complex situations and multi-task?
- Are they self-sufficient, seeking out the appropriate resources and reference material required to perform the tasks of a senior Instructor?
- Are they willing to seek advice from CFIs and peers?
- Do they have the courage and conviction to stand by tough decisions?
- Will they have the confidence and ethical ability to fail unsuitable candidates if required?
- Have they demonstrated resilience and maintain a positive attitude under trying circumstances?
- Are they prepared to put the responsibilities of the position above established friendships and group influence on the airfield?
- Are they a leader who inspires others to be their best?
- Are they considerate and compassionate when required in their previous instructional roles.
- Were they well regarded or observed to perform all of the above tasks to a professional standard?
- Can they effectively interact and manage others with consideration for personal feelings and emotions?

Very few candidates will tick all of the above boxes and some will rise to the responsibility when it is bestowed upon them. Nevertheless, consideration to all the above elements should be given.

An upgrade to Senior Instructor should not be considered automatic on gaining Operations Manual minimum aeronautical experience and recommendation of three candidates for solo. If warning bells start ringing then advice to the Operations Manager should be considered before pursuing the training any further. It is much easier to refuse a privilege than to take it away later!

This chapter was modified for RAAus purposes with acknowledgment to the original text from the Australian Parachute Federation.

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CHAPTER FOUR

PMI

Principles and Methods of Instruction: Techniques to improve training

The following RAAus approved Principles and Methods of Instruction (PMI) material is provided as the preferred content to be used for approved instructor training packages as outlined in the RAAus Operations Manual. The information referenced below has been provided by CASA as an extract of APPENDIX D To CAAP 5.14-2(0) March 2012 and approved for internal purposes for RAAus instructor training. Following completion of this training module a knowledge based assessment can be found in appendix 1 and this should be completed by the candidate and result noted in the instructor training record.

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INTRODUCTION

The trainer

What is a trainer?

The Macquarie Dictionary definition of the word ***train*** is: ‘to make proficient by instruction and practice’.

Flight instructors are trainers. If you are a flight instructor, your aim is to give students good instruction and sufficient practice so that they can fly an aircraft proficiently and safely.

These sample course notes are designed to describe some basic instructional techniques that apply to:

- Ground school training
- Preparatory ground instruction
- Pre-flight briefing
- In-flight instruction
- Post-flight briefing (debriefing)

By using these techniques you will make learning easier for your students as you help them to meet the required flight test standards.

Learning

No one ever learns except through their own activity, and strictly speaking there is no such art as teaching only the art of helping people to learn.

The instructional techniques described in these notes suggest actions that can be performed to stimulate student activity. These activities may be mental or physical, and it is through this process of directed activity that students learn the skills and knowledge required to become good, safe pilots.

Learning factors

Learning is made easier when the following factors are used:

- **READINESS:** Ensure students are mentally, physically and emotionally ready to learn.
- **PRIMACY:** Present new knowledge or skills correctly the first time. (Teach it right the first time)
- **RELATIONSHIP:** Present lessons in the logical sequence of known to unknown, simple to complex, easy to difficult and concrete to abstract.
- **EXERCISE:** Ensure students are engaged in meaningful activity.
- **INTENSITY:** Use dramatic, realistic or unexpected things, as they are long remembered.
- **EFFECT:** Ensure students gain a feeling of satisfaction from having taken part in a lesson.
- **RECENCY:** Summarise and practice the important points at the end of each lesson, as the last things learned and practiced will be remembered the longest.

The learning factors listed above are useful ‘tools’ when they are applied correctly. The question, of course, is: How do these learning factors apply to flight instruction? This question will be answered by reviewing and discussing each of the learning factors and offering specific suggestions on what you can do to utlise these ‘tools’ in your instruction.

Readiness

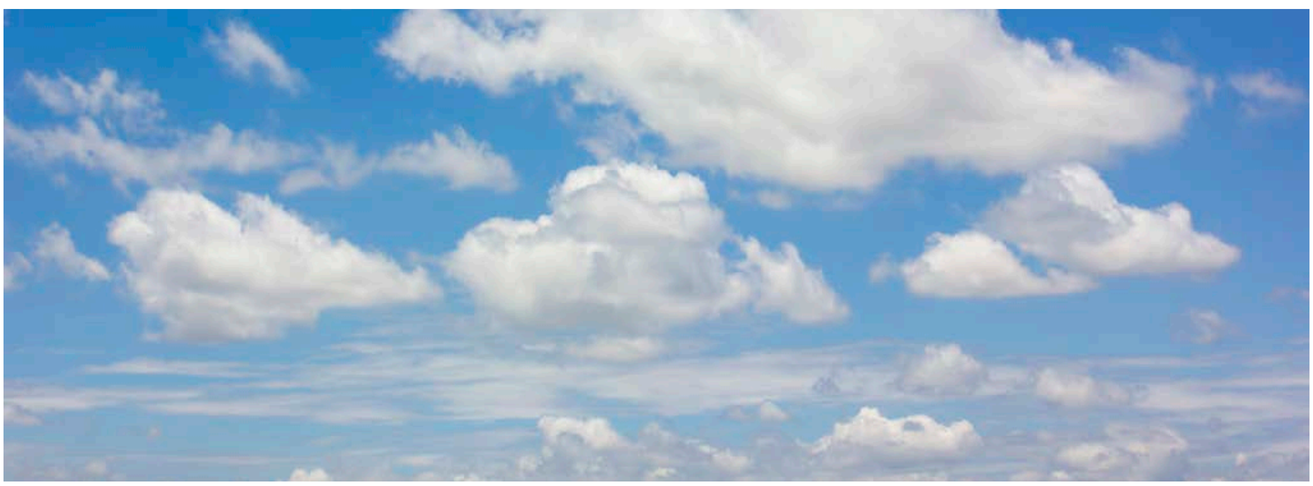
Ensure students are mentally, physically and emotionally ready to learn.

To learn, a person must be ready to do so. An effective instructor understands this necessity and does the utmost to provide well-conceived motivation. If a student has a strong purpose, a clear objective and a sound reason for learning something, progress will be much better than if motivation were lacking.

Under certain circumstances you can do little, if anything, to inspire a student to learn. If outside responsibilities, interests or worries are weighing heavily, if schedules are overcrowded, or if personal problems seem insoluble, then the student will be unable to develop the interest to learn.

Here are some suggestions you can follow to arouse interest and assist the student to prepare for learning:

- Start lessons with an **attention -getting** opening. For examples of opening sentences that are effective, listen carefully to the start of documentary films or interviews on television. Writers spend a great deal of time developing the exact words to tune you in.
- State **specifically what** is required during the lesson and how you intend to prove that the student has the knowledge or can master the skill at the end of the lesson. Make all your statements student-centred.
- State the PURPOSE of the lesson and stress the BENEFIT from the new knowledge or skill. Try to give more than one reason for learning, just in case the student doesn't fully accept the first reason.



- Describe WHERE the lesson fits into the overall picture, and relate the lessons to past experiences that the students may have had. This statement provides a link with something students have learned before and allows them to build on that knowledge or skill. As an example, if you were giving instruction on how to recover from a stall to a student with gliding experience, you could point out that the sequence of aerodynamic control movements is the same as in a glider. This concept is closely related to the RELATIONSHIP learning factor.

- If the new material is dependent on students having mastered previous lessons, confirm that the required level has been attained before proceeding with the new material. Conduct a review and, if necessary, clear up any misunderstandings by briefly re-teaching the major points.

- Plan for reviews of lesson material. Students start to forget the moment they leave the instructional environment. The greatest rate of forgetting occurs during the first 24 to 48 hours after the material has been learned. Ohio State University has carried out extensive research in this area and has designed a recommended schedule of when reviews should be done.

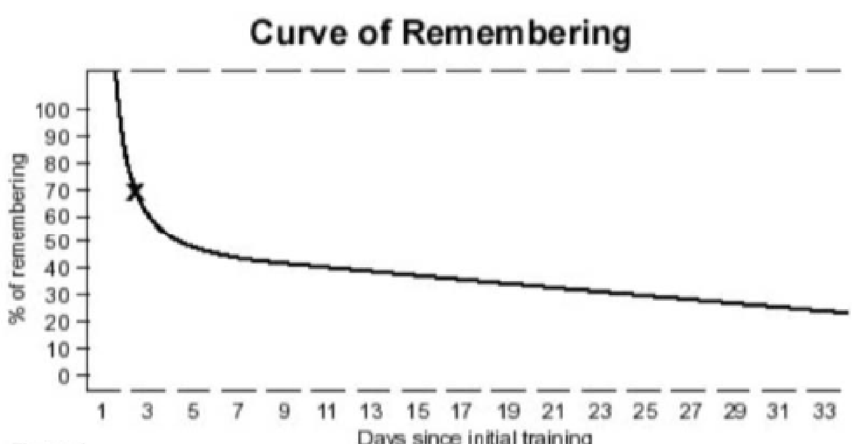


Figure 1

NOTES:

1. Statistics are based on an average cross-section of students.

2. The curve is very steep initially: within 2 days students will remember less than 70% of what they learned.

3. At the end of the month, without reviews, students will remember only approximately 40 % of the lesson material.

Refer to Figures 1 and 2 and the notes below each diagram.

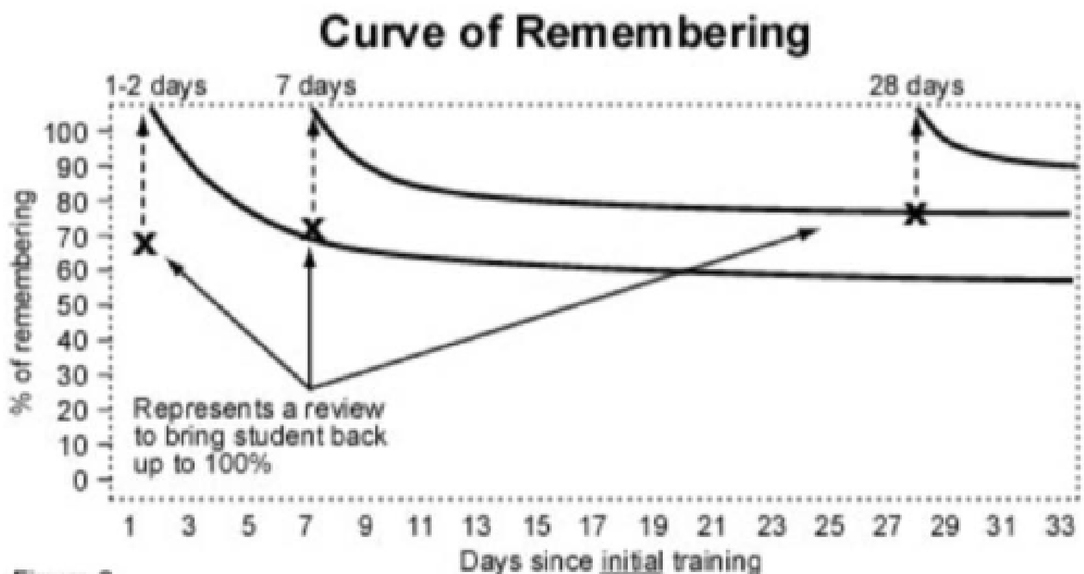


Figure 2

NOTES:

1. To maintain at least a 70% level, a review should be conducted within 2 days.

2. After the material is learned a second time the curve flattens out somewhat, but after 7 days the student is back down to the 70% level.

3. Another review at 7 days and the curve really flattens. The student will be above 70% retention until approximately day 28.

4. A review at this time will generally cause long-lasting retention of lesson material.

5. The amount of time required for reviews reduces each time a review is conducted.

Example:
Initial training: 50 minutes
1st review (at 2 days): 30 minutes
2nd review (at 7 days): 10 minutes
3rd review (at 28 days): 5 minutes

Primacy

Present new knowledge or skills correctly the first time (teach it right the first time).

When students are presented with new knowledge or skills, the first impression they receive is almost unshakeable. This means that what you teach must be correct the first time. Students may forget the details of lessons, but they will retain an overall image of the skill or knowledge for a long time. Frequently you will be required to perform manoeuvres in the aircraft before a student has had the necessary background training. You must perform those manoeuvres correctly or the student may imitate any errors you make. For example, before the exercise on cross wind circuits, you and your student may be required to take–off/land with a significant cross wind component. Any poor example shown at this time would have to be 'unlearned' when the exercise came up in a subsequent lesson.

Suggestions:

- Rehearse lessons to become thoroughly proficient at the skill or in answering questions related to the subject.
- Attempt to give a perfect demonstration of the manoeuvres to be learned in the next lesson. If students read or study exercise material without experiencing the actual exercise, they may form an incorrect mental image.
- If practicable, start each lesson with a perfect demonstration. Sometimes it may be better to avoid talking during this demonstration to allow maximum concentration on doing the skill perfectly.
- While the student is performing an exercise, supervise the actions very closely. Stop the student as soon as any performance error is noticed, and teach the correct method. Close supervision means that you NEVER allow a student to make an error during the initial stages of training. Think of how you would go about training a student to defuse a live bomb.

Relationship

Present lessons in the logical sequence of known to unknown, simple to complex, easy to difficult and concrete to abstract.

This particular learning factor emphasises the necessity for your student to understand relationships between new and old facts, or between ideas and skills, if learning is to take place. During flight training, students must understand not only why they are learning a particular exercise, but how that exercise combines with previous ones and where it fits into the overall syllabus. Giving students the relationship at the start of the lesson provides preparation for learning. Continuing the process throughout the lesson, helps to maintain the desire to learn.

Example: Compare or relate advanced take-offs and landings to normal take-offs and landings; show how a steep approach uses the same techniques.

Suggestions:
Present lessons in a logical sequence:

- Known to unknown.
- Easy to difficult.
- Concrete to abstract.
- Simple to complex.
- Familiar to unfamiliar.

"Explore
Dream
Discover"

- Always review basic knowledge before proceeding to the unknown. For example, when teaching students to multiply with a circular slide rule, the first example should be as simple as 2x2. The reason is that students already know the answer and are able to follow the manipulation of the slide rule. In the next problem or example, a change of one factor (2x4) allows students to build on knowledge already gained. The process is continued until students have mastered all the required knowledge and skills necessary to solve real problems.

- Present new material in stages, confirming that students have mastered one stage before proceeding to the next. The length of time for each stage would depend on the complexity of the material covered.

- Reinforce students' learning of new facts or ideas by frequently summarising the major points of your lesson.

- Use examples and comparisons to show how the new material being learned is really not much different from that already known by your students. The examples you use may be real or imaginary, as the main purpose of an example is to paint a verbal picture so students can visualise relationships between the new material and things that have happened before. This is called using 'verbal aids' for your instruction.

Exercise

Ensure students are engaged in meaningful activity.

Meaningful mental or physical activity is essential if learning is to occur. During flight training this is achieved through correct practice or repetition. Students learn by applying what they have been told or what has been demonstrated.

As learning continues or is strengthened by additional practice, your training syllabus should make provision for this practice time. You must ensure that the practice is directed towards a specific goal. Oral questions, hypothetical problems, dual review, or solo practice are all methods of providing mental or physical activity.

Instructor and student activities for each level of learning

LEVEL OF LEARNING	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY	KINDS OF QUESTIONS
Evaluation	Provides items to be tested	Records and draws conclusions	All
Synthesis	Provides exercise situations	Combines information into concepts	All
Analysis	Provides exercise situations	Breaks items into smaller components	All
Application	Demonstrates and explains	Imitates and practises	All
Comprehension (understanding)	Develops lesson by questioning	Answers and asks questions	Why? & How?
Knowledge (information)	Presents lectures	Listens	What?
Familiarisation	Gives briefings	Listens	Where? & When?

Table 1.

If students are able to answer questions involving the words ‘how’ and ‘why’, it usually means that they have a good understanding of the subject. For you as a flight instructor, these two words are probably the most important in your vocabulary.

Study Table 1 (page 55) and note both the instructor and student activities for each level of learning. Should you attempt to employ the application level of learning without having covered the understanding level, students will probably encounter much more difficulty than if they had mastered previous levels.

Suggestions:

- Unless you are testing to see what students have learned, avoid questions that are prefixed by the word ‘what’. Give students the facts, figures and necessary knowledge, then ask ‘how’ and ‘why’ questions to develop their understanding of the new knowledge.
- Once you have told students a fact, avoid repeating yourself. Instead, have them relate the facts back to you. This strengthens their learning and confirms their knowledge of the required material.
- Give students challenging problems that fit the level of learning, and provide only enough assistance to keep them on track. When students are able to solve the problems alone, they have demonstrated adequate knowledge and ability.
- Test students knowledge and abilities frequently. This reinforces learning and builds confidence. However, before testing you must be reasonably certain that students can answer the questions or perform the skills; otherwise they may become frustrated. Testing will also identify areas in which students have weaknesses, thus allowing you to re-teach these subjects to the required standard.

Intensity

Use dramatic, realistic or unexpected things, as they are long remembered.

Students learn more from dramatic or exciting experiences than from boring ones. It is a well known fact that a student's 'look-out' while flying will improve considerably after a first experience with a near miss. There is no suggestion here that you provide your student with a near miss, but you should attempt to make your students' learning experiences realistic, relevant and impactful as possible whilst ensuring you display enthusiasm and engagement during the exercise and taking opportunities to introduce them to the need to plan for the unexpected. The INTENSITY learning factor implies that students will learn more from real experiences than from substitutes. You will have to use your imagination to develop vivid experiences for dramatic or realistic effects.

Suggestions:

- Show enthusiasm and sincerity for the subject you are teaching.
- Attempt to employ a wide range of speech variation in rate, volume and pitch to keep students attentive.
- Use appropriate and effective gestures while explaining major points. The lesson will seem to come alive', and the points made will make a greater impression on your student.
- Use a variety of training aids to appeal to as many senses as possible. Each aid must relate directly to the subject matter being taught.

Effect

Ensure that students gain a feeling of satisfaction from having taken part in the lesson.

Learning is strengthened when accompanied by a pleasant or satisfying feeling. Students will learn and remember more under these conditions than when feelings of defeat, frustration, anger or futility are developed. If you were to demonstrate a 'wingover' type manoeuvre during the first air exercise, students would likely feel some inferiority, if not actual fear. The experience would be negative. They might even give up flying at that stage. This example is rather obvious, but you need to consider how your actions could produce feelings of frustration or anger. For example, you ask a student to perform a manoeuvre and then you immediately emphasise all the errors the student made. Your identification of each error may be very accurate, but how would the student feel about it? If the objective were to make the student feel defeated, then you would probably succeed. It is better to point out the positive aspects of a student's performance first and then discuss the major errors that were committed and finish with suggestions for improvement.

Whatever the learning situation, it should contain elements that affect your student positively and give feelings of satisfaction. Each learning experience does not have to be entirely successful, nor do students have to master each lesson completely; however a student's chance of success will be increased with a sense of accomplishment and a pleasant learning experience.

Suggestions:

- Involve students in the lesson by developing some of the new material from them. This can be done by asking students questions related to the subject and allowing students to contribute knowledge and ideas.
- Throughout your lessons, obtain feedback from students by asking questions, observing the performance of a skill, and watching for facial expressions that show a lack of understanding. You must respond to any feedback by answering questions and providing help and correction where needed.
- Show students how to improve, and offer praise when improvement occurs.

- Back up all of your statements with reasons. Whenever you tell students something, give the reason behind it. For example, you say to a student, ‘This aircraft has two static vents, one on each side of the fuselage.’ This is a fact, but if students do not know the reason for the two vents, they will probably pass it off as unimportant and forget. Remember, if a student understands the concept or theory, details may be forgotten but the overall concept will remain, and when an aircraft with only one vent is encountered more attention may be given to instrument readings while making a cross-wind approach.

- When a student encounters difficulty in mastering an objective, find a means of allowing some degree of success. For example, the lesson is steep turns. Rather than having students attempt the entire manoeuvre, try having them practice the entry. When no difficulty is experienced with the entry, add the next stage, then continue until the entire manoeuvre is completed. Should difficulty still occur, back up a step and attempt medium turns rather than causing too much frustration. Sometimes instructors make the mistake of continuing to have students attempt a manoeuvre when performance is deteriorating. It is better to quit at that point and go back to something the student can do well.

- Avoid ridicule or sarcasm. You may feel that it might take the place of humour; however students seldom have the same feeling, especially if they are the butt of the remark.

- Arrange each lesson so that when a student does something correctly there is a reward. This reward can be in the form of sincere, honest praise. You ask a student to complete a walk-around on a specific aircraft for which you have arranged to have a component such as a nut placed on the ground under the engine. Your student notices the offending part and brings this to your attention and is praised for this. If a thorough inspection is not completed, you have an excellent teaching point to emphasise why careful inspections must be done.

Recency

Summarise and practice the important points at the end of each lesson, as things learned and practiced last will be remembered longest.

Other things being equal, the things learned last are best remembered. Conversely, the longer students are removed from a new fact or even an understanding, the more difficulty they will have remembering it. The need for reviews was stated earlier, and a full circle has been completed: review - learn new material - review, etc.

Suggestions:

- Plan for a pre-flight briefing immediately before air exercise, and review the main points by questioning. This may sound like the **readiness and excercise** learning factors; however, recency deals with the timing of the practice.
- Ensure that students receive a thorough summary of the important points towards then end of each lesson.
- After each sequence within a flight or ground lesson, ask questions on the material or summarise the 'need to know' material.
- Conduct a test as the final part of your lesson.
- At intervals throughout the course, conduct review sessions in which no new material is taught, but reinforcement is obtained.
- Attempt to finish each lesson with a practice of the most important parts of the lesson. This applies to solo lessons as well as dual exercises. Remember, students practice knowledge by answering questions and they practice skills by doing.
- An important skill for a flight instructor is the ability to ask good questions. Good questions satisfy all the identified learning factors. The next section of this guide will deal exclusively with oral questions.

Oral Questions

When you present a lesson you have many techniques and aids at your disposal. One aid that can be used to stimulate learning and can be effectively applied to satisfy all seven learning factors is oral questioning.

The actual technique of questioning is a difficult one and is normally one of the most neglected areas of instruction. Good oral questioning requires the ability to think quickly and easily while facing a class or individual student, to shift and change as thoughts progress, and to phrase questions in clear and simple terms. You must always be mindful of the technique to follow when handling student questions and answers.

Purpose of oral questions

First, questions can be used to PROMOTE MENTAL ACTIVITY. You can state a fact and provide visual or verbal support to back it up, but the surest way for students to remember is to work it out for themselves. Whenever you can use an oral question to make your students think and reason out the fact, you should take advantage of the situation. For example: As students work towards an objective it is often necessary for them to recall pertinent data or knowledge learned previously.

A well-worded oral question could provide the required information, thus promoting mental activity. A second purpose of oral questions is to AROUSE AND MAINTAIN STUDENT INTEREST. Merely making a statement will often result in a ‘so what’ attitude, but asking questions makes students feel they are participating and contributing to the lesson and thereby arouses interest. You can maintain this interest throughout the lesson by the continuous development of facts and ideas.

Remember: Telling is NOT teaching.

Another purpose of oral questions is to GUIDE THOUGHT. By using questions you can lead students to think through to a logical solution. Questions can direct students' thinking through a definite sequence or to particular objectives. During discussions you can use questions to guide your students' thoughts back to the objective if they seem to be far afield. An experienced instructor can guide students through an entire lesson by asking the right questions at the right time.

A final purpose of oral questions is to EVALUATE LEARNING for the benefit of both instructor and student. Oral questions may be used after each stage of a lesson to ensure that students are following before you proceed to the next stage. At the end of the lesson, such questions confirm that students have attained the objectives for that particular lesson.

NOTE:
A drawback of using oral questions to evaluate learning in a class environment is that only random sampling of a class is obtained, since only one student answers each question. This drawback can be overcome by the use of some sort of student response system by the instructor. On a one-to-one basis, and during pre-flight and post-flight briefings, the above is not a problem.

Desired qualities of good oral questions

If oral questions are to serve the stated purpose, you must be mindful of the following desirable qualities of good questions when composing or preparing to use them.

EASILY UNDERSTOOD. Questions should be stated in simple straight forward language; they should be brief, yet complete enough that students have no doubt as to the meaning of the question. Examples include **open questions** which provoke open dialogue with no specific outcome or **closed questions** which seek a specific response. **Probing questions** are used to drill down to confirm the students understanding, while **leading questions** are used to get the discussion back on track. **Provocative questions** are used to test engagement and confirm students attention while **rhetorical questions** are not particularly valuable as the answer is often embedded in the question. **Double barreled questions** are also to be avoided as usually more than one question is asked at once causing confusion.

COMPOSED OF COMMON WORDS. Questions should be designed to measure knowledge of a subject, not use of language. The use of high-sounding words may give you a chance to display your vocabulary but adds nothing to instruction. Remember, if students do not know the meaning of the words they will not be able to answer the question. Always keep your vocabulary within the grasp of your student.

THOUGHT-PROVOKING. Questions should not be so easy that the answer is obvious to all students. Students should be challenged to apply their knowledge. You should avoid using questions where your student has a 50/50 chance of being correct. Examples of these are the YES/NO and TRUE/FALSE type, unless these questions immediately are followed by a 'why' or 'how' type question.

ABOUT THE MAJOR TEACHING POINTS OF THE LESSON. Questions must be built around the main teaching points of the lessons. They must be asked at the proper time so that these points are emphasised.

Your students may be confused if questions are asked in a haphazard fashion. The purpose for which a question is intended may be lost. To ensure mental participation by all students, the following procedure is used:

ASK THE QUESTION. You should state the question, applying the qualities of a good question. To do this you must have the question in mind before asking it. If questions are being used to evaluate learning or to confirm attainment of objectives, you should prepare them beforehand and write them in your lesson plan. It is often a good idea for beginning instructors to write out questions until they are accustomed to thinking on their feet.

PAUSE. After asking the question, you should pause for approximately 1 to 5 seconds (depending on the complexity of the question) to allow all the students to think it over and formulate an answer.

In a class environment, during the pause you should look over the class, being careful not to 'telegraph' who you are going to call upon to provide the answer.

NAME THE STUDENT. Class environment only. A problem you continuously have to face is selecting the student to answer the question. Some effort should be made to fit the question to the individual, because students will vary in ability and you have to recognise and provide for these differences. Therefore, you should consider giving the more difficult questions to the most advanced students. You also have to ensure that everyone in the class is called upon to provide answers with reasonable frequency. A number of systems commonly used to ensure this have serious drawbacks.

For example, if members of a class are called on according to seating arrangement or alphabetical order, it becomes quite easy for students to determine when they will be named to answer; thus the lazy students will not give serious thought to any question until it is getting close to their turn to answer. Possibly the most practical approach is to call upon students in a random order, then indicate by a check mark on a seating plan card each time a student is asked a question. To get a broader sampling of learning and to maintain interest, you should periodically call upon other class members to confirm the answer made by the first student asked.

LISTEN TO THE ANSWER. Often an instructor, after naming a student to answer a question, will immediately begin to think about phrasing the next question and will not be listening to the answer; and the instructor may say 'that's right' to an incorrect answer. This could lead to student confusion. You should always listen to the answer.

CONFIRM THE CORRECT RESPONSE. Student answers must be evaluated carefully so as to leave no doubt as to what is the correct answer.

Handling student answers

Aside from always confirming correct answers, there are certain techniques you must be aware of when handling student answers.

DISCOURAGE GROUP ANSWERS. Class environment only. When students answer as a group it is difficult to determine who supplied correct or incorrect answers; this may lead to student confusion. When you are given a new class, establish early that you do not want group answers but will call upon a student by name to answer. You may, however, want to use group answers at times to increase class enthusiasm.

DO NOT MAKE A HABIT OF REPEATING ANSWERS. This becomes monotonous to students when you always repeat the answer. If the answer provided is not correct or needs clarification, pass the question on to another student. If the student does not answer loudly enough for all the class to hear, have them speak more loudly and repeat the answer.

GIVE CREDIT FOR GOOD ANSWERS. This is especially true for the weak or shy student. When you are using oral questions to develop points from the class, do not reject answers that pertain to the subject although they may not be exactly what you are after. Give praise and try using a newly phrased question to bring out your point. If you receive a completely incorrect answer, don't embarrass your student by saying 'Wrong!' Diplomatically state that the answer is not what you wanted, and ask a supplemental question or refer the question to another student.

HANDLING STUDENT QUESTIONS. Never discourage a genuine question pertaining to the lesson. There is an old saying: 'For every student who asks a question there are six others who wanted to ask it'. Usually students ask questions because you have not given a clear explanation of the point or fact being queried. Some techniques to follow regarding student questions are:

ENCOURAGE QUESTIONS. Let the class know early in the lesson that you encourage questions at any time the students are not clear on points being taught. If it will not interfere with the presentation of the lesson, it is usually best to answer questions immediately if any point arises rather than waiting for a break in the lesson to solicit questions. If you wait for questions, the point of concern may have slipped their minds.

PASS QUESTIONS TO OTHER STUDENTS. Class environment only. Occasionally pass a student question to other members of the class; this will create interest and get class participation. Do not over-use this technique, as the students may get the impression that you don't know the answer and are fishing for help. Above all, never use this technique for any question to which you do not know the answer.

REJECT QUESTIONS NOT RELATED TO THE LESSON. Quite often students will ask a question totally unrelated to the lesson. Politely reject the question, being careful not to offend the student, and then say that it is a question you would prefer to discuss after class.

DO NOT BLUFF. No matter how knowledgeable you are of your subject, there will be times when you will be asked a legitimate question and will not have an answer. If you do not know the answer, say so - don't bluff. Tell the class you will find the answer. Ensure you do, and then inform the individual who asked, as well as the rest of the class.

ENSURE THAT THE ENTIRE CLASS HEARS THE QUESTION. Class environment only. When a question is asked, check that all the class has heard it. When you answer the question, answer to the class and not only to the individual asking it. If a long, detailed answer is necessary, the remainder of the class may lose interest and 'tune out' if you get into a conversation with one student.

RECREATIONAL AVIATION AUSTRALIA

The Demonstration-Performance Method of Teaching

General

A trainee-instructor once asked, ‘If I had time to learn only one method of lesson presentation, which one should I learn?’ The answer is the demonstration-performance method. Why? Well, the primary concern of an instructor is training. Training, in large part, is devoted to the development of physical and mental skills, procedures, and techniques. For example, flying aircraft, interpreting blueprints, driving vehicles, welding, building, shooting, repairing, solving problems, filling out forms-all of these, and many more, can be best taught by using the demonstration-performance method.

The demonstration–performance method can be broken down into five basic procedures:

- Explanation.
- Demonstration.
- Student performance.
- Instructor supervision.
- Evaluation.

Explanation and demonstration

The explanation and demonstration may be done at the same time, or the demonstration given first followed by an explanation, or vice versa. The type of skill you are required to teach might determine the best approach.

Consider the following: You are teaching a student how to do a forced landing. Here are some options:

- Demonstrate a forced landing and simultaneously give an explanation of what you are doing and why you are doing it; or
- Complete the demonstration with no explanation and then give a detailed explanation of what you have done; or
- Give an explanation of what you intend to do and then do it. You will find that different instructors will approach the teaching of this skill differently. The following represents a suggested approach that appears to work best for most instructors.
- On the flight before the exercise on forced landings, give a perfect demonstration of a forced landing. It may be better not to explain during this demonstration, since you want it to be as perfect as possible to set the standard for the future performance. There is another advantage of giving a perfect demonstration before the forced landing exercise. Your students will be able to form a clearer mental picture when studying the flight manual, because they have seen the actual manoeuvre.
- The next step would be for you to give a full detailed explanation of a forced landing. During this explanation you would use all the instructional techniques described previously. You must give reasons for what is expected, draw comparisons with things already known and give examples to clarify points. This explanation should be given on the ground and use visual aids to assist student learning.
- When in the air, give a demonstration, but also include important parts of the explanation. Usually asking students questions about what you are doing or should do will give them an opportunity to prove that they know the procedure, although they have not yet flown it.

- After completing the demonstration, practice a forced landing and while climbing for altitude, clear up any misunderstandings the students may have and ask questions.

- The demonstration and explanation portion of the demonstration-performance method is now complete, and you should proceed to the next part, which is the student performance and instructor supervision.

Student performance and Instructor supervision

Student performance and instructor supervision are always carried out concurrently during the initial stages of training. A student should not be allowed to make a major error at this time. Your supervision must be close enough to detect the start of an error, and you must correct the student at that point.

The student should be allowed to perform the task in small segments, with you providing close supervision of each segment.

Referring to our example of the forced landing, consider the following suggestion of how to divide the task into segments.

On the student's first attempt following an initial demonstration by the instructor. You, the instructor:

- Select the field, making sure that it is within easy gliding range; and

- Perform all in-flight checks, including look-out.

The student flies the aircraft and concentrates on making the field.

If the student makes a major error, you take control and place the aircraft in the correct position, then give the student control and continue the approach. (Try to ensure that the student makes the field on the first attempt, even if you have to help all the way through). On subsequent attempts, depending on the degree of success of the previous attempt, add more items for the student to carry out.

Continue the process until you feel the student can fly the complete manoeuvre alone. You have now completed the student performance and instructor supervision portion of this method, and you should now proceed to the evaluation.

Evaluation

The evaluation portion of the demonstration-performance method is where students get an opportunity to prove that they can do the manoeuvre without assistance.

For the practice forced landing you should explain to your student that you will be simulating an engine failure and that they are to carry out the entire procedure, including all checks and look-out.

While the student is performing this manoeuvre you must refrain from making any comments. Offer no assistance whatsoever*-not even grunts or head nods. You must, however, observe the entire manoeuvre very carefully, so that you can analyse any errors that the student may make and debrief accordingly.

NOTE:
You must interrupt the student's performance if safety is a factor. Success or failure during the evaluation stage of the lesson will determine whether you carry on with the next exercise or repeat the lesson.

Rules for using the demonstration-performance method

Give a perfect demonstration or, if this is not practicable, show the finished product.

For example: when teaching map preparation, show a map with a cross-country trip all marked out as students will see the standard expected in preparing their own maps.

Give a step-by-step explanation of the required task. Use reasons, examples and comparisons to make the explanation clear.

Have students imitate a step of the skill while you provide close supervision. For example, have students practice the entry to a steep turn until it is correctly done before you go on to the next step.

Continue until the student has imitated each step. Provide time for the student to practice with assistance as necessary.

Ensure that the amount of time allocated for student practice equals or exceeds the amount of time for the demonstration, explanation, and student performance under very close supervision. Students should take as much time to practice as you take to teach.

Overall rule: while you are demonstrating and explaining, your student listens and observes; while your student is performing, you listen and observe. NEVER ask the student to fly/perform while you are explaining.

Complete the exercise with an evaluation (final check-up where your student has the opportunity to prove what they can do).

NEVER just explain and demonstrate a skill or procedure for students. **Always** have students perform the skill to ensure that the skill or procedure is done properly. **Stick with them until the skill is performed competently**. For example, during the pre-flight briefing, your student is unable to correctly state the engine failure immediate actions. Explaining how to do this drill, even with a demonstration, is no guarantee of student success. Have your student review the flight manual and verbalise the procedure to you, then have them practice in the cockpit on the ground until competent before departing for the air exercise.

The following techniques, if applied in a conscientious manner, will help the flight instructor to give effective instruction. Because most flight instructors also carry out some, if not all, of the ground school training, references to classroom-type instruction are included in this summary.

The techniques of instruction, questioning techniques, lesson planning, etc., are equally applicable for providing large group instruction or for air instruction on a one-to-one basis, individual preparatory ground instruction, or pre-flight briefings.

To present a lesson in a professional manner, you must prepare in advance and proceed as follows:

Preparing a lesson plan

Reason: A lesson plan acts as a guide and keeps you on track during your presentation. It also ensures that important points are covered and not neglected because of poor memory.

What to include:

- sufficient notes to jog memory on talking points
- specific questions and answers
- to confirm student learning
- visual aid instructions (including a white-board plan)
- a well-thought-out opening and closing statement
- estimates of the amount of time to be spent on each major idea or item, and
- a visual aids plan; any other material that you feel will help to get the lesson across

What to avoid:

- writing material out in full detail (this promotes reading of the material while you are in front of the class)
- using single space format (this does not allow for revision of the notes the next time the lesson is to be given), and
- writing in longhand, unless you are able to read your notes at a distance of 1 metre. (This makes you appear not to know your material because you have to look closely at your lesson plan rather than just glance at it to jog your memory.)

Prepare the classroom/teaching area before the lesson

Reason: The class must be arranged for best student learning. If students cannot see all the aids, they may miss a point. Lesson preparation appears more professional if no time is wasted organising aids or

Prepare/check training devices/aids before the lesson

Reason: This avoids embarrassment should an item not work, or should any chart, slide or graph be shown in the wrong order.

Prepare your students for learning

Reason: If students are to learn, they must be physically, mentally and emotionally ready to do so.

How to do it: Explain to your students specifically what is required of them during the lesson and what they will be able to do at the end of the lesson. Explain why they should take part in the lesson and how the new skill or knowledge will benefit them. Give as many advantages as you possibly can for having students learn, as they may not agree with some of your reasons.

Describe an overall picture of the lesson, and show them how it fits into the entire course. Relate the new material to some past and/or future experience of your students.

The length of time required to prepare students for learning depends primarily on their background knowledge and the complexity of the material. As a general guide, the amount of time needed is approximately 10% of the lesson.

"One of the greatest safety devices in the world is a free state of mind, a happy state of mind on the part of those at the controls" Eddie Rickenbacker

Start the presentation of new material at the students level of understanding

Reason: If you begin your presentation at a level your students do not understand, there will be confusion, time wasting and little or no learning will take place.

How to determine the student's level of understanding:

- Before the instruction starts, conduct a Threshold Knowledge Test to determine what your students know or don't know. A Threshold Knowledge Test is simply some form of examination, written or oral, of sufficient length to inform you as to the actual level of knowledge.
- During the course of instruction have periodic reviews.
- Conduct a review of previous lessons before you start each lesson. The review should consist of a series of questions. If your students answer correctly, proceed. If they do not, re-teach.

Check with other instructors for the strengths and weaknesses of your students, and arrange your material to fit the students' needs.

Proceed at the rate of student comprehension

Reason: If you get ahead of your students during the presentation, you are in the same position as if you started above their level.

How to ensure that you are proceeding at the required rate:
Arrange your material in stages. Stop at the end of each stage and ask specific questions on the material you have just covered. If your students answer correctly, proceed. If they do not, re-teach. The length of time for a stage depends on the complexity of the material being presented, but a good general rule is 8 to 12 minutes.

Write out in full a number of well thought out questions. Put these questions on your lesson plan and make sure they are asked during the presentation. The feedback you get from these answers will determine whether or not your students understand.

Observe your students closely for facial expressions that could indicate that they do not understand a particular point. If students say they understand, ask them a question to make sure.

Encourage students to ask questions on points that they do not fully understand. Provide for lots of practice of basic skills before you go on to the more complex parts.

Identify and emphasise major points for the students

Reason: During any presentation there is a mixture of 'need-to-know' material, which is extremely important, and 'nice-to-know' material, which may or may not have to be remembered for a long period of time.

How to identify and emphasise points for your students:

- Prepare a visual aid of the main points; approximately 75% of learning comes from vision, whereas only about 13% comes from hearing. The visual aid may be a heading on a white-board, chart, or projected image.
- Have students write the main points down in their notebooks, or provide notes that include these main points.
- Make a verbal statement to the students, such as: 'This particular point is very important:- remember it.'
- Prepare an orientation board (whiteboard or sheet of paper) that identifies the major points for a lesson. Students can refer to this board throughout the lesson, and this helps their thoughts to be guided to a specific area.
- Raise the volume of your voice and reduce the rate of delivery while stating an important point, to add emphasis.
- Besides emphasising the main points, you should also emphasise safety and the points that are easily forgotten or difficult to remember.
- Provide emphasis according to relative importance. The most important things get a greater amount of emphasis.
- Emphasise points by giving verbal examples (real or imaginary); by comparisons (similarity to, or difference from, known facts); and perhaps most importantly, by giving reasons for each point you make. Students tend to remember better if they understand the reasons behind every point they must learn.

- Repeat the point frequently by using summaries, or have your students repeat the point by answering your questions.
- Conduct periodic reviews of the 'need-to-know' material.
- Have the students complete a home assignment of the important points of a lesson.
- Have students record in note form the major ideas or items that you feel must be emphasised. By having them write ideas down you are using another sense, so learning may be reinforced.
- Use a variety of training aids to appeal to several senses (touch, feel, etc.).
- Do not emphasise 'nice-to-know' material.

Give clear explanations and demonstrations

Reason: If students do not understand an explanation, you will have to re-teach by rephrasing or by going over the material a second time. The same applies to a sloppy or inaccurate demonstration.

Suggestions for ensuring that your explanations and demonstrations are clear:

- Start verbal explanations by referring to something already known by your students. Association of ideas makes it easier to follow your explanation.
- Use words and phrases that are commonly used. Avoid showing off your command of the English language by using such phrases as: 'Elaborate on the fundamental ramifications of hylampherism'. Instead, ask 'What happens when the lever is lifted?'
- Attempt to reduce complex material and ideas to a simple, easy to understand form. The best way to do this is to start with something your students know about and build on that knowledge in small steps.
- If you are required to demonstrate something, make sure you can do it correctly before you show the students.
- Make sure all students can see even the smallest points of a demonstration; if necessary, gather them around you.
- If you are doing a simultaneous demonstration and explanation, break the demonstration down into small steps and explain each step thoroughly, giving reasons, examples and comparisons.

Use visual aids and use them effectively

Reason: Approximately 75% of all learning comes through vision. Ideas can be sourced from:

- graphic artists or personnel associated with the production of visual aids.
- other instructors, who can often give spark to an idea.
- commercial displays in newspapers, magazines, television and stores and,
- your own imagination, which (if you give it full reign) is an excellent source of ideas for aids.

Types of visual support:

- actual equipment.
- mock-ups, charts, diagrams, pictures or models.
- DVDs, films, videotape and cassette recordings.
- sometimes, people.

Guidelines:

- Plan the lesson first, and then select the type of visual support that helps students learn the material. DO NOT select a visual aid and then try to build a lesson around it. Just because the aid looks impressive, it does not mean it will fill the need, the need being to help your students learn the ‘must-know’ information.
- Plan to use a visual display of all major points that are covered during your lesson. Simple wording on the whiteboard is usually better than repeating the main points over and over again.
- Make your aids simple and clear. Eliminate all unnecessary data. Avoid the tendency to produce ornate, detailed artwork.
- Manufacture aids that can be seen by all the students. Before you use it, put the aid in the position in which it is to be used. Go to the position of the student farthest away, and ensure that you can see the aid clearly.

- Use a variety of colours to add interest, but make sure you keep associated parts or ideas or a repeating idea in the same colour. In this way, you help your students to follow your presentation more easily.
- When an aid is not in use, cover it up or remove it from sight. It can act as a distraction for your students if it is there but not being used.
- If the aid includes written words, have someone check for correct spelling and grammar. You would be surprised how many times misspelled words are displayed for students.
- If possible, stand well away from the aid and use a pointer so that you do not obstruct the view of any student.
- If you are using charts it is sometimes advisable to have two copies, one labeled and one unlabeled. The unlabeled one can be used later to test student knowledge. Alternatively, a duplicate work sheet of the chart can be given to each student to fill in or label.
- Consider: Will the aid help the student learn better, easier, or faster? You should ‘show them as well as tell them’.

Vary the rate, volume and pitch of your voice when delivering the lesson

Reason: Any form of variety adds to student interest. Speaking in a dull manner will generally put students to sleep, or at least allow their minds to wander off the subject.

Consider:

- Speak at a fast rate while presenting 'nice-to-know' material. This produces the effect of observable enthusiasm, and enthusiasm is contagious.

- Speak at a slow rate when identifying 'must-know' information. This allows students to separate the 'need-to-know' from the 'nice-to-know' material and in most cases adds emphasis to the points being made.

- Adjust the volume of your voice to the conditions under which you are instructing. If there is background noise you must raise the volume of your voice so that all the students can hear what you are saying.

Generally you will have very little control over the pitch of your voice, but adjusting the volume and varying the rate of delivery will often help to vary the pitch to some extent.

Obtain feedback from students by looking at them (eye contact)

Reason: It gives students the feeling that you are interested in them and allows you to determine whether or not they understand what you are presenting.

Consider:

- Look directly at the students, but do not stare at any particular individual for too long at a time. If students avert their eyes it means you have stared too long and possibly caused some embarrassment, look at someone else or out the window.

- Make your eye contact impartial. Do not favour any individual student or group of students; include them all in your presentations.

Provide for maximum student activity during the lesson

Reason: Students learn more easily if they are actively engaged in the learning situation.

Consider:

- When learning a theory subject, students' practice of that theory is usually in the form of answering questions. Ensure that you ask questions throughout the presentation.
- Use sound questioning technique, as outlined in section 2 of the Appendix - 'Oral Questions'.
- Distribute your questions evenly among all the students, to avoid having a few answer all the questions.
- Make your questions thought provoking and challenging.
- Avoid questions that require a simple YES or NO answer, unless you immediately follow up with a 'why' or 'how' question.
- Always have enough information in the stem of your question to guide the students' thoughts towards a particular area. Avoid general or ambiguous questions, such as 'What goes up the cylinder of an engine?' You may not get the answer you are looking for.
- Meaningful activity while learning a skill is normally a combination of answering questions and practicing the various steps of the skill. Arrange to have students involved in the practice as soon as possible after the start of the lesson. If possible, build into the first part of the lesson a 'hands on' opportunity for your students. This increases their interest and in most cases will give them a positive desire to learn more.
- Always supervise student practice very closely; do not allow them to make mistakes from which they could begin to learn bad habits. If you do, you will have to reteach them. The phrase 'practice makes perfect' is only true if the person practicing receives close guidance and supervision.

"Once you've tasted flight you will forever walk on the earth with your eyes turned skyward, for there you have been, and there you will always long to return."

Leonardo Da Vinci

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Developmental Teaching or Teaching By Questioning

Developmental teaching is based upon a student-centred philosophy of teaching that requires you to reason with students to have them meet predetermined objectives. By using the students' background knowledge, you ask questions that lead the students to determine the next step in a procedure, the logical application of a principle, or the final solution to a problem. The rate of progress in developing the more complex ideas of the lesson is governed by the students' perception and comprehension.

Questions should be asked to review previously learned material. The process of developmental teaching begins when students are required to reason out, and make suggestions, with respect to new material.

Developmental teaching has been used throughout the years by all good teachers. Because of the requirement for every student to participate, developmental teaching is effective with small groups and with individual students. It can be used at any level of student knowledge, provided that you know or determine the appropriate level and proceed accordingly.

Depending upon the subject matter, some lessons can be entirely 'developmental'. More frequently, however, there will be a combination of teaching by explanation (where it may be more efficient to explain certain material) and developmental teaching (where crucial areas of the subject matter can be reasoned with your students). In almost every lesson, some developmental teaching is appropriate and desirable.

The main advantage of developmental teaching is that it promotes efficient student learning because it satisfies all the basic aspects of learning. Since students participate in meaningful activity, they are forced to think about the material being learned, as questions are answered verbally.

Consequently, interest is maintained, a sense of accomplishment is gained, and effective learning takes place. You receive constant feedback and frequent confirmation of the students' progress.

Careful planning for developmental teaching is critical because you must formulate appropriate questions that demand reasoning on the part of your students. The standard questioning techniques must be observed, and student responses must be handled with tact and discretion.

In addition to being a master of the subject material, you must be flexible in your approach. You must permit adequate discussion, yet exercise sufficient control to move towards the lesson objectives. Frequent summaries are necessary to consolidate the material as the lesson progresses.

Novice instructors are frequently apprehensive about trying developmental teaching. Experience has shown that students consistently surprise instructors if given the chance to participate actively in the learning process.

The disadvantage of lecturing during preparatory instruction is that students are frequently told material that they already know, or that they reasonably can be expected to deduce on their own. The best teaching occurs when students are led to a point from which they can systematically direct their own reasoning to the solution of a problem. The secret of effective learning is to keep students mentally active in the learning process. With developmental teaching students are forced to think.

Student Progress

Rates of learning

Although it would be convenient if the rate of learning could be consistent and predictable, it is not always so. Students may progress rapidly for a period, and then suddenly progress more slowly or even retrogress for a time. Such variations are to be expected. It is your responsibility to detect them as soon as possible and to try to eliminate their causes by redirecting your instruction to level them out as much as possible.

Advances and plateaus

Learning proceeds rapidly at first when a new task is introduced then slows as a reasonable degree of proficiency is achieved. When plotted on a graph, this decrease in the rate of learning is shown as a leveling of the ascending curve that represents progress (see Figure 3). As students achieve the ability to bring together other aspects of training, progress then tends to resume its upward climb at a slower but fairly constant rate.

The relatively level portion of the learning curve is termed a plateau. It may represent a period of training during which the student is perfecting the application of the new skill. The correlation of the new skill with the other learning tasks may not yet be obvious.

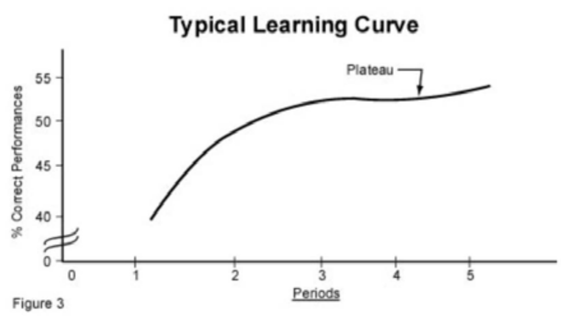


Figure 3

The rate of progress in learning is affected by so many outside influences that it is not often predictable. The rate of learning is affected by such things as:

- diversions
- lagging motivation
- emotional disturbances
- upset training schedule
- weather
- equipment breakdown
- unavoidable absences

Slumps or plateaus in the rate of learning are more likely to occur as your student advances to more complicated operations, such as hovering or transitions. Often the reason is that a student has failed to master one basic element of the operation, and this leads to the appearance of deficiency in the performance of later elements. Improvement usually becomes normal again when this one basic element is mastered. You can accelerate improvement by careful fault analysis and by concentrating instruction on that one phase of the operation concerned.

Without competent instruction, students will probably not understand why they aren't improving and will become discouraged. This discouragement tends to prolong the plateau. During such periods of discouragement, you should step in to isolate and correct the situation and to provide special incentives until normal progress is resumed.

Reversals sometimes occur, during which a student's performance becomes worse with continued practice. Generally such reversals are due to a faulty habit pattern involving one of the basic elements of the manoeuvre or operation involved. This faulty habit causes your student to practice an erroneous performance repeatedly, until correction becomes very difficult. You must not accept such errors and misunderstandings as normal plateaus in the learning process. They must be corrected before progress can resume.

During advanced stages of learning, the rate of progress can be very slow. For example: An acrobat who can perform a routine to a level of 9.6 continually practices to improve the performance. Raising the score up to 9.8 or 10 requires extensive training and practice. Students may be nearly ready for a flight test at an early stage, and added training will only show slight, slow improvement.

Reversals in the rate of learning could also take place if you were to place too much emphasis on a single phase, element or manoeuvre.

You are likely to be discouraged when you discover that a well planned lesson does not teach all students with equal effectiveness. Usually, however, you soon see that this is natural. One manifestation of the difference among students is that they seldom learn at the same rate. Differences in rates of learning are based on differences in intelligence, background, experience, interest, desire to learn, and countless psychological, emotional, and physical factors. You must recognise that students are different. You must recognise that this fact dictates how much you can teach, at what rate, and when.

Personality differences

ATTITUDE: Students have their own personal attitudes and methods of thinking. Thinking patterns and reactions to the various philosophies and types of training must be reconciled. The instructor must consider whether the attitude is caused by hereditary or environmental factors. The root of attitude problems may sometimes be found in the general attitude of the school staff.

INTEREST: People sense ideas and activities that possess special values, uses or attractions for them. Three general categories of interest are the vocational, educational, and avocational. The interests of students in different aspects of flying will differ. Efforts should be made to take advantage of these and to channel students into different areas as needed.

Emotions

Emotions play an important part in the training of a student. You must know the kinds of emotions and the techniques needed to control them. Most of us think of emotion as overpowering feelings such as passion, hatred or grief. These are not typical of the entire range of emotions. Everything we do, or with which we come in contact, is coloured by some emotional feeling. Emotions vary from mildly pleasant or unpleasant feelings, all the way up to feelings so intense that physical and mental activity is paralysed. All of us experience a wide variety of emotions every day. Rarely do they bother us or interfere with our ability or willingness to do our job. However, students in flight training are in an abnormal emotional condition. Students are in unfamiliar situations where accelerated pressures are experienced over a long period of time. The learning situation tends to intensify the students' emotional problems more than we would expect in everyday life. You cannot ignore this problem but must learn how to recognise and overcome it.

Degrees of emotion

For our purposes, we will divide the various levels of emotion into three categories:

MILD EMOTION: This is the everyday type of emotion such as a small amount of satisfaction or dissatisfaction with our jobs, our personal lives or with other people. Mild emotions affect motivation.

STRONG EMOTION: This degree of emotion is not felt very often in everyday life, but it causes most of our emotional problems in flying training. Strong emotions cause a large amount of tension in an individual and no one can live or work normally with prolonged tension; however, strong emotion can be coped with.

DISRUPTIVE EMOTION: These are very severe, deep-rooted emotional tensions that disrupt logical action and clear thinking. Persons suffering disruptive emotions usually require the assistance of a psychiatrist; however, these problems occur so rarely that you need only be aware that they exist.

The effect of strong emotional tension

A person cannot tolerate strong emotional tension over any length of time. It causes extreme nervousness, irritability, and an inability to relax. It interferes with normal eating and sleeping habits and makes the subject generally miserable. Everyone, either consciously or subconsciously, tries to relieve prolonged emotional tension.

The effect of emotional tension on learning depends on the method chosen by the student for relieving it. If the problem is attacked directly, and solved, then learning is enhanced. For example, students may have strong feelings of frustration or worry due to deficiency in one phase of the flight training program. If they work harder, study more, and receive extra instruction, progress will probably become satisfactory and tension will disappear. On the other hand, if the real problem is avoided, an escape mechanism may be used to reduce tension and learning will suffer.

Use of emotional escape mechanisms

Students in flight training will often use the following escape mechanisms. Occasional use of escape mechanisms is normal in everyone, but their over-use indicates strong emotional problems. You, therefore, must learn to identify the symptoms that indicate that a student is using escape mechanisms.

PROJECTION: transferring the blame from oneself to someone or something else.

RATIONALISATION: finding a believable excuse for one's actions or failure; trying to justify unjustifiable behaviour.

RESIGNATION: becoming resigned to the situation; giving up.

FLIGHT: physically or mentally removing oneself from the tension-producing situation.

AGGRESSION: taking one's tension out on someone else by becoming belligerent or argumentative.

A student's overuse of one or more of the escape mechanisms, along with other symptoms, may indicate an emotional problem. You should not wait until emotional tension becomes extreme before taking corrective action.

Meeting the differences

You must be aware of the differences in aptitude, personality, and emotions among your students and understand the necessity to treat students as individuals. When you have analysed the situation and determined the differences, seek help from more experienced instructors or supervisors when necessary. You will attempt to equalise the different levels of understanding, ideally raising the level of some without retarding the progress of others. Coping with differences among students is perhaps the greatest challenge of instructing, and finding the correct approach for each student is essential.

Some traits and faults of students are fairly common and can be recognised easily. These are discussed in the following paragraphs, together with suggested corrective actions and also provided in Table 2 (p 91).

NERVOUS OR UNDER-CONFIDENT. Nervousness or under confidence in a student is a trait that may or may not disappear. Instruction may be too rapid and material may not be absorbed. Repeating the fundamentals and ensuring mastery will often alleviate this condition. You must ensure that this type of student receives deserved praise whenever possible. Harsh rebukes should be avoided. Patience is very necessary when dealing with a student of this nature. The student must be aware that you are trying to help. Nervous students may be so apprehensive that they may not be suitable for pilot training. You should avoid manoeuvres involving extreme aircraft attitudes, unless they are essential to the lesson being taught. Take the time to build the student up to exercises involving extreme aircraft attitudes.

OVERCONFIDENT OR CONCEITED. You must first ensure that this type of student has the ability to match the confidence and, if so, set more difficult tasks that require greater accuracy. More criticism of imperfections is advisable. If the student has little ability, counseling may be required. Any signs of familiarity must be discouraged.

FORGETFUL OF INSTRUCTION. At the beginning of training, students may forget previous instruction. Students with this problem require a great deal of patience and probably need more review than the average student. Extra time spent in briefing and debriefing and more study on the student’s part should be rewarding for all concerned.

INCONSISTENT. Many students, at one time or another throughout the course, appear to lack consistency in flying proficiency. There are many reasons for this, and you must try to find the one that fits a particular student. You must look at yourself and your attitude towards the student. Most of us have good days and bad days, but when a student shows large fluctuations in proficiency the instructor must look closely at the teaching activities. A change in approach or even a change in instructors may be called for.

SLOW STARTERS. Slow starters are students who find difficulty doing more than one thing at a time. Again, patience is mandatory. Progress may be slow, but encouragement will help.

FAST STARTERS. Fast starters are usually students with previous exposure to flight training who quickly grasp the initial air exercises. You should not omit anything from the briefings.

Watch for signs of weakness when new work is introduced. This type of student usually slows down to the level of the others shortly after going solo. A high degree of proficiency throughout the course should not be anticipated unless the student has above-average ability.

IMMATURE. You must not be too harsh with students who appear immature. You will find that within a short time in the flying training environment, the students will attain a greater degree of maturity. Your attitude is of prime importance in setting an example. You must encourage and help these students whenever possible.

AIRSICKNESS. Some students may suffer from airsickness induced by motion, negative G, apprehension, claustrophobia, tension or excitement. You must attempt to determine what affects the student. When signs of airsickness show up, try methods of prevention such as letting the student fly straight and level, stopping instruction, inducing relaxation, making conversation about something else, or whatever will keep a particular student from becoming airsick.

Table 2: Student traits and how to address them

	PROBLEM												
SUGGESTED ACTION	Learns slowly	Know-it-all	Timid	Wastes time	Too aggressive	Antagonistic	Learns rapidly	Finds fault	Immature	Courts favours	Stalls, evades	Dominating	Inattentive
Tailor	*					*	*						*
Provide more work		*			*		*			*		*	
Give more individual instruction	*		*	*									
Be patient in correcting mistakes	*		*			*		*					
Give no chance to dodge responsibility		*	*	*				*	*	*	*		*
Rigidly check students work		*		*	*			*	*	*	*	*	*
Let student know what is expected	*		*	*	*			*		*	*		*
Determine validity of grievances						*		*					
Give student more responsibility		*		*	*	*	*	*		*	*	*	*
Give more difficult assignments		*			*		*					*	
Require student to prove ability		*		*		*		*		*		*	
Have student work alone						*	*	*				*	
Keep student informed of progress		*		*				*	*		*		*
Tell student why progress is poor	*		*	*	*	*		*	*	*	*		*
Check at first occurrence				*				*	*	*	*	*	
Have a personal talk with student		*	*	*		*		*	*		*	*	*

The Student-Instructor Relationship

The primary responsibility for establishing a favourable student-instructor relationship rests with you. The successful performance of your job requires that your relationship with students accomplishes three things. It must maintain discipline and respect for you, the instructor: these are necessary for any leader. Students must obey your directions, especially in an aircraft. They must follow your example and strive to carry out your instructions and suggestions for improvement.

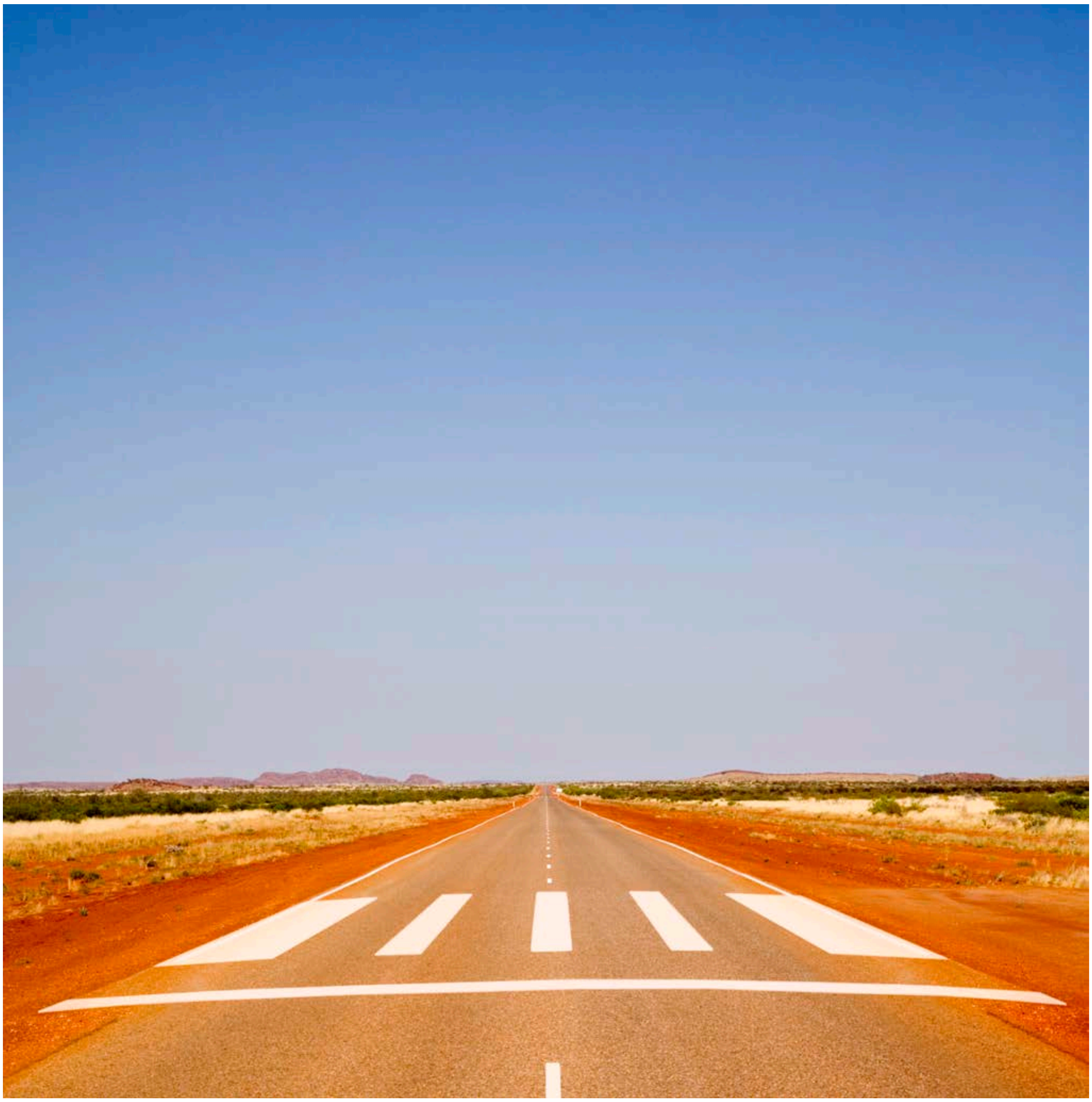
The desire to help your student solve a problem is an important part in student-Instructor relations. An obvious willingness to help students with problems will do more than anything else to hold respect, loyalty, and cooperation. This willingness to help can be demonstrated by counseling. Counseling is a continual process, and informal counseling takes place any time an attempt is made to help students with problems concerning training.

You want your teaching to result in good pilots who are able to use the initiative, judgement and skills that you have nurtured in them throughout the course. If students are to respect, rather than fear or resent, your authority, you must be fair, firm and friendly. Do the following and you will be considered to have some of the qualities of a good instructor:

- Inspire your students to set goals that will stand them in good stead in aviation. Your exemplary conduct and high ideals will help in this goal.
- Be decisive. Weigh all the factors necessary to make decisions and then act with conviction.
- Be interested in your students and let them know by being familiar with their backgrounds, problems and achievements.

- Respect their rights and, when correcting mistakes, do so in a straightforward manner, never using sarcasm as a correction method.
- Acknowledge your own mistakes. The admission that 'You were right and I was wrong' does much to develop morale.
- If you do not know the answers to relevant questions, say so, find the answers, and tell the students later.
- Be enthusiastic. Instructor enthusiasm is reflected in student learning.
- Encourage student initiative, self reliance, ideas and suggestions. By doing so, you teach your students to reason for themselves instead of driving them to rigid conformity. However, stress that there are certain boundaries that they must not overstep.
- Be impartial and fair: never show favouritism.
- Never bluff: much of your subsequent instruction may be distrusted.
- Use humour. Appropriate humour creates goodwill and can be used to teach difficult subject material-but don't become so humorous that the business at hand becomes secondary.
- If you doubt a student's progress or motivation, arrange for an independent check. Perhaps some modification to your teaching approach may be needed. In extreme cases a change of instructors may be in order, if your school situation will allow.
- Be aware that the use of cockpit intercommunication demands suitable phrasing, speech level, clarity, and discipline.
- Teach your students to have mastery over the aircraft, to fly with verve and spirit to the limit of the aircraft's flight envelope, and to know what they can and cannot do, but draw a very definite distinction between intelligent confidence and foolhardiness.
- Plan all solo lessons. Give your students thorough pre-flight and post-flight briefings, and make sure that they clearly understand the requirements and aims of the exercises. Thorough debriefings allow you to find out about difficulties that you may not hear about otherwise. To your student, failure to debrief may appear to simply a lack of importance of the exercise or a lack of interest on your part.

- Be present when your students are being debriefed after check rides or tests. You may find out points that you may have missed while flying with your student, and you will certainly get details in a verbal debriefing that will not be included in a written report.
- Maintain a professional image.



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Fault Analysis

Fault analysis is necessary at all levels of flight training. The ability to debrief effectively is a skill equally as important as the abilty to fly the aircraft to an exceptional standard. You must realise that the sole purpose of fault analysis is to improve future student performance.

A valid critique contains three essential elements:
1. Strengths;
2. Weaknesses; and
3. Specific suggestions for improvement.

Without each of these elements, fault analysis is ineffective, as it does not accomplish its sole purpose. Strengths are analysed to give a feeling of satisfaction and to show that you recognise what students can do well. If you are unable to identify strengths, it will be difficult for students to believe that your identification of weaknesses is accurate. Positive reinforcement of a student's strengths will frequently do more for the student than any number of remedial suggestions on your part. The necessity of analysing weaknesses is readily apparent. This leads into the third element: specific suggestions for improvement.

Whenever you are critiquing a student, consider the following: if you are unable to suggest a remedy for overcoming the weakness, your student does not have that weakness. Positive suggestions are mandatory for improving future performance; however, you should limit your critique to the identification of a maximum of three weaknesses with suggested remedies. Attempting to correct all the weaknesses that a student may have at one time could result in your student not being able to correct any weaknesses. During actual flight instruction you should attempt to pinpoint a single major weakness before considering the next. Improvement in a student's performance takes time: an expert will not appear overnight. More will be learned if a definite improvement in performance is experienced each time the student takes part in a lesson.

The recommended format to follow when conducting fault analysis is:

When in the air:
- identify major strengths.
- pinpoint a major weakness.
- suggest a remedy to correct that major weakness.

On the ground:
- identify major strengths.
- identify a maximum of three major weaknesses.
- suggest remedies to correct the major weaknesses.

NOTE:
One way to think of a major weakness is: ‘What item, if corrected now, would result in the correction of the greatest number of other faults? As student performance improves, the weaknesses that originally were considered minor ones now become the only weaknesses. All weaknesses will be dealt with in order, dealing with the most important ones first.

Characteristics of effective fault analysis

Effective fault analysis always strives for maximum objectivity. You should never allow personal bias to affect the grading or analysis of any particular flight.

Objectivity should be considered in both student personality and flying techniques. At times, personality conflicts occur but as a professional instructor you will hold these to a minimum. In the area of flight technique, you may become dogmatic and accept only one way to accomplish a manoeuvre. Always keep in mind that there are many techniques that accomplish the same manoeuvre correctly.

You must be consistent in your analysis. Always attach the same importance to an error, provided the circumstances remain the same. Without a consistent set of rules, you will be considered arbitrary or accused of playing favourites.

Honesty is the best policy for critiquing. The situation where you may attempt to motivate a weak student by giving better grades than deserved jeopardises the effectiveness of your instruction. Students must know exactly where they stand and be given specific suggestions for their improvement. This is the sole purpose of fault analysis, and emphasis must be placed on this function.

Preparatory Ground Instruction- Long BRIEFING

A long briefing is classroom-type instruction, normally on a one-to-one basis, but not excluding group instruction, covering the steps necessary to fly an air exercise. Whereas the basic theory of flight, where applicable, would previously have been covered in separate ground study, some theory may be necessary to explain a point related to the conduct of the air exercise. Essentially, preparatory ground instruction should cover 'how to do an air exercise'.

This is a presentation given by the instructor when introducing a new exercise. Ideally it should be given no more than 24 hours before the related training flight.

Pre-Flight Briefing

A pre-flight briefing is a discussion on a one-to-one basis just before the conduct of an air exercise to ensure that the student understands exactly what will take place.

This is essentially a practical briefing on the planned air exercise, avoiding theory but must cover three important aspects:

1. What are we going to do?
2. How are we going to do it?
3. Safety considerations.

A pre-flight briefing is separate from ground school/long briefings. It should precede all flights, whether or not there is a new exercise to be covered. It is also particularly important when sending a student solo. Points that should be covered irrespective of whether it is a dual or solo flight include:

- Meteorological and aerodrome conditions, and Notices to Airmen (NOTAM).
- The aircraft to be used, its fuel state and other relevant information.
- Where the exercises will be conducted.
- Take-off time, duration of flight, and time when the aircraft is due to land back at base.
- The sequence of exercises to be covered during the flight.
- How each sequence will be conducted.
- What the student will see, feel and do.
- Go/no-go criteria.
- Review of relevant airmanship points.

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In-Flight Instruction

The in-flight exercise is the culmination of all ground training and preparation. To achieve maximum effectiveness, it must be flown immediately after the preflight briefing, and to avoid confusion it should be flown as briefed. The following is a guide to the conduct of a training flight. Variations may be necessary to suit individual student requirements.

Control of aircraft

There should never be any doubt as to who has control of the aircraft. The procedure for giving and taking control is:

When you, as pilot-in-command, wish to give control to your student, say clearly 'You have Control'. Teach your student to take control only when ready and to always say 'I have Control'. You do not relinquish control until you hear this phrase.

When you want to take control, say 'I have Control' and then take control, ensuring that your student says 'You have Control' when relinquishing control.

As pilot-in-command, you have the final authority. Your request to give or take control should not be questioned but acted on as quickly as possible by your students.

When the student has control, you must not 'ride' the controls. Your student may feel that you are taking control, and this could lead to a dangerous situation.

Additionally, you may rob your student of the feeling of accomplishing the manoeuvre independently. This is particularly difficult during critical manoeuvres, such as cross wind landings, when there is little time available to the instructor to correct errors. This procedure must be adhered to at all times.

In-flight teaching

For most new exercises you should first review the main points of the manoeuvre and then give a perfect demonstration. The review must be short. Include such items as airspeeds, power settings, altitudes etc. Usually you can obtain this information from your student. Your demonstration should be a complete manoeuvre and should set the standard you want your student to ultimately achieve.

In the case of a complex manoeuvre, after the perfect demonstration, demonstrate a small portion of the manoeuvre, giving a brief explanation either before, during or after the demonstration. Have your student attempt this small portion. Watch closely for any major error. If you observe a major error, take control immediately and explain to your student what was done incorrectly, then demonstrate as soon as possible what to do to correct the error.

Allow practice of that small portion before proceeding to the next portion. Continue the process of demonstration, explanation and practice with close supervision of each step or portion, until your student has completed the entire manoeuvre. Then, allow continued practice, slowly withdrawing your guidance and assistance.

As your student gains proficiency, you may look for minor errors and correct them in the same manner. Remember, though, that learning to fly well takes time and you should concentrate on the major points first. Many of the minor errors will be corrected as your student corrects the major faults. Also, remember to praise for good performance.

If practicable, conclude the air exercise with a perfect demonstration of the manoeuvre to be learned on the next lesson. This will help your student to fully understand the home study for the next exercise and will also provide a positive mental picture about what will be taking place during the next flight. Of course, you would not give a demonstration of new material if the next lesson were to be a review or a repeat of a lesson.

Fault analysis

When discussing a student's faults, always take control so that your student may devote full attention to the instruction. In some cases you may ask the student to analyse the errors in a particular sequence; usually this will happen during the later stages of training. Do not be overly critical of minor faults during early stages.

Correct major faults first, then as improvement is noted, correct the minor errors. If a student indicates problems on a solo flight, it may be possible to analyse the problems from the student's description of actions and the aircraft's response. The correct technique can then be reviewed and practiced on the next flight.

Sometimes, however, students may not be able to identify or describe a problem clearly enough for a good ground analysis to be made. You should then fly the exercise on the next dual flight, where you can analyse the performance and correct any faults.

Planning of flight instruction

To make efficient use of the time available, you should plan the flight to avoid delays between exercises. Fuel limitations, area restrictions and weather conditions should all be considered. Your flight should be planned so that one exercise is logically and directly followed by another, with a minimum of time spent losing or gaining altitude or in transit from one area to another.

Post-Flight Debriefing

The post-flight debriefing is a review with the student of each exercise undertaken during the flight. In the case of a dual flight, the debriefing should include strengths and weaknesses and suggestions to improve performance. An outline of the next training session should be given, along with study assignments.

This should follow all flights, dual and solo. Points should include:

- the student's own assessment of the flight and performance.
- your assessment of the student's performance. This should include both the strong and weak points, and advice on how to correct any errors.
- assessment of the student's performance. This should include both the strong and weak points, and advice on how to correct any errors.
- answering any questions the student may have.
- assigning study subjects where appropriate.

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Flight Safety

Flight safety is an important aspect of flight training. Both aircrew and ground crew must be aware of the need for correct safety practices. You are in a position to reduce incorrect, unsafe and illegal practices. To be successful, a flight safety program requires the correct attitude, proper supervision, rigid enforcement, and proper training. Your student learns by example: you must set this example.

An experienced instructor is an effective supporter of the principles of good airmanship and flight discipline. As you gain experience, learn to recognise unsafe practices and do something to correct the situation.

Practice flight safety by:

- being alert to unsafe practices and taking the appropriate action.
- following up when you see an unsafe practice by informing the people involved that they have been seen.
- promoting the principles of effective flight safety to students and other aircrew and ground crew.

Flight safety consciousness by all personnel must become the fashion. Unsafe procedures must be watched for, identified, and eliminated by firm and consistent action. Throughout your instruction, stress the importance of being fuel conscious, the need for proper lookout and the danger of having loose articles in the aircraft.

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A Checklist For Good Instruction

"Delicious autumn! My very soul is wedded to it, and if I were a bird I would fly about the earth seeking the successive autumns" George Eliot

Table 3

Each Instructor Should:	✓
Explain to the student specifically what is required of them during the lesson and at the end of the lesson (the 'what' of the introduction).	
Identify the main teaching points for the student by: - Using visual support (i.e. white-board, orientation board or other visual aids) - Verbally referring to the visual aids Explain the purpose of the lesson and stress the advantages of the new knowledge or skill (the 'why' of the introduction). Explain to the student where the lesson fits into the overall picture.	
Related the lesson to the student's past and/or future experience (the 'where' of the introduction).	
Confirm that students are the required level before having them learn new material.	
Present the new material in stages. Introduce each stage of the lesson and provide a link or bridge between stages.	
Obtain student feedback throughout the lesson by: - Asking questions - Observing student performance of a skill - Looking at students (watching for facial expressions) - Taking student questions Respond to feedback by: - Answering questions - Stopping students from doing a step of a skill incorrectly - Reviewing material or steps - Asking questions - Correcting the student if an error has been made - Explaining why the student's performance is incorrect - Using verbal support - Re-teaching (if necessary) - Praising students for good work Appear enthusiastic about the subject being taught. Use speech variation in rate, volume and pitch.	
Have students answer questions related to the objective(s) for the lesson during the presentation of new material.	
Use correct questioning techniques. Use a variety of training aids to appeal to as many senses as possible whenever these aids help to achieve the objective(s) of the lesson.	
Provide sufficient meaningful practice of the main points of the lesson so that students confidently achieve the objective.	
Identify and correct errors or mistakes made by the students at the time they occur, or as soon thereafter as practicable.	

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Principles And Methods of Instruction

- Use clearly worded explanations.
- Deliver the lesson in a logical sequence.
- Conduct periodic reviews of critical areas of the lesson.
- Summarise the main points of each stage.
- Evaluate level of student learning at the end of each stage.
- Test students on the main points of the entire lesson towards the end of the lesson.
- Provide a final summary that links all stages to the objective(s) of the lesson.
- Re-motivate students by telling them how the new knowledge or skill will benefit them.

Upon completion of the above RAAus approved Principles and Methods of Instruction (PMI) material RAAus recommends trainee PMI knowledge be assessed as satisfactory before commencing further course components. It is recommended that the PMI training be undertaken over two days not exceeding 4-6 hours and active assessment by the instructor trainer be undertaken to confirm an appropriate application of the skills and methods outlined in this section.

Appendix 1 contains a list of 52 questions targeting PMI knowledge. The questions are open questions and are suited to either written or verbal answers. In this case it is recommended this material is presented to the trainee's in a formal examination format at the end of the PMI course.

Instructor Trainers should consider developing two 26 question examination papers with the second kept in reserve for resit attempts. In order to achieve the best training outcome, rather than a formal pass mark, it is recommended that all identified areas of knowledge deficiency should be satisfactorily addressed prior to considering that the trainee has passed the PMI course.

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CHAPTER FIVE

A Guide to Practical Flight Instruction

To enable the Instructor candidate to have a more complete understanding of the role of the flight Instructor, this chapter has been provided with examples of how to structure lesson planning and deliver in flight patter.

RAAus flight Instructors are in the unique position of introducing and training members to "Rise aloft in a flying machine and by skilful manipulation of the controls, alight again upon the ground and join that select band of intrepid aviators who have successfully broken the bonds that hold lesser mortals earthbound" © David Eyre

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Introduction

Although much of this training can be considered purely mechanical, following established patterns, there is a unique art and skill to presenting these lessons well. Development of this skill will enable the Instructor to impart clear information and consistent patter to the student leading to steady progress through the required elements. The genuinely motivated Instructor will also impart a true appreciation of the control needed for the flying machine to elegantly 'break these bonds.'

This chapter is intended to offer both the Instructor candidate and experienced Instructors sample briefing structures to build on to create their own unique style of instructing. It sets out standard techniques and phrases which will enable the Instructor to meet the required RAAus standards and provide a ready reference for all Instructors to refresh and improve their techniques.

The information in this chapter is presented in a number of sections.

- Tips for the Instructor – making the flight relevant to the student.
- Recommended in flight patter- to ensure effective and consistent language is used.
- Example briefings for the early lessons and recommended core content.

Chapter 6 will show the Instructor candidate how to structure ground based briefings using recommended RAAus briefings and lessons. This process uses three essential elements to form a standard flight training sequence, which usually consists of the Short Brief, what the student can expect to learn during the flight exercise, the flight, consisting of a demonstration, critique, feedback, monitoring and coaching the student to achieve the required standard, and the debrief to identify any deficiencies and guidance provided for improvement.

Flight syllabus sequence

In 1917, Major Robert Smith-Barry of the Royal Flying Corps developed a system of flying training which is still effectively in use to this day. The system of theoretical knowledge, pre-flight briefing, dual flight training, solo practice and post flight critique was constructed around a syllabus intended to be followed sequentially. The RAAus syllabus follows this basic structure which will be expanded on during this chapter.

It is vital that the student progress through syllabus elements in a structured sequence. The student should be permitted to develop competence and skills in each element before moving onto the next. As an example it is pointless to teach a new student circuits during the first lesson. A basic circuit consists of combining elements such as straight and level, climbing, descending, stalls, stall recovery and positioning and judgement which is impossible to develop without practice. Until the student is competent in all aspects of upper air work, circuits will be challenging or near well impossible to complete competently.

Determining competency

The RAAus Syllabus of Flight Training provides specific elements required for each unit along with guidance for Levels of Knowledge and Application. This section refers to 5 specific levels of competence. 5 indicates the need for further instruction in the lesson, while 4 indicates the need for further practice. A standard of 3 is required for the candidate to achieve for competence for solo flight, while 2 relates to requirements when training candidates for RAAus Pilot Certificate and 1 when training for Instructor ratings. Each of these levels is outlined in more detail in the extract from the Syllabus of Flight Training below.

The syllabus also provides additional information for how to assess the competency standards based on the elements within the syllabus. These are also provided in this section, but in practical terms how does a new Instructor determine a candidate meets a specific standard of competence? What is competence and how do we judge or assess this?

Competence can be defined many ways, and the experienced Instructor or CFI may simply say "you can tell when someone is ready", whether for solo, Pilot Certificate or Instructor rating. While this may be true after many years of instructing and valuable real world experiences have been gathered, for the new Instructor some assessment tools and guidance is invaluable.

Competence must comprise a number of interwoven and linked skills, some of which are specific technical flight tolerances, others less tangible and usually observed by the Instructor. Some of these nontechnical skill used to be referred to as Airmanship and include Threat and Error Management, Situational Awareness, Cockpit or Crew Resource Management and Aeronautical Decision Making. Repetition of these demonstrated skills and the intangible ability to manage and maintain situational awareness form another of the threads.

Cross referencing competency

To confirm or test for competency of a skill element or task, the Instructor must examine and measure the performance of the candidate in a range of different scenarios or environments. This may be categorised as assessment within a range of variables. The Instructor should be able to identify that the candidate is controlling the aircraft with correct actions, ensure the candidate recognises and corrects errors, and manages the aircraft within tolerances in a range of simple or complex scenarios.

The assessing Instructor should be skilled at "loading" a candidate to ensure they confirm basic skills and appropriate decision making. Further, the Instructor must be able to identify development of trends, slips and errors, particularly in regard to sustained errors during the assessment phase. An example would be the candidate consistently demonstrating good lookout and situational awareness in the training area, which may break down with increased workload in the circuit or during simulated emergencies. This process of assessment should also be applied by Examiners and Instructor Trainers when assessing Instructor candidates with the increased workload of instructional tasks.

Definitions

There is an astonishing amount of literature regarding competence and how to determine and assess it. A search for definitions for competence reveals a variety of descriptions including: "A cluster of related abilities, commitments, knowledge and skills that enable a person to act effectively in a situation", "the ability to do something successfully or efficiently", however the bottom line for our Pilot Certificate and Instructor candidates is, can the candidate safely and consistently manage a variety of normal and abnormal situations in flight and on the ground?

Further guidance material

CASA produced CAAP 5.59A-1(0) which provides guidance including definitions of Airmanship from ICAO, judgement, formative and summative assessments, technical and nontechnical skills and more. Instructors and candidates are recommended to spend additional time researching and reviewing further documents at their leisure.

Flight tolerances

Flight tolerances are a measurable component of competence and must be applied when training and assessing Instructor candidates. Likewise similar tolerances must be applied by the Instructor to assist in determining the competence of the Pilot Certificate candidate prior to recommendations to the CFI for first and subsequent solo and issue of Pilot Certificate.

The table below provides **recommended tolerances for issue of a RAAus Pilot Certificate**. An Instructor candidate should meet or exceed these flight tolerances when assessed under simulated in-flight delivery conditions.

Table 4

Flight path or manoeuvre		Flight tolerances
Taxing aircraft		± 1.0 metres of centreline
Nominated heading		± 10°
Climb airspeed		-0 / +5kts
Level off from climb and descent		± 150 ft
Straight and level	Altitude	± 150 ft
	IAS	± 10 kts
Power descent airspeed		± 10 kts
Glide		-5 / + 10 kts
Turns		Angle of Bank ± 5°
Turns onto nominated headings		Heading ± 10°
Steep Turn		Heading ± 10°
		Height ± 150 ft
Final approach airspeed		-0 / +5 kts
Landing	Touchdown	± 60 m
	Centreline tracking	± 2 m

SYLLABUS OF RECREATIONAL FLIGHT TRAINING

LEVELS OF KNOWLEDGE AND APPLICATION

The following syllabi specify the MINIMUM standard of knowledge required. The competency codes outlined below specify the levels required for each individual item within a particular subject, as follows:

- 5 requires further instruction specific to the lesson. The student did not reach the required standard to move onto the next lesson, or requires further instruction of a specific activity within the lesson, or sections of the lesson could not be completed.

- 4 outlines the need for further practice. The student demonstrated an understanding of the content of the lesson but has not met the requirements of competency code 3. The student will benefit from further practice gained during the normal progression though the syllabus. They can progress onto the next lesson, or may benefit from a refresh of multiple activities across multiple lessons.

- 3 is the required competency for solo conduct of the intended operation. This code represents the competency of the member to perform the activity correctly without instructional assistance under carefully supervised conditions in a safe environment.

- 2 is the competency required for the operation to be safely completed at a Pilot Certificate level. This represents the student's ability to be able to competently and without instructional assistance, perform the activity correctly and adjust actions to cope with emergencies under uncontrolled environments.

- 1 is the requirement for Instructors wishing to teach the endorsement. This standard represents the Instructor's ability to competently perform the required activity with a high degree of accuracy and in a professional and competent manner in uncontrolled environmentsments and adjust actions to cope with emergencies in a highly consistent manner, facilitating the instruction of the activity to a student.

These codes are the basis of assessing competency in the required fields of the syllabus. In order to establish consistency, accuracy must be witnessed by the instructor on greater than two occasions to ascertain proficiency in the required exercise. Attainment of these competency standards is required to be recorded in the student training records.

Training outside the briefed lesson

Throughout the upper air training sequences it can be tempting for the flight Instructor to introduce elements out of sequence or ask the student to undertake lessons not yet briefed or practices.

For example, when requiring changes in direction during the level and straight element, the Instructor may try to talk the student through completing a turn and expect the student to achieve a certain standard in turns.

To avoid student overload and confusion, and have them attempt to understand a sequence they have not yet been briefed on, the Instructor should take over and conduct any turns required to manoeuvre the aircraft during this lesson, allowing the student to focus on the straight and level element only. Patience on behalf of the new Instructor is required to ensure the student focusses on the intended lesson. The student should not attempt turns until they have been properly briefed and introduced to the turning element.

Likewise, expecting the student to take-off or land the aircraft in the first few lessons may create additional stress for the student. The skills and techniques for this advanced lesson must be developed over time and should not yet have been briefed. It is therefore recommended to introduce take-offs as a distinct lesson forming part of climbing and descending or the circuit lesson specifically, and likewise landings should not be attempted until the student has demonstrated an appropriate level of skill at basic upper air work.

The repetition of these basic lessons by the Instructor may result in an understandable boredom for the Instructor, however this boredom does not justify rushing new students through basic lessons. Practice and competence in the basic upper air lessons will ensure the student moves through the syllabus with ease, building on previous lessons.

If Instructors are concerned that the student could perceive this separation of elements as the Instructor showing off or attempting to keep some flying for themselves, it could be argued that the student will benefit more from observing the Instructor demonstrate accurate flying through other sequences or elements such as the take-off, circuits and landing. It is imperative at all times the Instructor flies the aircraft accurately, in balance and with due regard for all procedures.

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Section 1:

Tips For The Instructor Making The Flight Relevant To The Student

There are five essential steps when providing a practical flight lesson.

Explanation (ground)	A pre-flight brief on what the student can expect during the flight
Demonstration (in air)	The flight Instructor demonstrates and patters what is happening
Student follows through	The student follows through while the flight Instructor patters
Student practices	Flight Instructor patters and corrects faults
Analysis (ground)	Post flight brief- mentions strengths and deficiencies and provides suggestions for improvement

In the air these steps can be summarised as:

- Demonstrate
- Direct
- Monitor
- Coach

Above all else, this chapter emphasises that in order for students to learn the flight Instructor's task is to facilitate the Learning process. If the Instructor can relate a lesson to an element of the student's everyday life, experiences or already understood skills, the relevance of the lesson will also make more sense. As an example, if the student rides horses, the Instructor can talk about holding the controls in a light grip and light control inputs much like the gentle inputs or pressure of the reins when turning a horse.

Similarly, if the student has driven high performance sports cars or ridden motorbikes, parallels can be drawn between the type of inputs for the steering wheel or handlebars and the control column.

In-flight briefing

Some Instructors do not carry out pre-flight briefings but rely on briefing the student as the flight progresses. This is not recommended and may lead to poor learning outcomes for the student.

Pre-flight briefings are conducted:

- To check student progress with aviation theory knowledge.
- To revise aspects of all flight training to date.
- To briefly revise the previous flight.
- To give an in-depth explanation of the new flight sequence.
- To outline what the student can expect during the flight.
- To set out the aim and the expected outcome of the flight.

The pre-flight brief is also an opportunity to build rapport with the student, answer any queries and generally settle the student down.

In-flight briefings are not acceptable because:

- There is no opportunity to refer to the knowledge which has been gained during a proper pre-flight briefing.

- The student is concentrating on flying the aircraft and often is not capable of absorbing in-flight explanations.

- There may be communication difficulties in the in-flight situation resulting in poor comprehension by the student.

- The Instructor may be distracted from tasks such as monitoring the environment, basic lookout and airmanship.

Not conducting formal pre-flight briefings indicates a lack of discipline by the Instructor and willingness to shortcut established practices. It is also contradictory to basic PMI techniques, indicates a lack of consideration for student development and possible indifference to students learning processes.

Part of any effective pre-flight briefing is skilful questioning by the Instructor to ensure the student has adequately understood the aim of the previous lesson and remembered this information.

All training flights must be preceded by a pre-flight briefing.

Revision and practice sessions

- It is absolutely vital not to assume that the student has an understanding of an exercise. Always allow for revision periods. Ensure the student can competently carry out the exercise and don't be tempted to move on because the exercise has been completed with previous students. Remember, this is the first time the student has completed this exercise in their training and they deserve an uninterrupted opportunity to get it right.

- Make it part of your instructional technique to always revise previous exercises and allow time in each session for practice.

- At times, a whole flight session may be devoted to revision and practice of previous elements to ensure the student has reached the appropriate competency before moving on.

Student self-patter

If the student is capable, they can be encouraged to self-patter such things as the entry to a climb or descent or before turning. For example, the entry to a turn "All clear right, all clear left, all clear in front, turning left" This type of self-patter can become so ingrained as a good habit that it readily transfers to other disciplines, such as driving a car.

Further tips for the Instructor

Flight Instructors develop their own techniques for dealing with the many areas of flight and ground briefings. This is expected to allow for personal style and mannerisms to provide the best possible outcome.

However, during this process, Instructors can forget the essentials, including awareness of student needs and the proper instructional techniques to be used.

The tips in this chapter are offered from experienced Instructors to provide guidance for the new Instructor to develop good instructional skills. Rather than teaching the Instructor "how to suck eggs" they are intended to assist Instructors to be aware of issues which may not have been considered. They may be regarded as "tricks of the trade" because they offer specific methods to enable the student to receive the core message.

The Instructor candidate may use these tips for any section.

Teaching to aircraft type and location

A common issue encountered when assessing Instructors who may have operated one type of aircraft and only trained at one location is the tendency to teach to aircraft type and location. The Instructor makes comments which are only relevant to the aircraft being used for training.

'This aircraft will not stall,' 'we use this procedure when deploying flaps,' and the like.

Likewise, the Instructor, possibly in an effort to be helpful, will point out a geographical feature only found at the local airport to use for turning onto a particular leg of the circuit or for orientation purposes, such as roads, houses, mountains or water. The only constant feature for pilots conducting circuits is a runway, whether dirt, gravel, grass or tar. This must be the only reference used for spacing, turning for various legs and judgement of approaches, etc. The student must not focus on the runway to the detriment of the previously trained processes of referencing the horizon and relevant references once runway alignment and spacing is confirmed.

The only constant for distance judgement is a feature on the aircraft, whether the strut for a high wing, two thirds, or halfway along the leading edge of a low wing aircraft, and distances ahead and behind. Judgement using aircraft features and runways as references, when developed will also assist the student to manage forced landings and precautionary landings using the same techniques for paddocks or unfamiliar airfields, airstrips and ALAs.

If the Instructor is successful at providing generic but relevant information, the student should be able to operate any similar type of aircraft at any location with ease and a minimum of transition training. This will also reduce the number of Runway – Loss of Control accidents for pilots in new types or at new or unknown runways and ALAs.

Likewise, it is an easy trap for an Instructor to teach the student the radio calls required only at their location. When the student operates at a different airfield, problems can arise. The student may have been taught in a busy environment requiring minimal radio calls, or the local airfield owner may demand radio calls for all legs of the circuit. The student, if not aware of standard radio requirements outlined in the Aeronautical Information Publication (AIP) or Civil Aviation Advisory Publications (CAAP) will be confused about requirements.

Remember the intent of training is not to produce a clone of the Instructor capable of only operating at one location in one aircraft, but a well-rounded, professional and competent pilot the Instructor can observe with pride. Our category of training can be the affordable basis for a civil or military flying career and as mentioned in the PMI, primacy is difficult to overcome. "Teach it right the first time!"

Prompting information

A useful resource for the new Instructor is to use standardised briefings as provided in Chapter 6 and Appendix 5 as prompts to ensure all required elements are included. Just as vital is ensuring actions are taught in correct sequences, and so it can be useful to have the sequence written on a card and placed where the Instructor can see it. For example:

Axis	Control	Input		Primary E ect		Secondary/Further	Use
Lateral	Elevator	Control Column	forward rearward	Pitch	down up	–	Attitude an Airspeed
Longitudinal	Aileron	Control Column	right left	Roll	right left	Slip - Yaw	Directio
Normal	Rudder	Rudder Pedals	left right	Yaw	left right	Skid - Roll	Balance

Once the Instructor has memorised the sequence, the prompts may no longer be required.

Reassurance and relaxing

It is obvious that many students can be anxious about flying. Indeed, some pilots will continue to be anxious throughout their flying career. The thoughtful flight Instructor will recognise when the anxious student is allowing this tension to have a deleterious effect on the progress of the student.

Simply reminding the student to ‘relax’ does not have much effect. It is more effective to be specific with words such as ‘relax your grip on the controls’, ‘relax the tension in your legs’. Use of humour when relevant can encourage the student to relax ‘release the Vulcan death grip’.

The other aspect is for the flight Instructor not to add to student anxiety by using negative phrases, such as ‘if you use too much rudder, you might cause the aircraft to spin’.

Unfortunately in the past some flight Instructors have shown off by demonstrating their ability to recover from unusual manoeuvres.

The professional flight Instructor should always fly smoothly and not indulge in abrupt manoeuvres which may add to a student becoming anxious.

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Section 2:

Recommended Core Content For Flights

Taxiing

An often overlooked element of many lessons is the incorporation of taxiing and the many considerations related to this apparently simple exercise.

Elements relevant to this vital ground handling aspect of flight training include:

- The type of surface (grass, tarmac, gravel, dirt).
- Any slope (relevant to taxiways or runways).
- Wind direction.
- Wingtip and propeller clearances.
- Other traffic.
- Slipstream and jet blasts.
- Correct seat adjustment and appropriate vision of the student/pilot.
- Windscreen cleanliness.
- Management of aircraft energy and inertia.
- Blind spots.
- Aerodrome layout.
- Instrument checks.
- ATC clearances (if relevant).
- Right of way rules.
- Aerodrome signs and markings.
- Situational awareness and courtesy to other aerodrome users.

Taxiing is generally introduced as part of the Effects of Controls lessons, however due to the large number of considerations and gaining of competence required by the student, elements and discussions regarding taxiing are usually incorporated into lessons up to first solo.

Taxiing forms a large part of the responsibilities of the Instructor initially, gradually becoming the sole responsibility of the student by first and subsequent solo. If a student has limited practical experience with machinery or primacy with farm machinery a separate session for taxiing experiences and control may be appropriate.

Taxiing means the manoeuvring of the aircraft on the ground under its own power, and requires common sense and concentration. The student must be aware of the difficulties inherent in manoeuvring an aircraft, including wingspan width and the potential for collision with buildings, other aircraft and other objects and the practical considerations to manage a vehicle which cannot reverse. Further the engine drives the propeller to create movement rather than directly driving the wheels as for most land based vehicles.

Objective

Correctly use the aircraft controls to manoeuvre the aircraft on the ground at an appropriate and safe speed with consideration of the prevailing weather conditions. In order to demonstrate the aircraft is fully under the student or pilots control, adherence to accuracy of alignment to the taxiway or runway centrelines and bringing the aircraft to a stop at nominated points.

Considerations

Starting the aircraft

The aircraft or school recommended checklists must be used to start the aircraft, and the student must be briefed on considerations such as propeller wash, and ensuring the area is clear. A loud and clear call through an open window or door must be made to advise anyone in the vicinity the aircraft is starting by calling “Clear prop” or similar. After start, the appropriate checks for oil pressure and avionics, etc. must also be conducted.

Throttle use

Aircraft movement over the ground results from application of power via throttle. (It is recommended the Instructor avoid references to aircraft speed over the ground, as a key component of the Effects of Controls lesson is to present the concept of the speed of the aircraft resulting from relative attitude to the horizon rather than power application).

Due to inertia, initial movement will require more power, which must be reduced once the aircraft is rolling. Many a story can be told of the student or pilot applying significant power to move the aircraft initially, then losing control of the aircraft because they did not reduce the power and the brakes would not slow or stop the aircraft.

Taxi movement will be affected by the surface and slope operated on, the effect of wind and the amount of power applied. Some aircraft engines specify a minimum RPM to reduce damage to gearboxes, or reduce spark plug fouling. Instructor should also refer to their CFI for school preferences.

When stopping, the student should ensure the nose wheel (or tail wheel) is straight, and once the throttle is set to the preferred RPM, apply brakes. The slope, surface (wet or dry) and wind will all affect the ability to stop.

Directional control

Controlling the direction of the aircraft is accomplished via rudder pedals and steering to the nose or tail wheel. For three axis aircraft, steering is naturalistic, left rudder moves the nose left, right rudder moves the nose right. Many tail wheel aircraft also have differential brakes which, when used intelligently can greatly assist to manoeuvre the aircraft on the ground.

For weight shift trikes and wheel based Powered Parachutes the connection to the steering is less intuitive and best taught by referencing steering “ from the outside of the required turn”. While a reference to a billy cart may assist in grounding a known primacy, an alternative method after demonstration is to patter “push from the outside of the required turn”. It is vitally important that the student uses heels to effect the change of direction and doesn’t couple any movement of the footbrake or throttle during the steering exercise.

Wind affects directional control, as the aircraft generally weathercocks into wind due to the effect of wind on the vertical fin. Judicious use of combinations of aileron and elevator will assist to manage this effect. For tail wheel aircraft, taxiing is usually accomplished with full back pressure on the elevator to ensure authority on the tail wheel. For nose wheel aircraft, the elevator may simply be required to be maintained in a neutral position. Weight shift aircraft require careful management of the wing while taxiing, as the wing will act as a sail if not treated appropriately.

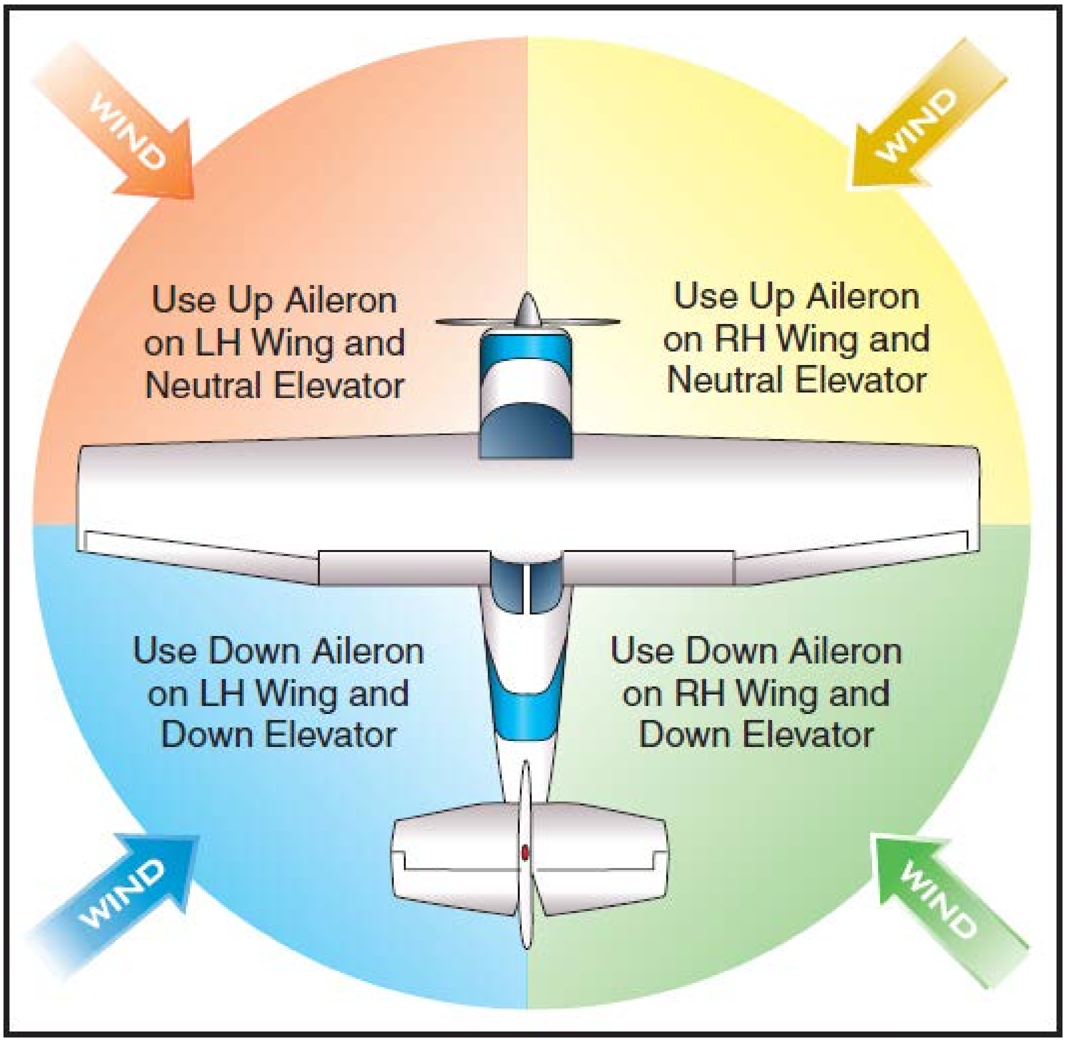


Diagram 1. Guide to taxiing control deflection

Regardless of the aircraft type, the student should be directed to look at a point somewhat in the distance rather than just ahead of the aircraft.

Airmanship

The student must be made aware of the right of way rules relating to ground operations including requirement to pass aircraft on the ground pilot to pilot. Aerodrome markings, including taxiway holding points and runway gable markers must be explained. If operating from a private or grass field, the student must still be made aware of aerodrome markings as they will encounter them at larger aerodromes. The student must be made aware of windsock locations, and how to interpret the windsock accurately.

Radio use and appropriate calls when taxiing must be explained and delegated to the student as their workload and capacity allows. While it may seem natural to the Instructor to require the student to make all required calls, in reality, many students struggle to achieve control of the aircraft and transmit coherent calls. Careful management of this important aspect of taxiing is required and responsibility should be slowly given to the student. Remember you are leading by example and should make all radio calls slowly and clearly.

Aircraft management

The easiest way for a student to irritate an Instructor or CFI is by using power against brakes while taxiing. While this is generally not deliberate on the part of the student, it may result from a poor explanation of appropriate actions to commence aircraft movement, or confusion with the everyday movement of a car.

The first action to slow an aircraft should always be to ensure the throttle is at the recommended idle RPM, then applying brakes to slow the aircraft if required. In extreme or emergency circumstances the higher drag from grass may be required to slow the aircraft.

In some cases, Instructors may choose to drive with students in a car to determine if the students jerky or late corrective actions or failure to respond to potential threats is an inherent problem in an area the student should have developed skills through practice for most of their adult life or is simply overload in a strange environment.

The Instructor must ensure the seating position of the student enables full rudder deflection (and use of two brakes if fitted). The seat must be locked securely and the student must be able to easily reach all controls and see over the instrument panel. Ensure the student uses appropriate positions for hands and feet when using the controls. This includes ensuring heels are on the ground if toe brakes are fitted, or that the hand or foot throttle in weight shift aircraft is used appropriately for taxiing.

Ensure the student appropriately warms the engine prior to moving the aircraft, however run up checks and the associated additional noise from engines should be avoided close to buildings or hangars to avoid possible conflict with people or animals and with consideration of neighbours. Once the aircraft is moving, a brake check should be conducted, by closing the throttle and checking correct action of the brakes, before continuing to move the aircraft. While a brisk walking pace has been the standard reference for taxiing speed, the reality is an appropriate speed to ensure safe control of the aircraft is a more sensible guide.

The Instructor should point out the parallax error inherent with side by side seating, and ensure the student is aware of the perception the aircraft will be too far to the right when on the centreline of the taxiway or runway. Deviation from the centreline should be corrected early and often as correct maintenance of the centreline must form part of the assessment of competence of the student. Likewise, the Instructor must lead by example and maintain runway or taxiway centreline, avoiding the tendency to maintain too far to the right. The maintenance of taxiway centrelines will also ensure the wings of most RAAus aircraft will not infringe or collide with aerodrome obstacles, although wingtip clearance must always be considered.

Protection of the propeller and aircraft empennage must be an important consideration, careful use of power and avoiding full stops on gravel runways should form part of any taxiing briefing. Students should keep the aircraft moving on gravel or dirt to avoid damage and reduce dust, which could decrease visibility.

Likewise the student must consider any difficulties or dangers when taxiing behind other aircraft, as a result of propeller wash or jet blasts from larger aircraft.

Ensure the student considers the dangers of taxiing across unprepared areas on the aerodrome or cutting across corners, as many accidents and damage to propellers have occurred when taxiing through long grass, rolling off the runway edge or failing to see drainage ditches or gable markers.

Run up location

The student should consider the appropriate location to use carburettor heat (if fitted) to avoid ingestion of dust, grass or rocks, as air from this source is unfiltered, which may result in damage to the engine. Likewise engine checks should be completed in a clear area to reduce damage to the propeller and empennage of the aircraft from prop wash.

The student should consider wind direction in relation to the best positioning of the aircraft to face into wind to assist with engine cooling, and the direction propeller wash will be directed, avoiding open hangars and other parked or taxiing aircraft. Finally the student should consider where the aircraft is aimed and what evasive or corrective actions may be required should the brakes fail to hold the aircraft while the higher RPM for engine checks is used.

Many aerodromes have specific run up bays, or concrete areas which are regularly swept for rocks and debris.

Human Factors

Familiarity with right of way rules, aerodrome markings and layout, windsock indications and clear understanding of control inputs will assist the student to manage aircraft taxiing competently and confidently.

The cleanliness of the windscreen is critical to safe operation of the aircraft, both on the ground and in the air. The student should be familiar with the appropriate technique for cleaning windscreens to ensure scratches are not produced or incorrect chemicals turn a windscreen milky or opaque. Likewise, blind spots created by door pillars, wing roots, canopy frames or high and low wings must be explained, and the student must understand the need to move the upper body to ensure obstacles are seen and avoided.

Ground exercise

The exercise consists of teaching the appropriate hand and feet positions and techniques for operating aircraft controls, and ensuring seating position, blind spots, parallax errors and appropriate decision making is understood.

Start the aircraft, applying sufficient power to overcome aircraft inertia, test the brakes and maintaining an appropriate taxiing speed, manoeuvre the aircraft to the run up area, making suitable radio calls and ensuring the aircraft park brake is fully applied. Once the student has observed a demonstration of the correct techniques, they may practice the techniques and be encouraged to verbalise their thoughts and observations as to taxiing considerations to assist kinaesthetic development. In order for the student to develop an appropriate feel for pedal movement required the instructor should initially encourage divergence to either side of the centreline, rather than only just focussing on maintaining the centreline. Practiced deflection will assist the student develop feel for the required movement and correlate that to their visual stimuli. The Instructor must recognise that steering with the feet and legs is usually foreign to most students and requires the development of appropriate muscle and kinaesthetic memory.

RECREATIONAL
AVIATION AUSTRALIA

The Flight
Effects Of Controls

EFFECTS OF CONTROLS - 3 AXIS

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To operate the primary and ancillary controls in flight and on the ground and feel and understand the primary, secondary, and further effects they have on the aircraft.

2. APPLICATION

- Control grip & feel
- Cockpit layout/adjustments
- Demonstrate/Practice sequence
- Visual flight focus outside cockpit
- Introduction of pre/post flight actions

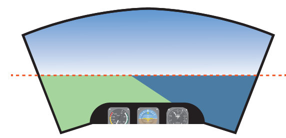
5. AIRMANSHIP AND HUMAN FACTORS

- Control handover process - CRM "I have control / you have control", "follow me through"
- VFR - see and be seen
- Clock code, relative height / distance
- Horizon is main reference
- Land features
- Limitations on lookout - SA
- Limitations of memory
- More comfortable with practice /workload
- Uncoordinated lesson by nature
- Demonstration / practice process - CRM
- Self assessment - I.M.S.A.F.E

4. FLIGHT EXERCISE

On the Ground

- Control speed with throttle and brakes
- One hand on control column and other on throttle
- Dual controls fitted
- Power - controls movement
- Brakes - control slowing / stop
- Pedals - control steering



In the air

Attitude flying is achieved by referencing nose and wings to the horizon

Axis	Control	Input		Primary Effect		Secondary/Further	Use
Lateral	Elevator	Control Column	forward rearward	Pitch	down up	_	Attitude and Airspeed
Longitudinal	Aileron	Control Column	right left	Roll	right left	Slip - Yaw	Direction
Normal	Rudder	Rudder Pedals	left right	Yaw	left right	Skid - Roll	Balance

Airspeed

- Increased airspeed - firmer control feel & response rate, less movement needed
- Decreased airspeed - reduced control feel & response rate, more movement needed

Slipstream

- Increased power → increased slipstream
- Increased flow over elevator → more effective control
- Affects vertical surfaces → yaw
- Effect balanced with rudder

Power

- Power decrease → nose pitches down / yaws right
- Power increase→ nose pitches up / yaws left
- Must balance with rudder

Trim

- To relieve the pressure
- If holding back pressure - trim backwards
- If holding forward pressure - trim forwards

Flap

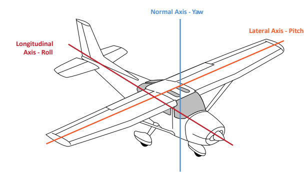
- Extending flap → increase in lift and drag → pitch change - trim change required
- Retracting flap → decrease in lift and drag → pitch change - aircraft will sink

3. UNDERPINNING THEORY

Lift

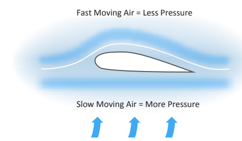
- As air flows over the wing, increased speed above the wing results in reduced pressure = Lift
- Lift can be altered by changing the shape of the wing, the angle of attack, and the airspeed

Aeroplane Axes



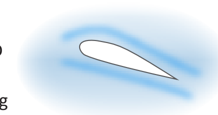
Primary Controls

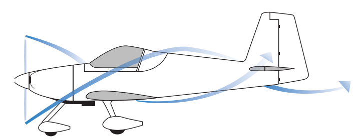
- Elevator pitches aircraft - changing attitude
- Aileron rolls aircraft - changing direction
- Rudder yaws aircraft - balanced flight
- Slipstream affects the rudder and elevator



Ancillary Controls

- Trim tabs provide a force to hold primary controls
- Flap changes shape of wing, increases lift, drag, and L/D ratio - changes pitch trim change required
- Carburettor heat assists in preventing and reducing icing in the fuel delivery system





6. OUTCOMES AND EXPECTATIONS

- Student identifies and understands control actions and responses.
- Can identify and reference the horizon correctly.
- Is comfortable in the airborne environment.

AIR EXERCISE

To ensure the student fully understands the effects of controls, both primary and ancillary, it is recommended to deliver the Effects of Controls lesson in two distinct flights, which have been described below.

Allow the student to enjoy the sensation of being airborne and relax in the aircraft prior to taking the controls, which will ensure they are receptive to the lesson. The Instructor should ensure the take-off maintains the centreline, the climb is balanced and on track and the nominated height is achieved accurately.

Be on the lookout for signs of the student becoming airsick. ALWAYS carry motion sickness bags and make the student aware of them and where they are stowed within easy reach. It may be believed that mentioning airsick bags may make the student become uneasy, however the student will be is less worried if they are aware they can grab a bag in a hurry if necessary.

BRIEFING CONSIDERATIONS – EFFECTS OF CONTROLS - Flight 1 of 2

PRIMARY EFFECTS OF CONTROLS

Elevator. When demonstrating the elevator, use smooth control movements. It can be very disconcerting for the student to see, and feel abrupt over pitching. Remember also that the pitching motion induces positive and negative 'g' which in turn, can induce air sickness.

The objective of the flight is to make the student aware of the control input, relative movement of the aircraft as a result, particularly in reference to the horizon, and further effect. It does not require over-controlling or abrupt movement of the controls to demonstrate this.

As will be noted in the Patter Section, after indicating changes to the airspeed, the Instructor must ensure the student is referred back to the attitude of the aircraft. As we fly visually ensure the student is constantly looking at the horizon and does not become fixated on the instruments.

Ailerons. When demonstrating the primary effect of Roll, inform the student you will be operating the controls to prevent secondary or further effects initially. Use opposite rudder and elevator to minimise further effects allowing the student to only see the primary effect.

Rudder. Ensure the same technique is used when demonstrating the primary effect of Yaw. Inform the student you will be preventing secondary or further effects. Use opposite aileron and elevator to minimise secondary and further effects. Using these techniques will ensure that the student only sees the primary effects and not wonder why you are putting in additional inputs.

SECONDARY AND FURTHER EFFECTS OF PRIMARY CONTROLS

Elevator. It is vital the student is referred back to the attitude relative to the horizon after indicating any instruments.

As an example, begin by flying level and ask the student to read the airspeed. Refer the student back to the horizon and as you move the control column back ask the student to observe the nose pitching up. Once stabilised, ask the student to read the airspeed and then refer them back to the attitude relative to the horizon whilst you patter the effect on airspeed of the pitch up of the nose attitude.

Use the same technique to indicate the lower nose attitude and subsequent increase in speed. This ensures the student always refers to the attitude relative to the horizon and encourages visual flying rather than being fixated on instruments.

Your patter should use the consistent term 'Pitch' as used in your briefing when using the elevator control.

'When I move the control column back, you will see that the nose pitches up.' Not, 'the nose moves up', or worse, 'the nose goes up'

Ailerons. It is vital to match and coordinate your words with the response from the aircraft. As an example 'Student, you will note that when I move the control column to the left, the aircraft will Roll----Slip-----Yaw to a nose down attitude.' Only use these critical and consistent terms as the aircraft actually rolls, slips and yaws.

Rudder. The same technique must be used when demonstrating the secondary and further effect of rudder.

The consistent terms, Yaw----Skid----Roll to a nose down attitude must be coordinated with the observed reaction of the aircraft.

COMPLETION OF FLIGHT 1 - EFFECT OF CONTROLS

You can now let the student informally fly the aircraft and attempt control inputs with you pattering. To return to the airfield, ensure you fly the aircraft while indicating key features of the training area which lead back to the airfield. You must fly an accurate and consistent circuit entry and circuit, landing on the centre line and observing all procedures. Allow the student to simply observe and enjoy this part of the flight, to assist them to absorb the key elements of the brief lesson.

BRIEFING CONSIDERATIONS – EFFECTS OF CONTROLS Flight 2 of 2

Demonstrate and patter the aircraft start sequence, taxiing the aircraft, conducting pre-take-off checks, the take-off and climb out for the start of the second part of Effects of Controls.

Airspeed. Ensure the power is set to maintain height during these demonstrations, resulting in changes of airspeed due to attitude changes. This will also assist the student to recognise the differing feel and effect of the controls due to airspeed and not power changes from the engine.

When demonstrating the increased stiffness and response of controls at a higher airspeed, ensure you move the control column more slowly and with slightly larger inputs. This exaggerates the increased responsiveness of the controls.

When demonstrating reduced responses and control feel at lower airspeed, it may be useful to move the controls fairly quickly and with smaller inputs. This exaggerates the relatively reduced feel and reduced responsiveness of the controls.

It is useful to demonstrate the control response at lower airspeed after the demonstration at higher airspeed. This is because with the higher nose attitude and the lower airspeed, the next demonstration can move smoothly to slipstream effect.

Slipstream. With the speed reduced and selecting a relatively high power setting, the controls should be moved in such a way that the student can feel that the ailerons now have reduced effectiveness and response. However, due to the effect of the slipstream over those surfaces, the rudder and elevator have an increased effectiveness.

Power changes. This can be an effective demonstration by first advising the student you will not correct yaw or pitch initially while changing power. Allow the aircraft to pitch up and yaw left (assuming normal engine rotation) by smoothly applying full power, then ensure the student is observing the attitude and yaw change relative to the horizon and a nominated point. Next, without abrupt changes, smoothly remove power, allowing the aircraft to pitch down and yaw right, again ensuring the student is referencing the horizon and a nominate point.

Do not continue the demonstration to the point the aircraft enters a steep nose down spiral.

Now prompt the student as to which control inputs would correct these effects and ask them to maintain a straight and level attitude while you make smooth power changes to full and idle power. This embeds the basic understanding of rudder and elevator applications, relevant to power changes. Finally, ask the student to make power changes while controlling the secondary and further effects.

Trim. Inform the student that trim systems generally work in a natural sense. To hold a nose down attitude, the trim needs to be moved forward, to hold a nose up attitude, the trim needs to be moved back.

Whether using electric or manual trim, ensure the student references the attitude and uses the primary controls to set the attitude prior to trimming. The student must never use the trim to set the attitude.

A useful exercise at this point is to have the student hold an attitude using elevator, while you override the trim. Place the aircraft in an out of trim condition, then ask the student to re-trim. This can beconducted for forward and backward pressures to ensure the student understands the attitude must be maintained with elevator and trim simply relieves the forces on the control column.

Some aircraft have the trim control set in the roof or on the side of the cockpit as a winding mechanism much like a window winder.

The student should be explained in this instance the trim works like a screwdriver. Screwing up, in a clockwise direction will hold a nose up attitude, while screwing down in an anti-clockwise direction will hold a nose down attitude. It should be emphasised that the pre-take-off checks ensure the trim is set to the recommended position, however an out of trim condition in a RAAus aircraft should never result in loss of control.

Flap. Depending on the aircraft type, some aircraft will pitch up with the application of flap and some aircraft will pitch down. The student must not only have this pitch change demonstrated but also be aware of how to manage it.

The student must be made aware of the flap operating limitations indicated by the white arc on the airspeed indicator for the flap operating range.

It is expected that the Instructor will cover elements 1 and 2, as with many other elements over the course of many lessons.

IN-FLIGHT PATTER - EFFECT OF CONTROLS Flight 1 of 2

(While sitting in the aircraft before start up)

You have Control/I have Control

Instructor. OK student, during the briefing we discussed the importance of knowing who has control of the aircraft. We will now practice this. You have control.

Student. I have Control.

Instructor. That's good. Remember to speak clearly. Once you have taken over you are now In Command and responsible for the aircraft. OK now, I have Control .

Student. You have Control.

Instructor. When I am in control I may direct you to follow me through on the controls. Just place your hands and feet lightly on the controls, now you can see what I am doing, hear what I am saying, and feel what I am doing.

The Instructor should then proceed with the start-up, pre-take-off checks, taxi, climb out and level out at the appropriate height.

Instructor. OK student, we are now at 3000 ft. Are you feeling comfortable? Continue to follow me through.

I want you to look outside at the horizon. Your head should be held naturally, don't try to look over the nose of the aircraft, but make sure you are looking directly ahead, not on an angle to the propeller or spinner. Sit relaxed and tell me what you can see of the cowling or windscreen against the background or what we call the horizon. Is there a screw, rivet or other reference level with the horizon at the moment? This is known as the level attitude, and using the same indication in the cockpit will ensure you maintain the same straight and level attitude.

Elevator - Pitch. Continue to look outside. You can feel me moving the control column gently back and you will see the nose pitch up.

You can now feel me moving the control column forward and you can see the nose is pitching down.

We can use the control column to pitch the nose back to the original level position.

Now I want you to try this, remember to use gentle pressure on the control column.

You have Control.

Student. I have Control. Student practices. Instructor patters.

Instructor. That was good student. Now follow me through again. I have Control.

Student. You have Control.

Instructor. We have learnt that the elevator is controlled by backward and forward movement of the control column. Note again, backward pressure on the control column----pitches the nose up and forward pressure----pitches the nose down (demonstrate again).

Are you still feeling comfortable student? OK.

Ailerons - Roll. We will now look at the operation and effect of using the ailerons. As before, look outside at the attitude of the aircraft against the horizon. As I move the control column to the left, you will note that the aircraft rolls to the left. Note: For an effective demonstration technique, refer to Section 1 Tips for Flight Instructors.

Instructor. The more I move the control column, the more the aircraft rolls. To stop the roll I will need to move the control column to the right. To return to wings level I will then need to move the control column even further to the right and when the wings are level, position the control column in the neutral position.

Instructor To reinforce. Moving the control column left, rolls the aircraft to the left and moving the control column right, rolls the aircraft to the right. We can use the control column to either roll the aircraft or to fly wings level.

You can now practice this. You have Control.

Student. I have Control. Student practices Instructor patters.

Rudder - Yaw

Instructor. You will remember that during the briefing we discussed how the rudder causes the aircraft to yaw. Once again, follow me through and continue looking out to the horizon. I have Control.

Student. You have Control.

Instructor. If I apply pressure with my left foot to the left rudder pedal you will note that the nose of the aircraft yaws left, more pressure, more yaw.

To stop the yaw I can centralise the rudder.

The same happens to the right if the right rudder is used.

You can now practice this. You have Control.

Student. I have Control. Student practices Instructor patters.

Note: For an effective demonstration, refer to Section 1

Tips for Flight Instructors That is good, student. I have Control.

Student. You have Control.

Instructor. It is important for you to understand that these effects are all relative to the aircraft axis. For example, if I roll the aircraft to the left, and pitch up, you will note that the nose still pitches relative to the aircraft.

Maintaining the nose high attitude and bank angle, if I yaw the aircraft to the left, it still yaws to the left even though it is banked to the left.

Instructor. You will recall that during the briefing we discussed the secondary and further effects of using the controls.

Elevator - Airspeed. Now I will demonstrate the further effect of elevator, as there is no secondary effect. Glance at your airspeed indicator. What is it reading? Yes, XX knots.

Now look out at the horizon, note that when I move the control column back, the nose pitches up.

Now if we glance at the airspeed indicator, what's happening? Yes, the speed is decreasing.

Look outside again. When I move the control column forward, the nose of the aircraft pitches down until it is below the horizon.

Now glance at the airspeed. What is indicated? Yes, it shows that the speed is increasing. So, we can see that pitching the aircraft also has an effect on the airspeed.

Ailerons - Roll - Slip - Yaw. Looking outside again.

Remember we also spoke about the secondary effect of the ailerons. First we will have a good lookout. Note that when I move the control column to the left that the aircraft will first roll, slip and yaw to a nose down attitude, from which I will recover.

Again, if we use the ailerons to roll the aircraft right---- we find the roll will lead to a slip and the slip will then lead to a yaw, and a nose down attitude. I will recover.

IN-FLIGHT PATTER - EFFECT OF CONTROLS Flight 2 of 2

Demonstrate and patter the start, take-off and climb for the start of flight 2 of Effect of Controls.

Instructor. OK, student, here we are again flying level at 3000 ft. During the briefing, we noted that apart from the primary effects of pitch, roll and yaw other effects also occur, and we will now have a look at these.

Airspeed. Firstly, the effect that airspeed has on the controls.

To show you this I am reducing the power to ensure we maintain level and reduce the effect the slipstream has on the controls.

I am now moving the control column forward to pitch the nose down in order to increase the speed.

Higher airspeed. Trimming the aircraft to maintain a relatively higher airspeed in a glide.

We are now descending at XX knots. Looking outside. Following me through, you can feel that the controls have an increased feel and are more effective with a better response than at the previous speed. Feel the elevator, the ailerons and the rudder.

Lower airspeed. Let us look now at the effect of a lower airspeed. Still with the power reduced I will pitch the nose to a higher attitude and trim.

The airspeed is now XX knots. Looking outside.

Again following me through, feel that the effectiveness of the elevator is reduced, the response is not as before and that the control has a reduced feel. The same with the ailerons, and the same with the rudder.

Slipstream effect. Whilst the power is reduced I will demonstrate the effect that the slipstream has on the aircraft. You will recall that the slipstream is the spiral of air being generated by the propeller.

As the aircraft is now flying relatively slowly with only a little slipstream, with me you can feel that all the controls feel less responsive, they have reduced feel and are less effective.

I will now increase the power and therefore the slipstream, and hold the same low airspeed. Follow me through and you will now feel that the ailerons still feel less responsive and are less effective, due to our low speed, however feel that the elevator has increased response and is more effective due to the increased airflow from the slipstream. And the rudder, feel how much more effective and sensitive the rudder pedals feel.

We can see then, that the effect of slipstream from the propeller increases the effectiveness of the rudder and elevator but, being outside the slipstream, the ailerons are not affected. I am now returning the aircraft to the level attitude and the normal power setting again. During the briefing, we also discussed the effect that increases and decreases in the power setting had on the aircraft. So let’s have a look at these effects.

Power changes. Here we are flying straight and level with a power setting of XX rpm and the aircraft trimmed.

If I increase the power to full, looking outside, you will see that the aircraft pitches up and yaws to the left.

To control the pitch change we apply forward pressure on the control column, and to prevent further yaw we apply sufficient rudder to prevent further movement to the right.

If I gradually reduce the power from full to idle, looking outside, you can see that the aircraft pitches down and yaws to the right. I can now prevent the aircraft pitching further by applying back pressure to the control column and prevent the yaw by applying sufficient pressure to the left rudder pedal. More about this in the next lesson.

Trim

Instructor. During the briefing we spoke about the use of the trim and you would have noticed that I have been referring to and using the trim. I will now demonstrate how this works in practice.

The aircraft is currently in a trimmed condition, if I release the controls the aircraft remains in steady flight, straight and level. Looking out the front.

If I now move the control column back note as before that the nose pitches up. If I now relax the control column, the nose will pitch down to its original position due to the effect of the original trim position.

If I want to keep the nose high position, I can pitch the nose up and by feeling the pressure on the control column, relieve this pressure by holding the nose steady and move the trim control back until there is no pressure felt on the control column. The aircraft is now trimmed for that higher nose attitude.

To return to level flight, looking out the front I will pitch the nose back to the level attitude, hold the control column steady and adjust the trim forward until the pressure is once again relieved on the control column.

At this point, student, I emphasise that the trim is not to be used to change the attitude. The attitude is changed with the control column and the pressure on the control column is relieved with the trim.

You can now practice this.

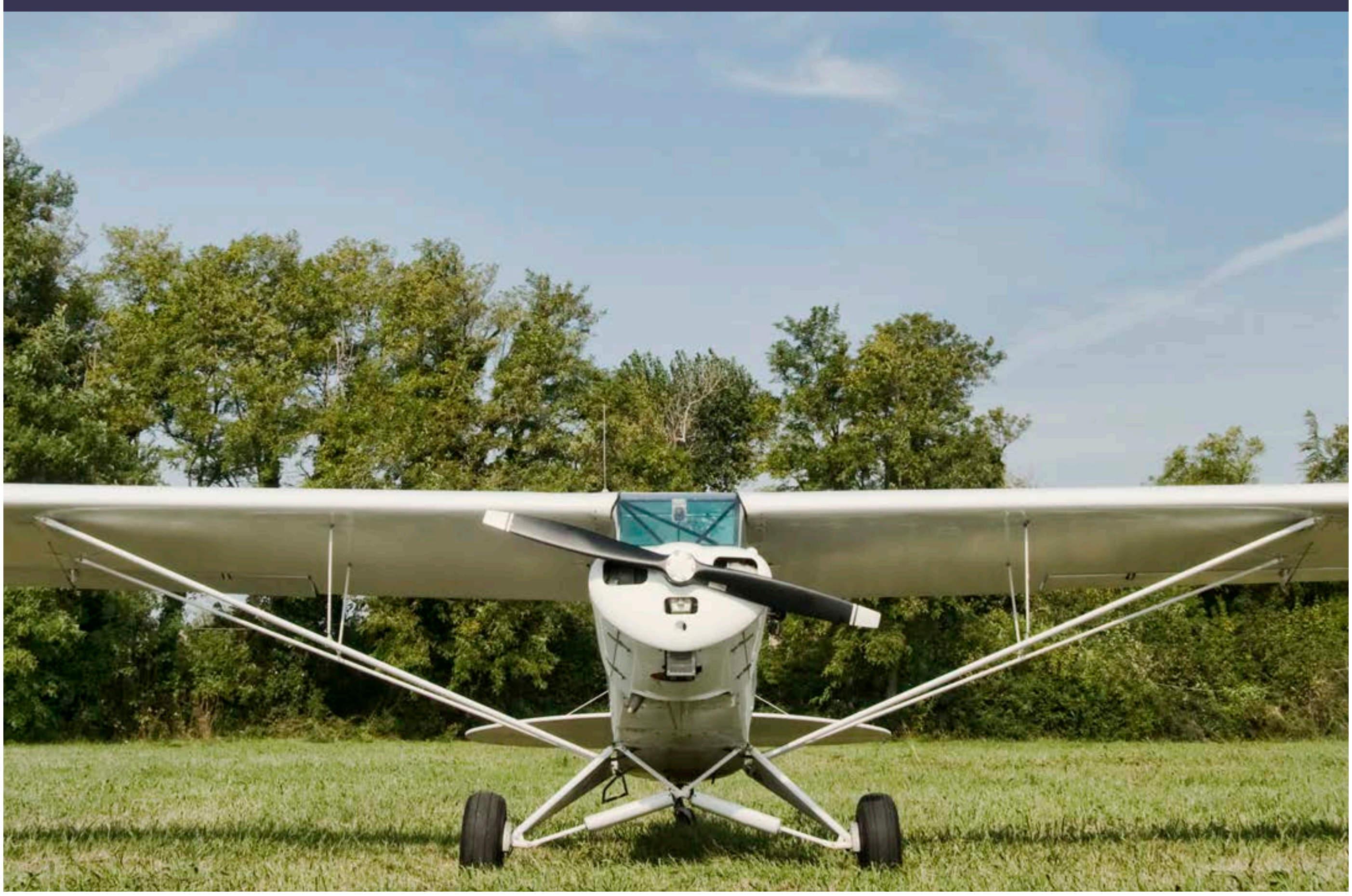
You have Control.

Student. I have Control. Student practices Instructor patters.

Note: The student should now be given ample opportunity to operate the controls and become used to the feel of the controls with the Instructor offering some light patter.

On the return to the airfield, the Instructor can introduce the next exercise of Level and Straight by a brief demonstration and patter.

The Flight
Straight and Level



STRAIGHT AND LEVEL - 3 AXIS

1. AIM

To establish and maintain straight and level flight, at a constant airspeed, constant altitude, in a constant direction, and in balance.
To regain straight and level flight.
To maintain straight and level flight at selected airspeeds or power settings.

2. APPLICATION

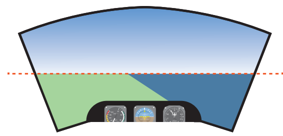
- Smooth throttle movements
- Coordination of controls
- Elevator (pitch) controls attitude
- Power controls climb / descent

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - SA - method for scanning, training area boundaries, maintaining visual horizon
- "I have control / you have control"
- Scan - work cycle
- Threat referencing - CLOCKCODE Principle
- Blind Spots

4. FLIGHT EXERCISE

- Horizon
- Demonstrate stability
- Power setting
- Attitude for level



Establishing Straight and Level

Attitude elevator - set attitude
Power set to maintain level

aileron wings level
rudder in balance

attitude
relative to horizon
no yaw - stand on the ball

Trim to relieve pressure - hands off

Maintaining Straight and Level

Lookout **ahead**
Attitude **reference position**
Instruments - to confirm - not set
- Altimeter and RPM checked every time
- O he ti s rumtn nts en ad gauges, less frequently

Regaining Straight and Level

- Attitude to set airspeed / power setting correct
- Attitude confirmed
- Wings level and balance ball centered
- Reset power (as required)
- A P T

Straight and Level at Different Airspeeds

- Attitude controls airspeed
- Inverse relationship between power / attitude
- Power changes must be balanced with rudder
- Manage secondary effects and balance

Power + Attitude = Performance

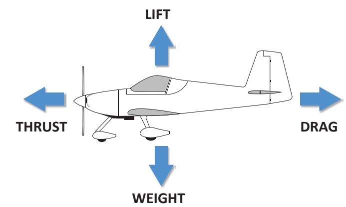
Performance	Mid	Low	High
Power	Cruise	Reduced	Higher
Attitude	Normal	Higher	Lower
Airspeed	80-90 knots	60 knots	110 knots

3. UNDERPINNING THEORY

- The horizon is the line where the land or sea meets the sky
- All references use the aircrafts attitude to the horizon
- Concepts of aerodynamic stability and relevance to flight.

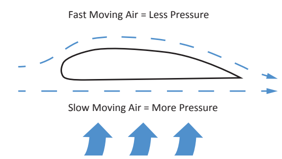
The Four Forces

- Lift, Weight, Thrust, Drag
- Equilibrium when Lift = Weight and Thrust = Drag
- Forces don't act through the same point → moment arms → couple
- Lift and Weight couples balanced by tailplane force
- Changes in Thrust → pitch changes



Lift

- Air over the wing accelerates compared to air passing under the wing
- $L = C_L \frac{1}{2} \rho V^2 S$
- L = Angle of attack × Airspeed
- Angle of attack altered with elevator



Performance

Power + Attitude = Performance

PWR+ $\frac{\text{IAS}}{\text{A of A}}$ =P

6. OUTCOMES AND EXPECTATIONS

- Student understands use of primary controls to maintain S&L flight
- Student configures aircraft correctly for any required performance
- Student recognises and corrects deviation with appropriate scan & work cycle
- Competencies +/- 150 ft, +/-5kts, +/- 10 degrees
- Effective use of CLOCKCODE and See & Avoid

RECREATIONAL AVIATION AUSTRALIA

BRIEFING CONSIDERATIONS - STRAIGHT AND LEVEL

Once the aircraft is established in level flight, remind the student the aircraft is set to a level attitude with the elevator, held level and then trimmed. Remind the student the attitude referenced to the horizon is the primary reference for level flight. Confirmation of the success of this is referenced to the relevant instruments.

Straight and Level flight. Remind the student the horizon is also the primary reference for keeping the wings level.

While some Instructors ask the student reference the wing tips against their relative horizons to maintain wings level, due to parallax errors this can be problematic. As the student is sitting to the left of the centreline of the aircraft, they may perceive a different view of the far wingtip to the near wingtip. It is recommended to use a feature directly in front of the student which they can relate to the horizon.

The student must be made aware of the tendency to look across the centre of the cowling to the propeller or spinner rather than directly ahead of their seat.

They must focus on the feature directly in line from the student's eyes from the left seat to avoid offset of the feature to the right. As the student and the Instructor are offset from the centreline of the aircraft they cannot both use the same reference point.

The Instructor should advise the student to choose a feature in line with the student's eyes when looking straight ahead at the horizon. This feature will invariably be slightly different to what the Instructor will sees.

Balanced flight. During the briefing it should be clear the purpose of the rudder is to ensure that the aircraft is not yawed. While the student will not yet be able to "feel" the aircraft out of balance, it may be useful to demonstrate this while holding the wings level. As a secondary reference the balance indicator, commonly called "the ball", indicates if the aircraft is slipping or skidding. You may reinforce the further effects of yaw during this section.

Because small amounts of imbalance may not yet be felt by the student, the key is to ensure that the student flies visually with wings level and references the ball to determine imbalance. Ensure the student does not focus only on the balance ball.

Straight and Level at various Airspeeds and Power settings. It is important that the Instructor reinforces the information learned in Effects of Controls. Attitude has a direct relationship to airspeed and power controls climb, level altitude or descent.

When demonstrating the effects of power when straight and level it is important to make smooth power changes. Abrupt power changes result in aircraft responses that disrupt smooth flight and are not good practice for the engine life as all those little moving parts have to accelerate or decelerate rapidly.

Remember that you have already dealt with power changes during the Effect of Controls element. This therefore becomes a perfect opportunity to reinforce these effects of power changes. The student should now be given plenty of practice, accompanied by corrective patter as necessary.

Other manoeuvres during the lesson. During the course of any flight the student should be observing and possibly following through other manoeuvres such as climbing and descending, turning, etc. It is important that the Instructor is not tempted to add these additional elements to the planned lesson. The student should simply observe and monitor these manoeuvres.

IN-FLIGHT PATTER – STRAIGHT AND LEVEL

The student should have gained additional confidence to take on additional tasks.

Instructor. OK student, we are now established in the training area at 3000 ft. Continue to follow me through on the controls. First, we will conduct a lookout using the scan technique we discussed in the briefing.

You will recall that we also explained the use of the CLOCKCODE. What is the relative position of that convenient geographical feature? (Mountain, boat, cloud, etc.)

Student. Example response, 10 o’clock.

Instructor. Yes, that is correct, but what else?

Student. Ten o’clock, low and moving to the east.

Instructor. Good, remember, you are an essential member of this crew. If you sight another aircraft, or object of importance, you must report it to me. Now student, you will remember that in the previous flight we learnt the action and reaction of using the controls. During this lesson we will get to use these controls to make the aircraft do what we want it to.

Instructor. During the briefing we spoke about how to keep the aircraft level. I will now formally demonstrate this to you. Continue to follow me through. Look out straight ahead in front of you at the horizon, not across to the centre of the cowling. Note where the nose attitude is relative to the horizon. This is the level attitude.

Find a reference inside the aircraft to help you identify this again. Because the aircraft is inherently stable and I have trimmed it, the attitude stays the same if we relax our hold on the control column. We now check the relevant instruments, to confirm what we see. The altimeter shows a constant height, the vertical speed indicator is showing neither climb nor descent and the airspeed is constant. We immediately return to the horizon outside again.

If there is a disturbance and the nose pitches up, I will ease forward on the elevator control to pitch the nose back to where it was before.

If I don't do this, the aircraft will climb, like this.

You will note that the nose is slightly higher than before and a quick check of the instruments shows that the altimeter indicates an increase in height, the VSI indicates a small rate of climb and the airspeed is slightly reduced. Looking outside again, we pitch the nose back to level, pause to settle the aircraft and then check the instruments before looking outside again at the attitude. We shouldn't need to re-trim.

I emphasise that the check of the instruments must be quick and with purpose. Before you check the instrument, visualise which instruments you are checking. Your eyes should go straight to that relative instrument.

Looking outside again, if there is another disturbance and the nose pitches down, we use the elevator to pitch it back to its original level position.

I will now pitch the nose up and down to various positions and I want you to practice restoring it to the level attitude. You have Control.

Student. I have Control. Student practices. Instructor Patters.

Instructor. That's good student. I have Control.

Student. You have Control.

Instructor. I will now demonstrate how we keep the aircraft straight, continue to follow me through. You will remember from the briefing the importance of looking straight in front of you to choose a reference point. Tell me what reference point you have chosen.

Student. The gap in the mountain.

Instructor. Good, continue to look at that point. You will note that the wings are level. You can see this because the view out the front is level with the horizon reference point. With the wings level, provided that the aircraft is balanced, the aircraft will fly straight. For example, if I use the aileron control to lower the left wing, you will see that the aircraft is banked to the left. Because the aircraft is banked to the left, the nose will yaw left away from your reference point.

To correct this we will first of all use the ailerons to roll the wings level. Because we are now not flying to your reference point we will need to bank slightly to the right and when you have the reference point in front of you, you can then level the wings.

We will talk more about the coordination of ailerons and rudder shortly.

You can now practice this with small degrees of bank to the left and right and then make the necessary correction. You have Control.

Student. I have Control. Student practices Instructor Patters

Instructor. I have Control.

Student. You have Control.

Instructor. We have been emphasising that the primary reference for control is assessing the attitude of the aircraft relative to the horizon.

When we control the balance of the aircraft of the aircraft with the operation of the rudder the primary reference is still the horizon and a reference point, and we confirm this with the balance indicator, the ball.

For the moment, continue to look straight ahead. It is possible to fly level and straight but be out of balance. In other words, the aircraft is yawing with the tail of the aircraft not following the nose.

Continue to follow me through. A quick glance at the airspeed and we see XX knots. Looking ahead again at your horizon reference point. If I apply left rudder like this, I can keep straight to your reference point by banking to the right. At this point you can feel uncomfortable and feel like you are skidding in your seat.

Another quick glance at the airspeed and note that it is now XX knots although we are still flying level and straight. Note also that the ball is hard over to the right.

This is a very inefficient way of flying, we will take longer to get from A to B, use more fuel and it is tiring and uncomfortable. To correct this state of affairs, we apply right rudder and keep straight with the use of ailerons until the wings are level and the ball is centred.

It is also possible to keep straight and level but without noticing it, by being slightly out of balance, like this. It is important therefore to reference the ball by glancing at it to check we are still in balance.

I want you to practice this. I will disrupt the aircraft and you will restore it to level, straight and balanced flight. You have Control.

Student. I have Control. Student practices Instructors disrupts and patters

Instructor. That was pretty good, student. I have Control student.

Student. You have Control

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I want you to practice this. I will disrupt the aircraft and you will restore it to level, straight and balanced flight. You have Control.

Student. I have Control. Student practices Instructors disrupts and patters

Instructor. That was pretty good, student. I have Control student.

Student. You have Control

Instructor. Remember during the briefing we discussed how we use different attitudes to set our airspeed and then will require different power settings to maintain straight and level? I will now demonstrate this. Continue to follow me through. Note our current attitude relative to the horizon, giving us an airspeed of XX knots and the required power setting to maintain this.

I will simultaneously pitch the nose down and increase the power.

Forward pressure is required on the control column to stop the nose pitching up with a touch of right rudder to correct the left yaw. As the aircraft accelerates I need to hold forward pressure on the control column to maintain our new attitude. When the aircraft settles I can trim forward to keep level.

Now you will note that we have a slightly lower nose attitude and an increase in speed to XX knots with a higher power setting. Due to the inherent stability of the aircraft, and if it is properly trimmed, we can relax on the controls and maintain steady flight.

To demonstrate a lower speed maintaining straight and level, I will simultaneously pitch the nose up and decrease the power setting. As the power decreases, the nose wants to pitch down and yaw to the right. To maintain straight and level flight I will hold back pressure on the control column and apply left rudder. When the aircraft has settled I can trim to relieve control column pressures.

You will note that the airspeed is now XX knots and that we have a higher nose attitude to keep level.

I will now set the attitude to our original attitude and increase the power to our original setting and once the aircraft has settled, trim.

Now you can try these sequences. You have Control.

Student. I have Control. Student practices adjusting the attitude and power setting for various speeds. Instructor patters.

Instructor. Just one more point to remember, remember we spoke about stability. The inbuilt stability of the aircraft will correct small disturbances, which allows us to be quite relaxed on the controls. If we are not relaxed and constantly make changes we will over control the aircraft. This leads to a rough ride and increased pilot fatigue.

Ok, student, using these skills you can now return to the airfield, telling me what the appropriate features are and how you are identifying you are headed in the correct direction. Note: It is inevitable that during the course of the lesson some turns will be required. As outlined earlier the Instructor should conduct these turns to avoid dilution of the primary exercise, straight and level.

RECREATIONAL AVIATION AUSTRALIA

The Flight
Climbing And Descending

CLIMBING AND DESCENDING - 3 AXIS

1. AIM

To climb or descend the aircraft to a pre-determined height, at a rate and airspeed appropriate for the nominated phase of flight.

2. APPLICATION

- For use in all phases of flight to change the altitude of the aircraft
- Appropriate climb/descent angles for phase of flight
- VFR - conditions considered
- Minimum and maximum heights

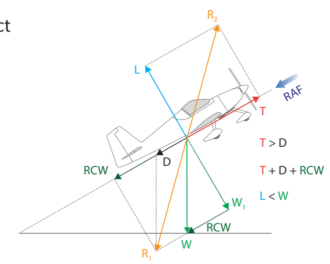
5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA - monitor for changes in level
- Blind spots managed during climb or descent
- Horizon remains primary reference
- Pre-plan required performance
- Understanding vestibular system and pressure equalisation
- Monitoring and management of temps & pressures
- Smooth throttle movements
- Carb heat HOT for descent

3. UNDERPINNING THEORY

Changing power settings is the primary method for creating required force to climb or descend the aircraft.

- Power: Primary control for aircraft height change
- Elevator: Sets airspeed and angle of climb/descent
- Rudder: Balance to control changes due slipstream effect
- Amount of available power determines ultimate climb performance, Vx, Vy



Climbing

- Aircraft is in equilibrium when climbing
- Lift is not increased
- T must be greater than D
- Rate of climb (climb performance) depends on excess power available

Climb Performance

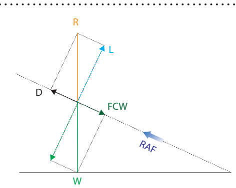
Power More power, better climb performance
Altitude Limits the performance
Weight ↑ weight - ↓ rate of climb
Flap ↑ drag - ↓ rate of climb
Wind Affects climb angle and distance covered

Climb Configurations

Performance	Power	Attitude
Best RoC	Full	_____ kts
Best AoC	Full	_____ kts
Cruise	> Cruise	_____ kts
Recommended		_____ kts

Descending

- Aircraft is in equilibrium when descending
- Airspeed maintained by lowering nose attitude
- FCW balances D



Descent Performance

Power Controls rate of descent
L/D ratio Efficiency of wing, steepness of glide
Weight ↑ weight ↑ FCW - ↑ glide speed
Flap Needs ↑ FCW to balance D - ↑ rate of descent
Wind Affects descent angle and range

Descent Configurations

Performance	Power	Attitude
Glide	Idle	_____ kts
Powered		_____ kts
Cruise		_____ kts

4. FLIGHT EXERCISE

Climbing

Entry

Lookout Above / Around
Power Full power, balance
Attitude Climb attitude, wings level, balance
Trim To maintain attitude
Airspeed Controlled with attitude

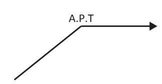
Maintaining

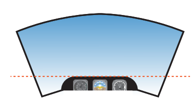
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

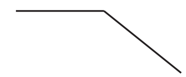
Attitude Select and hold S+L attitude, adjust as speed increases, balance
Power Wait for aircraft to accelerate, then set cruise power, balance
Trim To hold S+L attitude





Descending

Entry



Lookout Below/Around
Power Carb heat HOT, throttle, balance
Attitude Hold S+L attitude until glide speed, then set glide attitude (high performance) to
Trim Maintain attitude

Airspeed = _____ RoD = _____
Airspeed controlled with attitude

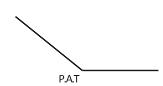
Maintaining

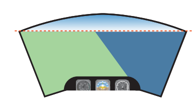
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

Power Carb heat COLD, increase power to cruise, balance
Attitude Simultaneously set to S+L, balance
Trim To hold S+L attitude





6. OUTCOMES AND EXPECTATIONS

- Correct sequence of actions and control through a range of climb and descent scenarios and configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Nominated height +/- 100ft Airspeed +/- 5 kt, aircraft balanced for all exercises

RECREATIONAL AVIATION AUSTRALIA

BRIEFING CONSIDERATIONS - CLIMBING AND DESCENDING

As the student is now gaining more experience and confidence the flight instruction can be commenced on track to the training area. By now the student should be taxiing, and conducting the pre take-off checks and possibly some radio calls.

Lookout

Reinforce normal lookout procedure and emphasise that because we are changing from one altitude to another, it is even more important to conduct a thorough lookout.

During the climb, the nose should be pitched down periodically to lookout every 500 ft. The same lookout procedure applies before entering and during the descent.

Remind the student of the need to assess the weather.

Management of engine temperatures and pressures. Emphasise that before changing altitude and before the lookout the relevant engine temperatures and pressures should be checked prior to entering the climb. During the climb or the descent as part of the periodic lookout, the student should check the ‘T’s and P’s’ continue to be in the normal range.

Indicate the appropriate actions if the ‘T’s and P’s’ are not normal, or are becoming critical.

General Handling. Reinforce the pre-flight briefing regarding the climb entry LPAT, leveling from climb or descent LAPT and entry to descent LPAT.

Note: In high drag aircraft like Drifters or Thrusters, entry to the descent is LPAT due to the high drag resulting in excessive speed reduction when the power is decreased.

Demonstrate how to coordinate control inputs with the power changes.

Ensure the student is not paying too much attention to the airspeed indicator instead of holding a constant attitude.

Check the student understanding of Vy and Vx or the various rates of climb or descent profiles, and these can be practiced once the student demonstrates a good understanding of basic climbing and descending.

During the exercise, the student should concentrate on accurately leveling at the nominated height and continue to ensure accurate level and straight flight is maintained between climbing and descending.

Whilst pattering, the Instructor should reference descent or climb rate.

Carburettor heat use. Use the opportunity to describe potential conditions for carburettor icing, particularly relevant when descending. Because many descents are performed with some power the student may mistakenly believe that icing cannot occur. When in doubt---apply full heat!

Revision. Allow the student to practice straight and level flying between climbing and descending exercises. Monitor the student's flying and be prepared to critique his flying to prevent lapses into bad habits.

Accurate flying. Leveling out from a climb or descent should be as accurate as possible. Accepting standards less than nominated during the brief is not consistent. The Instructor must insist on accurate flying at all times. The nominated heights, bank angles, speeds, etc. are examples of areas that the student was briefed about on the ground and is therefore aware of. Not only will this result in a sense of achievement for the student, clearly understanding what the expected flight tolerances are, but also instilling the self discipline required for In-Command flying.

The Glide Descent The glide descent should be introduced as part of this exercise. It is important that the student gains confidence in the aircraft being flown with the power reduced to idle.
Descents with flaps It must be emphasised that flaps must not be extended with the speed above the flap extension speed Vfe.

Other climb and descent exercises. Vy and Vx climbing can be introduced during other exercises. Practice of normal climbing is sufficient during this initial exercise. Emergency descents should be introduced later.

IN-FLIGHT PATTER – CLIMBING AND DESCENDING

Introduction

The student should be following through your demonstrations of take-off, initial climb and circuit departure.

Instructor. OK student, we are now at 2000 ft and tracking to the training area. During the briefing we spoke about how to enter a climb and I will now demonstrate this to you. We will use a normal climb airspeed of XX knots.

As the engine will be operating at a higher power setting we to monitor temperatures and pressures and confirm they are OK to enter the climb. Visualise where you will be looking then take a quick purposeful look to confirm the temperatures and pressures are in the normal range.

Now, from our briefing LPAT I will commence the climb. Continue to follow me as I apply full power and pitch the nose up, controlling left yaw by applying sufficient right rudder. I will set our attitude relative to the horizon and allow the speed to settle at XX knots. Now the aircraft is settled I will trim to hold that attitude. You can say these key words aloud as you do them.

Throughout the climb we continue our lookout, as we gain 500 ft we will check our climb path continues to be clear. Smoothly pitch the nose down to check ahead, then looking at the horizon, reset the climb attitude. If all clear resume the climb and check the engine instruments are still within operating limits.

As we are approaching our nominated altitude of 3000 ft, we will go through the level out procedure LAPT. Continue to follow me through.

Have a good lookout left and right and as the altimeter is indicating 3000 ft, we pitch the nose to the level attitude. As the airspeed increases we need to increase pressure on the control column to maintain the attitude and start reducing to cruise power. With the reduction in power we no longer require as much right rudder. When the attitude and airspeed are stabilised, we trim the pressure off the control column.

Remember from the briefing that we spoke about the Vy being XX knots, the speed for best rate of climb, and Vx, XX knots, as the speed for best angle of climb. Today you will be practising a normal climb at an airspeed of XX knots.

OK, student, you can now practice this, firstly your level and straight flying check. You have Control.

Student. I have Control. Student practices. Instructor monitors and patters.

Instructor. OK, student, you can now practice a climb to 4000 ft. Use a speed of XX knots for a normal climb. I will guide you along as necessary.

Student. Student practices. Instructor monitors and patters.

Instructor. That is pretty good! As we are now level at 4000 ft I will now demonstrate the descent. I have Control.

Student. You have Control.

Instructor. You will recall we enter a descent using LPAT and we must coordinate power and attitude inputs to achieve our required descent rate and nominated airspeed. The standard descent rate most comfortable for our passengers is 500 ft per minute.

Until we are familiar with the performance of the aircraft, we may need to adjust the power and attitude to achieve the nominated descent rate and speed. Lookout left and right and down our descent path, and conduct a check of the engine instruments. Assess the conditions to decide if carburettor heat is required.

Now we need to set an appropriate power setting and control the right yaw, keeping the wings level. We hold the selected attitude and confirm with a quick glance at the airspeed indicator that it is reducing towards XX knots. We can start adjusting the attitude relative to the horizon to maintain XX knots. Confirm the expected descent rate of 500 ft per minute. Now we hold this attitude, wings level, ball centred and trim.

During the descent we maintain a good lookout along the descent path and every 500 ft check the engine instruments to ensure the engine is operating within normal limits.

As we approach 3000 ft, we conduct a good lookout, especially along our intended altitude and then apply power to cruise power. As the power is increasing we start pitching the nose to our expected level attitude and coordinate the controls, preventing yaw and keeping the wings level. Once the aircraft we stabilises we trim.

OK, student when you are ready, you can practice a descent to 2000 ft. You have Control.

Student. I have Control . Student practices. Instructor monitors and patter.

Instructor. That is good. I will now nominate some climbs and descents for you to practice. Remember that the power setting controls the rate of descent and airspeed is controlled by setting the attitude with the elevator.

You have Control.

Student. I have Control. Student practices. Instructor nominates various climbs and descents.

Instructor. I have Control.

Student. You have Control.

Instructor. I will now demonstrate a Glide Descent. As discussed during the briefing, the aircraft is capable of descending with the power reduced or even if the engine is not operating.

The normal glide speed for this aircraft in the POH is XX knots. The entry to the glide descent is the same as for a normal descent, except that as a precaution, prior to removing power we will apply carburettor heat.

First we conduct a good lookout, apply full carburettor heat and then smoothly reduce the power to idle. Coordinate the controls to counteract the effect of the power reduction. Initially maintain the nose attitude and as the aircraft slows pitch the nose to hold XX knots.

When stable, trim for that attitude. You will note that we hold a constant airspeed in a glide descent and accept the descent rate shown. I will now bring the aircraft to straight and level and you can practice. You have Control.

Student. I have Control. Student practices. Instructor patters and monitors

Instructor. I have Control.

Student. You have Control.

Instructor. That is coming along well. I will now demonstrate a descent with flap extended. As discussed during the briefing, we must not extend the flaps above flap extension speed, Vfe which is indicated on the airspeed indicator as the top of the white arc and in this aircraft is XX knots.

We will choose a descent at 500 ft per minute and a speed of XX knots which is our normal approach speed when landing. We are now at 4000 ft and will descend to 3000 ft.

Although we can select full flap at this stage and sometimes it will be necessary, it is usual to select flap in stages. Firstly reducing the power we control the pitch down and yaw responses. When the airspeed reduces to below XX knots we select flap in stages. When we select first stage we must control the nose pitching in response. At this point we can adjust the attitude to maintain XX knots and we may need to adjust the power setting to settle our required 500 ft per minute rate and then trim. You will note the lower nose attitude as a result of flap use.

When we are ready we extend full flap and control the nose pitching before pitching the nose to a lower attitude to maintain our nominated XX knots. A glance at our descent rate shows that it has increased above 500 ft per minute so we need to increase the power, a touch of back pressure on the control column and when we are stabilised we will trim. To level out and raise the flap, we need to be aware that initially there will be an increase in the sink rate and the nose will pitch.

I will now apply cruise power, controlling the nose pitch and yaw and select no flap, with pauses at each stage, and adjusting the nose to the level attitude. Checking power setting and attitude and that the aircraft is stabilised, I can now trim.

As before, remember that the power setting will determine the rate of descent and the nose attitude controls the airspeed and the result will equal the required performance. You can now practice, setting up a full flap descent at XX knots and 500 ft per minute and leveling out at 2000 ft. You have Control.

Student. I have Control. Student practices Instructor monitors and patters

Instructor. Finally, if we were to apply full power from this configuration with flap extended, as we might when conducting a go-around, we must be mindful of the potential couple as a result of retracting flap and applying power. I have Control

Student. You have Control.

Instructor. Here we are established in a descent which is simulating a glide approach, and we decide we need to apply full power and conduct a go-around.

I am smoothly applying full power and making sure I manage the resulting pitching up and yaw to the left. The resulting control forces, being pitch up after full power application and pitch up resulting from previous trim for descent along with the yaw induced from propeller torque and slipstream effect must all be managed to ensure, if we conduct this manoeuvre at low level, the aircraft is maintained under control.

Once we have established a positive rate of climb, we retract the flaps and the resulting pitch change (as relevant to high or low wing aircraft) must also be managed.

Note: Ensure the student operates flaps up in stages to prevent abrupt pitch changes and loss of height.

Complete the exercise with plenty of student practice. On the return to the airfield, have the student assess when to descend to circuit height.

RECREATIONAL
AVIATION AUSTRALIA

The Flight
Turning

TURNING - 3 AXIS

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To roll the aircraft to a predetermined Angle of Bank (AOB), whilst maintaining the required performance and balance for level, climbing or descending flight to any predetermined heading.

2. APPLICATION

For use in all phases of flight to change the aircraft heading.

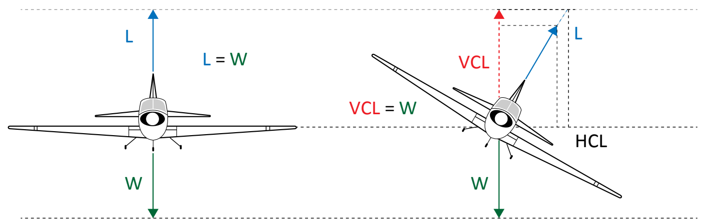
5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Appropriate bank angles for phase of flight
- Blind spots in turn
- Horizon remains primary reference
- Understanding vestibular system and balance
- Banked horizon reference different in turn (side by side seating)

3. UNDERPINNING THEORY

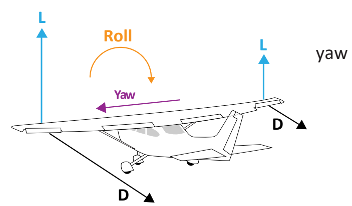
Banking the aircraft is the primary method for creating a force towards the turning direction.

- Ailerons are primary control to turn the aircraft
- Rudder for balance to overcome adverse yaw
- Elevator maintains height in the turn
- Adverse yaw explained
- Stall Speed increases in turning flight due to increased "loading"



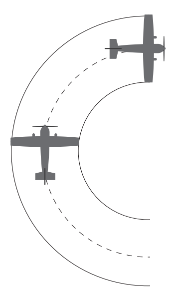
Adverse Yaw

- ↑ L on upgoing wing, also means ↑ D yawing away from turn
- Rudder to balance yaw as ailerons deflected - then neutral



Over Banking

- Outer wing travels further, more L, creates increased rolling force
- Avoid tendency to hold off bank with aileron



Performance

- When climbing and turning, angle of bank must be considered (recommend maximum 15 degrees)

4. FLIGHT EXERCISE

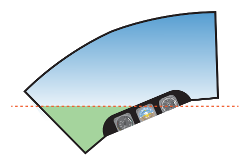
Adverse Yaw

- Demonstration only

Entry

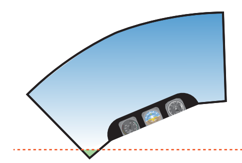
Medium Level Turn

- From S+L
- Lookout
- Roll with aileron to 30° AoB
- Balance with rudder
- Backpressure to maintain altitude - ↑



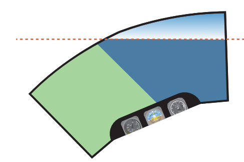
Climbing Turn

- Establish in climb
- Lookout
- Roll with aileron to set AoB
- Balance with rudder
- Hold backpressure to maintain climb airspeed



Descending Turn

- Establish in descent
- Lookout
- Roll with aileron to set AoB
- Balance with rudder
- Maintain backpressure to descent airspeed



In Turn

- Lookout - ALWAYS before turning
- Ailerons for Roll
- Rudder for Balance
- Elevator to maintain lift (power as required for steep turns)
- Turn maintenance, types of turns

Exit

- Look for reference point
- Anticipate rollout by reducing the angle of bank
- Roll wings level
- Balance with rudder
- Relax backpressure
- Reset S+L attitude
- Check **PAT**

6. OUTCOMES AND EXPECTATIONS

- Correct sequence and control through a range of bank angles up to 60 degrees and in all configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Height +/- 100 ft, Airspeed +/- 5 kts, Balanced

Introduction

Before proceeding with this lesson, ensure the student has demonstrated to you on previous flights a full understanding of the operation of controls, straight and level flight and climbing and descending.

Always allow either sufficient revision periods, or revision periods within each exercise, to make sure that this competency has been developed.

BRIEFING CONSIDERATIONS - TURNING

Lookout

As we are changing direction and our position in space, we require a good lookout. If we are turning left, we first check ‘clear right’, ‘clear ahead, above and below’, then ‘clear left’. Obviously the reverse applies if turning right. Ensure you verbalise this procedure and encourage the student to do the same.

During the turn the student should be made aware of the importance of monitoring the attitude of the aircraft and only referencing instruments to confirm the picture in front. This will ensure the student does not become fixated on instruments, using the horizon and aircraft relative attitude instead.

Self-patter. Encourage the student to patter this sequence of lookout, out loud, and to make this become a habit. For example “All clear right, all clear left, all clear in front, turning left.”

Direction/Compass heading. If not previously demonstrated, the alignment of the compass with a directional indicator or the EFIS should now be demonstrated. This can only be accurately done in level, un-accelerated flight. Mention the need to check the compass alignment is accurate and this can be done when lined up on the runway.

Turns to compass heading with reference to the briefed information regarding O.N.U.S may be introduced if the student is demonstrating competence, or left for later revision exercises.

Angles of bank. Turns greater than 30° angle of bank should not be introduced during this exercise.

Medium turns to 30° are to be demonstrated and the student should practice with turns completed to a geographical reference. The student should become comfortable with turns to reference points with quick scans to instruments and the majority of the focus outside. We do not teach instrument flying and this should be emphasised by referring to the outside reference.

Climbing turns up to 15° angle of bank should be shown along with a demonstration of the aircraft tendency to increase bank angles. The normal climbing speed should be used along with the recommended power setting.

Descending turns are usually demonstrated at shallow angles of bank with the power and attitude selected to manage the descent rate at 500 fpm.

Angle of bank v attitude against horizon. Most of our training aircraft have been designed with side by side seating and this arrangement will influence the way the horizon looks when the aircraft is banked from left to right. Because both the student and the Instructor are offset from the centre line, each will have a different view when the aircraft is banked either to the left or to the right.

If the student is looking straight ahead rather than across the cowling and the aircraft is banked to the left, the nose of the aircraft will appear much lower relative to the horizon. Due to this perception the student will generally raise the nose, resulting in the aircraft climbing. During the demonstration the Instructor should patter this sight picture and encourage the student to note a useful reference inside the cockpit to ensure the correct attitude is held. Reference can be made to the pre-flight briefing where this was explained.

When turning right the student will generally pitch the aircraft nose high. Again, during the demonstration, the Instructor should patter the correct sight picture. Obviously, it is critical during these demonstrations for the Instructor to fly accurately when turning in both directions!

The patter to the student will confirm the views noted are normal for turning manoeuvres and that he or she will become accustomed to these.

Coordination of Controls. The need to coordinate ailerons, rudder and elevator should be demonstrated by reviewing the effects of controls lesson and include:

- Use of ailerons alone: Point out the initial drag as a result of aileron input, the subsequent roll in the required direction, the sideslip indication of the balance ball, the secondary yaw and further nose down attitude and the feeling on the body of the sideslip forces. Most people will tend to lean away from the sideslip.

- Use of rudder alone: Point out the skid, followed by the secondary roll and further nose down pitch and the ball indication. Note the feeling of the skid forces on the body. Most people will tend to lean towards the skid.

- Now demonstrate a properly coordinated turn with the initial input of ailerons and rudder, neutralising aileron once the desired bank angle is achieved and maintenance of the attitude with elevator. Noted that the forces on the body are such that the body has no tendency to lean in the seat.

Revision periods. Commence each exercise with revision of previous exercise. It is also good practice to expand on previous exercises, for example, during this exercise, Best Rate of Climb and Best Angle of Climb can be introduced and practiced.

IN-FLIGHT PATTER - TURNS

Instructor. As discussed during the briefing, because we are changing direction when turning, it is vital we check for other users of airspace and conduct a good lookout. You would have noticed how I have conducted this during our previous flights and the lookout patter I have used. I will now formally demonstrate this to you. As usual, follow me through.

First of all, the lookout. Because we will be turning left, we will check that it is all clear to the right. Scanning round to the right, “all clear right”, then scanning to the front “all clear ahead, above and below” and to the left “all clear left” and finally “turning left.”

As discussed during the briefing for a medium level turn to the left we will choose an angle of bank of 30°. Looking straight in front we will choose a reference point on the horizon. What point can you see straight in front? (Student answers) So, coordinating the controls, we move the control column to the left and at the same time we apply gentle left rudder pressure. Once we are established at the required bank angle we neutralise the ailerons and rudder and to overcome pitch down tendency, apply sufficient back pressure on the control column.

You will note that the nose appears to you to be well below the horizon. You will recall during the briefing that this is due where you are seated on the left of the centreline of the aircraft. What you are seeing is the normal view of the horizon when the aircraft is banked to the left at 30° angle of bank.

Continue to look at the horizon but think about where the flight instruments are located on the instrument panel. Now with a quick glance confirm the balance ball is in the middle, the turn coordinator (if fitted) shows 30° angle of bank, the VSI is confirming a level attitude, no climb nor descent and looking back to the front, we may need small changes in pressure on the control to hold the turn attitude constant.

In the turn, continue to lookout particularly in the direction of the turn. You can see your reference point coming into view and just prior to it being directly in front of you we will level out by rolling the wings level and at the same time apply a little right rudder at the same time relaxing the back pressure to return the nose to the usual level attitude relative to the horizon.

Instructor tip. This demonstration is most effective at slow airspeed.

We don't generally trim in a turn, as we usually return to straight and level flight, so you will need to maintain steady back pressure in a turn for the duration of the turn.

Now I will give you a demonstration of turning without coordinating the controls, to remind you why we must coordinate control inputs. Firstly, tell me what you see when I move the only the control column to the left. Yes that is correct. The nose of the aircraft initially yawed to the right. I will recover to straight flight. The yaw in the opposite direction was caused by aileron drag, as we dicussed during the briefing.

Observe again what happens when I use ailerons alone. Left stick – initial yaw right – then roll left – and yaws left.

Now tell me what you see when I coordinate left aileron with left rudder. Yes, there was no initial movement of the nose to the right, but, the nose pitches down due to further effects as we discussed in the effects of controls exercise. To prevent this we needed to use back pressure on the control column as required to maintain the nose on the reference point relative to the horizon. Returning now to straight flight. (This is a useful coordination exercise for the student to practice during revision lessons, rolling around a point, however be careful the student doesn't become ill as a result).

OK student, you can now take over and practice some turns, full 360° turns to the left and right, starting and finishing the turn to your reference point on the horizon. You have Control.

Student. I have Control. Student practices. Instructor patters and monitors.

Instructor. Remember that we spoke about climbing and descending turns. I will now demonstrate the climbing turn. This is usually done in two moves, I have Control, and I want you to follow me through.

Student. You have Control.

Instructor. We conduct a good lookout (usual patter). I will now increase to full power, controlling yaw and pitching the nose up to achieve our climb speed of XX knots and then trim. Note our rate of climb is XXX fpm. We can now start the turn after a good lookout and noting our horizon reference point and coordinating the controls, left aileron until 15° bank angle,rudder to maintain balance and to maintain XX knots we need to lower the nose slightly, now trim.

Note that our rate of climb has dropped slightly to XXX fpm. We continue to maintain a good lookout and monitor engine temperatures and pressures. Also you will note the tendency for the angle of bank to increase, as we spoke about during the briefing, and we need to prevent this with opposite aileron.

To stop the turn we will simply roll the wings level, maintain balance and adjust the nose attitude to maintain our climbing speed and trim, checking engine temperatures and pressures. Just prior to our selected height we will pitch the nose down to the level attitude, reduce power to cruise, stabilise and trim. We are now level at 3500 and you can now practice a climbing turn to 4500 ft. You have Control.

Student. I have Control. Student enters the climb and initiates the turn and the level out. The Instructor monitors and patters.

Instructor. That was good student. During the briefing we discussed descending turns and the need to carefully control both the bank angle and the airspeed. I will now demonstrate a gliding descending turn. I have Control and I want you to follow me through.

Student. You have Control.

Instructor. First we conduct a good lookout (usual patter). Because we will be descending in a power off glide, I will now apply full carby heat and then smoothly reduce the power to idle. As the power reduces we coordinate controls with left rudder to prevent right yaw. This maintains balance and we adjust our attitude to the decent attitude using elevator and set best glide speed of XX knots and once stabilised, trim.

We will now roll to an angle of bank of 20° to the left and ailerons and a touch of left rudder to maintain balance and adjust the pitch attitude to maintain our speed and trim. We must also periodically check engine temperatures and pressures.

Just prior to our selected height of 4000 ft we will roll wings level, maintain balance and increase power to cruise power. Once stabilised we will trim and remove carby heat. You can now show me a glide descent to 3500 ft. You have Control.

Student. I have Control. Student sets up a descent and turn and then levels out. Instructor monitors and patters.

Instructor. Good. Now show me a descending turn at XX knots, at 500 fpm with 20° angle of bank. I want you to level out at 2500 ft.

Student complies. Instructor monitors and patters.

Conclude the exercise with practice of turns and climbing and descending turns.

RECREATIONAL AVIATION AUSTRALIA

The Flight Stalling

STALLING - 3 AXIS

1. AIM

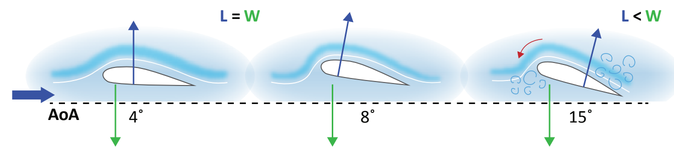
To identify the situations where the aircraft is likely to stall and recognise pre-stall symptoms. When stalled adopt the appropriate recovery actions for minimum height loss.

2. APPLICATION

Any phase of flight where critical A of A is exceeded.

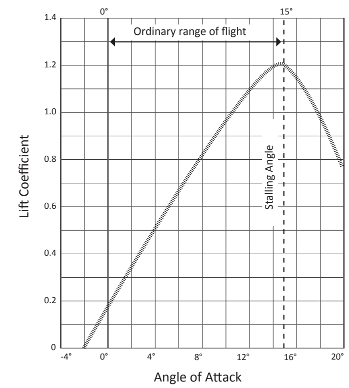
3. UNDERPINNING THEORY

- L = Angle of Attack x Airspeed
- Smooth airflow over the wing breaks down and becomes turbulent
- Breaks away from upper surface, aircraft sinks, nose pitches down



At the stall

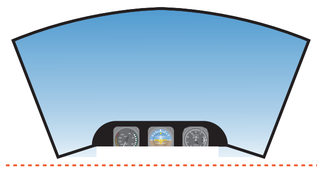
- When the wing stalls there is a ↓ in L and large ↑ in D
- Aircraft sinks, C of P moves rearwards →pitch down
- Stalls result from exceeding critical Angle of Attack
- The elevator controls the A of A of wing
- Lift/Drag curve
- Airspeeds are referenced in POH in relation to stalling
- Stall Speed increases in turning flight due to increased "loading"



4. FLIGHT EXERCISE

Entry

- **HASELL check (Minimum height I.A.W. RAAus Operations Manual)**
- Adopt slow flight to identify symptoms and reduced control
- Recognition of the stall point in various configurations
- Practice and develop recovery actions for min height loss in stall including any "incipient" rotation
- Demonstration and understanding of developing conditions due to mishandling of controls or lack of recognition
- Practice and recognition of pre-stall scenarios and appropriate actions
- Carb heat HOT
- Close throttle
- Keep straight with rudder
- Maintain altitude with backpressure



Symptoms

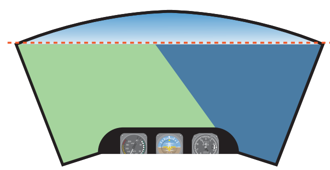
- Low and decreasing airspeed
- Possible high nose altitude
- Less effective controls - higher stick forces
- Stall warning - if fitted
- Buffet (turbulent air from wing striking tailplane)
- Control column will be fully back - no further control movement, past stall stick position
- High sink rate often undetected

At the stall

- Aircraft sinks and nose pitches down
- If aircraft yaws/rolls correct with opposite rudder only - do not use ailerons

Recovery

- Unstall wing
- Check forward with control column to reduce angle of attack
- Do not use ailerons, maintain heading with rudder only
- Aircraft will descend
- Recover to S+L with PAT



To Minimise Height Loss - max of 100 ft

- **Power + Attitude = Performance**
- Unstall, as above, check forward
- Apply full power - balance with rudder
- Raise nose to the horizon to reduce sink
- Lowering attitude assists acceleration
- Regain height and S+L

Recovery at Onset

- Normal situation - when not training
- Recover at stall warning / buffet
- Height loss - 50 ft maximum

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Counterintuitive responses and fear TEM
- Mismanagement and distraction SA
- Recognition of loss of primary control functions
- Limitations in identifying sink rate (Vestibular)
- Adherence to personal minimums and airspeed management

6. OUTCOMES AND EXPECTATIONS

- Define the stalled condition
- Developed recognition of all pre-stall symptoms in flight
- Pilot can state likely scenarios where stalling may occur
- Apply timely and appropriate corrective actions
- **Required recovery standards:** Height loss <200 ft, Heading maintenance +/- 10 degrees, Airspeed within V_a/V_{fe}

RECREATIONAL AVIATION AUSTRALIA

Introduction

During the student's theory study, stalling will appear a complex exercise and often provokes feelings of apprehension. The thinking Instructor will be aware of this and adopt techniques to minimise these feelings.

BRIEFING CONSIDERATIONS - STALLING

At the conclusion of flight prior to the stalling flight

Because the Student may have heard frightening stories about stalling it may be helpful to demonstrate a gentle stall with no flap at idle power stall.

The recommended process for this demonstration is to take control and patter:

"I am just going to show you something interesting"

Then run through the pre-stall checks and without further information:

Instructor. I am now reducing the power and you can see that the nose pitches down and yaws. To prevent height loss I am applying back pressure to the control column and sufficient rudder to stop further yaw. As the speed drops further I apply more back pressure and keeping the wings level using more rudder.

Note the reduced airspeed and the comparatively high nose attitude. I can feel that the controls are becoming less responsive and now we hear the stall warning. There is a slight buffet and a quick glance at the airspeed which is registering XX knots. The control column is now fully back, the nose pitches down and we are losing height. That was a stall and I am recovering by simply releasing the back pressure on the control column and smoothly pitching the nose attitude to just below the horizon. As the speed increases I can apply cruise power and fully recover to level and straight flight. You can see that this is a fairly straight forward procedure which we will be introducing you to during the next exercise.

Do not allow the student to try a stall, which should form part of the next exercise when the student has been fully briefed.

During the pre-flight briefing, the following areas should be part of the brief:

- As this is a flight exercise, be careful not to place too much emphasis on the lift formula.
- Confirm weight and balance will ensure the centre of gravity (C of G) is within limits.
- Referencing the aircraft POH for stall speeds, stalling characteristics and any limitations placed by the manufacturer.
- Revise the symptoms of the approach to a stall.
- Revise the recovery technique.
- Revise the pre-stall check-HASELL.
- Reassure the student you will ensure the aircraft remains in control at all times.

As the Instructor you must be confident when conducting this stall lesson and manage any apprehension you have. If unfamiliar with the aircraft fly the exercise with an experienced Instructor on type and ensure you are confident. This is particularly important if the aircraft type is unpredictable.

During demonstrations, the Instructor must use smooth control movements. It is extremely disconcerting for the student to see and feel abrupt pitching of the aircraft. For most RAAus aircraft an excessively high nose attitude is unnecessary.

Ensure airmanship is effectively managed using HASELL or other wellknown mnemonics.

Height awareness is paramount. The RAAus Operations Manual states “where the stall characteristics are known to be benign... stall recovery is completed by 2000 ft AGL”. At all times the Instructor must be prepared to manage the aircraft safely regardless of what actions the student takes. Stall characteristics listed by the manufacturer as ‘benign’ may not be correct if the aircraft is out of alignment or rigged poorly.

The Operations Manual continues “...stall recovery is to be completed by 3000 ft AGL”. Instructors should use this as a minimum standard and ensure the student understands the necessity of recovery above 3000 ft AGL.

Lookout and the clearing turn. Prior to commencing the exercise, conduct an appropriate lookout with regard to the aircraft type, being high or low wing, to ensure clear airspace for 360° around, above and below the aircraft. The lookout should include an assessment of the weather so that the exercise can be concluded above 3000 ft AGL and remain clear of cloud.

The Instructor must carefully ensure they always conduct recovery actions correctly. This can prove challenging while providing appropriate patter and should be regularly practiced. Ensure the student clearly understand the importance of recovering from the stall as the first action, and preventing further yaw with rudder. The Instructor must ensure they do not inadvertently apply aileron while recovering, and the control column must be moved forward without any sideways inadvertent aileron input.

The appropriate technique to enter the stall is to apply sufficient back pressure to maintain a specific reference point relative to the horizon resulting in a steady decrease in airspeed. Avoid the tendency to reduce the power abruptly and aggressively apply back pressure to the controls. Likewise the recovery action does not require aggressive control inputs. The professional Instructor can recover from a stall positively and smoothly. Likewise the nose should be recovered to the horizon rather than pitched aggressively low, which will result in increased height loss.

The objective of this early stall exercise is so the student 'recognises an approaching stall and completes appropriate recovery actions'. The emphasis should be is on how to recognise the signs of a stall being imminent and the correct recovery action. Basic stall recognition and recovery in various configurations can be demonstrated and practiced, however it is important to monitor the student to ensure they are coping with the lesson. Very few students can absorb all aspects of stalls in one lesson.

It is therefore recommended to conduct the lesson over two flights.

The first flight can include an introduction to slow flight and stalls in glide configuration, i.e. power at idle, no flaps and recovery with and without power, focussing on entry and recovery technique and recognition of the symptoms of impending stall.

The second flight can include power on stalls and recovery, stalls with various flap settings and in turns along with approach configuration stalls. It is recommended that the flight time also include practice and revision of previous elements with the stall component only taking half the lesson, including demonstration and student practice.

Further revision, practice and more advanced stalling should take place during the first lesson after circuit consolidation.

You can assist the student to manage this lesson by giving them specific direction on how to relax. For example, 'Now student, just relax the tension in your shoulders and on the control.'

The point of the exercise is for the student to recognise the symptoms of the incipient stall. Emphasis should be placed on recovery immediately the first signs of an impending stall, decreasing speed, less responsive controls, increased sink rate, control column position, buffeting and stall warning occur. The student must then take decisive and appropriate recovery action.

IN-FLIGHT PATTER – STALLING Flight 1 of 2

Introduction

At this stage, the student should be managing all radio calls and under supervision be capable of taking off and climbing to the training area. If that level of proficiency has not been achieved, it is suggested that further revision be conducted ensure the student is at the appropriate competencies of the syllabus.

The student should be instructed to climb to a suitable height, in the training area and level out.

Instructor. Well student, at XXXX ft we have sufficient height for the stall manoeuvres. You will remember we need to recover from the manoeuvres by 3000 ft AGL. You will remember I demonstrated a basic stall and recovery at the end of our last session and that it was a fairly straightforward procedure. I will now demonstrate a straight and level stall, with idle power and recovery without power, to prove that the theory of stalling angle of attack works.

Instructor. First we conduct the **HASELL** check.

Height. Confirm XXXX ft to recover above 3000 ft AGL.

Airframe. Trim and flaps set as required. for this exercise, no flaps.

Security. Check there are no loose articles, harness is firm, doors and hatches closed.

Engine. Check fuel is on appropriate tank, fuel pump on. Temperatures and pressures OK Note: The use of carburettor heat will depend on prevailing conditions.

Location. Not over built up area, near controlled airspace, restricted airspace or danger areas and clear of cloud.

Lookout. Make sure there are no aircraft or other hazards in our area using the lookout process as briefed.

I will now demonstrate what we call a straight stall entry with idle power, no flaps and recovery with and without power. Note the current attitude and airspeed XX knots and note the increased sink rate and our height XXXX ft.

Looking at the horizon, I smoothly reduce power to idle, apply sufficient back pressure to the control column to maintain height and sufficient rudder to prevent further yaw. As the speed continues to decrease I apply increased back pressure and rudder to prevent further yaw. The controls are becoming less responsive and the stall warning is sounding (if fitted). We have a relatively high nose attitude, the VSI is indicating a high sink rate, which we can't feel, and the airspeed is now XX knots.

There is a slight buffet felt through the controls, speed now XX knots and now the nose pitches down even though I am holding full back pressure on the control column. That is a stall and you can see that the descent rate has now increased to XXX ft per minute.

To recover, we simply reduce the back pressure and pitch the nose to this position, just below the horizon. Now we have un-stalled the wing, the speed is increasing and control response is restored. We can now increase power and regain level and straight flight.

Note that our height loss was 700 ft.

So, you can see, student, that this exercise is fairly straight forward. As mentioned during the briefing the point is for you to recognise the signs of an impending stall and recover.

I will now hand over and you can climb back to XXXX ft and practice this stall and recovery. You have Control.

Student. I have Control. Student climbs to 5000 ft and practices stall. Instructor patters.

Instructor. I have Control.

Student. You have Control.

Student. I have Control. Student practices. a few times. Instructor patters.

At this stage it is recommended to complete the lesson with revision of previous exercises.

NOTE: For brevity by now the Instructor candidate should have a good understanding of how to construct air exercises and deliver patter. Therefore for future exercises, this chapter will only provide occasional patter references for clarity.

IN-FLIGHT PATTER – STALLING Flight 2 of 2

In this flight the student should have gained confidence in their ability to recognise the basic impending stall and carry out recovery actions.

For more advanced stalls, if the student is showing signs of being uncomfortable, revert to practice of simple stalls. Introduce advanced stall practice only when he or she is more comfortable, even if this requires an additional flight.

During the pre-flight briefing for advanced stalls, the key elements should include Airmanship considerations, weight and balance, aircraft operating envelope, appropriate operating height for recovery, the HASELL and weather assessment. The student should recognise and recover stalls confidently and with little prompting or corrective action.

Initially revise power off stalls and ask student to demonstrate. They should remember the pre-stall checks and don't forget to praise correct responses and correct poor actions promptly.

Now you demonstrate the effect of power on the stall, resulting in slower speed reduction, more sensitive elevator and rudder due to slipstream effect, and less effective ailerons as they are outside the slipstream. A slightly higher nose attitude at stall will be evident and a reduced airspeed at stall due to power application. The aircraft may show an increased tendency for uncommanded yaw.

Ensure the student completes the correct recovery actions, pitching the nose down to just below horizon while applying full power. The resulting pitching up and yaw due to power application should be controlled and finally wings leveled if roll occurs.

Demonstrate the effect of flaps on the stall, commencing with half flap and then full flap. Expected outcomes include a faster speed reduction, slightly lower nose attitude and reduced airspeed at stall. Demonstrate the recovery action including raising flaps at safe speed and in stages. The student should then practice these with the Instructor monitoring.

Now demonstrate the effect of power and flaps and provide reference to an approach configuration, resulting in slightly higher nose attitude, increased tendency for a wing to drop, reduced airspeed and the need for prompt recovery action.

It is essential that the student becomes highly proficient with recognition and recovery from this type of stall and does not allow the nose to pitch too high, and context is provided relative to the approach configuration and the conduct of go-around manoeuvres.

Note
Instructors are cautioned that due to typical power to weight ratios of RAAus aircraft, during power on stall exercises the aircraft may be positioned in an unusual attitude that could result in the aircraft operating outside the manufacturers' prescribed flight envelope.

The Student should practice with Instructor monitoring.

Finally, demonstrate stalls in a turn at bank angles to 30°. You should have referenced the Flight Manual for the expected increased stall speed with angle of bank. The student should be aware of the same speed reduction but a higher stall speed with a bank angle of about 30° and the importance of first recovery actions followed by leveling the wings promptly.

RECREATIONAL AVIATION AUSTRALIA

The Flight Circuits

CIRCUITS - 3 AXIS AND WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To combine all practiced phases of flight in a standard format including take off, approach and landing in accordance with recognised circuit procedures.

2. APPLICATION

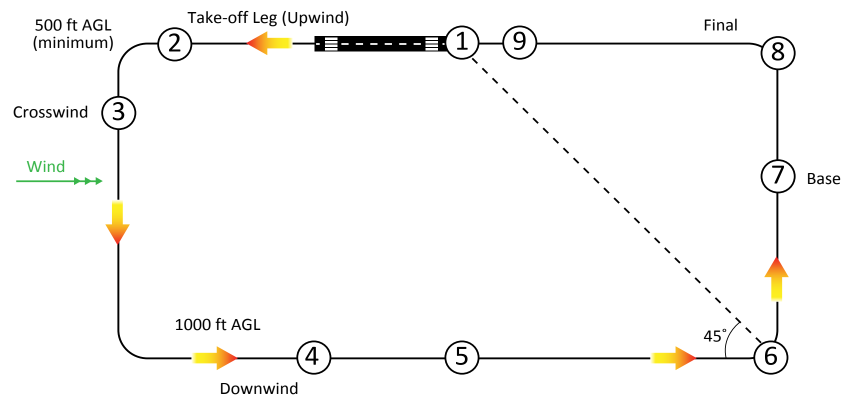
For use when operating at aerodromes for arrival, departure and standard traffic flow around a preselected runway.

3. UNDERPINNING THEORY

- Circuit conventions based on ICAO standards and outlined in CAR 166C
- Use of standard traffic pattern within the manoeuvring area of a landing area
- Circuits should be conducted on the most into wind runway unless conducting cross wind operations
- CAR 166C and CAAP 166-1(X) provide requirements and guidance for operations at non-controlled aerodromes including use of radio for "alerted see and avoid"
- Reference RAAus Syllabus of Flight Training 1.02 Circuits

4. FLIGHT EXERCISE

1. Takeoff	• Reference points and line up checks	• Keep straight
2. Climb out	• Separation • After takeoff checks	• T.O.S.S. • Turn at 500'ft AGL
3. Crosswind	• Tracking and lookout	
4. Downwind	• Positioning	• Checks
5. Aircraft configuration	• Possible to reconfigure aircraft depending on performance	
6. Base turn	• Lookout • Reference point • Carb heat as required	• Positioning • Flap set as required • Turn
7. Base leg	• Track • Attitude controls airspeed	• Flap set as required • Power controls descent rate
8. Final	• Anticipate turn 500' ft AGL • Short final alignment • Power to control aim point	• Attitude controls airspeed • Reference aiming point • Carb heat as required
9. Landing	• Glide approach OR powered approach (power as required) • Touch down on main wheels • Let nosewheel settle • After landing checks - clear of runway	• Look ahead towards end of runway • Progressively increase back pressure to control sink • Keep straight



- Lookout - ALWAYS prior to conducting manoeuvres in vicinity of aerodrome
- Assessment of appropriate runway and taxiing/holding points
- Take-off considerations: performance and emergencies
- Circuits broken down into basic flight manoeuvres
- Demonstration of full standard circuit
- Progressive introduction of all circuit tasks relative to workload
- Aircraft configurations and pre-landing checks
- Descent profile management and the landing phase
- Modification of circuit for conditions/ traffic

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA
- Appropriate climb/descent profiles for each leg of circuit
- Management of flight sequences while multi-tasking SA, CRM
- Reference attitudes, and runway positioning SA
- Monitoring and management of circuit and aircraft operation TEM
- Right of way and circuit rules

6. OUTCOMES AND EXPECTATIONS

- Correct application of controls and decisions through the range of sequences in the circuit
- Recognition of errors and appropriate corrections applied
- Awareness and appropriate actions for corrections required in circuit
- Reference RAAus Radio Operator Syllabus 2.04 and CAR 166C for radio use
- Required standards: Heading +/- 5 degrees, Nominated Height +/- 50 ft, Airspeed +/- 5 kt, aircraft balanced for all manoeuvres

Introduction

Accurate circuit flying is a complex exercise, to brief and to fly. This complexity is not diminished by the wide range of interpretations by flying Instructors. There have been many attempts to standardise circuit procedures with limited success. Military, civil airlines, general aviation and recreational pilots all have differing needs, aircraft operating requirements and procedures.

For RAAus purposes the intent of a successful circuit for recreational pilots is to ensure the greatest possible options for a safe return to the aerodrome in the event of an engine failure and to integrate with other circuit operations in a professional manner. This is the basis for the information provided in this section. As a result, there may be some controversial points or objections however the procedures discussed are the result of thousands of hours of practicable application and the reader should note these procedures with an open mind.

It should be noted that this element cannot be covered in one session but requires many sessions.

Time to solo. This subject is so important and so often discussed due to the mythical aspects attributed to the student who solos quickly as a badge of hour and the mark of an exceptional pilot. Over the years this myth has led Instructors to rush through preliminary exercises and circuit flying in order to give themselves and their students some sort of legendary status. When boasting of their prowess and ability these Instructors may not have considered they have in fact, let the student down by not ensuring competency in all sequences.

As mentioned in earlier chapters, rushing through the upper air exercises to enter the circuit can also be a response to boredom by the Instructor, and again reflects poorly on the Instructor rather than making them a legend.

The time to solo generally has little to do with either the ability of the Instructor or of the student. In times past solo could be achieved in 1-2 hours, however pre and post WW2 averages time to solo had increased 7-10 hours. In today’s environment and considering the average RAAus member’s demographic, age and social background, it is more common to take between 10-20 hours. Different types of aircraft, different learning environments, changes to Instructors, weather and family, work and competing leisure activities can extend these hours, however the bottom line is what does it really matter?

If an average recreational pilot has 10-20 years of flying and averages 50 hours per year, an additional 5 or even 10 hours prior to solo will make very little difference to their overall years, and it could be argued that additional time with the experience of an Instructor in the right seat can deliver other intangible benefits.

BRIEFING CONSIDERATIONS - CIRCUITS

- Reasons for conducting circuits.
- How runways numbers are derived.
- Circuit size. Aiming to ensure the success of an engine out forced landing from the downwind leg, the glide ratio of a typical aircraft is 12:1, the aircraft can glide 12,000 horizontal ft or 2 nm. To achieve the runway with allowances for the effect of wind and turns, etc., we should conduct the downwind leg at a distance of 1.5 nm from the runway.
- Factors affecting this ideal distance include ATC requirements, preceding aircraft patterns, high drag versus low drag aircraft.
- The aircraft climb rate and power to weight ratio also has relevance to the distance maintained for downwind and a turn onto downwind may be required while still climbing to circuit height.
- When briefing circuits consider the orientation of circuit diagrams to actual compass points to assist student comprehension.
- Ensure when drawing the circuit diagram with specific orientation that any associated runways match the appropriate bearing.
- Circuit leg identification and consistent use of terms. Upwind, crosswind, downwind, base and final should all be referenced to the expected wind direction to create context for the student.
- Active or live side versus inactive or dead side of the circuit.

Circuit training sequence. During previous exercises, the student should have been following with the Instructor through take-off, circuit departures, circuit entry, circuit procedures and landings and taxiing. Most of the time, it is assumed, that the student has actually been flying many of these sequences under instruction. It follows then, that all remains is for the Instructor to formalise the circuit procedures and flight practice.

While there can be altruistic intent in allowing the student to fly as much as possible, there is benefit to letting the student sit back and observe correct and accurate circuit exit, conduct and entry by the Instructor without the pressure of actually conducting the flying themselves.

Students can gain great benefit particularly from observing a number of landings and having the Instructor begin to patter them through without the student flying.

Accordingly, the professional Instructor must and will conduct all aspects of circuit flying accurately and with the same procedures and processes expected of the student.

When we consider the workload involved for a successful circuit, including radio, taxiing, take-off, climbing, flap configuration changes, climbing turns, straight and level flight with reference to a landmark (the runway), level turns, pre-landing checks, lookout and control of the aircraft, descents with and without flap, descending turns, judgement of the approach, the landing and maintaining control of the aircraft through the landing roll, is it any wonder students may struggle?

Instructors must therefore not short cut circuit procedures for expediency or any other reason.

Circuit orientation. The correct technique when briefing circuits includes visually orienting the pattern to the runway in use. This will assist the student to understand laying off drift, what to reference on the runway to turn for each leg, distance out, etc. While reference can be made to geographical features there is a danger the student will become reliant on ‘turning over the house with the red roof’ or ‘level out when alongside this hill’. Far better to reference the runway, and a geographical point ahead to ensure tracking remains constant, compass references, angles relative to the runway and aircraft references like ‘halfway along the wing strut’ for a high wing, or ‘two thirds of the way along the leading edge’ for a low wing aircraft.

If the Instructor teaches the student to orient their circuit pattern to local geographical or ground features these students cannot easily conduct an accurate circuit in a different location.

Radio calls. Standard radio calls and phrases are outlined in the AIP, however some Instructors insist on teaching radio calls relevant to their aerodrome, or insist radio calls are not required at rural airfields. This results in student inconsistency and lack of awareness of required procedures. Student either do not learn radio calls or omit them when they should be made.

Checks. Students must be aware that checklists must be used. Professional pilots, not limited to those being paid to fly, use checklists due to known limitations of the memory. Generic checklists may be safely used to ensure correct configuration of the aircraft, although manufacturers generally provide recommended checklists for their type. While variations in standard checklists exist, the most well-known are provided in the Definitions, Abbreviations and Checklists section.

Circuit etiquette

- Maintain position in the circuit, do not short cut or overtake.
- Maintain awareness of other pilots. If they act in what you believe is an improper manner, do not use the radio inappropriately. Note the aircraft call sign and report this to your CFI or RAAus directly.
- Use correct radio phrases and correct circuit positions. While you may not be aware of other traffic in the area, continue to make a minimum of appropriate radio calls to keep other airspace users informed.
- Avoid irrelevant chit-chat.
- Never direct another pilot to conduct a specific action.
- Listen carefully to all calls from other circuit traffic even if not directed to you. There could be implications affecting your circuit.
- Never allow radio operations to be a higher priority than controlling the aircraft and maintaining “see & avoid” awareness.

Ground operations

- Aircraft must not be taxiied faster than can be safely managed, with consideration of factors such as environmental, pilot expertise and aircraft braking effectiveness. Instructors must lead by example.
- Ensure a good lookout before starting the aircraft taxiing and especially before and after making entering runway call.
- Do not dawdle on the runway.
- Enter and line-up promptly.
- Vacate the runway as soon as feasible after landing.

Pre-Take-off Safety Brief. This basic exercise in ensuring the student has a plan to easily be enacted in the event of an issue during the take-off ground roll and subsequent climb is not as common as it should be.

This simple exercise provides preplanned essential safety actions in the event of an emergency. This should be provided as part of the school handout information and again should be generic in nature. This brief should be spoken aloud prior to takeoff, usually at the holding point. The brief reinforces and predetermines the actions that the pilot will take should the engine fail during or after the take-off. An example is provided below.

If an emergency occurs while on the ground, I will close the throttle and maintain directional control with rudder, bring the aircraft safely to a halt using brake.

If an emergency occurs on this take-off upwind, I will set best glide attitude to maintain XX knots and if insufficient runway remains land straight ahead. If runway doesn't remain, I will select an area to land within 30 degrees either side of the aircraft.

If the engine fails on crosswind, I will set best glide attitude to maintain XX knots, and select an area within safe gliding distance ahead. If I have time I will do emergency checks and make a MAYDAY call.

Some elaboration. In an emergency the throttle should be closed on the take-off roll in case the engine returns to life again and creates a problem stopping the aircraft. The student must be made aware of the impossibility of turning back to the runway below 1000 ft. A controlled touchdown, even on unsuitable terrain is preferable than stalling in the turn and losing control of the aircraft.

If possible, with consideration for traffic, a demonstration of a turn back from upwind should be provided by the Instructor, to visually confirm the practical impossibility of managing a turn back.

If time permits, the fuel should be turned off to reduce the possibility of post-impact fire. Full flap should be used if the aim point is achievable to ensure that the lowest possible touchdown speed is achieved.

Finally, the best possible management of emergencies is via practice so reactions become instinctive. If an engine failure occurs, vital time is wasted if the pilot actively has to process the required actions, while processing the fact the emergency has actually occurred. It is not recommended to practice a simulated emergency just after take-off as it is inherently dangerous.

During training and once the Pilot Certificate is achieved the best practice can occur at home while carrying out normal day to day routines. Decide an engine failure or other emergency has occurred and practice the drills and actions. This is a known technique of visualisation and has been practiced by pilots and athletes for years.

Flaps. The use of flaps is commonly misunderstood. Instructors must reference the aircraft POH rather than create their own procedures.

POH procedures are developed by test pilots to establish safe flying practices for the particular aircraft. Take-off and landing distances are predicated by the use of flaps, so use of the recommended flap setting in the POH will ensure the best possible outcome.

Crosswind considerations. Controversy can exist about the use of flaps in a crosswind. A manufacturer will specify the maximum flap to be used. Full flap enables the aircraft to have a lower landing speed and a shorter float distance reducing the effect of the cross wind.

Full flap should only be extended when the aim point for landing is assured, ensuring the pilot can conduct a safe go-round if required.

The student pilot must be entirely familiar with managing and controlling pitching as a result of raising and lowering flap.

Circuit practice. Consideration should be given to conducting full stop landings in addition to only practicing 'touch and go' landings.

Benefits of Full Stop landings

- The student experiences controlling the aircraft to a full stop safely, maintaining directional control, managing brakes, and manage the aircraft.
- During the back track the student can receive feedback and consider how to improve.
- Provides the benefit of more practice with radio calls.
- Ensures the student sets the aircraft up again for the next take-off.
- The student practices controlling the take-off from a full stop.
- Prior to first solo, the Instructor can vacate the aircraft knowing the student will correctly configure the aircraft and manage the full take-off and landing process.

Negatives of Full Stop landings

- The time between take-offs is increased, reducing the number of possible practices.
- The aerodrome may be too busy to permit full stop, back track and take-off.

Benefits of Touch and Go

- Excellent practice for 'Go-arounds.'
- More circuits per hour.

Ideally, the first few circuits could be full stop and touch and go landings can be introduced. If first solo is imminent, the student should be given practice at landing to a full stop and a subsequent take-off from full stop.

Cross wind circuits

Take-off technique Hold into wind aileron and commence the take-off run. Use sufficient back pressure to keep the nose wheel lightly loaded and when the rudder becoming effective, raise the nose to the normal take-off attitude. As the airspeed increases and ailerons become more effective the amount of aileron required is reduced, but they must be used to maintain wings level.

Use sufficient rudder and nose wheel steering to keep the aircraft straight against the tendency to weathercock into wind.

It is important to not raise the nose too early or too high as the aircraft may lift off prematurely and could then touch down again without being straight.

Once airborne, the aircraft is turned (not yawed) into the wind to counteract drift. During the circuit keep the aircraft track parallel to the runway by laying off drift.

Approach using the crab method. Use flap as per POH recommendations to manage the aim point. The aircraft should be tracked down the extended centre line by laying off drift. This is achieved by turning the aircraft into the wind, not using the rudder. The wings are kept level and the aircraft is flown in balance, no slip or skid.

The aircraft is flared as normal and just prior to touch down rudder is used to yaw the aircraft to align with the runway. The secondary roll effect from yaw is corrected by the ailerons to lower the into wind wing.

At touch down, the main wheels should touch down into wind wheel first, then the other. The nose wheel must be maintained in alignment with the runway and allowed to contact the ground as speed decreases. As the weight of the aircraft tends to move forward with the decreasing speed, light back pressure is used to keep the nose wheel lightly loaded. As the rudder becomes less effective with decreasing speed, directional control is maintained with nose wheel steering. Into wind aileron is maintained to ensure the into-wind wing does not lift.

Approach using the slip method This may be easier for the student to manage initially, and if using the crab method, can be transitioned to earlier on the approach (at say 200 ft AGL), to assist the student to visualise the appropriate control inputs.

The disadvantage of using this method is the higher rate of decent, and careful use of power may be required to slow the rate of descent.

The student should align the aircraft with the runway using rudder and control the resulting secondary roll with into wind aileron. The advantage of this method is the aircraft is directionally aligned and managed and a normal round out, hold off and flare can then be conducted. The student workload is therefore reduced.

To assist the student to understand the appropriate control inputs, the Instructor may nominate that the student will only manage one specific control at a time. Starting with rudder, the student can concentrate on ensuring the aircraft is aligned with the runway centreline leaving the other inputs for the Instructor.

Next the Instructor can nominate the student only manage the aileron, to understand and manage the correct into wind positioning to prevent drift.

Finally, the student can practice using all control inputs, and gradually bring the corrections closer to the runway round-out moment. Crosswind circuits should be understood and practiced prior to first solo.

A student successfully managing the crosswind corrections is one of the most satisfying moments for an Instructor, topped only by sending the student for their first solo.

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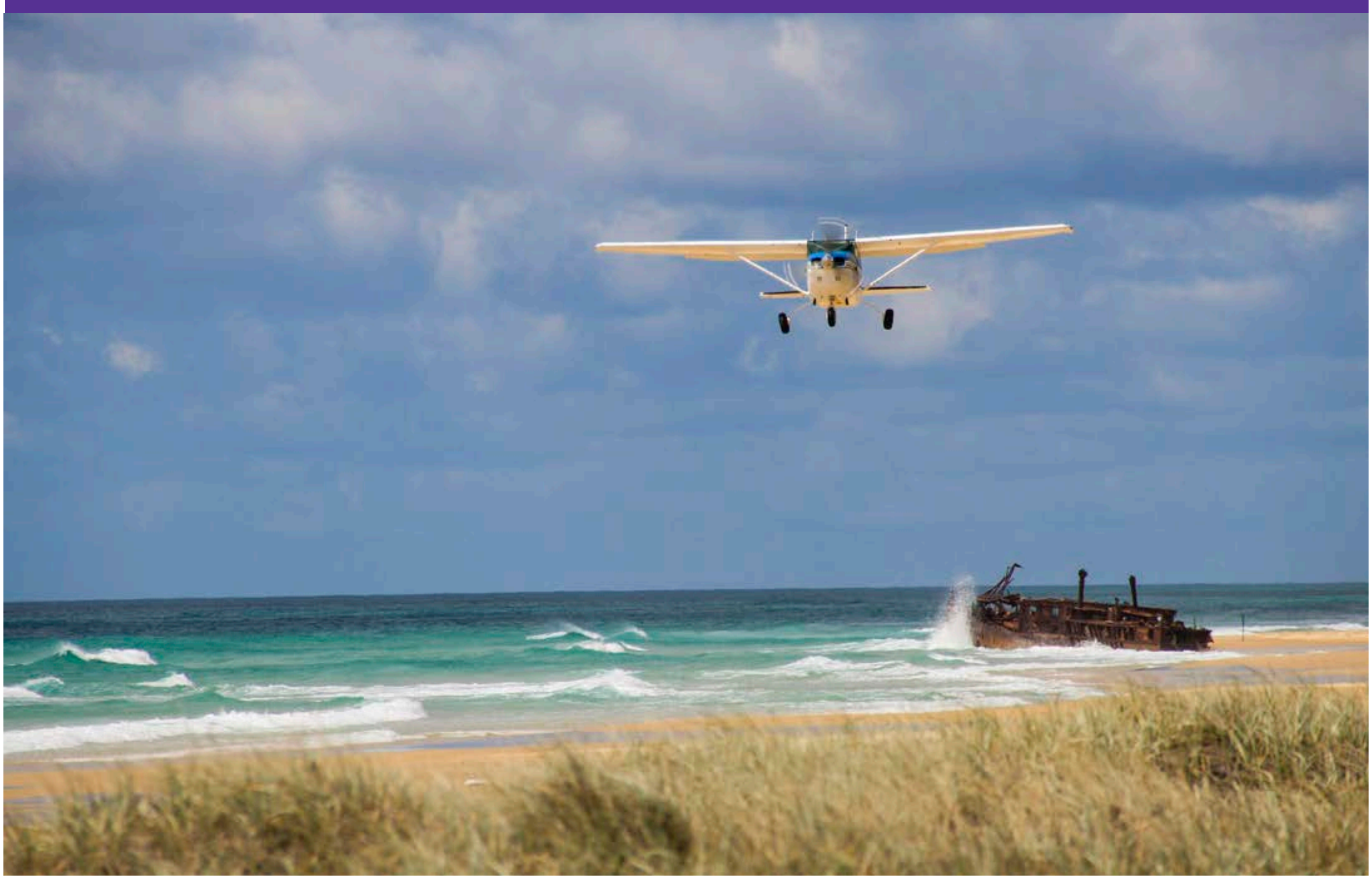
CHAPTER SIX

Create A Lesson Plan

This chapter is intended to assist the new Instructor rating holder to create a standard briefing structure to suit their briefing style, ensuring consistent use of terminology on the ground and in the air and delivery of core elements of each lesson.



Airmanship elements common to every lesson

There are key airmanship elements including practical areas such as Aeronautical Decision Making (ADM), Situational Awareness (SA), Threat and Error Management (TEM) and Cockpit Resource Management (CRM). As a minimum, these areas should include the following considerations.

Lookout

The three core reasons for maintaining an effective lookout include; awareness and management of external threats, maintaining situational awareness in relation to the ground including position, and applying visual flight rule disciplines using the horizon as the primary reference.

Emphasise the lookout procedure during the briefing and reinforce this during the flight. Ensure the student holds their head at a natural and comfortable position, looking at the far horizon directly in front of the student rather than across to the propeller and referencing a convenient point such as a rivet or screw in the cockpit peripheral vision to ensure the attitude of the aircraft against the horizon reference.

One recommended scan procedure is to select a small segment of sky to the left, scan up and down, move to the next segment to the right and repeat until the scan is completed to the right. Finally, scan across relevant flight and engine instruments.

Managing control of the aircraft

Critical to student development is the gradual understanding of situational awareness or airmanship. The Instructor must ensure this vital aspect of safety forms the basis of every practical lesson.

A critical part of aimanship is ensuring clarity for who is in control of the aircraft at any point during the lesson. The use of one specific phrase is not critical provided consistent phrasing is applied at the school and they are clearly understood. For this manual, we will use “You have Control/ I have Control”.

When handing over control of the aircraft the Instructors aim is to not only ensure the student is aware of they have control of the aircraft, but that the student understands they are now In-Command. It should be emphasised that the student not only has command of the aircraft but is responsible, under the Instructors supervision, for the operation of the aircraft.

Ensure the student acknowledges ‘I have Control’ and has placed hands and ft on the controls. If the student does not acknowledge, the Instructor should hold the controls to prevent them moving and make the student acknowledge they have taken over reinforcing the importance of acknowledging who has control.

It also shows good discipline to formally use the words, You have Control/I have Control. Simply saying You got it or just gesturing as to who has control can indicate a lack of discipline on behalf of the Instructor, degrading the importance of the procedure.

The Instructor may also use the term follow me through intended for the student to lightly place hands and feet on the controls. The Instructors makes all inputs and controls the aircraft, however the intent of follow me through is to assist the student to gain an understanding of control inputs and practical motor skills for specific lessons. The Instructor must ensure the student does not attempt to make any inputs.

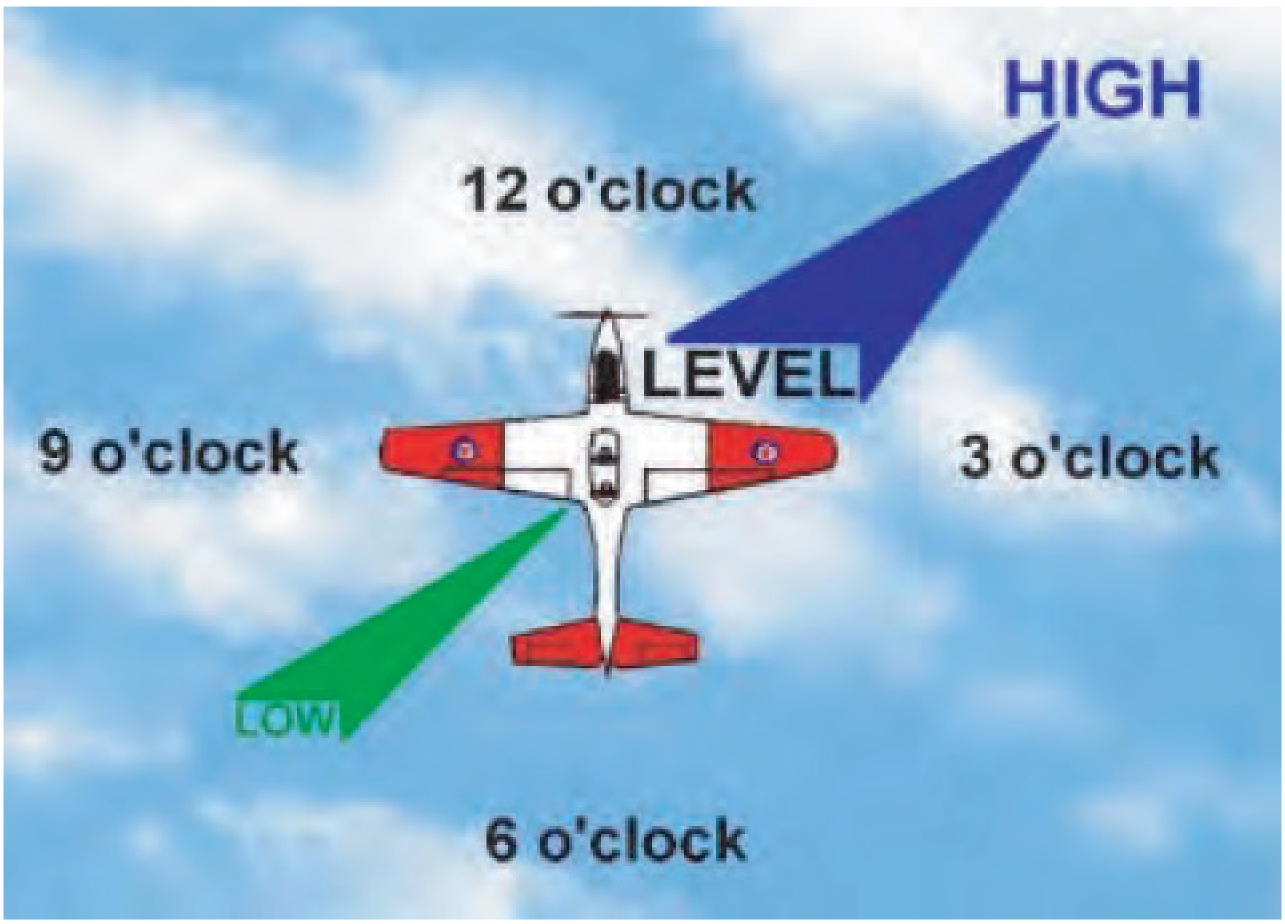
Situational Awareness

Airmanship, while currently out of vogue as a phrase, refers to a fundamental behaviour to be emphasised throughout the training period and any subsequent review. As an example, during the Trial Instructional Flight (TIF) it is sufficient to simply patter and indicate the lookout procedure used. Lookout technique, along with use of the CLOCKCODE should be emphasised during subsequent lessons.

The CLOCKCODE

This simple procedure for referencing a position relative to the aircraft must be included as part of the preliminary lessons. The picture below depicts the aircraft at the centre of a flat plan view of the clock face. The nose of the aircraft is 12 o'clock, the left wingtip 9 o'clock, the right wingtip 3 o'clock and the tail 6 o'clock. If another aircraft or object is sighted by it should be relayed to other aircraft occupants as being in one of these clock positions.

Additionally, the object is reported as being high, level or low relative to the aircrafts position. Further, when giving information about your aircraft relative positions to the pilot of another aircraft, describe your aircraft relative to a clock code which is centred on the other aircraft. In this case the observer must visualise the other aircraft as being in the centre of the clock and report the position of your aircraft relative to the other aircraft.



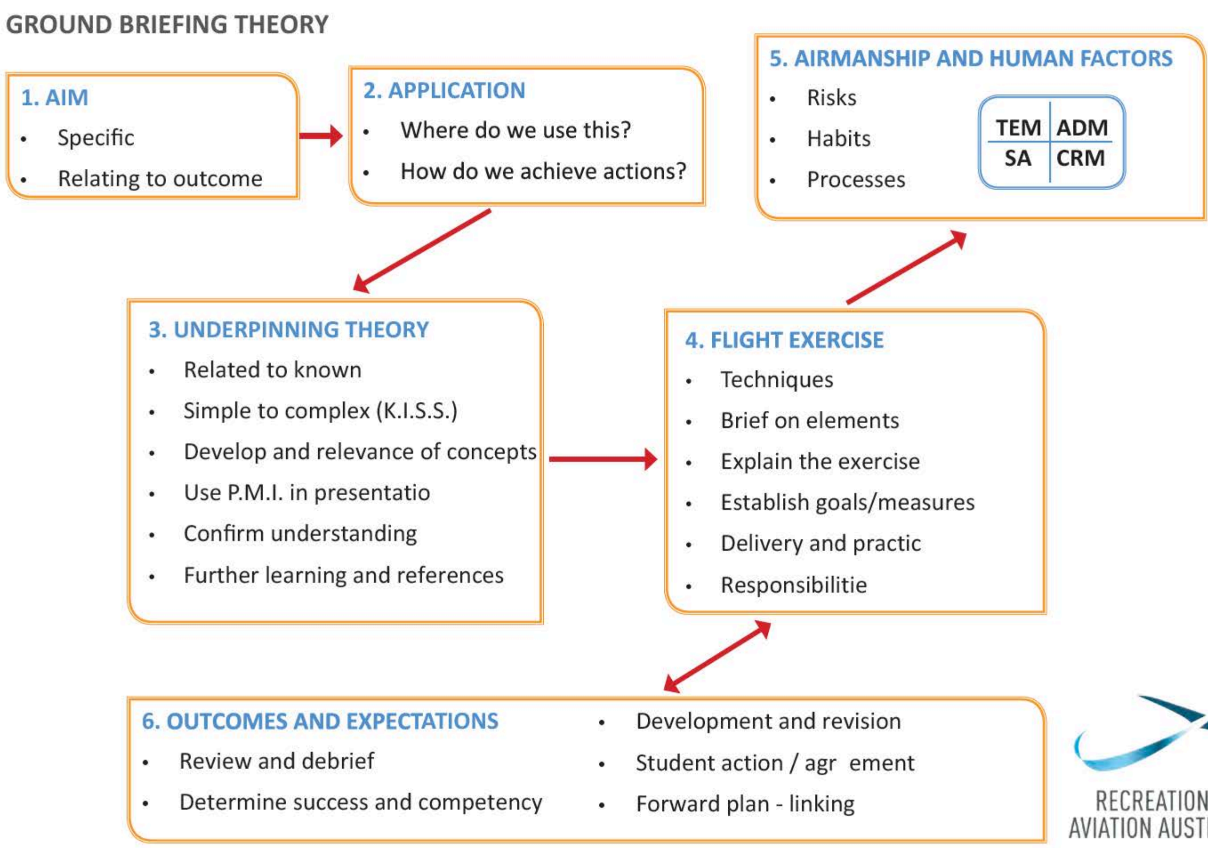
Standard ground briefing template

Title
The title of the subject and lesson being delivered. This should be consistent with the briefing samples and RAAus Syllabus of Flight Training.

Aim
This is the intended objective of the lesson. At the completion of this lesson it is expected that the student will be able to...*"Operate the controls correctly and identify and correct for any secondary or further effects as required."*

"Climb or descend the aircraft to a predetermined height at any desired airspeed or rate"

The aim should be clear and concise and relate specifically to the skills and operations to be introduced and practiced in the lesson.



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Application. Where will the student expect to use this skill and how does it relate to other flight sequences? What is the significance of this element and what safety and further implications does it have in the pilots development?

Airmanship and Human Factors. Talk about this vital subject early and often. Airmanship can be directly related to applied skills, judgement and Human Factor elements. It also reflects practices and behaviours based on the right “attitude” to flight and the need for underpinning safety at all times. The instructor should help the student develop confidence to interact with them in assessment and judgement in all situations and develop threat recognition such as good “see and avoid practices” and situational awareness.

First briefing item - Underpinning theory or aeronautical knowledge. Construction of content with explanations, appropriate level of underpinning theory, diagrams and analogies. Correct use of standard terms, accurate diagrams or representation of flight modes and simple to complex development are key factors.

Pictures tell a thousand words. If you are not good at drawing use photos, cut outs etc. Use analogies relevant to the students’ life experiences and practical expertise to assist understanding.

Second briefing item - Flight exercise. The flight exercise takes the underpinning theory and application of the briefing and provides the framework for the flight lesson component. This part of the briefing represents the drills, processes and applied skills that will be developed in the air to meet the aim and expand on the student’s developments. This is what the instructor will demonstrate, monitor and coach.

Further elements. These can be introduced if required, but Instructors must be wary of going off topic or on tangents, creating confusion and wasting time. Develop a series of short explanations or phrases e.g.

“The manufacturer has designed the aircraft to behave in that manner, for more information you can read the POH or in the BAK book.”

Outcomes and Expectations. A brief over view of the content with reference to the aim. So long as the aim was accurate this will prompt you to confirm that everything has been delivered. Relate the outcomes back to the initial aim and cross reference these in any debrief. These can be used as a basis for student records and continued training in this area in agreement with the student.

What every student needs from their instructor

Keep It Simple Stupid (K.I.S.S)
You know what we mean. The student wants it as simple as you can make it without loss of what they need to know. This can be achieved by the following steps.

Consistent language
English words can have several meanings. Students should tell you when misunderstood (apologise, dont make the student feel bad at this point as this was a fault of the instructor).

"Did you see the nose drop?"
One student will respond with yes, the next will be quiet as he ponders where did the nose drop off to or go. And if we use this term, what would be the opposite term? "Drop up?" or maybe "Rise up?"

The student in this scenario now has to learn two new terms instead of one. Nose pitches down/Nose pitched up. And of course in the air the action should be timed with the input for maximum absorption by the student. And most importantly of all during the demonstration, where should the student be looking? The horizon!

Prior to each demonstration make a point of focusing the student's attention on the horizon. For the student, it can be likened to learning to dance. All you want to do is look at your feet. Likewise the student will gain no benefit from looking at the control column or instruments at that vital moment.

You may think this is pedantic at this point but when there are moments that the student will hesitate in order to process ambiguous language. The lesson takes longer and the student could feel embarrassed because they don't understand. This behaviour, along with demeanour can be a significant insight into why some students prefer one instructor to another. If the school has multiple Instructors, it is vital there are no differences or inconsistencies with terms used.

Delivery of content and the why

Keep the 'why' basic. The Instructor is responsible for controlling the level and complexity of the 'why', otherwise the briefing can go on for hours. The lesson needs to be kept as short as practical. Long complex briefs can confuse the student and make them think that it is all too hard. This may translate in the air to the student being vague or distant. Only deliver the content required for the demonstration of that flight. If the information is not practically useful for the student whilst in the air for that lesson then don t introduce it in that lesson. Provide theory information without flights for subjects like aerodynamics.

Direct correlation between content delivered, demonstrated and practiced
A student will learn with more focussed attention and correlation between the briefing and the upper air patter. This provides kinesthetic reinforcement of the briefing and the flight exercise.

Q&A time

Instructional delivery and the new flight concepts that are inevitably and being practiced will require consolidation development for thorough understanding of the exercise. This is critically important to the student's true learning as a pilot and prevents only rote learning, developing true understanding in the application of any flight skill.

Questioning is the cement that builds these foundations.

Students should be encouraged to actively consider areas for discussion after review and given time to reflect on any lesson. Preparation of key questions firstly by the student and prompted by the instructor is an important interactive process that allows the student to probe and confirm their understanding. This also gives the instructor confidence that what is being taught is being correctly absorbed. The instructor must ensure the student understands that ***"there are no dumb questions"*** and an inquisitive mind is the hallmark of a good pilot. Clearly this is best done after any flight, due to the workload whilst airborne, but with careful attention some questions can be effectively answered in the air for maximum understanding. As an example *"What happens if I don't relax back pressure at the onset of a stall?"* can be effectively answered by demonstration; but "How does a variable pitch propeller work?" is best answered on the ground. Questioning by both student and instructor is a key part of the rapport building relationship that ensures teaching is properly transitioned to understanding in the learning process.

Separate theory lessons from flights

The pre-flight briefing and disciplined self-study may not be sufficient to ensure the appropriate level of knowledge is gained in all the training sequences. Additionally if we are observing learning and attention principles from our Principles and Methods of Instruction (PMI), a preflight briefing that exceeds as little as 20 minutes may see many recreational pilots defocussing and losing attention to important concepts that must be understood.

These reasons create an important opportunity to consider different scheduling for the traditional long brief and also any additional briefings that are better conducted outside of the normal flight booking slot. While these can place additional demands on both instructors and flight school operations, the aim should always remain to ensure all students have a suitable level of knowledge that is supported by tailored briefing sessions. There are also advantages in conducting these in small group formats where shared learning can occur. Examples for this type of briefing include HF training, radio procedures, air legislation, pilot duties and responsibilities and even simply how to fill out a logbook.

Young mind vs Mature mind

The purpose of this subject is not to delve into the psychological and physiological differences of the developing or mature brain, but to give practical insight as to how differing age profiles adapt to the concepts of learning to fly and underpinning knowledge. The collective experience of recreational flight Instructors has provided ample evidence there can be substantial difference in successful training approaches when applied to differing ages and maturity of any student.

For example; the young mind will often not question, all you may get is a constant “yep, yep” and then action. The mature mind will question, and occasionally no action can be carried out until the ‘why’ is understood. Students who have limited life experiences to work from or those who feel overwhelmed or threatened by the Instructors perceived authority may retreat into partially developed rote learning only.

Superficially they may appear to be progressing well, further they may take instruction quite literally and do exactly as they are told without understanding the ‘why’. This is why it is important as Instructors we consider the terms used and the requests made, carefully in light of their experience, not just ours. All the more reason to stay true to terms.

Another area that may be observed in the young student is fear indifference; that is, they don't yet know what can hurt them! They may have never been involved in an accident or seen the consquence of tragedy and the aviation environment is a cruel teacher in this regard- giving the test first and the lesson later!

Conversely, mature students may challenge instruction, or with well developed social skills operate agreeably to new concepts, masking the fact that they haven't truly acquired understanding. In teaching "an old dog new tricks" we need to be mindful of strongly developed primacies, whether this reflects in how they hold a control or operate a mechanism to deeply ingrained beliefs.

The more mature student is also likely to have had degrees of success and development in their lives that may be challenged when attempting to learn new skills in a three dimensional environment. These and many other idiosyncrasies of the mature student may lead to a degree of expectation bias in regards to their training progress. This need to be recognised by the astute instructor both initially and throughout the students progress.

Finally unlike the young student, the mature pilot may be "fear averse" which is sometimes misconstrued by the instructor as "safe" and may therefore not be effectively addressed in training development. Older pilots often need to be mentored to extend their learning experiences whilst under instruction in order to develop confidence and understanding as part of their training development. A classic example of this can be seen in the landing phase where fear often masks effective pitch control in the flare, or an over exuberance to "just get her down".

By no means is this a comprehensive break down of the many nuances of training across various age groups. Younger students learn with varying degrees of absorption of information whereas older students will assimilate knowledge based on known experiences. Given the wide scope of recreational pilot candidates it offers some areas for consideration for all Instructors.

Syllabus instruction guide

The table provided below is intended to assist Instructors in the **effective delivery of the RAAus Syllabus of Flight Training.** In all cases, it is recommended that the Instructor reference the RAAus Syllabus of Flight Training to ensure all required for practical and theoretical elements are delivered as part of each specific lesson. More importantly, the student achievement of competency of these skills must be confirmed during subsequent lessons.

Lesson	Core elements demonstrated, practiced and understood
1. Trial Introductory Flight (TIF) 0.5-1.0 hours	Student is introduced to aircraft discussion on aspirations, and basic overview of RAAus, syllabus and how RA fits into aviation landscape (if required) and basic introduction to control concepts mixed with fun to allow student and instructor to evaluate the desire and motivations to continue. Flight geared towards customer expectations. Emphasis on enjoyment, professionalism and safety.
2. Effects of Controls 1-2 hours	Introduce the fundamental control inputs and their primary, secondary and further effects and build on the airborne environment/classroom for the student. This lesson builds rapport and establishes a good student and teacher relationship and set's guidelines for behaviour attention protocols and the demonstration replication process in the cockpit. This is without doubt one of the most important basic lessons and should not be rushed.
3. Straight & Level 1 hour	Lesson reinforces and builds on horizon as primary focus, and builds students understanding and awareness of visual stimulus and correctly correlated control reactions in all three planes. The concept of infinite solutions for level flight at any airspeed within normal envelope is introduced and may need a follow up lesson aft r C&D to tie together effectively. Also, introduces the important concepts of lookout. Student needs to be given longer periods of control authority and the instructor can begin assessing the student's progress in this new environment.
4. Climbing & Descending 1 hour	The concept of power as control for vertical movement and correct sequencing is introduced with drill acronyms to be used with ROTE reinforcement to build a thorough understanding of protection of airspeed in a low inertia environment. Instructor should immediately recognise any signs where attitude is not used for primary airspeed management. Revisiting secondary and further effects of power and slipstream is important at this stage. Where possible descent profile referencing should be explored.
5. Turning 1 hour	Aft r a thorough briefing on the forces at play, this lesson is the first that calls for all three primary controls to be bought together for one control exercise. The student should clearly understand the differential lift and drag bought about through roll input and the importance of 'stick & rudder' for effective turning. Adverse yaw should be identified at the start of the turning demonstration with the student correctly relating rudder as primary to overcome. Accuracy with height, Lookout PRIOR to turning and then with focus forward throughout the turn are imperative behaviours to be practiced. Turns in level, climbing and descending flight should be introduced if time allows and turning accurately to a point if student is advanced. Particular vigilance by the instructor needs to be adopted in relation to balanced use of controls and this lesson oft n can be broken into two parts.
6. Consolidation -	This lesson should not be overlooked in spite of the relative progress of the student and the instructor should be satisfied the student easily and accurately can operate the aircraft in all phases of flight with clear verbalized actions of sequences to cement the students basic aircraft handling prior to circuit introduction. This lesson presents an ideal opportunity to revisit effect of controls and explore flight in all phases at various airspeeds and high level rectangular exercises in the t/a can be employed in readiness for circuit work. The instructor should "test" these foundations by provoking and exploring various scenario's as better done before further workload is introduced.
7. Stalling 1-2 hour	An important lesson to associate a well presented brief highlighting the dangers of stalling and the lesson goal is not to teach you how to stall but recognise the numerous symptoms and implement an immediate and appropriate recovery should one occur. A significant amount of time should be spent focusing on the pre-stall condition and the scenarios likely to occur. The student will oft n struggle to affect the full stall so the instructor may need to assist at this point to ensure the student understands the appropriate behaviours the aircraft can exhibit. Use of rudder and the importance of the recover attitude before power application are also highlighted areas of focus. Repetition is again the key to building effective recognition and recovery habits in this significant lesson.
8. Circuit Introduction 0.6-1.0 hours	Two-part brief process over selected lessons. Simplified format and leg process introduction at first. Align the sequence to skills already practiced. Instructor to subtly manage all peripheral requirements. Focus should be on horizontal referencing features not airfield and vigilance for good lookout and attitudinal references, particularly in turning phases. The student may easily feel intimidated at the volume of workload in early circuit sequences and the instructor needs to manage this effectively to ensure progress not regression in previous learned techniques. Good airspeed management and transitions, systematic operations of ancillary control without loss of focus on external referencing, and accurate Power/Height management are the expected goals and outcomes in these early lessons.

Lesson	Core elements demonstrated, practiced and understood
9. Circuit development 0.6-1.0 hours	As lesson 8 skills are gained the instructor should begin to expand the understanding of turning reference points, the 45 degree intersections, and appropriate glide profile position in the circuit. A supplementary brief should be conducted at this stage to introduce pre-landing checks, required radio, and modifying the circuit for differing wind conditions and traffic. Listening watch, Lookout and good airmanship should all be re-enforced in this stage. The take-off and landing phases should be becoming developed at this stage, recognition of flare heights, drift ballooning and bouncing should be covered and "mini" briefs and lessons may need to be introduced to ensure circuit development is consistent across all phases of the circuit process.
10. Modified circuits 0.6-10 hours	In this series, the student is tested to confirm their fundamental understanding of Attitude (Airspeed) – Power (Climb/Descend), and power for profile understanding. The instructor should allow the student to conduct normal circuits at first then take over repositioning and profiling the aircraft outside of expected parameters. The first response on handover back to student should be the student's recognition of the incorrect position/profile. Then a reaction that is appropriate to repair the situation created by instructor. The instructor should be looking at correct primacies in PAT/APT and appropriate countering of secondary/further effects as required.
11. Crosswind/downwind circuit techniques 1 hour +	Assessment criteria for judging/calculating x-wind, discussion on techniques and uses and aircraft limitations. Introduction of forward slip, and crab techniques. Explain benefits of "protecting" into the wind wing. This will most likely be the students first extended use of "crossed controls" and the instructor should clearly demonstrate, and articulate the fixed rate of slip with bank and directional control with rudder. Downwind circuit should be included to confirm the students understanding of airspeed/groundspeed and the changed glide profiles and adjustments for aiming points and take off climb angles.
12. Engine failures in circuit 1 hour +	Having demonstrated competency in all of the above areas, introduction of circuit emergency procedures should be introduced with a thorough briefing. The briefing not only presents the cornerstones of aircraft performance, decision planning and execution, but most importantly the disciplines of attitude and human factors in these situations. Exercises should be clearly demonstrated in separate and distinct parts of the circuit, starting with downwind and moving back towards x-wind leg and initial leg failures. Correct and immediate attitude action is paramount before venturing to EFATO areas of the circuit. The student's judgement of glide angle should be developed and any tendencies to deviate from controlled, balanced manoeuvres should be checked. Slipping turns, S turn profiling, sideslip technique and need to be introduced, demonstrated and practiced in conjunction with EFIC sequences. The instructor should caution against and be vigilant for excessive manoeuvring close to ground, the skidding turn, overbanking, extending the glide and delayed decision monitoring. The take-off decision point, rejected take-off criteria, climb performance, splay options, Take-off Safety Speed (TOSS), adoption of safe airspeed attitude, braking, stopping and developed emergency stopping strategies and more should all be covered and explored with the student, again being reviewed and assessed with student as part of EFATO. NB: Suggested school training policy – no EFATO simulations under 300'AGL.
13. Missed approached & non-standard circuits 1 hour	In these later procedures the instructor is assisting in developing judgement, ADM, and airmanship principles as well as knowledge of published "missed approach (go around)" procedures. Low Level, extended legs, power assisted leg, collision avoidance and separation strategies should be demonstrated and developed by the student with instructor adopting a "devil's advocate" style as a catalyst for the student to extend awareness, learning and adaptability in busy, or altered environments.
14. Solo assessment & administration -	At this stage the student should have developed self-discipline, unprompted decision making, accurate, smooth and vigilant flying attributes, and importantly being able to correctly recognise, react & repair any anomalies in their own flying with little or no prompting from the instructor. The instructor should be able to "load" the student and they able to prioritise, act and re-assess in any flight situation or non-standard procedure the instructor may choose to introduce. All pre-solo ground exams, legal requirements, documentation and records should be checked, agreed with student, and jointly signed off as completed prior to assessed solo flight.

Lesson	Core elements demonstrated, practiced and understood
15. Post solo review & development -	Aft r 3rd solo lesson and with a joint discussion on the conditions as appropriate the student should be assessed and allowed to conduct solo from departure point and return aircraft to parking unassisted with supervision and observation by the appropriate instructor. Key elements are good ground behaviour and procedures, observed consistency and airmanship, and decision making, with radio listened to as required.
16. Inbound / Outbound / Rejoining procedures 1.0-1.5 hours	A thorough brief & awareness of CAAP 166 (X) should be discussed and the various joining options at non-towered circuit areas should be discussed. The pertinence of this lesson at early solo also gives the student the option to exit/rejoin the circuit appropriately should the need arise due traffic conflicts, wind direction changes or in relation to other user types (e.g. gliding/parachuting) or an airfield emergency. An area familiarization should be conducted with the appropriate area chart on board to highlight key features and distances in the local training area and the concept of orientation should be introduced.
17. Practiced forced landings & precautionary searches 1.0-1.5 hours	The appropriate brief should be given and this should be "interactive" at this stage of the student development. Demonstrated emphasis should be two fold – ALWAYS be pre selecting during any flight & ALWAYS fly and maintain control of the aircraft at all times. The powered "precautionary search & landing" should be covered to re-enforce the evaluation of a suitable landing area and to check the students familiarization with circuit process overlayed on a foreign landing location. This concept can then be developed to the Engine Failure scenario and the importance of correct choice and glide capabilities and limitations, particulary in relation to the prevailing wind / air conditions. Correct orientation of a "high key" (Upwind) and "low key" (abeam aiming) point is paramount to this sequence. Clarity of delivery by the instructor and correct aiming point management within a "safe glide angle circuit" should be consistently executed by the developed student, with the appropriate use of drag devices and height loss configurations (sideslipping) S-turns etc. where required to effect an appropriate final approach. NB: Restart procedures and emergency radio and make-safe procedures whilst all important should never be enforced at the expense of safe flight and good developed glide judgement. Various locations should be practiced with only approved LZ's used to ground level and all other exercise area's practiced to no lower than 500'AGL and with respect to all CAR's/CAO's.
18. Standardised procedures -	- All pre-flights to be checked by instructor. - All starts – instructor to confirm student's responsibility for throttle. - No students to taxi with doors open (instructor discretion on type). - Hand throttle/Hand brake for taxi with legs supporting control column as a/c type requires. - Run ups in designated run-up area's only. - Always stop/look at threshold markers. - Stop at 45 degrees facing approach to clear before entering for line up. - No EFATO sequences under 200'AGL. - No deliberate bouncing of aircraft ever. - Radio calls in circuit call (base) unless for avoidance. - Student to complete pre/post activity & record flight details in log.

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CHAPTER SEVEN

Common Student & Instructor Faults

This chapter introduces the most common faults of Instructors and students and is presented to ensure newly approved Instructors avoid these mistakes, and provide existing Instructors with the opportunity to review their performance to ensure these faults have not crept in over time.

Human nature makes some mistakes inevitable. After all, even though students may believe otherwise, Instructors are not infallible.

Because learning to fly is a unique experience, the student pilot is on a relatively steep learning curve and errors can be expected. Our work, as Instructors, is to correct these errors and ensure that errors do not develop into bad habits.

During the Principle and Methods of Instruction (PMI), we learnt that it is important to 'Teach it Right, First Time'. This Law of Primacy is the first step in ensuring that the student is taught the right thing in the first place. Our demonstrations must be delivered correctly and accurately first time and the Instructor must fly consistently when demonstrating any element.

Most importantly errors must be corrected immediately if the correction is to be effective. For example, if the student fixates on the instruments and this is only remarked upon during de-brief, it will not be as effective as if it is corrected while airborne, when it occurs.

Occasionally a student may come to the lesson with pre-conceived ideas. These ideas may lead to errors occurring during a flight. The Instructor will need to exercise patience when explaining and demonstrating the correct technique or procedure. Perhaps the worst fault that a student can have is when it is due to an instructional fault. After all, students don't know what they don't know!

The thinking flight Instructor will constantly revise and review their performance to ensure it results in the best possible learning experience for the student.

Relevant and consistent language

Student faults can develop if the Instructor fails to adequately explain what is happening, at the time it is happening. This why a patter guide as provided in Chapter 5 can be invaluable to ensure the flight Instructor uses consistent language that enables the student pilot to 'learn'. If reference is made during the pre-flight briefing to 'pitching the nose', use of alternative terms in the cockpit such as 'raise or drop the nose' should be avoided.

Too much patter

There are plenty of times when the Instructor should remain silent and give the student an unrestricted go. The student should be given the opportunity to recognise faults, analyse their performance and self-correct. This assists the student to develop 'In-Command' skills, which will be more easily achieved if given the opportunity to show these skills whilst being monitored during the practice of the sequence.

Inconsistency of training at a school

The real world example provided in this section gives insight into a common problem at schools where multiple Instructors operate. An Instructor at this school may have taught one specific way, using language and terms learned from a specific Instructor trainer or CFI, where the next Instructor uses slightly different terms and language. This issue results in, as an example a student at a school having persistent problems rounding out during landings. The problem was identified as their first Instructor telling the student to only flare when the ground rush could be seen under the nose of the aircraft. The student was able to progress normally when the next Instructor advised the student to look further ahead during the flare.

To prevent this from occurring the CFI must conduct regular flights with all Instructors, along with regular group meetings with all Instructors and the CFI about students and their progress. The CFI must ensure this type of problem does not occur and must advise and ensure all Instructors at the school are teaching using similar language and consistent terms, both for pre-flight briefings and in-flightpatter. All Instructors at the school must agree on common terms and techniques, or the student's progress will suffer. The CFIs decision must be the last word in these situations as they are ultimately responsible to RAAus Operations for the standards of training at the school.

Common Instructor faults

- Not providing a formal pre-flight briefing.
- Pre-flight briefing too long and too complex.
- Pre-flight briefing not focused on the forthcoming flight and what the student can expect.
- Pre-flight briefing not mentioning airmanship and safety checks.
- Not setting out the aim and expected outcome of the flight.
- Not checking the student has an understanding of all elements of the briefing.
- Not providing handouts or checklists.
- Not ensuring the student is comfortable, can reach the controls and see.
- Taxiing too fast.

- No pre-take off checks, not using a check list or applying professional discipline to use of checks.
- Not using clear and recommended radio calls.
- Not pattering actions during take-off, climb, track to training area and level out or return.
- Trying to brief the student in the air.
- Using abrupt and disconcerting control movements.
- Inconsistent language, phrases and terms.
- Not being aware of where student is looking.
- Not ensuring the student is holding the controls correctly.
- Incorrect explanation of how to assess aircraft attitude against the background.
- Incorrect explanation of how to assess aircraft attitude against the background.
- Not using consistent terms from the briefing to in flight demonstrations.
- Not allowing enough student participation or handling of controls.
- Not referring to elements of the pre-flight briefing.
- Not monitoring the student to ensure they are comfortable or feeling unwell.
- Not demonstrating airmanship.
- Hovering over the controls or making control inputs without telling the student.

Note:
These are common instructor faults which have been observed during instructor check flights. The professional Instructor will remain aware every action and flight must be carried out as if the world was observing and ensure these habits do not creep into their flights with students (Or even during private flights!).

Common student faults

- Not participating in the briefing.
- Not asking questions.
- Not making their own notes.
- Not sitting comfortably in the cockpit.
- Not telling the Instructor they aren't comfortable.
- Not concentrating on the lesson.
- Not acknowledging Handing over/Taking over procedure.
- Not relating performance to attitude.
- Looking at nose instead of horizon.
- Gripping controls too tightly and/or exerting too much pressure on rudder pedals.
- Focusing too much on instruments.
- Not concentrating on external references.
- Using abrupt and jerky control movements.
- Not advising instructor when feeling unwell.

Note:
These fairly common student faults are easily recognised and dealt with by the professional and observant Instructor.

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CHAPTER EIGHT

Administrative Requirements

The Flight Instructor Reference Manual, for very good reasons, has focussed on the key ground and airborne teaching elements for Instructors. Of equal importance to these tasks, for different reasons, is the range of administrative requirements. These include student training records and documentation, Instructor administration and compliance and interactions with RAAus administration to recommend applications and approvals.

The RAAus Operations Manual provides specific information on requirements for issue and renewals, currency and the limitations of ratings and approvals so this chapter focuses on the administrative requirements of an Instructor. We will discuss strategies and requirements for ensuring governance, compliance and documentation are managed as part of the instructional role whether for basic flight training delivery, oversight or school management.

General requirements

Student Records. At the completion of the lesson, part of the debriefing process should not only include the outcomes of the lesson, but writing notes in the students' progress record. It is apparent this component of the Instructors responsibilities is delayed, forgotten or hastily added with little thought to the importance of the written record.

This not only impacts the student record, but can have consequences for the next Instructor or the next lesson. While many RAAus schools operate in a single Instructor environment making accurate record keeping seem a little superfluous, a well-written summary and notes form important building blocks in effectively managing student's progress. The RAAus Generic Student Progress (GSP) record provides an effective and comprehensive format to complete these requirements. Reference to the RAAus competency coding makes it simple for the Instructor to easily determine if the competencies were met for the syllabus elements trained during the lesson.

Likewise, the detail provided in the comments section can greatly assist the next Instructor when to conducting the next lesson. "Student did not manage rudder inputs with power applications" is a clear comment indicating the student was not on top of rudder inputs, whereas "Student failed to use rudder properly, needs work" does not.

Once the student has been made aware of this deficiency and is now correctly managing rudder inputs "Student is now correctly correcting power changes with rudder", is clearer than "Student has now fixed this problem" or worse still, not noting the correction has been made.

Managed successfully, the writing of notes in the student record can be conducted as part of the debrief process with the student, by involving them in the process and ensuring the student agrees with the Instructor outcomes. Samples of the use of the GSP have been provided in Appendix 5 of this manual.

The debrief

This process must be adapted by the Instructor to be relevant to the elements covered in the lesson and the progress of the exercise. There should be a clear understanding and agreement between Instructor and student regarding attainment of outcomes and standards. Often the student is excessively harsh in their own assessment or they may focus on areas that you as the Instructor know is superficial and will come with time and experience. The balanced debrief will ensure that key lesson elements are discussed and agreed on, and remedial actions or relearning agreed on as action plan. Linking the successful preceding lesson with the next is an effective method of "signposting" for the student that will allow them to associate the previous and future lessons. It will also assist to underpin the importance of basic flight skills as experience and skills are built.

A student may ask "Was I good enough?" or "how did I go?" The Instructor may be tempted to assure the student that they will know when they are good enough or that the Instructor "will let you know" but this does nothing to provide assurance or specific guidance to the student. This is where the competencies referenced in the RAAus briefing sets can be used during debriefings, to assist the student become more effective at self-assessment at a practical standard as they develop in their flight training.

Understanding basic student training requirements

The RAAus training landscape is far more complex and varied than the past 30 years but the basic requirements are unchanged. Current membership, health standards, English Language Proficiency and an understanding of the risks are all outlined within the Operations Manual and must be fully understood by all Instructors.

Membership requirements, assessing students, declarations of medical status and a thorough understanding of the RAAus Syllabus of Flight Training for practical and theoretical requirements are some of the key areas that Instructors should be fully conversant with prior to the commencement of any instructional duties.

Risks of flying

The Instructor must also provide clear information to the prospective student about the risks of flight training. The RAAus Operations Manual provides a clear outline of the specific risks:

"Persons undertaking flying training and other types of flying in recreational aircraft are advised that there are risks involved. These risks cannot be specifically quantified, however; recreational aircraft used for pilot training are constructed, operated and maintained under exemptions from the regulations.

These exemptions are from the regulations that apply to General Aviation aircraft. Whilst similar rule sets apply to our organisations and replace those that we are exempt from, it must be accepted that the overall safety of recreational flying is generally below the well-known commercial air transport standards in Australia."

In 2013, the NSW Supreme Court determined in two separate cases that a student learning to fly a light aircraft is engaging in a dangerous activity (Campbell v Hay (2013) NSWDC 11) and (Echin v Southern Tablelands Gliding Club (2013) NSWSC 516). In NSW, pursuant to the Civil Liability Act (NSW) 2002 (the Act), a person injured whilst participating in a dangerous recreational activity and as a result of the injury arising from a risk that is an obvious risk is barred from recovering damages from another person, notwithstanding that other person may have been negligent.

It is recommended that for the initial flight the Instructor point out the mandatory placards in the aircraft and advise that the aircraft does not comply to general airworthiness standards, but is compliant to alternative standards for Type Certified or Light Sport Aircraft (LSA). Instructors must make sure the student understands this specific risk.

The Instructor must be also be clear about providing information relevant to RAAus flight privileges and the structure of regulations ranging from the Civil Aviation Act 1988, the Civil Aviation Regulations (CAR) and Civil Aviation Safety Regulations (CASR) and the unique Civil Aviation Orders relevant to RAAus. This includes information relating to the limitations and options available by starting flight training within the RAAus framework. Additional considerations include an understanding of the requirements for working with young student and requirements for converting local and overseas pilots. Useful checklists and resource material has been provided as Appendices to this manual and via the RAAus CFI Portal. The Operations Manual remains the ultimate reference document.

Requirements for CFIs

This section will provide information on: Responsibilities for renewals and proficiency checks for I/SI, use of aircraft daily flight logs and maintenance confirmation, understanding guidance material RAAPs regarding supervision, temporary approvals (in the absence of the CFI), satellite operations, medical maintenance and administration, potential conflict of interest issues, the RAAus Technical Manual and CFI Procedures Manual, oversight of accurate student record completion, use of reminder system to manage Instructor and aircraft compliance requirements.

CFI Approvals are issued to a Senior Instructor rating holder to acknowledge their responsibility for a RAAus Flight Training School. The CFI Approval is issued by Operations based on the applicant holding a current RAAus Senior Instructor rating.

The CFI Procedures Manual https://cfiportal.raa.asn.au/resources is the reference document that all CFIs should be familiar with and refer to when conducting school operations. This document is accessed via the RAAus CFI Portal https://cfiportal.raa.asn.au/home along with other valuable resources to assist the CFI to effectively deliver compliant, consistent training within the RAAus flight school framework. The CFI is responsible for conducting proficiency checks for Instructors unless otherwise authorised by RAAus Operations.

The CFI must ensure an easily referenced document system is available and used to record all flight training activity at the school. Additionally, students and Instructors must be able to readily determine the time before scheduled maintenance and a means to record any identified defects or 'gripes'. This may be completed via individual aircraft daily log sheet and maintenance record, or a combined school flight training log. Important information which must be captured in this documentation includes a means to determine the airworthiness of the aircraft (other than simply having the CFI or Instructor provide verbal assurance), the total time for the lesson, fuel aboard at departure, landings during the exercise, and name's of pilots, students and Instructors. The RAAus Maintenance Record https://members.raa.asn.au/storage/maintenance-form.pdf is a useful document which meets these requirements.

Membership requirements, assessing students, declarations of medical status and a thorough understanding of the RAAus Syllabus of Flight Training for practical and theoretical requirements are some of the key areas that Instructors should be fully conversant with prior to the commencement of any instructional duties.

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It is important CFIs develop an effective means to manage required all compliance requirements for Instructors, via an electronic calendar or use of a white board system. While the Instructor is expected to be responsible for their own renewal requirements, the CFI has an overarching responsibility to RAAus to ensure these requirements are current. These requirements include Instructor validity, ongoing and periodical medical compliance requirements and normal flight currency requirements. Further guidance material can be found in RAAP 3 Instructor Supervision https://members.raa.asn.au/documents-and-forms/raaps/ on Instructor supervision.

The CFI therefore has a multi-faceted management role over and above the flight training requirements that includes administrative and technical duties they are solely responsible for, even if these responsibilities are delegated within the school operations. An example of this is where maintenance of flight school aircraft is performed by an independent L2 Maintenance Approval holder. The CFI is still responsible for ensuring the aircraft is airworthy and that all mandatory maintenance requirements practices have been completed. These include complance with both manufacturer and RAAus Technical Manual https://members.raa.asn.au/documents-and-forms/technical-manual-version-4/.

CFIs who also hold L2 Maintenance Approvals and conduct maintenance on aircraft used in schools are committing to additional workload and potential conflict of interest concerns that must be carefully managed. The CFI/L2 Approval holder must be particularly aware of the potential conflict of interest inherent when conducting maintenance on aircraft used for flight training. RAAus encourages these functions to be separated or independently oversighted where possible.

Where flight training is conducted at Satellite Flight Training Schools all training, administrative and compliance requirements are still the direct responsibility of the CFI. Requirements including regular visits by the CFI and oversight of documentation is critical.

Senior Instructors seeking to gain temporary approvals as a CFI during periods of absence by the CFI and by arrangement with Operations should reference the RAAus Operations Manual to ensure minimum requirements are met in order to be eligible to hold a CFI Approval and be fully conversant with the RAAus CFI Procedures Manual https://cfiportal.raa.asn.au/resources A temporary Approval represents an ideal opportunity for CFIs to mentor and develop suitable SI to understand the role of the CFI as required. CFIs should also consider appropriate succession planning.

Requirements for Senior Instructors

This section will provide information on:

- Oversight of student record completion and accuracy.
- Temporary CFI approvals for Senior Instructors.
- When can SI do checks/renewals.
- Operations at Satellite Operations.
- Endorsements that can be issued by SI.

Senior Instructors are a pivotal role in flight training delivery and assistance to the CFI with flight school operation and development. The scope for a competent SI in the training role is quite broad, however limitations exist and are outlined in the RAAus Operations Manual. These limitations include the conduct of flight tests for Pilot Certificate applicants and Cross Country endorsements, which is the exclusive domain of the CFI. The SI also cannot conduct Instructor proficiency checks, however he or she can actively be involved in the mentoring and standardisation employed at the school.

Nonetheless the operational authority for a Senior Instructor includes the ability to operate without direct supervision and conduct of all aspects of ab-initio flight training, on ground and in the air at the primary Flight Training School and any satellites. The remainder of the endorsements available in the RAAus Operations Manual may be issued under SI authority provided the SI holds the endorsement with sufficient aeronautical experience. The SI may also conduct Pilot Certificate holder Biennial Flight Reviews (BFR) and supervise Instructors with written Operations approval.

Requirements for Instructors

This section will provide information on:

- Recency and currency.
- Medical maintenance and administration.
- Limitations.
- Direct supervision requirements.

In addition to the general requirements and those outlined in the RAAus Operations Manual the holder of a RAAus Instructor rating must be aware of the limitations and renewal requirements of the rating. These differ from CASA Grade 3 CASA Flight Instructor Rating, which must be carefully managed by the CFI of schools operating combined GA and RAAus operations. These differences also apply to supervision requirements and Instructors are referred the guidance material on Instructor supervision contained in RAAP 3 Instructor Supervision https://members.raa.asn.au/documents-and-forms/raaps/.

In relation to checks, the 90 day proficiency check with the CFI should be seen as an opportunity to ensure standardisation and consistency, review specific training delivery issues and an opportunity to further develop skills and explore any specific training difficulties. Standard flight training elements and briefings should form part of the check flight rather than simply a “lap around the block” with the CFI. A 90 day proficiency check can be incorporated into a biennial Instructor renewal at the discretion of the CFI but a Pilot Certificate BFR cannot substitute for the more complex and detailed Instructor renewal. As noted in the RAAus Operations Manual the completion of any Instructor or higher renewal also resets the BFR requirement.

Medical requirements

Instructors are required to hold a higher medical standard than that of a Pilot Certificate holder. The required minimum is a CASA Class 2 Aviation Medical Certificate or higher, or RAAus Medical Questionnaire and Examination form completed by the candidates usual General Practitioner.
For compliance and documentation purposes it is important to supply a copy of any interim Medical Certificates or renewed Medical Certificates to RAAus at members@raa.asn.au for addition to the member’s file. Instructors must also immediately advise RAAus if any variation from required health standards using the same email address. Further reference should be made to the appropriate medical requirements section of the RAAus Operations Manual.

Instructor renewals

Previous to gaining an instructor rating the only renewal requirements were a Biennial Flight Review. As an instructor you will now be required to complete an instructor renewal. Completion of an Instructor renewal will also reset your BFR.

“The exhilaration of flying is too keen, the pleasure too great, for it to be neglected as a sport” Orville Wright

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APPENDICES

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APPENDIX 1

TEST QUESTIONS 1-26

PMI

Principles and Methods of Instruction: Techniques to improve training

Question 1
Define Learning.

Answer

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____

Question 2
Explain what is meant by perception.

Answer

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Question 3
Explain the relative importance of each physical sense in learning.

Answer

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Question 4
Explain how the defence mechanisms listed may hinder learning.
- Rationalisation
- Flight
- Aggression
- Resignation

Answer

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Question 5
Explain how the level of stress may affect learning.

Answer

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Question 6
Explain the relationship between perception and understanding.

Answer

Question 7
Give an example of how a flight instructor would assist the process of perception and understanding.

Answer

Question 8
State how positive and negative motivation affects learning?

Answer

Question 9
Explain the application of the levels of learning.

Answer

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Question 10
State examples of how rote learning, understanding of knowledge and correlation apply to flight training.

Answer

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Question 11
Identify the outcomes of aeronautical knowledge instruction associated with the 3 domains of learning?

- Cognitive (knowledge)
- Affective (attitudes, beliefs and values)
- Psycho-motor (physical skills)

Answer

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Question 12
Explain the factors that may hinder learning with respect to aeronautical knowledge training.

Answer

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Question 13
Explain how the rate of learning may vary with practice.

Answer

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Question 14
Explain the role of each of the memory systems in terms of the model of information processing.

- Sensory register
- Short term memory
- Long term memory

Answer

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Question 15
Give examples of positive and negative transfer in aeronautical knowledge training.

Answer

Question 16
Explain how an Instructor may monitor whether communication has been achieved.

Answer

Question 17
Explain the role of each factor listed in the communication process.

- Source
- Symbols
- Receiver

Answer

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Question 18
Recall how these common barriers affect communication.

- Lack of common experience
- Confusion
- Abstractions

Answer

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Question 19
Identify adult learning issues applicable to aeronautical knowledge training.

Answer

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Question 20
Explain each of the basic steps of the teaching process:Preparation

- Preparation
- Presentation
- Application
- Review and Evaluation

Answer

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Question 21
State the purpose of behavioural (performance based) outcomes in flight training.

Answer

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Question 22
Explain the following attributes of effective outcomes:

- Achievable
- Observable
- Measurable

Answer

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Question 23

Explain how to develop the three essential elements of behavioural outcomes:

- Performance (what has to be done)
- Performance criteria
- Conditions

Answer

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Question 24

Explain the advantages and disadvantages of the teaching methods listed and give practical examples of situations best suited to each of these techniques in flight training.

- Lecture
- Theory or skill lesson
- Group learning
- Guided discussion
- Briefing

Answer

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Question 25
State the reasons for limiting the duration of lessons and indicate the desirable duration of a typical lesson.

Answer

Question 26
Explain the general purpose and content of each of the components of a typical aeronautical knowledge lesson plan:

- Aim/motivation/revision
- Outcomes
- Explanation of principles
- Threat and error management
- Practice
- Review

Answer

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TEST QUESTIONS 27-52

PMI

Principles and Methods of Instruction: Techniques to improve training

Question 27
Explain the purpose and content of a training syllabus (or curriculum).

Answer

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Question 28
Explain the difference between a training syllabus and competency based standards.

Answer

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Question 29
Explain the advantages of guided discussion in flight training and identify flight training activities for which this technique could be suitable.

Answer

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Question 30
Explain the reasons for questioning trainees.

Answer

Question 31
Explain the characteristics of an effective question.

Answer

Question 32
Give examples of good and poor questions.

Answer

Question 33
Explain the purpose of training aids.

Answer

Question 34
Give examples of training aids particularly suited to aeronautical knowledge training.

Answer

Question 35
Explain the role of the instructor in each of the following phases of review and evaluation.
- Fault analysis (diagnosis)
- Competency assessment
- Trainee self assessment
- Training effectiveness

Answer

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Question 36
How can oral questions promote mental activity?

Answer

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Question 37
Why will oral questions maintain student interest during a lesson?

Answer

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Question 38
Explain the role of the instructor in each of the five steps involved in providing skill practice to trainees.

- Explanation
- Demonstration
- Performance
- Supervision
- Evaluation

Answer

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Question 39
What is the drawback in using oral questions to evaluate learning?

Answer

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Question 40
Consider the following three questions: For each on decide if it meets all the qualities of a good oral question. If it does not, why not?

- Was Sir Edmond Barton the first Prime Minister of Australia?
- What goes up the barrel of a rifle?
- In the event of canonic paralysis induced anxiety neurosis, what is the most efficacious procedure for prevailing upon the parachutist to abandon the aircraft?

Answer

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Question 41
After asking the question, why pause before naming a student to answer?

Answer

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Question 42
Why is it essential that the Instructor always confirm answers to questions?

Answer

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Question 43
What technique would you use if a student answers a question and all the class cannot hear it?

Answer

____
____
____
____

Question 44
Why should group answers be discouraged?

Answer

Question 45
State three points to observe in the handling of student answers.

Answer

Question 46
State five points to observe in the handling of student questions.

Answer

Question 47
At what time in a lesson should students be encouraged to ask questions?

Answer

Question 48
How would you handle a students question if it did not pertain to the lesson?

Answer

Question 49
How would you handle a question for which you were unable to provide the answers?

Answer

Question 50
State four purposes of oral questions.

Answer

Question 51
State the procedure to follow when asking a question.

Answer

Question 52
State four qualities of good oral questions.

Answer

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APPENDIX 2

Requirements Reference Table

Quick Reference All

	Student	Pilot	Theory Instructor	Instructor	Snr Instructor	CFI Approval	Pilot Examiner
Age = or greater		15	18	18	18	21	21
Membership	✓	✓	✓				✓
RAAus Medical Declaration	✓	✓	✓				✓
Class 2/Medical Questionnaire				✓	✓		✓
Pax recency		✓		✓	✓	✓	✓
Endorsements							
Radio			✓	✓	✓		✓
Human Factors		✓	✓				✓
Passenger			✓	✓	✓		✓
Cross Country			✓	✓	✓		✓
Competencies							
Group syllabus elements		✓	✓				✓
PMI			✓	✓	✓		✓
Ground Theory			✓				
PPL theory or equivalency			✓		✓	✓	✓
Time held lower rating/Approval							24
Aeronautical experience							
> 20 hours Ab-Initio Dual		✓					
> 100 hrs total time (*Note 1)				✓	✓		✓
>75hrs PIC				✓	✓		✓
>150hrs PIC					✓		
>250hrs PIC						✓	
>600hrs PIC							✓
Proficiency checks							
90 Day				✓			
12 month					✓		
24 month(BFR)		✓		Updated with Instructor Renewal			
Instructor renewal				✓	✓	✓	✓

****Note 1–For converting applicants only***

Instructor Quick Reference

	Theory Instructor	Instructor	Snr Instructor	CFI Approval	Pilot Examiner
Age = or greater	18	18	18	21	21
Membership	✓	✓	✓		✓
RAAus Medical Declaration	✓	✓	✓		✓
Class 2/Medical Questionnaire		✓	✓		✓
Pax recency		✓	✓		✓
Endorsements					
Radio	✓	✓	✓		✓
Human Factors	✓	✓	✓		✓
Passenger	✓	✓	✓		✓
Cross Country	✓	✓	✓		✓
Competencies					
Group syllabus elements	✓	✓	✓		✓
PMI	✓	✓	✓		✓
Ground Theory	✓				
PPL theory or equivalency	✓		✓	✓	✓
Time held lower rating/Approval				12	24
Aeronautical experience					
> 20 hours Ab-Initio Dual					
> 100 hrs total time (*Note 1)		✓	✓		✓
>75hrs PIC		✓	✓		✓
>150hrs PIC			✓		
>250hrs PIC				✓	
>600hrs PIC					✓
Proficiency checks					
90 Day		✓			
12 month			✓		
Instructor renewal (24 months)		✓	✓		✓

****Note 1–For converting applicants only***

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APPENDIX 3

Training Sequences

The following table provides recommended sessions to permit delivery and practice of each sequence. Due to the complex nature of the Effects of Controls and Stalling lessons more time should be spent on these elements.

APPENDIX 3 RECOMMENDED SEQUENCE FOR INSTRUCTOR PRACTICAL AND THEORY TRAINING

SEQUENCE	Allocated Time (hrs)	SEQUENCE	Allocated Time (hrs)
EFFECTS OF CONTROLS	1-3	CIRCUITS: GLIDE APPROACH	1.0
STRAIGHT AND LEVEL	1.0	ADVANCED STALLING	1.0
CLIMBING AND DESCENDING	1.0	STEEP TURNS	1.0
MEDIUM LEVEL TURNS	1.0	PRACTICE FORCED LANDINGS	1.0
STALLING	1-2	PRECAUTIONARY SEARCH AND LANDING	1.0
CIRCUIT INTRODUCTION	1.0	SHORT FIELD TAKE OFF AND LANDING	1.0
CIRCUITS	1.0	CONSOLIDATION FLYING	*AR
CIRCUITS: MISSED APPROACH	1.0		
CIRCUITS: EFATO	1.0	TOTAL HOURS	20

SEQUENCE/BRIEFING	Allocated Time (hrs)	SEQUENCE/BRIEFINGS	Allocated Time (hrs)
PMI COURSE	**8.0**	CIRCUITS: EFATO	2.0
EFFECTS OF CONTROLS	2.0	CIRCUITS: GLIDE APPROACH	1.0
STRAIGHT AND LEVEL	2.0	ADVANCED STALLING	1.0
CLIMBING AND DESCENDING	1.0	STEEP TURNS	1.0
MEDIUM LEVEL TURNS	1.0	PRACTICE FORCED LANDINGS	1.0
STALLING	2.0	PRECAUTIONARY SEARCH AND LANDING	2.0
CIRCUIT INTRODUCTION	1.0	SHORT FIELD TAKE OFF AND LANDING	1.0
CIRCUITS	1.0	AERODYNAMICS REVISION	1.0
CIRCUITS: FLAPLESS	1.0		
CIRCUITS: MISSED APPROACH	1.0	TOTAL HOURS	30

*AR - AS REQUIRED

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APPENDIX 4

Generic Instructor Record

Instructor Training Record Summary

CANDIDATE NAME: ____________________

		Page Number						7	8	9	10	11	12	15	16	17	18	19	20	21	22	23	24	Ground Theory		Flight Hours Record			
		Lesson Code						EC	SL	CD	TN	ST	CT	ME	EF	CS	FL	XW	DA	SA	XC	PT	FT						
I.T/S.I.	DATE	LESSON	Formal Briefing (Y/N)	Delivery	Lesson Plan	Presentation Material	Verbal/Non-Verbal	Effect of Controls	Straight & Level	Climbing & Descending	Turning	Stall recognition & recovery	Circuits	Instructor emergencies	E.F.I.C.s & E.F.A.T.O.	Revision all elements	Area Forced landings	Cross-Wind Circuits	Dep.-Arrival-Rejoin	Solo to Training Area	Navigation elements	Practice Test	Flight Test	Time	Total	Dual	Solo	Total Dual	Total Solo
								Operations Training Approval																					
								Date:																					
																PMI Course completed													
																Date:													
																Result													
																		RAAus exam completions											
																		Date:											
																		Independent assessment											
																		Date:											

(1) IT CHECKLIST- Instructor candidate 20 hrs flight training & 30 hrs Ground briefings minimum.

COMPETENCY CODING: 2 Requires Further Training 1 Standard Required for Instructor issue

Grand Total		Grand Total

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APPENDIX 5

3 Axis Briefings

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PRE-FLIGHT INSPECTION: 3 AXIS

1. AIM

To determine the airworthiness of the aircraft for flight based on regulatory and operational requirements.

2. APPLICATION

Before first flight of the day and any command flight.

5. AIRMANSHIP AND HUMAN FACTORS

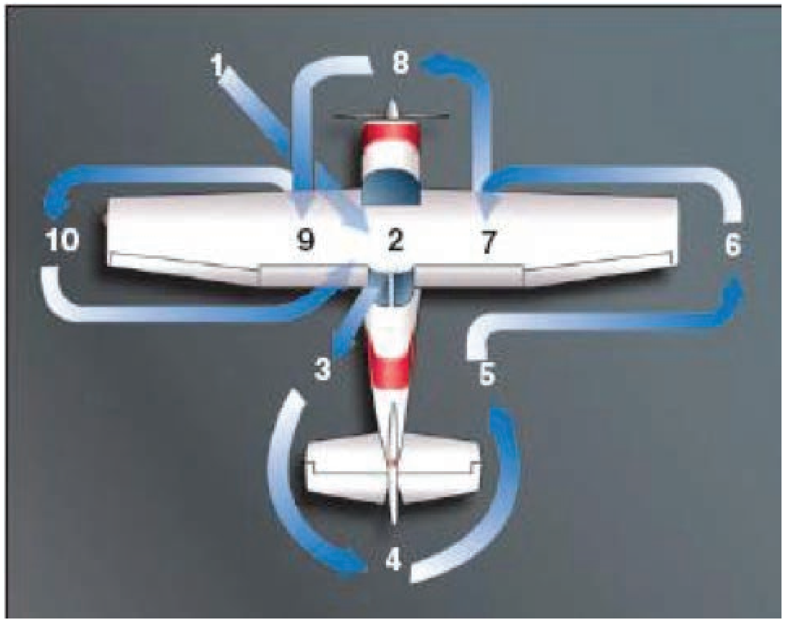
- Assume something is wrong with the aircraft TEM
- Focus on task without distractions SA
- Seek assistance or confirmation if required ADM
- Perform inspection methodically and consistently TEM
- Familiarise with aircraft type and known watch items CRM

3. UNDERPINNING THEORY

Aim: The pre-flight inspection is a mandatory function to be carried out by the command pilot in order to determine the airworthiness of the aircraft for the intended flight. The aircraft POH is the reference document or the RAAus Technical Manual if no POH exists.

- Each inspection element can be assessed using a short acronym of 3 C's:
- **Correct** operation and assembly,
- **Condition** - determined as airworthy
- **Change** in condition or integrity from known standard

- CAR 1998 Schedule 5
- CAR 42B and CAAP
- Aircraft Flight & Maintenance Manuals
- RAAus Operations and Technical Manuals.

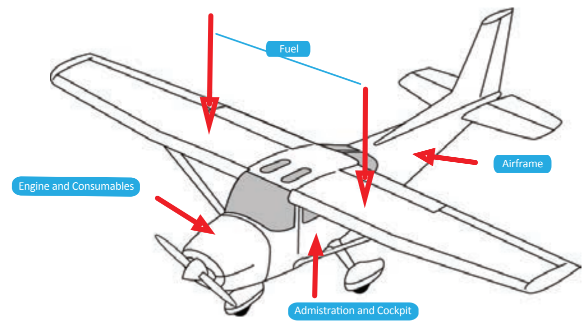


Pre-flight should follow a consistant flow process example above from aircraft POH

4. PRE-FLIGHT EXERCISE

- Review POH, Maintenance Record and flight authorisation sheets
- Determine administrative compliance to fly via MR and RAAus requirements
- Ensure the aircraft is secured in suitable place for inspection/refuelling
- Determine in what sequence fuelling or pre-flight is to take place

A: Administration:	Appropriate aircraft documents checked, maintenance record, flight record, registration, known AD's and SB's
C: Cockpit:	Remove locks, confirm switches OFF
E: Engine & Consumables:	Fuel, Oil, coolants hydraulics etc. Fuel checked for quantity, colour, contamination, clarity and odour
A: Airframe:	Metal composites, and fabric all have different unique requirements for checking
A: Authorisation:	Complete any Administration required



6. OUTCOMES AND EXPECTATIONS

- Pilot understands relevant maintenance privileges
- Understands and identifies all appropriate systems pertinent to aircraft
- Pilot can determine and confirm aircraft serviceability including W&B for flight

EFFECTS OF CONTROLS - 3 AXIS

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1. AIM

To operate the primary and ancillary controls in flight and on the ground and feel and understand the primary, secondary, and further effects they have on the aircraft.

2. APPLICATION

- Control grip & feel
- Cockpit layout/adjustments
- Demonstrate/Practice sequence
- Visual flight focus outside cockpit
- Introduction of pre/post flight actions

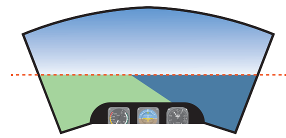
5. AIRMANSHIP AND HUMAN FACTORS

- Control handover process - CRM "I have control / you have control", "follow me through"
- VFR - see and be seen
- Clock code, relative height / distance
- Horizon is main reference
- Land features
- Limitations on lookout - SA
- Limitations of memory
- More comfortable with practice /workload
- Uncoordinated lesson by nature
- Demonstration / practice process - CRM
- Self assessment - I.M.S.A.F.E

4. FLIGHT EXERCISE

On the Ground

- Control speed with throttle and brakes
- One hand on control column and other on throttle
- Dual controls fitted
- Power - controls movement
- Brakes - control slowing / stop
- Pedals - control steering



In the air

Attitude flying is achieved by referencing nose and wings to the horizon

Axis	Control	Input		Primary Effect		Secondary/Further	Use
Lateral	Elevator	Control Column	forward rearward	Pitch	down up	–	Attitude and Airspeed
Longitudinal	Aileron	Control Column	right left	Roll	right left	Slip - Yaw	Direction
Normal	Rudder	Rudder Pedals	left right	Yaw	left right	Skid - Roll	Balance

Airspeed

- Increased airspeed - firmer control feel & response rate, less movement needed
- Decreased airspeed - reduced control feel & response rate, more movement needed

Slipstream

- Increased power → increased slipstream
- Increased flow over elevator → more effective control
- Affects vertical surfaces → yaw
- Effect balanced with rudder

Power

- Power decrease → nose pitches down / yaws right
- Power increase→ nose pitches up / yaws left
- Must balance with rudder

Trim

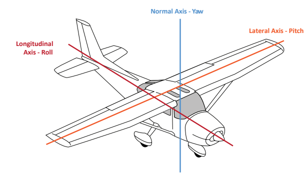
- To relieve the pressure
- If holding back pressure - trim backwards
- If holding forward pressure - trim forwards

Flap

- Extending flap → increase in lift and drag → pitch change - trim change required
- Retracting flap → decrease in lift and drag → pitch change - aircraft will sink

3. UNDERPINNING THEORY

Aeroplane Axes

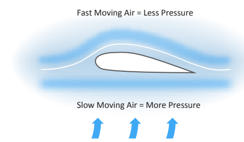


Lift

- As air flows over the wing, increased speed above the wing results in reduced pressure = Lift
- Lift can be altered by changing the shape of the wing, the angle of attack, and the airspeed

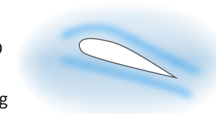
Primary Controls

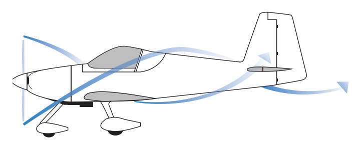
- Elevator pitches aircraft - changing attitude
- Aileron rolls aircraft - changing direction
- Rudder yaws aircraft - balanced flight
- Slipstream affects the rudder and elevator



Ancillary Controls

- Trim tabs provide a force to hold primary controls
- Flap changes shape of wing, increases lift, drag, and L/D ratio - changes pitch trim change required
- Carburettor heat assists in preventing and reducing icing in the fuel delivery system





6. OUTCOMES AND EXPECTATIONS

- Student identifies and understands control actions and responses.
- Can identify and reference the horizon correctly.
- Is comfortable in the airborne environment.

STRAIGHT AND LEVEL - 3 AXIS

1. AIM

To establish and maintain straight and level flight, at a constant airspeed, constant altitude, in a constant direction, and in balance.
To regain straight and level flight.
To maintain straight and level flight at selected airspeeds or power settings.

2. APPLICATION

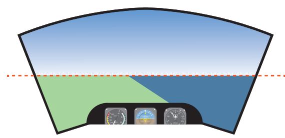
- Smooth throttle movements
- Coordination of controls
- Elevator (pitch) controls attitude
- Power controls climb / descent

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - SA - method for scanning, training area boundaries, maintaining visual horizon
- "I have control / you have control"
- Scan - work cycle
- Threat referencing - CLOCKCODE Principle
- Blind Spots

4. FLIGHT EXERCISE

- Horizon
- Demonstrate stability
- Power setting
- Attitude for level



Establishing Straight and Level

Attitude elevator - set attitude
Power set to maintain level

aileron wings level
rudder in balance

attitude
relative to horizon
no yaw - stand on the ball

Trim to relieve pressure - hands off

Maintaining Straight and Level

Lookout **ahead**
Attitude **reference position**
Instruments - to confirm - not set
- Altimeter and RPM checked every time
- O he ti s rumtn nts en ad gauges, less frequently

Regaining Straight and Level

- Attitude to set airspeed / power setting correct
- Attitude confirmed
- Wings level and balance ball centered
- Reset power (as required)
- A P T

Straight and Level at Different Airspeeds

- Attitude controls airspeed
- Inverse relationship between power / attitude
- Power changes must be balanced with rudder
- Manage secondary effects and balance

Power + Attitude = Performance

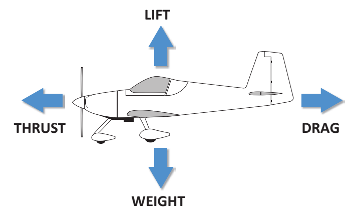
Performance	Mid	Low	High
Power	Cruise	Reduced	Higher
Attitude	Normal	Higher	Lower
Airspeed	80-90 knots	60 knots	110 knots

3. UNDERPINNING THEORY

- The horizon is the line where the land or sea meets the sky
- All references use the aircrafts attitude to the horizon
- Concepts of aerodynamic stability and relevance to flight.

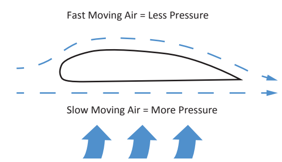
The Four Forces

- Lift, Weight, Thrust, Drag
- Equilibrium when Lift = Weight and Thrust = Drag
- Forces don't act through the same point → moment arms → couple
- Lift and Weight couples balanced by tailplane force
- Changes in Thrust → pitch changes



Lift

- Air over the wing accelerates compared to air passing under the wing
- $L = C_L \frac{1}{2} \rho V^2 S$
- L = Angle of attack × Airspeed
- Angle of attack altered with elevator



Performance

Power + Attitude = Performance

PWR+ IAS / A of A =P

6. OUTCOMES AND EXPECTATIONS

- Student understands use of primary controls to maintain S&L flight
- Student configures aircraft correctly for any required performance
- Student recognises and corrects deviation with appropriate scan & work cycle
- Competencies +/- 150 ft, +/-5kts, +/- 10 degrees
- Effective use of CLOCKCODE and See & Avoid

RECREATIONAL AVIATION AUSTRALIA

CLIMBING AND DESCENDING - 3 AXIS

1. AIM

To climb or descend
the aircraft to a pre-determined height, at a rate and airspeed appropriate for the nominated phase of flight.

2. APPLICATION

- For use in all phases of flight to change the altitude of the aircraft
- Appropriate climb/descent angles for phase of flight
- VFR - conditions considered
- Minimum and maximum heights

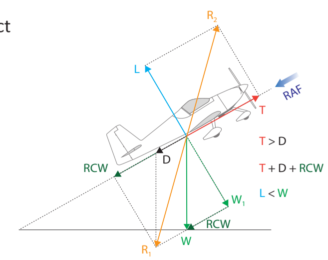
5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA - monitor for changes in level
- Blind spots managed during climb or descent
- Horizon remains primary reference
- Pre-plan required performance
- Understanding vestibular system and pressure equalisation
- Monitoring and management of temps & pressures
- Smooth throttle movements
- Carb heat HOT for descent

3. UNDERPINNING THEORY

Changing power settings is the primary method for creating required force to climb or descend the aircraft.

- Power: Primary control for aircraft height change
- Elevator: Sets airspeed and angle of climb/descent
- Rudder: Balance to control changes due slipstream effect
- Amount of available power determines ultimate climb performance, Vx, Vy



Climbing

- Aircraft is in equilibrium when climbing
- Lift is not increased
- T must be greater than D
- Rate of climb (climb performance) depends on excess power available

Climb Performance

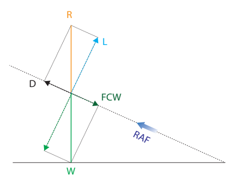
Power More power, better climb performance
Altitude Limits the performance
Weight ↑ weight - ↓ rate of climb
Flap ↑ drag - ↓ rate of climb
Wind Affects climb angle and distance covered

Climb Configurations

Performance	Power	Attitude
Best RoC	Full	_____ kts
Best AoC	Full	_____ kts
Cruise	> Cruise	_____kts
Recommended		_____ kts

Descending

- Aircraft is in equilibrium when descending
- Airspeed maintained by lowering nose attitude
- FCW balances D



Descent Performance

Power Controls rate of descent
L/D ratio Efficiency of wing, steepness of glide
Weight ↑ weight ↑ FCW - ↑ glide speed
Flap Needs ↑ FCW to balance D - ↑ rate of descent
Wind Affects descent angle and range

Descent Configurations

Performance	Power	Attitude
Glide	Idle	_____ kts
Powered		_____ kts
Cruise		_____kts

4. FLIGHT EXERCISE

Climbing

Entry

Lookout Above / Around
Power Full power, balance
Attitude Climb attitude, wings level, balance
Trim To maintain attitude
Airspeed Controlled with attitude

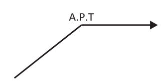
Maintaining

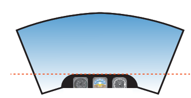
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

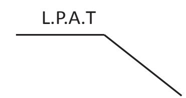
Attitude Select and hold S+L attitude, adjust as speed increases, balance
Power Wait for aircraft to accelerate, then set cruise power, balance
Trim To hold S+L attitude





Descending

Entry



Lookout Below/Around
Power Carb heat HOT, throttle, balance
Attitude Hold S+L attitude until glide speed, then set glide attitude (high performance) to
Trim Maintain attitude

Airspeed = _____ RoD = _____
Airspeed controlled with attitude

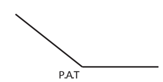
Maintaining

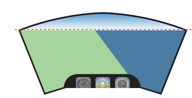
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

Power Carb heat COLD, increase power to cruise, balance
Attitude Simultaneously set to S+L, balance
Trim To hold S+L attitude





6. OUTCOMES AND EXPECTATIONS

- Correct sequence of actions and control through a range of climb and descent scenarios and configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Nominated height +/- 100ft Airspeed +/- 5 kt, aircraft balanced for all exercises

RECREATIONAL AVIATION AUSTRALIA

TURNING - 3 AXIS

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To roll the aircraft to a predetermined Angle of Bank (AOB), whilst maintaining the required performance and balance for level, climbing or descending flight to any predetermined heading.

2. APPLICATION

For use in all phases of flight to change the aircraft heading.

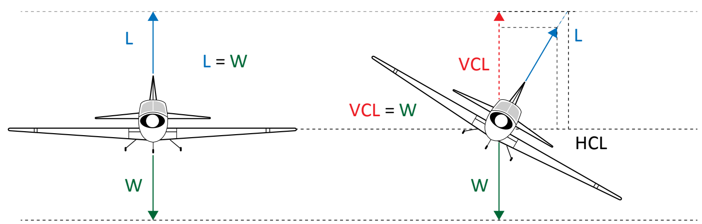
5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Appropriate bank angles for phase of flight
- Blind spots in turn
- Horizon remains primary reference
- Understanding vestibular system and balance
- Banked horizon reference different in turn (side by side seating)

3. UNDERPINNING THEORY

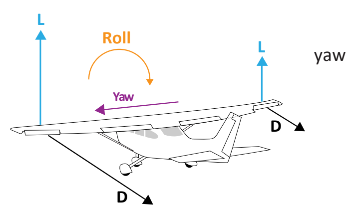
Banking the aircraft is the primary method for creating a force towards the turning direction.

- Ailerons are primary control to turn the aircraft
- Rudder for balance to overcome adverse yaw
- Elevator maintains height in the turn
- Adverse yaw explained
- Stall Speed increases in turning flight due to increased “loading”



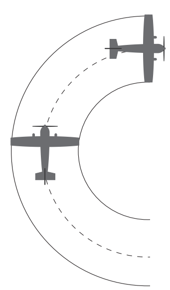
Adverse Yaw

- ↑ L on upgoing wing, also means ↑ D yawing away from turn
- Rudder to balance yaw as ailerons deflected - then neutral



Over Banking

- Outer wing travels further, more L, creates increased rolling force
- Avoid tendency to hold off bank with aileron



Performance

- When climbing and turning, angle of bank must be considered (recommend maximum 15 degrees)

4. FLIGHT EXERCISE

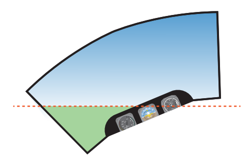
Adverse Yaw

- Demonstration only

Entry

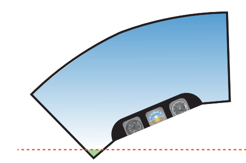
Medium Level Turn

- From S+L
- Lookout
- Roll with aileron to 30° AoB
- Balance with rudder
- Backpressure to maintain altitude - ↑



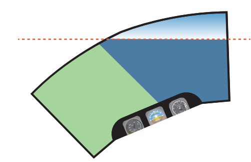
Climbing Turn

- Establish in climb
- Lookout
- Roll with aileron to set AoB
- Balance with rudder
- Hold backpressure to maintain climb airspeed



Descending Turn

- Establish in descent
- Lookout
- Roll with aileron to set AoB
- Balance with rudder
- Maintain backpressure to descent airspeed



In Turn

- Lookout - ALWAYS before turning
- Ailerons for Roll
- Rudder for Balance
- Elevator to maintain lift (power as required for steep turns)
- Turn maintenance, types of turns

Exit

- Look for reference point
- Anticipate rollout by reducing the angle of bank
- Roll wings level
- Balance with rudder
- Relax backpressure
- Reset S+L attitude
- Check **PAT**

6. OUTCOMES AND EXPECTATIONS

- Correct sequence and control through a range of bank angles up to 60 degrees and in all configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Height +/- 100 ft, Airspeed +/- 5 kts, Balanced

STALLING - 3 AXIS

1. AIM

To identify the situations where the aircraft is likely to stall and recognise pre-stall symptoms. When stalled adopt the appropriate recovery actions for minimum height loss.

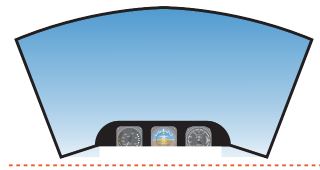
2. APPLICATION

Any phase of flight where critical A of A is exceeded.

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Counterintuitive responses and fear TEM
- Mismanagement and distraction SA
- Recognition of loss of primary control functions
- Limitations in identifying sink rate (Vestibular)
- Adherence to personal minimums and airspeed management

4. FLIGHT EXERCISE



Entry

- **HASELL check (Minimum height I.A.W. RAAus Operations Manual)**
- Adopt slow flight to identify symptoms and reduced control
- Recognition of the stall point in various configurations
- Practice and develop recovery actions for min height loss in stall including any "incipient" rotation
- Demonstration and understanding of developing conditions due to mishandling of controls or lack of recognition
- Practice and recognition of pre-stall scenarios and appropriate actions
- Carb heat HOT
- Close throttle
- Keep straight with rudder
- Maintain altitude with backpressure

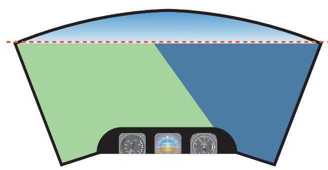
Symptoms

- Low and decreasing airspeed
- Possible high nose altitude
- Less effective controls - higher stick forces
- Stall warning - if fitted
- Buffet (turbulent air from wing striking tailplane)
- Control column will be fully back - no further control movement, past stall stick position
- High sink rate often undetected

At the stall

- Aircraft sinks and nose pitches down
- If aircraft yaws/rolls correct with opposite rudder only - do not use ailerons

Recovery



- Unstall wing
- Check forward with control column to reduce angle of attack
- Do not use ailerons, maintain heading with rudder only
- Aircraft will descend
- Recover to S+L with PAT

To Minimise Height Loss - max of 100 ft

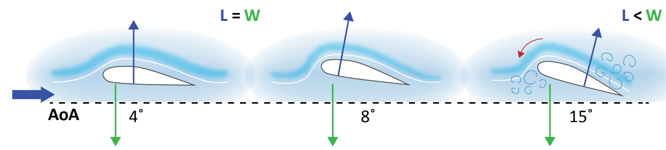
- **Power + Attitude = Performance**
- Unstall, as above, check forward
- Apply full power - balance with rudder
- Raise nose to the horizon to reduce sink
- Lowering attitude assists acceleration
- Regain height and S+L

Recovery at Onset

- Normal situation - when not training
- Recover at stall warning / buffet
- Height loss - 50 ft maximum

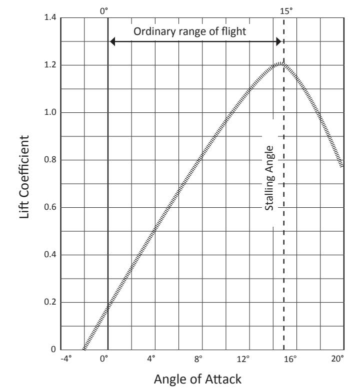
3. UNDERPINNING THEORY

- L = Angle of Attack x Airspeed
- Smooth airflow over the wing breaks down and becomes turbulent
- Breaks away from upper surface, aircraft sinks, nose pitches down



At the stall

- When the wing stalls there is a ↓ in L and large ↑ in D
- Aircraft sinks, C of P moves rearwards →pitch down
- Stalls result from exceeding critical Angle of Attack
- The elevator controls the A of A of wing
- Lift/Drag curve
- Airspeeds are referenced in POH in relation to stalling
- Stall Speed increases in turning flight due to increased "loading"



6. OUTCOMES AND EXPECTATIONS

- Define the stalled condition
- Developed recognition of all pre-stall symptoms in flight
- Pilot can state likely scenarios where stalling may occur
- Apply timely and appropriate corrective actions
- **Required recovery standards:** Height loss <200 ft, Heading maintenance +/- 10 degrees, Airspeed within V_a/V_{fe}

RECREATIONAL AVIATION AUSTRALIA

CIRCUITS - 3 AXIS AND WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To combine all practiced phases of flight in a standard format including take off, approach and landing in accordance with recognised circuit procedures.

2. APPLICATION

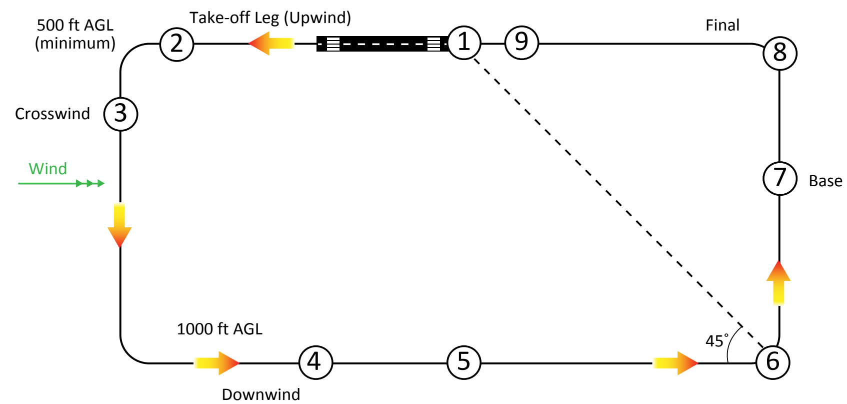
For use when operating at aerodromes for arrival, departure and standard traffic flow around a preselected runway.

3. UNDERPINNING THEORY

- Circuit conventions based on ICAO standards and outlined in CAR 166C
- Use of standard traffic pattern within the manoeuvring area of a landing area
- Circuits should be conducted on the most into wind runway unless conducting cross wind operations
- CAR 166C and CAAP 166-1(X) provide requirements and guidance for operations at non-controlled aerodromes including use of radio for "alerted see and avoid"
- Reference RAAus Syllabus of Flight Training 1.02 Circuits

4. FLIGHT EXERCISE

1. Takeoff	• Reference points and line up checks	• Keep straight
2. Climb out	• Separation • After takeoff checks	• T.O.S.S. • Turn at 500'ft AGL
3. Crosswind	• Tracking and lookout	
4. Downwind	• Positioning	• Checks
5. Aircraft configuration	• Possible to reconfigure aircraft depending on performance	
6. Base turn	• Lookout • Reference point • Carb heat as required	• Positioning • Flap set as required • Turn
7. Base leg	• Track • Attitude controls airspeed	• Flap set as required • Power controls descent rate
8. Final	• Anticipate turn 500' ft AGL • Short final alignment • Power to control aim point	• Attitude controls airspeed • Reference aiming point • Carb heat as required
9. Landing	• Glide approach OR powered approach (power as required) • Touch down on main wheels • Let nosewheel settle • After landing checks - clear of runway	• Look ahead towards end of runway • Progressively increase back pressure to control sink • Keep straight



- Lookout - ALWAYS prior to conducting manoeuvres in vicinity of aerodrome
- Assessment of appropriate runway and taxiing/holding points
- Take-off considerations: performance and emergencies
- Circuits broken down into basic flight manoeuvres
- Demonstration of full standard circuit
- Progressive introduction of all circuit tasks relative to workload
- Aircraft configurations and pre-landing checks
- Descent profile management and the landing phase
- Modification of circuit for conditions/ traffic

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA
- Appropriate climb/descent profiles for each leg of circuit
- Management of flight sequences while multi-tasking SA, CRM
- Reference attitudes, and runway positioning SA
- Monitoring and management of circuit and aircraft operation TEM
- Right of way and circuit rules

6. OUTCOMES AND EXPECTATIONS

- Correct application of controls and decisions through the range of sequences in the circuit
- Recognition of errors and appropriate corrections applied
- Awareness and appropriate actions for corrections required in circuit
- Reference RAAus Radio Operator Syllabus 2.04 and CAR 166C for radio use
- Required standards: Heading +/- 5 degrees, Nominated Height +/- 50 ft, Airspeed +/- 5 kt, aircraft balanced for all manoeuvres

ENGINE FAILURES: AFTER TAKE-OFF AND IN CIRCUIT (EFATO, EFIC)

RECREATIONAL
AVIATION AUSTRALIA

1. AIM

To be able to plan and execute an appropriate range of actions based on an engine failure emergency at any point in the circuit area.

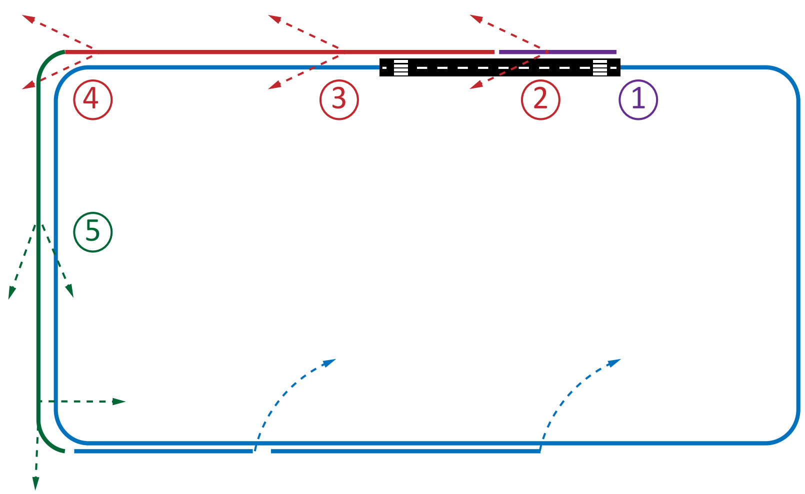
2. APPLICATION

Full or partial failures or other circuit emergencies that require immediate actions to ensure safest possible outcomes.

3. UNDERPINNING THEORY

1. **Ground Roll.** Abort take-off at pre-determined "rejection point" power to idle, control direction
2. **On take-off with runway remaining .** Lower nose to best glide attitude. Power to idle, land on remaining runway or within 10 degrees of heading. Emergency braking as required
3. **On upwind climb.** Lower nose to best glide attitude, land straight ahead or best option within 30 degrees of heading only. DO NOT ATTEMPT turn back
4. **On crosswind climb.** Lower nose to best glide attitude, options only within 30 degree of heading or alternate runway if possible. DO NOT ATTEMPT turn back
5. **Approaching circuit height.** Modified circuit or alternate landing options, manage energy to achieve best glide speed, configure aircraft and plan for landing 1/3 into the available landing area. Broadcast emergency only if time allows

NOTES: 1. In all cases maintain safe airspeed 2. Rehearse a pre-take-off safety brief 3. Use appropriate height loss techniques - flap, sideslip, slipping turns to prevent overshoot. 4. Never attempt to "stretch the glide". Reset aiming point if approach misjudged.



5. AIRMANSHIP AND HUMAN FACTORS

- Pre-planning TEM
- Immediate actions based on suitable options ADM
- Constant assessment of options SA
- Discipline and resist turn back - HF fear & auto responses)

4. FLIGHT EXERCISE

- BEFORE LINE UP/TAKE OFF: Pre take off safety brief
- Demonstration and practice EF at various points identified in brief
- Development of "SAFE GLIDE" assessments
- Introduction and practice of height management techniques
- Focus on key tasks

6. OUTCOMES AND EXPECTATIONS

- Student understands likely scenarios and immediate actions required in EF scenarios
- Effective strategies adopted for range of emergencies including safety briefs
- Student demonstrates appropriate disciplines in airspeed management and decision making in a range of engine failure and emergency situations
- Student can determine and execute a suitable landing or appropriate final glide based on any presented EF scenario
- Competencies: Airspeed management +5/-0kts. Nominated landing point (safe stopping distance)

MODIFIED CIRCUITS AND MISSED APPROACHES: 3 AXIS AND WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

For the student to identify scenarios where a modified circuit or missed approach needs to be made and safely conduct the modified procedures with reference to aircraft management, published procedures and airmanship.

2. APPLICATION

For use where alterations or discontinuation of a standard circuit pattern is required for traffic separation or where any doubt exists regarding the safety of continuing any circuit leg or final approach.

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA
- Decision making in rejecting take-off and landings ADM
- Management of flight sequences while multi-tasking SA, CRM
- Reference attitudes, and runway for positioning SA
- Monitoring and management of circuit and aircraft operation TEM
- Right of way and circuit rules

3. UNDERPINNING THEORY

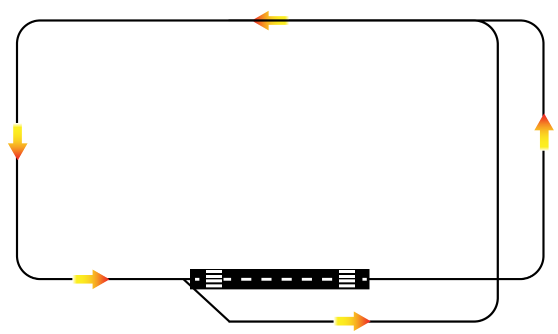
Touch and Go • Skill development and practice of landing phase	**Low Level Circuit** • To expedite landing or where environmental or mechanical hazards exist. 500 ft AGL minimums as per regulations. PPR where required from AD OPR
Stop and Go • Allows full reconfiguration and full take off technique	**Wind Gradient** • Reducing wind velocity close to ground from mechanical disturbances due to friction with surrounding air
Missed Approach • ("Go Round") Overshoot of aiming point, hazards or unstabilised approach. Energy management, aircraft control (secondary & further effects)	**Wind Shear** • Sudden change in windspeed and/or direction. Effect on airspeed, controllability, and sink rate near the ground
Varied Circuit Speeds • Application of level flight at various airspeeds within manoeuvring range for separation and aircraft configuration requirements	**Wake Turbulence** • Disturbed air created by a wings production lift. Wingtip vortices create turbulence. Greatest at high angles of attack and behind taking off or landing aircraft. 600M separation minima's. May require a planned missed approach Reference RAAus Syllabus of Flight Training 1.01/1.02 Elements 8 & 10

2. OUTCOMES AND EXPECTATIONS

- Correct application of controls and decisions through the range of sequences in the circuit
- Recognition of errors and appropriate corrections applied
- Awareness and appropriate actions for corrections required in circuit
- Reference RAAus Operations Manual, CAR 166C and VFRG
- **Required standards:** Heading +/- 5 degrees, Nominated height +/- 50 ft, Airspeed +5/-0 kt, aircraft balanced for all manoeuvres. Decision making to satisfaction of instructor.

4. FLIGHT EXERCISE

Touch and Go landings • Review of rejection points. Minimum obstacle clearance. Runway alignment, suitable aircraft configurations	
Stop and Go landings • Practice reconfiguration, aircraft control and changing controllability	
Missed approaches • Aircraft configurations and pre-landing checks • Decision points for aborted approaches • Maintaining safe climb airspeed and attitude • Aircraft reconfiguration practice and managing secondary effects • Repositioning aircraft for effective SA • Safe re-joining	**Circuit arrival, departure, and re-joining** • Departure from all legs of circuit and re-join • Arrival to join any circuit leg and considerations understood • Modification of circuit for conditions/traffic • Alerted See & Avoid with radio as required



Missed approach path

RECREATIONAL AVIATION AUSTRALIA

APPENDIX 6

Weightshift Briefings

PRE-FLIGHT INSPECTION: WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To determine the correct rigging and airworthiness of the trike based on regulatory and operational requirements.

2. APPLICATION

Before first flight of the day, after rigging, and any command flight.

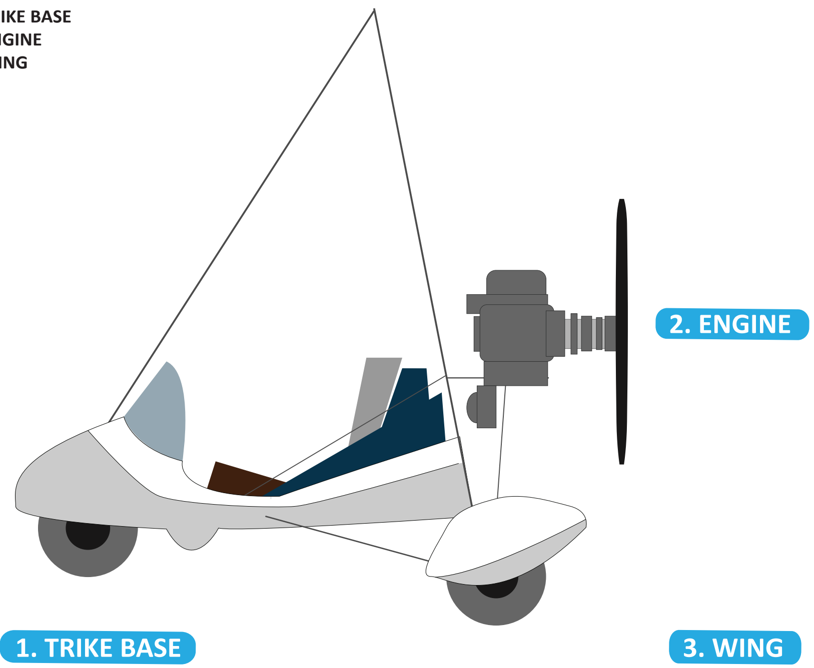
5. AIRMANSHIP AND HUMAN FACTORS

- Assume something is wrong with the trike TEM
- Focus on task without distractions SA
- Seek assistance or confirmation if required ADM
- Perform inspection methodically and consistently TEM
- Familiarise with trike types and known watch items CRM

3. UNDERPINNING THEORY

The trike pre-flight inspection should be broken down into 3 separate individual inspections;

1. **TRIKE BASE**
2. **ENGINE**
3. **WING**



Further References

- Trike Flight & Maintenance Manuals
- RAAus Operations and Technical Manuals
- CAR 1998 Schedule 5
- CAR 42B and CAAP

4. PRE-FLIGHT EXERCISE

- Review POH, Maintenance record and flight authorisation sheets
- Determine administrative compliance to fly via any maintenance record and RAAus requirements
- Ensure the aircraft is secured in suitable place for inspection/refueling
- Determine in what sequence fueling or pre-flight is to take place

General sequence is;

A: Administration:	Appropriate trike documents checked, maintenance record, flight record, registration, known AD's and SB's
C: Cockpit:	Remove locks, confirm switches OFF
E: Engine & Consumables:	Fuel, Oil, coolants hydraulics etc. Fuel checked for quantity, colour, contamination, clarity and odour
A: Airframe:	Metal, composites, and fabric all have different unique requirements for checking
A: Authorisation:	Complete any Administration required

Each inspection element can be assessed using a short acronym of 3 C's:

- **Correct** operation and assembly
- **Condition** - determined as airworthy
- **Change** in condition or integrity from known standard

6. OUTCOMES AND EXPECTATIONS

- Pilot understands relevant maintenance privileges
- Understands and identifies all appropriate systems pertinent to trike
- Pilot can determine and confirm trike serviceability including W&B for flight

EFFECTS OF CONTROLS - WEIGHTSHIFT (B)

1. AIM

To operate the primary and ancillary controls in flight and on the ground and feel and understand the primary, secondary, and further effects they have on the aircraft.

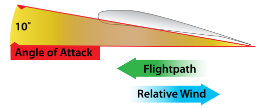
2. APPLICATION

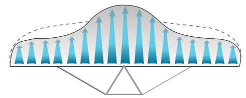
- The fundamental understanding and use of all controls in relation to the weightshift trike.

3. UNDERPINNING THEORY

Lift

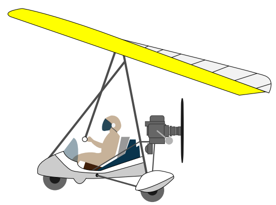
- As air flows over the wing, increased speed above the wing results in reduced pressure = Lift
- Lift can be altered by changing the shape of the wing, the angle of attack, and the airspeed

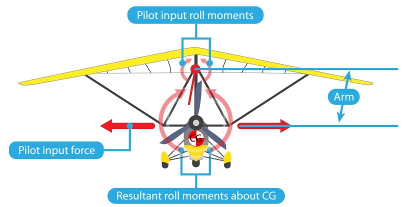




The trike flies due to the production of lift created by the wing and is controlled by the movement of control bar to effect weight shift in pitch & roll (2 axis)

- Control Bar movement affects C of G
- Moving forward/aft sets attitude of wing
- Rolling is achieved by moving bar sideways
- Rolling of wing occurs due to changes wing shape

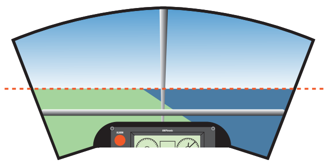




4. FLIGHT EXERCISE

In the air

- Attitude flying is achieved by referencing the wing to the horizon (fly the wing)
- Attitude - horizon as primary reference, bar position relative to the horizon
- Demonstrate - Handover sequence
- Pendulum and stability demonstrated
- Primary control effects demonstrated and practiced
- Secondary/further control effects, effects of airspeed
- On ground control of wing and steering system - understand and practice
- Power and slipstream effects demonstrated and practiced



On the ground

- Control speed with throttle
- Brakes - control slowing / stop
- Pedals - control steering

Axis	Input	Movement	Primary Effect		Secondary/Further	Use
Lateral	Control Bar	Forward Rearward	Pitch	Up Down	Airspeed	Attitude and Airspeed
Longitudinal	Control Bar	Right Left	Roll	Left Right	Slip - spiral descent	Direction

Airspeed

- Increased airspeed - increased control feel, faster response rate, less movement needed
- Decreased airspeed - reduced control feel, slower response rate, more movement needed

Power

- Decrease in power → nose pitches down and rolls*
- Increase in power → nose pitches up and rolls*
- Increased power → increased torque effect

*Roll will vary depending on engine rotation

Trim

- To relieve bar pressure (if fitted)

5. AIRMANSHIP AND HUMAN FACTORS

- "I have control / you have control"
- See and avoid
- Clock code, relative height / distance
- Horizon & control bar remains primary reference
- Land features
- Limitations on lookout - SA
- Limitations of memory
- More comfortable with practice/workload
- Demonstration / practice process - CRM
- Self assessment - I.M.S.A.F.E
- Handover process (CRM)
- Correct horizon referencing and scanning SA
- Fly the wing not the base - correct referencing
- Uncoordinated lesson by nature
- Control feel and grip

6. OUTCOMES AND EXPECTATIONS

- Student identifies and understands control actions and responses.
- Can identify and reference the horizon correctly.
- Is comfortable in the airborne environment.

STRAIGHT AND LEVEL - TRIKE

1. AIM

- To establish and maintain straight and level flight at a constant airspeed, height and heading when required.
- To regain straight and level flight.
- To maintain straight and level flight at selected airspeeds or power settings.

2. APPLICATION

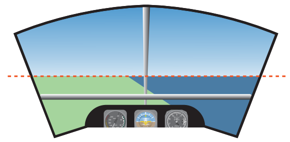
- Smooth throttle movements
- Coordination of controls
- Pitch controls attitude
- Power controls climb / descent

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA - method for scanning, training area boundaries, maintaining visual horizon
- "I have control / you have control"
- Scan - work cycle
- Threat referencing - CLOCKCODE Principle
- Blind Spots

4. FLIGHT EXCERCISE

- Horizon
- Demonstrate stability
- Power setting
- Attitude for level

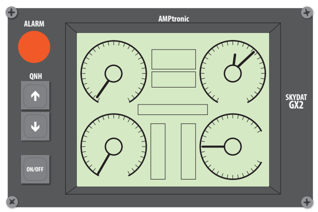


Establishing Straight and Level

Power set for straight and level
Attitude control bar set nose attitude
control bar wing level relative to horizon
Trim to relieve pressure - hands off (if fitted)

Maintaining Straight and Level

Lookout ahead
Attitude reference position
Instruments - to confirm - not set
- Altimeter and RPM checked every time
- Other instruments and gauges, less frequently



Regaining Straight and Level

- Attitude to set airspeed / power setting correct
- Attitude confirmed
- Wing level
- Reset power
- P A T

Straight and Level at Different Airspeeds

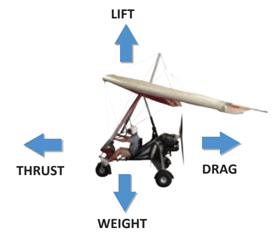
- Any changes in power will result in pitch change
- Inverse relationship between Power / Attitude
- Compensate for secondary effects

Power + Attitude = Performance

Performance	Mid	Low	High
Power	Cruise	Reduced	Higher
Airspeed	50-60 knots	40 knots	70 knots
Attitude	Normal	Higher	Lower

3. UNDERPINNING THEORY

- The horizon is the line where the land or sea meets the sky
- All flying references the trike's control bar with the horizon

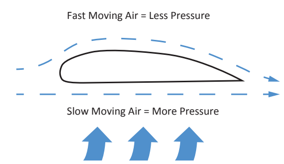


The Four Forces

- Lift, Weight, Thrust, Drag
- Equilibrium when Lift = Weight and Thrust = Drag
- Forces don't act through the same point → moment arms → couple
- Changes in Thrust → pitch changes

Lift

- Air over the top accelerates compared to air passing under the wing
- $L = C_L \frac{1}{2} \rho V^2 S$
- L = Angle of attack × Airspeed
- Angle of attack is altered through pitching control bar



Performance

Power + Attitude = Performance

PWR+ IAS / A of A =P

6. OUTCOMES AND EXPECTATIONS

- Student understands use of primary controls to maintain S&L flight
- Student configures trike correctly for any required performance
- Student recognises and corrects deviation with appropriate scan & work cycle
- Competencies +/- 150 ft, +/-5kts, +/- 10 degrees
- Effective use of CLOCKCODE and See & Avoid

RECREATIONAL AVIATION AUSTRALIA

CLIMBING AND DESCENDING - WEIGHTSHIFT (B)

1. AIM

To climb or descend the trike to a pre-determined height, at a rate and airspeed appropriate for the nominated phase of flight.

2. APPLICATION

- For use in all phases of flight to change the altitude of the trike
- Appropriate climb/descent angles for phase of flight
- VFR - conditions considered
- Minimum and maximum heights

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA - monitor for changes in level
- Blind spots managed during climb or descent
- Horizon remains primary reference
- Pre-plan required performance
- Understanding vestibular system and pressure equalisation
- Monitoring and management of temps & pressures
- Smooth throttle moments

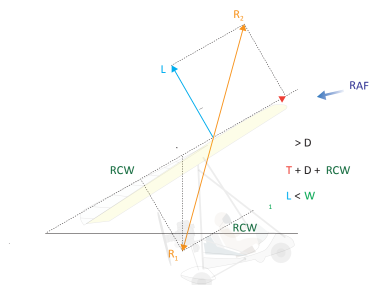
3. UNDERPINNING THEORY

Changing power settings is the primary method for creating required force to climb or descend the trike.

Power: Primary control for trike height change
Control Bar: Set attitude and airspeed
Manage secondary roll due to increased torque effect

Climbing

- Trike is in equilibrium when climbing
- Lift is not increased
- **T must be greater than D**
- Rate of climb (climb performance) depends on excess power available



Climb Performance

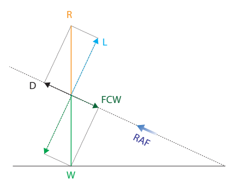
Power More power, better climb performance
Altitude Air density limits performance
Weight ↑ weight - ↓ rate of climb
Wind Affects climb angle and distance covered (relative to ground)

Climb Configurations

Performance	Power	Attitude
Best RoC	Full	_____ kts
Best AoC	Full	_____ kts
Cruise	> Cruise	_____kts
Recommended		_____ kts

Descending

- Trike is in equilibrium when descending
- Airspeed maintained by Control Bar/attitude
- FCW balances D



Descent Performance

Power Controls rate of descent
L/D ratio Efficiency of wing, steepness of glide
Weight ↑ weight ↑ FCW - ↑ glide speed
Wind Affects descent angle and range (relative to ground)

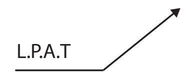
Descent Configurations

Performance	Power	Attitude
Glide	Idle	_____ kts
Powered		_____ kts
Cruise		_____kts

4. FLIGHT EXERCISE

Climbing

Entry



Lookout Above / Around
Power Full power (control pitch and torque)
Attitude Climb attitude, wings level
Trim Set (if fitted)
Airspeed Controlled with attitude

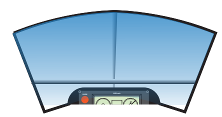
Maintaining

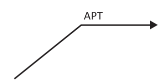
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

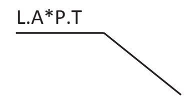
Attitude Select and hold S+L attitude, adjust as speed increases
Power Wait for trike to accelerate, then set cruise power
Trim To hold S+L attitude





Descending

Entry



*Protect airspeed in low performance trikes in descent
Lookout Below / Around
Power Descent power (control pitch and torque)
Attitude Set glide attitude
Trim Set (if fitted)

Airspeed = _____ RoD = _____

Airspeed controlled with attitude

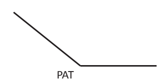
Maintaining

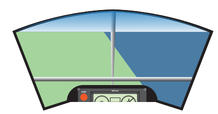
Lookout
Attitude
Instruments

Change - check - hold - trim

Exit

Power Increase power to cruise
Attitude Manage pitch for S+L attitude
Trim To hold S+L attitude





6. OUTCOMES AND EXPECTATIONS

- Correct sequence of actions and control through a range of climb and descent scenarios and configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Nominated height +/- 100 ft, Airspeed +/- kt

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To roll the trike to a predetermined Angle of Bank (AOB), whilst maintaining the required performance and balance for level, climbing or descending flight to any predetermined heading.

2. APPLICATION

For use in all phase of flight to change the trikes heading.

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Appropriate bank angles for phase of flight
- Blind spots in turn
- Horizon remains primary reference
- Understanding vestibular system and balance
- Dangers of pilot induced oscillations

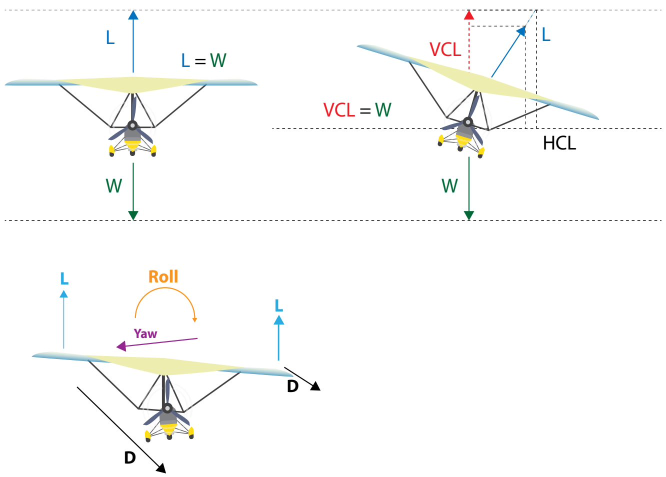
3. UNDERPINNING THEORY

Banking (Rolling) the trike is the primary method for creating a force towards the turning direction.

- Weightshift using the control bar is the primary control to initiate roll
- Aerodynamic shift in the wing occurs to create rolling force
- Pitch via the Control Bar is used to balance the turn
- Power overcomes additional turning sink rate in steeper turns
- Yaw stability is managed by sweepback of delta wing design

Performance

- When climbing and turning, angle of bank must be reduced maximum of 20°, use 15°



4. FLIGHT EXERCISE

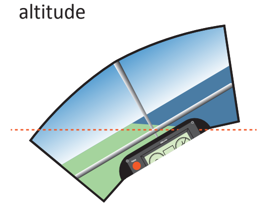
Slip and spiral descent revisited as further effects of roll

- Lookout - ALWAYS before turning
- Use weightshift to roll wing in desired direction
- Centralise weightshift at desired AOB
- Pitch via Control Bar to maintain height and balance turn
- Turn maintenance - AOB & Pitch control, power as required
- Exit from turn same control sequence, pitch, roll, centralise, relax
- Demonstration only

Entry

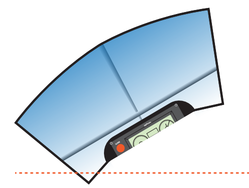
Medium Level Turn

- From S+L
- Lookout
- Roll to 30° AoB
- Pitch as required for level altitude



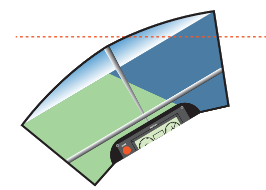
Climbing Turn

- Establish in climb
- Lookout
- Roll to 15° AoB
- Pitch for climbing attitude



Descending Turn

- Establish in glide
- Lookout
- Roll to 30° AoB
- Pitch for descending attitude



In Turn

- Lookout
- Attitude
- Maintain bank angle
- Altitude controlled with bar pressure and power as required

Exit

- Look for reference point
- Anticipate rollout by half the angle of bank
- Roll wing level
- Relax bar pressure
- Reset S+L attitude
- Check **PAT**

6. OUTCOMES AND EXPECTATIONS

- Correct sequence and control through a range of bank angles up to 60 degrees and in all configurations
- Recognition of errors and appropriate corrections applied
- Required standards: Heading +/- 10 degrees, Height +/- 100 ft, Airspeed +/- 5 kts, Balanced

RECREATIONAL AVIATION AUSTRALIA

STALLING - WEIGHTSHIFT (B)

1. AIM

To identify the situations where the trike is likely to stall and recognise pre-stall symptoms. When stalled, adopt the appropriate recovery actions for minimum height loss.

2. APPLICATION

Any phase of flight where critical A of A is exceeded.

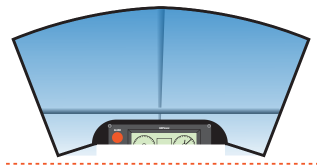
5. AIRMANSHIP AND HUMAN FACTORS

- Lookout - Situational Awareness SA
- Counterintuitive responses and fear TEM
- Mismanagement and distraction SA
- Recognition of loss of primary control functions
- Limitations in identifying sink rate (Vestibular)
- Adherence to personal minimums and airspeed management

4. FLIGHT EXERCISE

Entry

- **HASELL check (Minimum height I.A.W. RAAus Operations Manual)**
- Adopt slow flight to identify symptoms and reduced control
- Recognition of the stall point in various configurations
- Appropriate recovery actions for min height loss and understanding "tuck"
- Demonstration and understanding of developing conditions due to mishandling of wing or lack of recognition
- Practice and recognition of pre-stall scenarios and appropriate actions
- Close throttle
- Keep straight, prevent roll
- Maintain altitude with increasing forward pressure on Control Bar



Symptoms

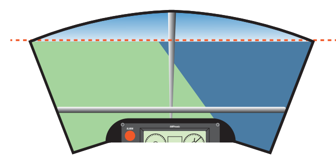
- Low and decreasing airspeed
- High nose attitude
- Less effective controls - higher Control Bar forces
- High sink rate often undetected
- Control Bar will be fully forward - no further control movement possible

At the stall

- Trike sinks and wing pitches down

Recovery

- To unstall
- Release Control Bar pressure to reduce angle of attack
- Correct for any roll
- Trike will descend
- Recover to S+L with PAT



To Minimise Height Loss - max of 100 ft

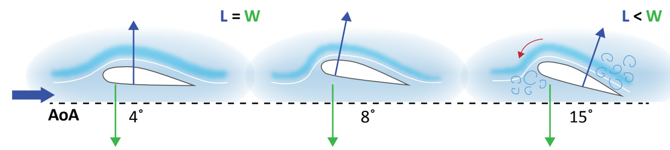
- **Power + Attitude = Performance**
- Unstall, as above, release Control Bar pressure
- Apply full power - maintain heading
- Raise nose to the horizon - reduces sink
- Accelerate then adjust attitude to normal speed
- Regain starting altitude and S+L

Recovery at Onset

- Normal situation - when not training
- Recover at recognition of pre-stall
- Height loss - 100 ft maximum

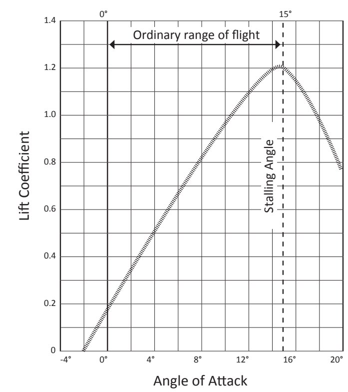
3. UNDERPINNING THEORY

- L = Angle of Attack x Airspeed
- Smooth airflow over the wing breaks down and becomes turbulent
- Breaks away from upper surface, aircraft sinks, nose pitches down



At the stall

- When the wing stalls there is a ↓ in L and large ↑ in D
- Aircraft sinks, C of P moves rearwards →pitch down
- Stall results from exceeding critical Angle of Attack
- Control Bar controls the A of A of wing
- Lift/Drag curve
- Airspeeds are referenced in POH in relation to stalling
- Stall Speed increases in turning flight due to increased "loading"



6. OUTCOMES AND EXPECTATIONS

- Define the stalled condition
- Developed recognition of all pre-stall symptoms in flight
- Pilot can state likely scenarios where stalling may occur
- Apply timely and appropriate corrective actions
- **Required recovery standards:** Height loss <200 ft, Heading maintenance +/- 10 degrees, Airspeed within Vm

RECREATIONAL AVIATION AUSTRALIA

CIRCUITS - 3 AXIS AND WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

To combine all practiced phases of flight in a standard format including take off, approach and landing in accordance with recognised circuit procedures.

2. APPLICATION

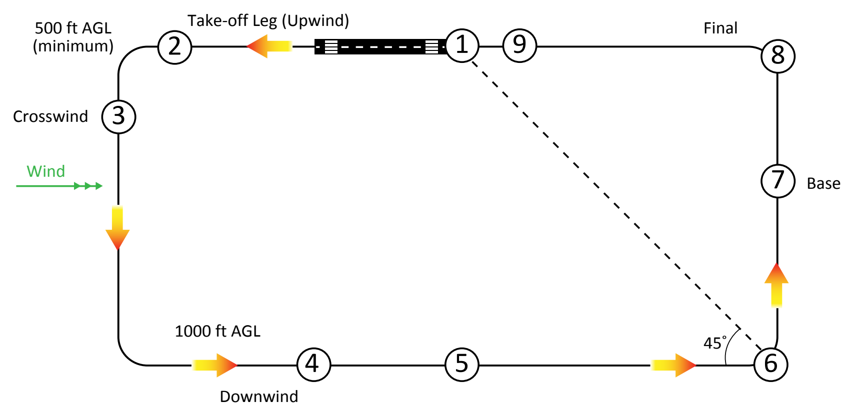
For use when operating at aerodromes for arrival, departure and standard traffic flow around a preselected runway.

3. UNDERPINNING THEORY

- Circuit conventions based on ICAO standards and outlined in CAR 166C
- Use of standard traffic pattern within the manoeuvring area of a landing area
- Circuits should be conducted on the most into wind runway unless conducting cross wind operations
- CAR 166C and CAAP 166-1(X) provide requirements and guidance for operations at non-controlled aerodromes including use of radio for “alerted see and avoid”
- Reference RAAus Syllabus of Flight Training 1.02 Circuits

4. FLIGHT EXERCISE

1. Takeoff	• Reference points and line up checks	• Keep straight
2. Climb out	• Separation • After takeoff checks	• T.O.S.S. • Turn at 500'ft AGL
3. Crosswind	• Tracking and lookout	
4. Downwind	• Positioning	• Checks
5. Aircraft configuration	• Possible to reconfigure aircraft depending on performance	
6. Base turn	• Lookout • Reference point • Carb heat as required	• Positioning • Flap set as required • Turn
7. Base leg	• Track • Attitude controls airspeed	• Flap set as required • Power controls descent rate
8. Final	• Anticipate turn 500' ft AGL • Short final alignment • Power to control aim point	• Attitude controls airspeed • Reference aiming point • Carb heat as required
9. Landing	• Glide approach OR powered approach (power as required) • Touch down on main wheels • Let nosewheel settle • After landing checks - clear of runway	• Look ahead towards end of runway • Progressively increase back pressure to control sink • Keep straight



- Lookout - ALWAYS prior to conducting manoeuvres in vicinity of aerodrome
- Assessment of appropriate runway and taxiing/holding points
- Take-off considerations: performance and emergencies
- Circuits broken down into basic flight manoeuvres
- Demonstration of full standard circuit
- Progressive introduction of all circuit tasks relative to workload
- Aircraft configurations and pre-landing checks
- Descent profile management and the landing phase
- Modification of circuit for conditions/ traffic

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA
- Appropriate climb/descent profiles for each leg of circuit
- Management of flight sequences while multi-tasking SA, CRM
- Reference attitudes, and runway positioning SA
- Monitoring and management of circuit and aircraft operation TEM
- Right of way and circuit rules

6. OUTCOMES AND EXPECTATIONS

- Correct application of controls and decisions through the range of sequences in the circuit
- Recognition of errors and appropriate corrections applied
- Awareness and appropriate actions for corrections required in circuit
- Reference RAAus Radio Operator Syllabus 2.04 and CAR 166C for radio use
- Required standards: Heading +/- 5 degrees, Nominated Height +/- 50 ft, Airspeed +/- 5 kt, aircraft balanced for all manoeuvres

ENGINE FAILURES: AFTER TAKE-OFF AND IN CIRCUIT (EFATO, EFIC)

RECREATIONAL
AVIATION AUSTRALIA

1. AIM

To be able to plan and execute an appropriate range of actions based on an engine failure emergency at any point in the circuit area.

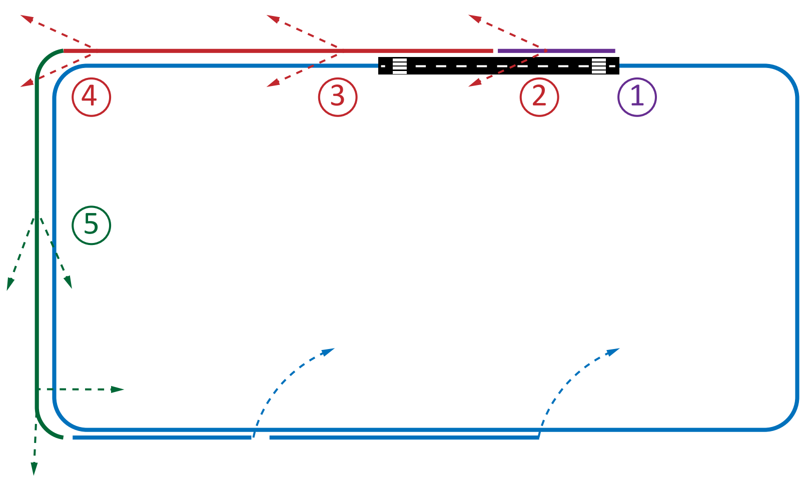
2. APPLICATION

Full or partial failures or other circuit emergencies that require immediate actions to ensure safest possible outcomes.

3. UNDERPINNING THEORY

1. **Ground Roll.** Abort take-off at pre-determined "rejection point" power to idle, control direction
2. **On take-off with runway remaining .** Lower nose to best glide attitude. Power to idle, land on remaining runway or within 10 degrees of heading. Emergency braking as required
3. **On upwind climb.** Lower nose to best glide attitude, land straight ahead or best option within 30 degrees of heading only. DO NOT ATTEMPT turn back
4. **On crosswind climb.** Lower nose to best glide attitude, options only within 30 degree of heading or alternate runway if possible. DO NOT ATTEMPT turn back
5. **Approaching circuit height.** Modified circuit or alternate landing options, manage energy to achieve best glide speed, configure aircraft and plan for landing 1/3 into the available landing area. Broadcast emergency only if time allows

NOTES: 1. In all cases maintain safe airspeed 2. Rehearse a pre-take-off safety brief 3. Use appropriate height loss techniques - flap, sideslip, slipping turns to prevent overshoot. 4. Never attempt to "stretch the glide". Reset aiming point if approach misjudged.



5. AIRMANSHIP AND HUMAN FACTORS

- Pre-planning TEM
- Immediate actions based on suitable options ADM
- Constant assessment of options SA
- Discipline and resist turn back - HF fear & auto responses)

4. FLIGHT EXERCISE

- BEFORE LINE UP/TAKE OFF: Pre take off safety brief
- Demonstration and practice EF at various points identified in brief
- Development of "SAFE GLIDE" assessments
- Introduction and practice of height management techniques
- Focus on key tasks

6. OUTCOMES AND EXPECTATIONS

- Student understands likely scenarios and immediate actions required in EF scenarios
- Effective strategies adopted for range of emergencies including safety briefs
- Student demonstrates appropriate disciplines in airspeed management and decision making in a range of engine failure and emergency situations
- Student can determine and execute a suitable landing or appropriate final glide based on any presented EF scenario
- Competencies: Airspeed management +5/-0kts. Nominated landing point (safe stopping distance)

MODIFIED CIRCUITS AND MISSED APPROACHES: 3 AXIS AND WEIGHTSHIFT (B)

RECREATIONAL AVIATION AUSTRALIA

1. AIM

For the student to identify scenarios where a modified circuit or missed approach needs to be made and safely conduct the modified procedures with reference to aircraft management, published procedures and airmanship.

2. APPLICATION

For use where alterations or discontinuation of a standard circuit pattern is required for traffic separation or where any doubt exists regarding the safety of continuing any circuit leg or final approach.

5. AIRMANSHIP AND HUMAN FACTORS

- Lookout and situational awareness SA
- Decision making in rejecting take-off and landings ADM
- Management of flight sequences while multi-tasking SA, CRM
- Reference attitudes, and runway for positioning SA
- Monitoring and management of circuit and aircraft operation TEM
- Right of way and circuit rules

3. UNDERPINNING THEORY

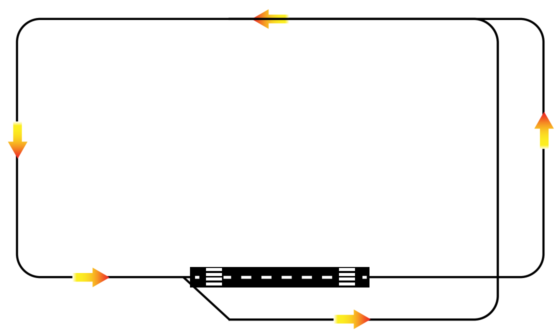
Touch and Go • Skill development and practice of landing phase	**Low Level Circuit** • To expedite landing or where environmental or mechanical hazards exist. 500 ft AGL minimums as per regulations. PPR where required from AD OPR
Stop and Go • Allows full reconfiguration and full take off technique	**Wind Gradient** • Reducing wind velocity close to ground from mechanical disturbances due to friction with surrounding air
Missed Approach • ("Go Round") Overshoot of aiming point, hazards or unstabilised approach. Energy management, aircraft control (secondary & further effects)	**Wind Shear** • Sudden change in windspeed and/or direction. Effect on airspeed, controllability, and sink rate near the ground
Varied Circuit Speeds • Application of level flight at various airspeeds within manoeuvring range for separation and aircraft configuration requirements	**Wake Turbulence** • Disturbed air created by a wings production lift. Wingtip vortices create turbulence. Greatest at high angles of attack and behind taking off or landing aircraft. 600M separation minima's. May require a planned missed approach Reference RAAus Syllabus of Flight Training 1.01/1.02 Elements 8 & 10

2. OUTCOMES AND EXPECTATIONS

- Correct application of controls and decisions through the range of sequences in the circuit
- Recognition of errors and appropriate corrections applied
- Awareness and appropriate actions for corrections required in circuit
- Reference RAAus Operations Manual, CAR 166C and VFRG
- **Required standards:** Heading +/- 5 degrees, Nominated height +/- 50 ft, Airspeed +5/-0 kt, aircraft balanced for all manoeuvres. Decision making to satisfaction of instructor.

4. FLIGHT EXERCISE

Touch and Go landings • Review of rejection points. Minimum obstacle clearance. Runway alignment, suitable aircraft configurations	
Stop and Go landings • Practice reconfiguration, aircraft control and changing controllability	
Missed approaches • Aircraft configurations and pre-landing checks • Decision points for aborted approaches • Maintaining safe climb airspeed and attitude • Aircraft reconfiguration practice and managing secondary effects • Repositioning aircraft for effective SA • Safe re-joining	**Circuit arrival, departure, and re-joining** • Departure from all legs of circuit and re-join • Arrival to join any circuit leg and considerations understood • Modification of circuit for conditions/traffic • Alerted See & Avoid with radio as required



Missed approach path

RECREATIONAL AVIATION AUSTRALIA