

**LEADING
CADET**

 **ROYAL
AIR FORCE**
AIR CADETS
the next generation

PRINCIPLES
OF FLIGHT

CADET NOTEBOOK



NAME:

SQN:

USING THIS NOTEBOOK

This notebook is for cadets who wish to complete the Leading Cadet *Principles of Flight* topic.

It has been designed for those who are studying for this topic without an instructor, but can also be used in conjunction with instructor led training sessions.

The red **pass** sections prepare you for the exam questions you might encounter.

The blue **develop** sections are optional but can help you increase your interest and understanding of the topic.

Use the training material found on Utlearn to help you answer each question. You can also use textbooks or the Internet to help you.

When you are ready your squadron staff will register you for your Utlearn exam.



LEARNING CHECKLIST

When you have completed a section you can tick it off here.

LO1: Understand the principles of flight.		✓
PASS	P1: Identify factors that affect the creation of lift in an aircraft in flight.	
PASS	P2: Describe how thrust, drag, weight & lift affect aircraft in flight.	
DEVELOP	Explain ways in which a 'swing wing' performance changes with wing geometry.	
DEVELOP	Explain how lift, weight, drag & thrust may change whilst an aeroplane is in flight.	

LO2: Understand how the stability and manoeuvrability of an aeroplane are controlled.		✓
PASS	P3: Explain how stability of an aeroplane is maintained.	
PASS	P4: Explain factors which cause an aeroplane to stall.	
PASS	P5: Explain how aeroplanes are designed to provide manoeuvrability.	
PASS	P6: Describe how aircraft and controls can be used for manoeuvrability.	
DEVELOP	Explain how flaps, slats and airbrakes are used by aircraft during landing.	
DEVELOP	Analyse the effect of manoeuvring at critically low airspeed.	

LO3: Know the principles of flight and control for gliders.		✓
PASS	P7: Identify forces acting on a glider in flight.	

LO4: Know the principles of flight and control for rotary wing aircraft.		✓
PASS	P8: Identify the features of rotary wing aircraft that enable flight and control.	
DEVELOP	Compare and contrast the principles behind use of helicopter rotor and fixed wing aircraft rudder to manoeuvre aircraft in the yawing plane.	

Completed every activity? Send this booklet to you instructor who will register you for the *Principles of Flight* exam.



LEARNING OUTCOME 1: IDENTIFY FACTORS THAT AFFECT THE CREATION OF LIFT OF AIRCRAFT IN FLIGHT



LO1: IDENTIFY FACTORS THAT AFFECT THE CREATION OF LIFT OF AIRCRAFT IN FLIGHT

P1: Identify factors that affect the creation of lift in an aircraft in flight.

The table below shows six things that can affect the lift of an aircraft in flight. Write a short description of each in the boxes below.

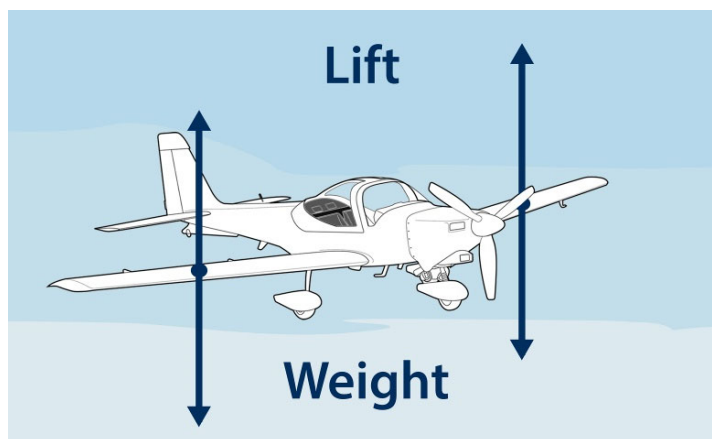
Downwash	Airspeed	Air Density
Angle of Attack	Shape/Area of a Wing	Flaps



LO1: IDENTIFY FACTORS THAT AFFECT THE CREATION OF LIFT OF AIRCRAFT IN FLIGHT

P2: Describe how thrust, drag, weight and lift affect aircraft in flight.

Next to the pictures, describe how lift and weight, thrust and drag affect an aircraft.



Lift and Weight



Thrust and Drag



LO1: IDENTIFY FACTORS THAT AFFECT THE CREATION OF LIFT OF AIRCRAFT IN FLIGHT

FURTHER DEVELOPMENT

Explain in the boxes below how the positions of the wings on a swing wing aircraft change the aircraft's performance.

Wings Forward



Wings Swept



LO1: IDENTIFY FACTORS THAT AFFECT THE CREATION OF LIFT OF AIRCRAFT IN FLIGHT

FURTHER DEVELOPMENT

In each box write a description of how the forces of lift, weight, drag and thrust can change during a flight.

Lift	Weight
Drag	Thrust



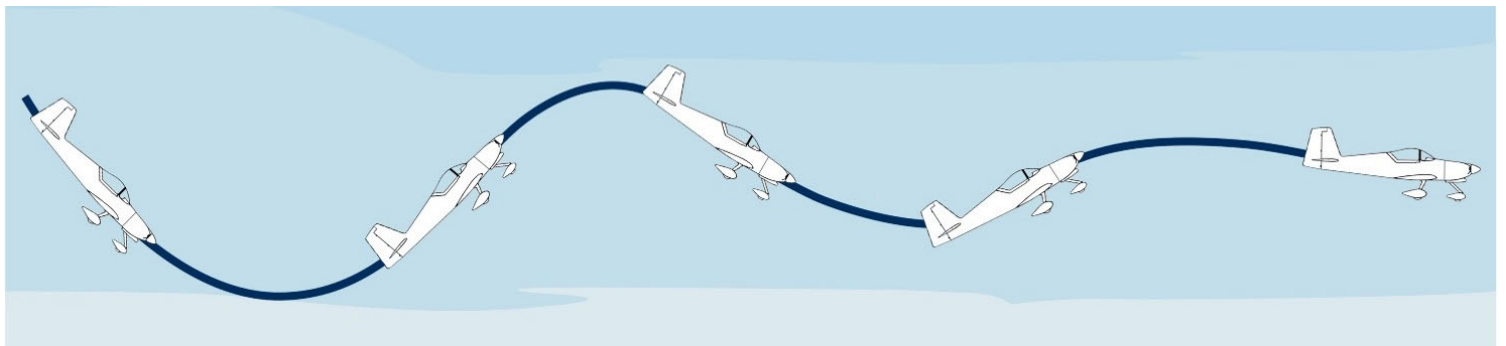
LEARNING OUTCOME 2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

P3: Explain how stability of an aeroplane is maintained.

In the box below explain how an aircraft is kept stable in flight. Refer to counteracting forces and how this keeps the aircraft from climbing/descending, rolling or yawing if the control column is released. Think about **positive** types of stability



What is Static Stability?	What is Dynamic Stability?



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

P4: Explain factors which cause an aeroplane to stall.

Describe why each of the factors below might cause an aircraft to stall.

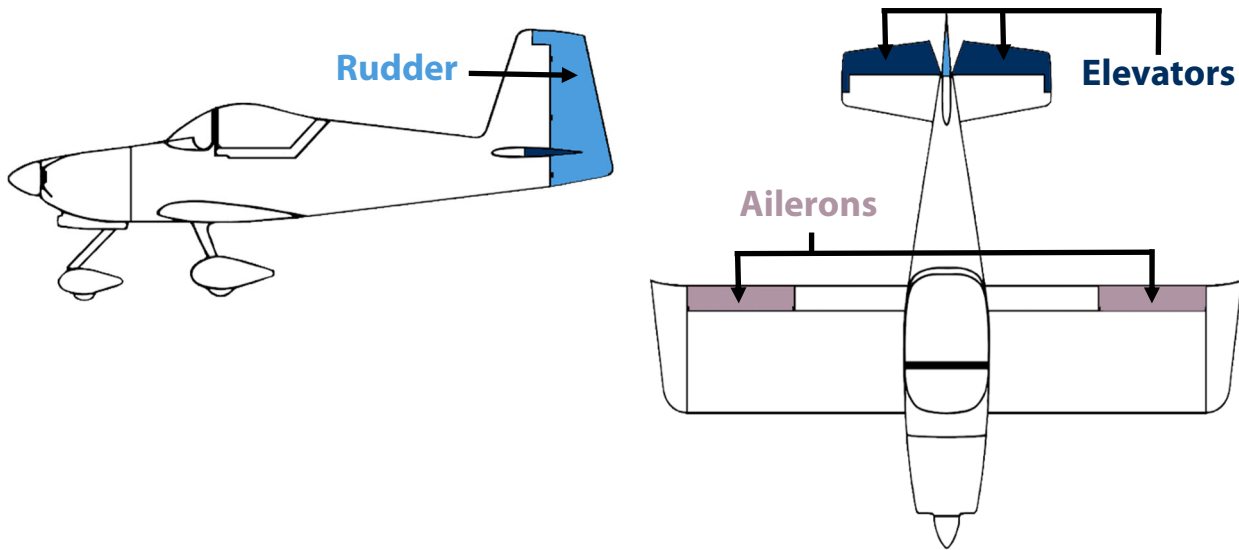
Weight	
Ice and Dirt	
Wing Damage	
Power	
Flaps	
Turning the Aircraft	



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

P5: Explain how aeroplanes are designed to provide manoeuvrability.

In each box below explain how rudder, elevators and ailerons make an aircraft manoeuvrable.



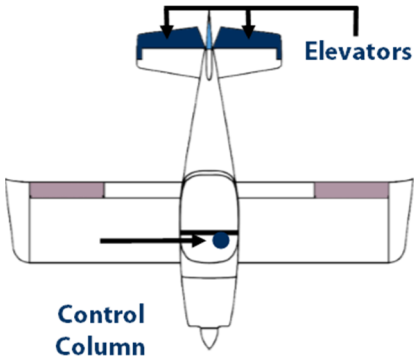
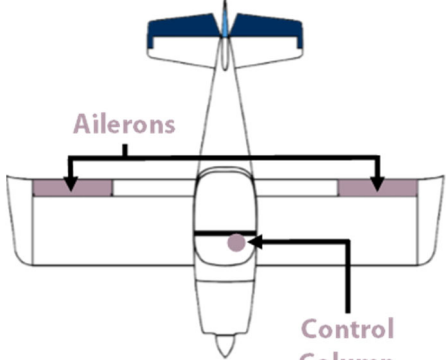
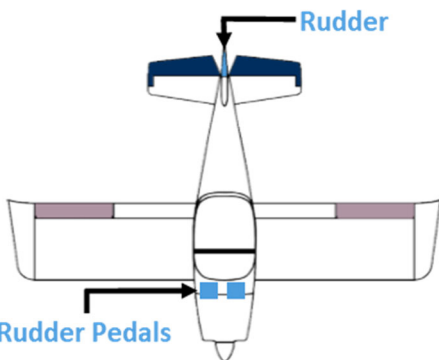
Rudder	Elevators	Ailerons



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

P6: Describe how aircraft controls can be used for manoeuvrability.

Describe how the aircraft pitches, rolls and yaws using the controls. For each movement describe the control movement and what the aircraft does.

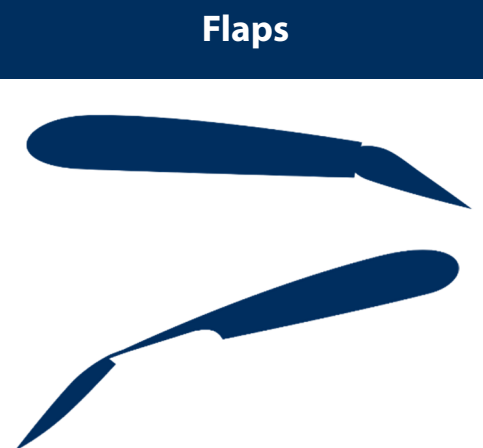
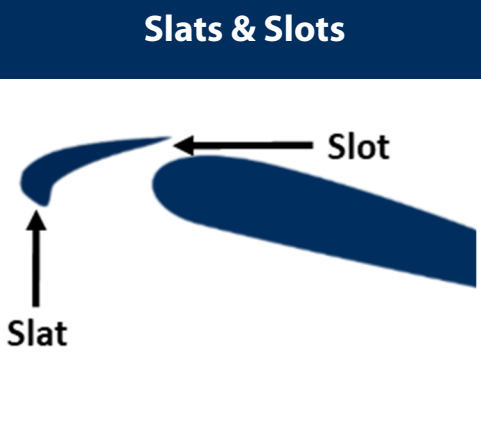

 <p>Elevators</p> <p>Control Column</p>	 <p>Ailerons</p> <p>Control Column</p>	 <p>Rudder</p> <p>Rudder Pedals</p>
Pitch	Roll	Yaw



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

FURTHER DEVELOPMENT

Describe how each wing feature can assist an aircraft's landing.

Flaps	Slats & Slots	Air Brakes
		



LO2: UNDERSTAND HOW THE STABILITY AND MANOEUVRABILITY OF AN AEROPLANE ARE CONTROLLED

FURTHER DEVELOPMENT

Write a paragraph analysing the effects on the aircraft when manoeuvring at a critically low airspeed. (Lift required? Stalling? Handling?)



LEARNING OUTCOME 3: KNOW THE PRINCIPLES OF FLIGHT AND CONTROL FOR GLIDERS



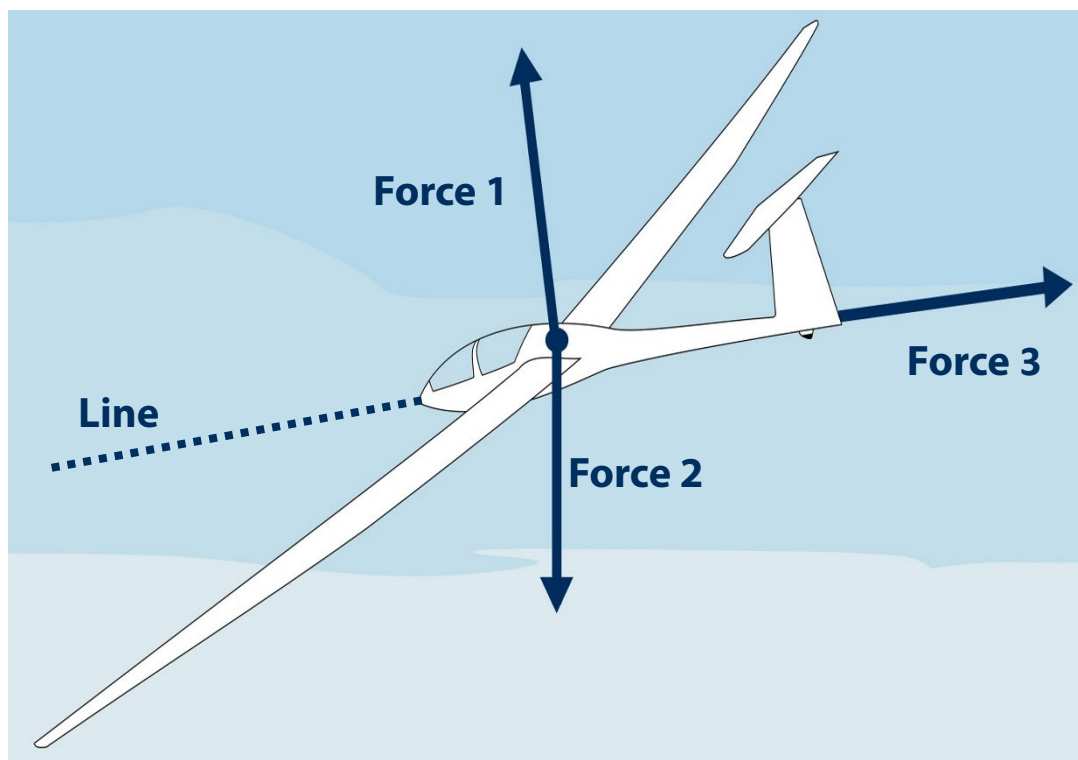
Picture © Mark McEwan, used with permission

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LO3: KNOW THE PRINCIPLES OF FLIGHT AND CONTROL FOR GLIDERS

P7: Identify forces acting on a glider in flight.

Fill in the 3 forces and then the forth line in the table below. In the bottom box describe the difference between the forces acting on a glider and a powered aircraft.



Force 1	Force 2	Force 3	Line

Difference Between Powered Aircraft and Gliders

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LEARNING OUTCOME 4: KNOW THE PRINCIPLES OF FLIGHT AND CONTROL FOR ROTARY WING AIRCRAFT



LO4: KNOW THE PRINCIPLES OF FLIGHT AND CONTROL FOR ROTARY WING AIRCRAFT

P8: Identify the features of rotary wing aircraft that enable flight and control.

Fill in the table below, listing the three main types of helicopter control, the control surface that they affect and what the helicopters subsequent action is.

	Control	Control Surface	Helicopter's Action
1			
2			
3			



LO4: KNOW THE PRINCIPLES OF FLIGHT AND CONTROL FOR ROTARY WING AIRCRAFT

FURTHER DEVELOPMENT

In the boxes below, outline the similarities and differences between a fixed wing aircraft's rudder and a rotary aircraft's tail rotor in the yawing plane.

Similarities	Differences



NOTES

WRITE ANYTHING YOU MIGHT FIND USEFUL IN YOUR EXAM HERE:





ROYAL AIR FORCE **AIR CADETS** the next generation

This booklet was produced by Sgt Jack Evitts
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