Flying Training The PPL Course Jeremy Pratt

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Notebook

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Exercise n° 1 : Aircraft familiarisation

Background Briefing

- Aircraft Construction
- ~~Air~~ Cockpit Layout
- Main Aircraft system
- Use of Checklist and Pilots Operating Handbook / Flight Manual
- Airfield Sense

Aircraft construction

The wings provide the lift force that enables an aircraft To fly.

Aircraft can be : high wing (single engine Cessna 152)
: low wing (single engine Piper PA-38 Tomahawk)
: medium wing (twin Engine Piper Aerostar)

The lift provided by the wing is independent of the engine power.

The main component of the wing
- Wing Root
- Walkway
- Trailing edge
- leading edge
- Wing Tip

The main component of the fuselage
- Engine
- Cockpit
- Tail Section

The engine is located under the cowling ahead of the cockpit and it drives the propeller at the front of the aircraft.

The Tail unit is located behind the cockpit and its component provide an aerodynamic balancing force. To give the aircraft stability and control

The Tailplane can be: a low position on the fin (Cessna 152)
: a high position on the fin (Piper PA38 Tomahawk)

The Main component of the Tail section.
- Fin (also known as the vertical stabiliser)
- Tailplane (horizontal stabiliser.)

The Undercarriage.
On modern aircraft it consist of main wheel under the wing or the fuselage and a nosewheel under the engine or a tail wheel.
nosewheel : Piper PA 28 warrior / cadet
Tailwheel : de Havilland Chipmunk.

The three main flight control

- The ailerons are at the outboard of the trailing edge of the wing and are interconnected so that one go up the other go down
- The Rudder is fitted to the fin
- The elevator / stabilator are attached to the rear of the tailplane

*
Some aircraft (eg PA-28 Cherokee (~~Warrior~~) have a combined tailplane and elevator, know as an all-moving tailplane or stabilator

- Flaps are fitted on most training aircraft and are located at the inboard trailing edge of the wing.

Cockpit layout

- Most training aircraft have side by side seating: left for pilot in command (used by student): Right for instructor

Adjust seat, belt to be able to ~~see~~ see and reach instrument panel, control and switches

The pilot must reach the Rudder peddal, which are linked through cable and pulleys to the rudder and to a nosewheel (steerable)

The rudder peddal may also be fitted with "toe breaks"

The control column (also called stick) or control wheel is infront of the pilot seat (control column: Robin, control wheel: Cessna 152)

The control column is linked to the ailerons and the elevator / stabilator by cables & pulley.

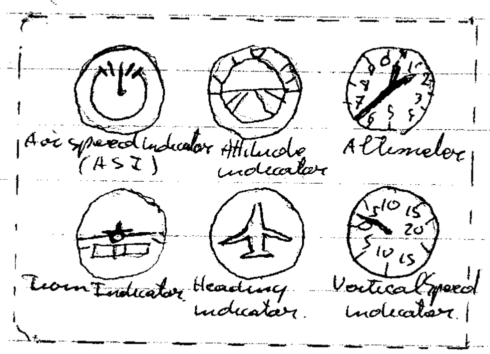
Moving the control back & forward control the elevator
Moving left & Righ control the ailerons

The Rudder & Control column are also duplicated on the instructor seat (right seat)

The Throttle control the engine, it can be: plunger or quadrant type. Forward increase engine power
Backward decrease engine power.

The instrument panel contains various instrument, switches circuit breakers etc

The 6 basics 'flight instruments' are most often arranged in this box standard.



Air Speed Indicator
Attitude Indicator
Altimeter
Turn Indicator
Heading Indicator
Vertical speed indicator

Main Aircraft system

The brake system control the brake on the main wheels.
It is ~~fitted to the~~ operated by toe brake fitted to the rudder peddal or a hand operated brake lever.
There is also a parking brake.

The Master switch control the electrical system that supply power to light, radios, and some instrument.
On some aircraft (mostly high wing) the flaps may be electric.

The engine does not require power from the aircraft system once it ~~is~~ ~~operated~~ running. It incorporates magnetos ~~which~~ which derive electrical power from the rotation of the engine.

The fuel system supplies to the engine from fuel tank located in the wings. It is commanded by a fuel selector located in cockpit

- Use of Checklist and Pilot. Operating Handbook / Flight Manual.

Your Flight Training Organisation provide the checklist for the aircraft your are learning.

Check done on the ground : from ~~memory~~ checklist
Check done in flight : from memory.

⌈ Each individual aircraft has its own individual POH/FM which contain detailed information on the subject aircraft. It is a legal document and procedure and limitations must be complied. ⌋

Air field Sense.

The manoeuvring area and apron of an active airfield is dangerous. Follow guideline :

- keep clear of running engine, aircraft about to start or depart.
- do not walk in front of aircraft
- Do not drop litter (if any pick it up). Foreign Object Damage is dangerous for plane.
- No smoking
- Do not leave chocks, tie weight etc which can hit airplane.
- if you see any obstruction, danger alert staff.

Exercise n1e : Emergencies

Background Briefing

- Fire on the ground.
- Cabin Fire in the air.
- Engine Fire in the air.
- Emergency Equipment & Fuel

Fire on the ground.

If taxiing stop clear of aircraft, building, fuelling area.

Throttle - Closed
Mixture - Fully lean (Idle cut off } or ICO)
Fuel - OFF
Magnetos - OFF
Master Switch - OFF
Brakes - Parking Brake on.

- evacuate the aircraft with fire extinguisher if possible
- stay upwind of the aircraft.

Cabin Fire in the air

likely to be an electrical fire characterised by the acrid burning smell.

- Master switch off (if electrical fire suspected)
- Electrical circuit off (to isolate fault)
- Cabin Heater / Defrost off
- Fire extinguisher (if absolutely necessary).

Engine Fire in the Air

Throttle - Closed.
Mixture - fully lean (Idle cut off or ICO).
Fuel off
Magnetos off
Cabin Heater / Defrost off.

Refer to POH / FM of the aircraft.

Know where is fire extinguisher, first aid kit and exit.

Emergency Equipment, Emergency Exit.

Make sure that fire extinguisher and first aid kit are present and not out of date.

Small training aircraft unlikely to have separate emergency exit.

Know to operate exit.

On light aircraft the side windows or canopy can be kicked out

Preparation for flight and Action After flight

Develop good habit, After flight also important, leave a/c in good state.

Background Briefing.

- Personal Preparation.
- Flight ~~Prep~~ authorisation.
- Flying Equipment Required
- Booking out procedure.
- External Check
- Internal Check
- Starting
- Starting problem.
- Power and Pre Take off Check.
- Closing down.
- Moving, Security and Tie Down.
- Post Flight Documentation

Personal Preparation.

More accident are caused by pilot error than by aircraft failure
Learn checklist & mnemonics.

'I'm Safe'

I - Illness. symptoms
M - Medication (side effect)
S - Stress. (work, family, money etc)
A - Alcohol (drunk in last 8hrs or in last 24 hrs)
F - Fatigue
E - Eating (feeded!)

if any doubt do not fly.

Flight authorisation.

It must be filled out before flight.
It contain basic detailed of the intended flight
In the case of training exercise the flight is then authorised by the instructor
There is also detailed of previous flight.
On this sheet or attached document, any aircraft defects or unserviceability are recorded and any rectification action noted.
It is the pilot's decision whether or not to accept the aircraft.

Flying Equipment Required

- No special closing
- Always have an current aeronautical chart of the area
- Practice using the chart and identify landmark you see on the chart when you fly.
- The chart also shows controlled airspace, restricted airspace and other aeronautical information.

Book out Procedure.

Before take off you must give detail of your intended flight to the Air Traffic Service Unit (ATSU) on the airfield

Depending on the nature of your flight the booking out could be a simple phone call, completing an airfield movement record or filling a full flight plan. (also by Radio)

External Checks

The aircraft checklist details the "pre-flight" check
Refer to the POH / FM for each type of aircraft.

- In general: aircraft security: remove all tie down, tow bar, control lock, chocks and pitot cover.
  general appearance: aircraft sit level, look right no leak or pool of fuel or oil.
  Most aircraft are of stressed-skin construction meaning that the skin of the aircraft helps to carry the load and the stresses. Any dents, punctures or wrinkles of the skin indicate more serious damage to the aircraft. Aircraft of Glass-Reinforced Plastic (GRP) may show cracks ~~it~~ in the skin if the structure is damaged

- flying controls: move the flying control surface gently to check if they are operating properly (do not bang them against the ~~controls~~ stops)

- Check fuel: for its purity. Take a sample into a sampler and look for colour, sediment, globule of water (not acceptable).

- undercarriage: There are ~~two~~ two type: oleo and leaf spring
  On the oleo check that the correct amount of shiny oleo is visible: no leak oil around seal.
  The ~~hydraulic line~~ to the brake unit should be secure (no leak of oil (red))
  The ~~tyre~~ should have at 2mm of visible tread and No bald patches or cuts
  Look for sign of over or under inflation
  Also the creep mark painted on the tyre and the wheel rim should be aligned.

- oil: must be check, use a dipstick (located under the cowling wait for at least 10mn after the engine has stopped
  Check for ~~loose wire~~, frayed leads, oil leak etc in the cowlin

- windscreen & windows must be clear, an insect on the window look like an approaching aircraft

Any doubt during external check ask the instructor or engineer. Use checklist from FTOT (memory not always reliable).

Internal check

See in the checklist, and follow step by step. Brief passenger for belt, emergency door & equipment.
Loose article in the cockpit represent a serious safety hazard (a single pen can foul a control cable or linkage).

Starting

Check that the aircraft is in a safe location to start: no gravel or stone under the propeller, blocked out on the taxiway.
Be aware of the propeller slipstream. Is it close to another plane or hangar open door.
The Propeller must be clear before starting. (open window and shout "Clear Prop")

Check that the starter warning light has gone out and that the oil pressure register with 30 second of start.

Follow the checklist

Starting Problems

A Flooded engine: to much fuel so it does not start
Refer to POH / FM for detail procedure. General advice are:
Magneto - OFF
Throttle - Fully open
Mixture - fully lean (ICO)
Operate the starter through a few turn, then repeat checklist without priming

Engine Fire on start (rare): Assuming the starter is still engaged - continue operating and
Mixture - fully lean (ICO)
Fuel - off
Throttle fully open
The fire should go out when the fuel stops. Then stops cranking the engine and ~~engine~~ proceed with the "engine fire on the ground" procedure..
The POH / FM procedure always override general advice.

Power and Pre-Take-Off checks

are carried out on the ~~runway~~, aircraft facing wing.
Check that propeller slipstream does not cause damage behind.
Go through the checklist methodically and cancel flight if any doubt or problem.
"Better be down here, wishing you were up there, than up there wishing you were down here"

Closing down

Usually ~~a~~ light aircraft park after flight without outside assistance.
If you are ~~given~~ being given marshalling signal, remember that the pilot remain legally responsible
Leave the cockpit tidy, no loose article.
Confirm that the master is off, the magnetos are off with the key out and the fuel is off.
Glance at the aircraft to see any change in external condition.

Moving Security Tie Down.

Best move an aircraft with Towbar that fit on the nosewheel. Or push on part indicated by instructor.

Do not try to move it alone, you can damage it.
Inside hangar the brake is off so you can move the plane
<u>Securing an aircraft which is not inside a hanger is done</u>
in accordance with the weather condition and the
Flying Training Organisation (FTO) procedure.
The parking brake on. and wheel chock in place.
A pitot cover to protect the head and internal/
external control lock.
The aircraft has a number of tie down from which
rope and cable is secured to a ground tie down
anchor.
Your instructor will show you how to secure the
aircraft properly (look in P.O.H/F.M).

Post-flight documentation.

At some airfield it may be necessary to book in with the
Air Trafic Service Unit.
The authorisation sheet must be completed with
detail of your flight and any defect must be recorded.
Your personnal flying logbook should be completed
at this stage. Take care of it, it is the only complete
record of your flying experience.

Exercise n° 3 . Air experience

- Flight and enjoy it.

Experience the feel

Exercise 4 : Effect of Controls

Background Briefing

- Flying Lesson Format.
- The Planes and Axes of Movement.
- The functions and initial effect of the 3 primary Flying control
- The Further effect the 3 primary Flying Control.
- The effect of differing Airspeed.
- The effect of Propeller Slipstream
- The effect of Differing Power Setting
- The Trimming Controls
- The Flaps
- Carburettor Heat.
- Mixture.
- Cockpit Heating and ventilation
- Other Controls.

Flying Lesson Format

- Background briefing - from self Study of the student and are Flying Training Organisations (FTOs) briefing
- Pre flight briefing - at the FTO before the flight with instructor (question & answer).
- In flight - see manoeuvre of instructor & do it under ~~sp~~ supervision
- ~~A/f~~ After flight debrief: small discussion with instructor to see progress, problem etc. Instructor inform you on ~~prep~~ background brief for next flight.

Review course before & after flight.

– The Planes and Axes of Movement

Plane Movement	Control Surface	Cockpit control Movement
– Pitch	– Elevator / Stabilator	Control Column Forward and Bac
– Roll	ailerons	Control Column Left and Right
– Yaw	Rudder	Rudder Peddal Left and Right

The axes are fixed in relation to the aircraft, not the horizon – for ex whatever the aircraft attitude, elevator control the pitch as the pilot see it.

The function and Initial Effect of the Three Primary Flying Control

Each control surface functions by altering the airflow around it

The movement of the aircraft around axes is governed by how quickly and how far the control column is moved.
Each control surface is located some distance from the centre of gravity (CG). The distance between the control surface and the centre of gravity gives the control leverage and enhances its effect.

Effect of Controls.

- When The Control column is moved back, the elevator (or stabilator) move up, creating a downforce at the tail (left). The aircraft pivot around CG and PITCHES nose up

- When the Column column is moved forward, the elevator (or stabilator) move down, creating a lift upward at the Tail. The aircraft pivots around CG and PITCHES nose down.

- When the control column is moved to the left, the deflection of the ailerons change the amount of lift produced at each wing. The aircraft ROLLS to the left

- When the control column is moved to the right, the deflection of the ailerons change the amount of the lift produced at each wing. The aircraft ROLL to the right.

- When the left rudder peddal is pressed, the change of lift at the fin / rudder pivot the aircraft around the CG and the aircraft yaws to the left

- When the right rudder peddal is pressed, the change at the fin / rudder pivots the aircraft around CG and the aircraft yaw to the right

The further effect of the Three Primary Flying Controls

- Arguably the elevators have further effect, in that when the aircraft is pitch up, the airspeed will decrease and when it is pitch down, the airspeed increase.

The further effect of the Roll.
After the aircraft has rolled, it slips toward the lower wing. The airflow is now striking the fin / Rudder from one side. Lift is created at the fin / rudder, and this yaws the aircraft toward the ~~lowering~~ wing.

The further effect of yaw.
When the aircraft is yawing, the wing on the "outside" of the turn is moving faster. The faster airflow creates more lift at this wing that at the slower moving "inner" wing. This lift imbalance cause the aircraft to ~~roll~~ in the same d as it is yawing.

The effect of differing Airspeed.

The flying controls function by altering the airflow at their location. It follow that at different airspeed, the effectiveness and feel of the control is altered.
At fast speed the control are very effective and only small control movement are needed to achieve the desired result.
At slow airspeed the control are much less effective and larger control movement are needed.

According to the level of control a pilot should have an idea at which speed it is flying.

The effect of Propeller Slipstream

The slipstream generated by the propeller increases the speed of the airflow within a tube surrounding the fuselage. Most training aircraft are fitted with a fixed-pitch propeller rotating ~~speed as~~ at the same speed as the engine. At high power setting there is an increased slipstream and increased airflow speed within the slipstream. At low power setting there is decreased slipstream and decreased airflow speed inside the tube.
Any flying controls inside the slipstream will be affected by differing slipstream speed, just as they are affected by differing airspeed.
Usually the elevator/stabilator and rudder are affected by the slipstream effect. However if the aircraft has a high tailplane (T tail) the elevator may be outside the slipstream.
The ailerons are outside of the slipstream.
It is important to note that in a high power/slow airspeed situation the rudder and elevator of a low-tailplane aircraft will still feel effective due to the slipstream effect despite the slow airspeed.

The Effect of Differing Power Setting.

The aircraft is designed to be stable at its normal cruise and power setting, so that at normal cruise the pilot has the least work to do to maintain this condition. If any other power setting is used, there is an associated pitch and yaw force.

The aircraft stability in pitch is governed in part by a balance between the Thrust force provided by the engine and the Drag force caused by the movement of the aircraft through the air. On most light aircraft the Thrust line is lower than the drag line.

If the power is increased both the Thrust and the Drag increase and the aircraft pitch up. It is also help by the increased propeller slipstream that affect the airflow over the tailplane.

When the power decreased, it result a weaker Thrust/Drag couple pitches the nose down. The decreased propeller slipstream also affect the airflow over the tailplane.

When an aircraft has a clockwise rotating propeller (as viewed from the cockpit) the slipstream helix strikes the Fin/Rudder on its left hand side, creating a left force that would tend to yaw the aircraft to the left.

To counteract this yaw force, some aircraft are built with the fin or the engine offset a few degrees from of dead-ahead. However it follows that this counterforce is fixed and is designed to balance force created when the aircraft is at cruise power setting and airspeed.
So when power is increased beyond the normal

setting, the counteracting force designed into the aircraft is overcome and the aircraft yaw to the left.
When power is reduced below the normal setting the counteracting force overcompensates and the aircraft yaws ~~the the~~ to the right.

Where an aircraft has a propeller rotating to the left (~~anticlo~~ anticlockwise) the counteracting forces and yaws movement are reverse. (when power is increased the aircraft yaws to the right.)

The Trimming Controls

In different conditions there are ~~varying~~ load on the flying control particularly the elevator / Stabilator and Rudder
To relieve the physical work the elevator (or stabilator) is fitted with Trimmer. (some aircraft have it also on Rudder)
The Trimmer take the form of a small control surface (trim tab) on the trailing edge of the elevator.
The cockpit trimmer control is used to move the trim tab.

There are - floor mounted elevator stabilator trimmer?
& control pannel mounted " " "

Some aircraft achieve trimming through a spring in the elevator control cable circuit instead of a trim tab

The Flaps

The flaps are fitted to the trailing edge (inward) of the wing and are operated manually or electrically from a switch or lever in the cockpit

When the flaps are lowered, the shape of the wing and hence

the airflow around are altered.
The first stage or degrees of lowered flap 10-20° (initial flap) cause a large increase in lift and a small increase in drag. As more flap is lowered 20-40 degrees (intermediate to full flap) there is a much smaller further increase in lift and a much larger increase in drag.

When the flaps are lowered, the aircraft will pitch up or down, depending on the aircraft type.
In either case airspeed reduces due to the increased drag.

The use of flaps is limited by a speed known as "VFE" - the flaps must not be operated when flying faster than this speed, nor should this speed exceeded when flaps are lowered. On the airspeed indicator the VFE speed is the "top" (faster speed) end of the white arc.

Carburettor Heat

In the majority of engines used for training aircraft, a carburettor supplies the engine with its fuel/air mixture. Should Ice forme inside the carburettor (happen in def T° condition) the power from the engine will be reduced. The carburettor heat control routes hot air through the carburettor, melting any ice. When the pilot operates the carburettor heat control, there is a small reduction in power and possibly a little unevenness if any ice has melted.

The carburettor heat control is left in the fully cold position ~~it is~~ (the lever up or the knob fully in) most of the time. Approximately every 10 minute put it in the fully hot position (lever down or knob fully out) for no less than 5-10 seconds and then returning it to the cold position

Usually the engine speed measured in revolutions per minute (RPM), will return to the same setting as before the carburettor heat was used, If the ~~carburettor~~ RPM came back to a higher setting then carburettor ice was present and you will need to recheck regularly.

Mixture

The fuel-air mixture in the carburettor is controlled from a red lever or knob next to the throttle
- the mixture control.

When flying at lower altitudes the engine is operated with the mixture in the fully rich position - that is with the mixture control fully forward and in.

At high altitude the reduced air density means that less fuel is required to maintain the correct fuel-air ratio - the mixture need to be "leaned". This is done by moving the mixture control back or out.

An aircraft fitted with a fixed-pitch propeller (as are most training aircraft) will show an initial RPM increase as the mixture is leaned. The RPM will peak, then reduce as the mixture is leaned further. The mixture should now be enriched again until the RPM is on the rich side of the peak. The mixture will need to be reset for any change in power or altitude. For specific advice on mixture leaning refer to the aircraft POH/FM

The engine is stopped by moving the mixture control to the fully lean position or Idle Cut OFF (ICO). This completely shuts off the fuel supply to the carburettor

There is: Quadrant type mixture control (forward for Rich, back for fully lean or Idle Cut off: Plunger type mixture control (same).

~~Flight Exercise~~

Flight Excercise

D Purpose

To learn the effect of the controls when operated independly in flight

D Airmanship

Airmanship is the commensense element of flying but also the quality thant differentiate a pilot from an aeroplane driver

Watch your instructor

Handing over / Taking over

To avoid confusion over who is actually flying the aircraft between the Student and the Instructor

- When the instructor wish you to fly the aircraft
  Instructor say "You have control"
  Student takes the control column in one hand on the throttle, feet placed on rudder pedals
  Student say "I have control"

- When the instructor wish to take control again
  Instructor say "I have control"
  Student removes hand and feet from controls

Simple Routine : You have contro
I have control.

Following through

When your instructor is demonstrating an escercise, he may ask you to follow through. This means that you should place your hands and feet lightly on the controls, so that you can feel the control movement made by your instructor without moving the controls yourself.

Lookout

Take the habit of looking outside the aircraft, to look out for other aircraft, see location, changing weather.

Point out to your instructor any aircraft you spot.

Attitude

Instructor refer to Attitude

There are the aircraft attitude, normal straight attitude and a level attitude, nose attitude, nose-high attitude, nose low attitude etc

In this instance, attitude mean the angle of the aircraft in relation to the natural horizon.

VFE

When using flap, ensure the airspeed is below the flaps limiting speed (VFE), that is the airspeed is within the white arc marked on the airspeed indicator.

Do not lower or raise flap if the airspeed is faster than VFE or Allow the airspeed to exceed VFE whilst flap is lowered

The initial effect of the elevator.

[1] — Note the normal attitude
Lookout before beginning the manoeuvre.

[2] — Apply back pressure to the control column.
The aircraft pitches nose up and rises above the horizon

[3] — When the control column is returned to the neutral position,
the pitching stops

[4] — Use the control column to regain the normal attitude
lookout ...

[5] — Apply forward pressure to the control column
The aircraft pitches nose down and the nose falls
below the horizon.

[6] — When the control column is returned to the neutral
position, the pitching stops.

[7] — Use the control column to regain the normal attitude

Remember.

- The aircraft respond to how far and how fast you move the control column.

- When controlling pitch, there is little actual movement of the control column required, it is more a matter of applying forward or rearward pressure.

The Initial effect of the ailerons.

[1] - The normal attitude - note wings level
look out.

[2]. Control column is moved left.
The aircraft Roll left.

[3] - Centralise the control column to stop roll.
Reverse the control column movement to level wing

[4] - The normal attitude
look out

[5] Control Column is moved to the right
The aircraft Rolls to the right

[6] Centralise the control column to stop the roll
Reverse the control column movement to level the wing

[7] The normal attitude

The initial effect of Rudder

[1] – The normal attitude. Choose prominent landmark ahead. Lookout.

[2] – Apply left Rudder. The aircraft yaws to the left.

[3] – Centralise the rudder to stop the yaw. Lookout

[4] – Apply right rudder. The aircraft yaws to the right

[5] Centralise the rudder to stop the yaw

The further effect of aileron

[1] - Note the normal attitude
look out.

[2] - Roll the aircraft to a banked attitude using the aileron

[3] - Centralise the ailerons to stop the roll. Without any use of rudder, the aircraft yaws toward the lower wing.

[4] The spiral descent gradually steepens, with increasing roll, yaw and loss of height.

[5] It is easy to regain the normal attitude ~~us~~ with standard use of controls.

The further effect of Rudder

[1] Note the normal attitude
Look out.

[2] Apply left Rudder.
The aircraft yaw to the left

[3] Without any movement of the control column the aircraft roll in the same direction as yaw.

[4] The Spiral descent gradually steepens, with increasing yaw roll and loss of height.

[5] It is easy to regain ~~control~~ the normal attitude with standard use of the controls.

The effect of differing airspeed

[1] - At the normal cruising airspeed assess the feel and effect of the 3 primary flying controls
Lookout -

[2] Without altering the power setting your instructor will reduce the airspeed by pitching the aircraft to a nose-up attitude.

[3] - At this slower airspeed assess the feel and effect of the 3 main control. They will be less effective and larger control movement are needed.

[4] - Your instructor will now increase the airspeed without changing the power setting by pitching the aircraft to a nose down attitude.

[5] - At this faster airspeed, assess the feel and effect of the 3 primary flying controls. Very effective and only small control movement are needed.

[6] Back at normal cruising airspeed again reassess the normal feel and effectiveness of the 3 primary control

The effect of propeller slipstream

[1] - At the normal cruising power setting and airspeed, note the feel and effect on the 3 P.C
Look out

[2] - Your instructor will increase the power but maintain the normal cruising speed.

[3] Note the more effective feel of the rudder and elevator. The ailerons feel the same as they are outside the slipstream

[4] - Your instructor will reduce the power but maintain the normal cruising airspeed.

[5] The elevators and rudder are less effective. The ailerons retain the same effectiveness.

[6] The aircraft is returned to the normal power setting and attitude

Note Aircraft with high tailplane or T tail - such as Piper Tomahawk - have the elevator largely outside the propeller slipstream

The effect of differing power setting.

[1]. With the normal cruise power setting and a normal attitude, a properly trimmed aircraft can fly hand off. Look out.

[2] The power is increased without any other control movement the aircraft pitch nose up and yaw to the left

[3] The power is returned to the normal cruise setting and the control can be used to return to the normal attitude. Lookout.

[4] The power is reduced. Without any other control movement the aircraft pitches nose down and yaw to the right

[5] The power is returned to the normal cruise setting and the control can be used to return to the normal attitude.

Note: Where the aircraft has a propeller rotating to the left. (anti-clockwise) The yawing movement are reversed.

The effect of elevator trim

[1.] When properly trimmed, the aircraft maintains its attitude without the pilot need to use undue control force

[2] As the elevator trim wheel is used to trim the a/craft nose down, the pilot has to use an increasingly strong pull on the control column to maintain the attitude

[3] By trimming nose up, the pilot can remove the pressure on the control column.

[4] if the trim wheel is trimmed further nose up the pilot has to use an increasingly strong push on the control column to maintain the same attitude

[5] By trimming nose down, the pilot can remove the pressure on the control column

The effects of flaps

[1] - Note normal attitude
Lookout

[2] Lower the initial stage of flap. Depending on aircraft type, the aircraft may pitch nose up or nose down. Airspeed will reduce slightly.

[3] As more flap is lowered most aircraft will pitch nose down and airspeed will reduce further.

[4] As flap is raised, airspeed will increase and the aircraft should pitch back to the normal attitude.

Note - Flaps are normally operated in stages not in a continuous movement.

Taxying Exercise n°5

Here to manoeuvre the aircraft safely on the ground. You learn the check and procedures carried out while taxing, Air Trafic Control (ATC) procedures and signal. Understand the emergency procedures to be used in the event of a steering or brake failures.

Background Briefing

- Pre Taxying checks
- Effect of Inertia
- Engine Handling
- Control of direction
- Parking Area Procedures and Taxying in Confined Spaces
- Effect of Wind and use of the Flying Controls
- Effect of ground surfaces
- Apron & Manoeuvring Area Markings
- Marshalling Signals
- ATC Light Signal
- Right of Way on the ground
- Rudder Check
- Instrument check

Pre Taxying Checks

The ~~Pre~~ taxying checks are normally done with reference to the aircraft check list. Depending on the airfield, it may be necessary to obtain ATC clearance by radio before to taxy. You must take a good look around Before starting taxy in case your exit path has become obstructed since you did your pre-flight check. If in any doubt do not taxy but close down the engine and check for yourself

Effect of Inertia

An increase in power is required to get the aircraft moving, particularly on grass surface. Much less power is needed once the aircraft is moving. Your instructor will demonstrate the safe taxying speed, which varies according to the ground and prevailing wind. When taxying be aware that a change in speed or direction will have to be anticipated because it is necessary to overcome the inertia of the aircraft which want to continue in the original direction at the original speed.

A high power setting may be needed to overcome the inertia of a stationary aircraft and get it moving. Once on the move, power is reduced to prevent the aircraft accelerating to an unsafe taxying speed.

Engine Handling

The engine power setting, adjusted by the throttle, is the primary means of controlling speed whilst taxying. To help the pilot make smooth throttle movement, the throttle friction controls is set loose when taxying. When slowing or stopping the aircraft, the throttle should be closed first and the brakes applied after.

The carburettor heat is normally kept at "cold". The reason for this is that the air inlet used when hot air selected is unfiltered and so any debris grass etc can enter the engine, increasing engine wear.

The Pilot must monitor the engine temperatures carefully especially in hot weather. Most light aircraft engines are air-cooled and so rely on a good measure of airflow to remain at the correct operating temperature

The aircraft checklist will specify an RPM setting to be used when the aircraft stationary with the engine running. The engine is not left to idle on a closed throttle because this causes the spark plugs to "foul up"

Control of Direction.

Most light aircraft are fitted with a nosewheel, direction on the ground is controlled through the rudder pedals, which are linked to it directly or via springs. A nosewheel aircraft has the centre of gravity ahead of the main wheels (otherwise it would tip on its tail.) which makes the aircraft directionally stable when taxying. This turn force is supplied by the rudder which are applied in the direction of the turn and the pressure maintained during the turn, otherwise the aircraft straighten out again.

Where an aircraft is fitted with differential braking (most are), it is possible to assist the turn by applying the brakes to the left or right wheel only. This will give a tighter than using nosewheel steering alone

Where the rudder pedals are fitted with toe brake the ~~lower~~ half of the pedals control the rudder (and nose wheel steering on most aircraft). The upper half of the pedal - toe brakes - control braking

Some nosewheel aircraft have no linkage between the rudder pedals and the nosewheel, and the nosewheel is completely free castoring. These aircraft are still controlled through the effect of the rudder, but much more differential braking is required to control direction, especially when taxying with a crosswind!

Parking Area Procedures and Taxying in Confined Space.

Great care must be taken when taxying around other aircraft with an engine(s) running. The propeller slipstream of even a light aircraft can damage the controls of another aircraft behind and the jet blast from an airliner starting to taxy can reach ~~up~~ to 80 mph up to 120 ft behind it.

When taxying in a confined space consider the size of the aircraft in terms of wingspan and the length of aircraft behind you. A small change in direction can cause a large movement of the wingtips and tail unit.

When using differential braking to turn, extra power may be needed to keep the aircraft moving. Be aware of the effect of the extra propeller slipstream may have behind your aircraft. Taxy slowly but avoid ~~riding~~ the brakes continually since this will make them overheat and fade. Never use the power against the brakes while taxying. Avoid turning around a locked wheel because this will cause serious damage to the tyre. If you have any doubt about the clearance between your aircraft and an obstruction, do not hesitate to ask for assistance or shut down the engine and check yourself

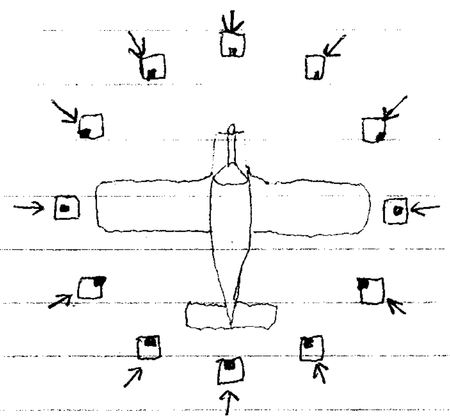
Effect of wind and use of Flying Control.

Light winds have little effect on an aircraft taxying. If the wind is stronger control of the aircraft's speed and direction may become more difficult. A wind blowing from one side (a crosswind) will encourage the aircraft to "weathercock" in the wind, as the wind striking the side of the fin cause the aircraft to pivot around its centre of gravity

The pilot will need to use the rudder pedal and possibly differential braking to prevent the aircraft weathercocking into wind and away from the desired taxying direction.
Control of the aircraft will be greatly aided by the correct use of the flying controls with respect to the wind direction relative to the aircraft.

Used properly, the correct control position will prevent the lifting the "up-wind" wing. This possibility is a particular danger when the aircraft is experiencing a quartering rear tailwind. In strong winds reduce taxying speed and make all turns slowly. Turning away from a crosswind - for turning left when there is a crosswind from the right - may be difficult as the aircraft will be trying to weathercock back into wind. Exercise extreme caution if the wind speed exceeds half the aircraft's stalling speed. Better still avoid taxying until the wind speed has reduced.

Recommended control position.



Effect of ground surface.

The slope and type of ground surface will have a marked effect on the controls of the aircraft whilst taxying.

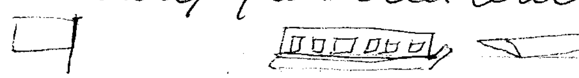
A downslope increases taxying speed so less power is required while taxying upslope requires more power. Anticipate these effect to maintain a consistent taxying speed.

Taxying on hard surfaces requires less power than taxying on a grass surface. Avoid long grass, which may hide obstruction or holes. Try to avoid gravel or loose stones which can cause damage to the propeller and airframe especially at high power setting

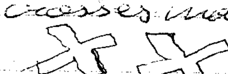
When crossing from one surface type to another (e.g concrete to grass) the aircraft should be positioned to cross at an angle of about 45° moving as slowly as possible and using the minimum power required to keep moving. These actions will minimise stress on the undercarriage and avoid the nose pitching up and down with the consequent risk of the propeller striking the ground.

Apron and Manoeuvring Area Marking.

Orange / white marker ~~hand~~ board or flags are placed at the boundary of an area where it is unsafe to taxy.



Two or more white crosses mark a disused taxiway or runway



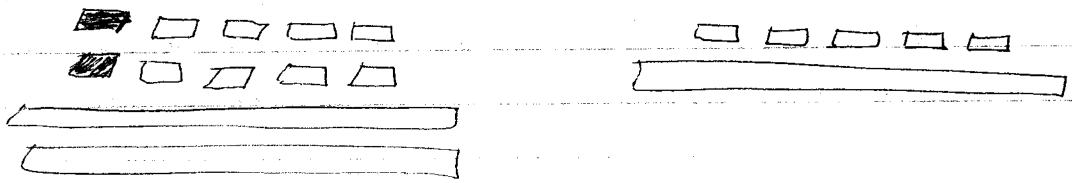
A marker board with two digit identifies a runway

24 (runway 24)

Taxiways and holding point are identified with a ~~large~~ letter at large airfiel

B 24 (holding point B (bravo) for runway 24.

The holding point for a runway may have these taxiway marking. The line can be single or double



A Black C on a yellow square indicates the point to which visiting pilot should report on arrival

Marshalling Signal

You may be given marshalling signal to a parking bay at the end of a flight

This bay : both arm up straight above head.

Move ahead : arm move up & down like bird

Turn left : right arm down, left arm up & down

Turn Right : left arm down, right arm up & down

Stop : cross arm above ahead in X

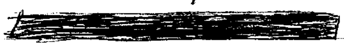
Stop engine : military salut.

Marshalling finished : ~~arm~~ right arm brake like L

ATC Light Signal

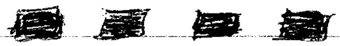
It is unlikely that you will see light signal being used except in the event of a radio failure. The principal light signal to an aircraft on the ground are.

Steady Red



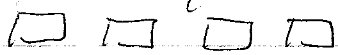
Stop.

Green Flashes



Authorised to taxi at pilot's discretion.

White flashes



Return to starting point on aerodrome.

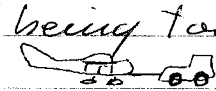
Right of Way on the Ground

There are certain rules concerning right of way and priority of traffic on the ground.
Ultimately it is the pilot responsibility to avoid collision

Order of Priorities on the ground.

-1- Aircraft landing and taking off.

-2- Aircraft being Towed

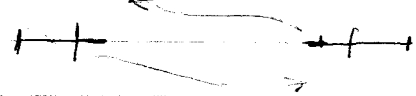


-3- Aircraft Taxiing

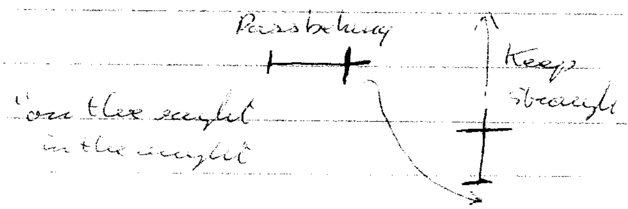
-4- Vehicles and Pedestrian

When aircraft with the same priority are near each other they shall avoid collision:-

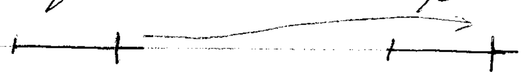
- where 2 aircraft are approaching head on, each aircraft should go to the right



- where 2 aircraft are converging, the aircraft on the right has right of way on the right, in the right.



- An ~~overtaking~~ aircraft overtaking another on the ground should go to the left



Rudder Check

On aircraft which have rudder pedal linked directly to the nosewheel, it is not possible to check freedom of rudder movement when the aircraft is stationary. It can be done when taxying. The aircraft must be clear of other aircraft and obstruction and have an area wide enough to allow full rudder deflection to be applied. The aircraft should only be moving slowly when this check is carried out. Differential braking should not be used during the rudder check.

Instrument Checks

When turning during taxying. four of the flight instrument can be checked. Your instructor will tell you how. The Turn Indicator (or turn coordinator) including the balance ball. The Attitude Indicator (or artificial horizon). The heading indicator (direction indicator). These are checked in a left and right hand turn...

Flight exercise n° 5 Taxying

Purpose

To manoeuvre the aircraft safely on the ground

Airmanship

Lookout

Before moving off always check that the aircraft will be able to manoeuvre safely. Maintain a good look whilst taxying - especially when near runways ~~active~~ or not. Always visually check before crossing or entering a runway even after you have received ATC clearance. Always lookout before changing direction

ATC liaison

At an airfield with an Air Traffic Service Unit (ATSU) obtain taxying instructions before beginning to taxy. Have an airfield chart at hand for orientation, do not hesitate to ask for confirmation or help.

Brake check

Check the brakes in the first few feet of taxying and give your instructor the opportunity to check the operation of the brake. It should be checked also when entering a parking are or a ~~ff~~ confined space

Moving off.

[1] - Look out before moving off.

[2] - Close the Throttle and release parking brake.

[3] - Increase power gradually until the aircraft move forward.

[4] - Close the throttle and test the brakes with 5 to 10 metre of moving off.

[5] Use power to regulate taxying speed less power is used once moving.

Control of Direction on the ground

[1] Look out before Turning.

[2] When left rudder pedal is applied, the aircraft turn to the left

[3] When the rudder pedal are centralised the aircraft stop turning

[4] Look out before Turning

[5] When right rudder pedal is applied, the aircraft turn to the right

[6] When the rudder pedal are centralised, the aircraft straightens out.

Note: When an aircraft is fitted with a free castering nosewheel, opposite rudder and opposite differential braking may be required to straighten the nosewheel and stop turn.

Remember. The aircraft respond to how far and fast you move the controls

Use of Differential Braking.

[1] Lookout before turning

[2] - Turn to the left using left rudder

[3] Use the left brake to **tighten** the turn and reduce the turning circle

[4] Centralise the rudder pedal and release the brake to stop the turn.

[5] Use right rudder and brake to return to the original heading

Note: When an aircraft is fitted with a free-castoring nosewheel, **opposite** rudder and opposite differential braking may be required to straighten out of a turn.

Stopping

[1] Maintain a good lookout, anticipate braking distance.

[2] To stop, close the throttle, then apply the brake evenly

[3] Once at rest, set the parking brake and adjust throttle to the recommended RPM.

Note: The aircraft should always be stopped with the nosewheel straight

Taxying Emergencies

Emergencies during taxying are very rare.

Background Briefing.

Steering failure

In the event of a steering failure, the pilot should still have a degree of directional control through the use of the rudder and differential braking (if available).
Stop the aircraft and request assistance.

Brake failure

Very unlikely event, and there is some warning signs.
Steer clear of any obstruction, close throttle and look for an open space to halt the aircraft.
If not possible to avoid the obstruction, shut down the fuel, engine and electrical system and steer to lessen the force of the impact - avoid head on collision.

Emergency Stop

If an emergency stop is necessary, close the throttle and apply the brakes evenly hard enough to stop the aircraft without locking the main wheels.
Taxying fast with a strong tailwind, on a slippery surface (ie wet grass, slush, ice), down a slope or through standing water will increase the braking distance and increase the possibility of one main wheel locking under heavy braking.