Principles of Flight
Principles of Flight

Learning Outcome 4:

Be able to apply the principles of flight and control to gliders
Questions

What happens to Lift when a Wing is Stalled?

a. Lift Increases as Angle of Attack Decreases.
b. Lift Decreases as Angle of Attack Increases.
c. Lift is Greatly Reduced.
d. Lift Remains unchanged.
The Critical Angle of Attack is Generally about?

a. 5°.
b. 15°.
Questions

Which of the following will NOT REDUCE the Stalling Speed?

a. Extra Weight.
b. Larger Wing Area.
c. Flaps Lowered.
d. Flaps Raised.
GLIDING
Gliding

Objectives:
1. List and describe the Forces acting on Glider during balanced flight.
2. State the effect of Wind on the distance travelled over the ground.
3. Explain the effects of Airbrakes on Glide Performance.
Gliding

What are the Forces acting on a Powered Aircraft?

Are these forces in Balance for Straight & Level Flight?
Gliding

What would happen if we had NO Thrust?

What do we need to do to overcome the Drag?
Gliding

Lift

Drag

Weight
Gliding

Drag

Lift

Weight
Gliding Speed

The car can ‘coast’ down the hill with no engine. How?

GRAVITY

Can we use ‘Gravity’ to fly a Glider?
Gliding Speed

A Glider uses Gravity to Descend.
The Airflow over the Wing produces Lift.

How do we Control the Speed?
If the Nose is raised, What will happen?

Lift and Speed reduce.
The Rate of Descent also reduces!
If the Nose is lowered, what will happen?

Lift and Speed increase.
The Rate of Descent also increases!
Gliding

Remember:
If you fly too slowly Lift will be lost and the Glider will Stall.
If you fly too fast the Rate of Descent will be High.
Gliding

How far will a Glider travel?
The flatter the Gliding Angle, the further the distance over the ground. The steeper the Gliding Angle, the shorter the distance over the ground.

What is the BEST Angle to Fly?
Lift/Drag Ratio

\[ C_L \text{ vs } \alpha \]

\[ C_D \text{ vs } \alpha \]
Lift / Drag Ratio

\[ \frac{C_L}{C_D} \]

Usual Angles of flight

Most efficient Angle of attack

Less Lift More Drag
Speed to Fly?

We know the best Angle to fly, but what is the Best Speed to Fly?
Gliding

The Pilot’s Notes will give information on Gliding Speeds.

For Example:

A Viking Glider’s angle is about 1 in 35.

Therefore, from a height of 3,280 ft (1 kilometre),

In Still Air,

It will travel about 35 kilometres.
Effect of Wind

What will happen when flying at the same Airspeed and Angle of Attack?
Effect of Wind

What will happen when flying at the same Airspeed and Angle of Attack?

- Still Air
- Headwind
- Tailwind
Effect of Airbrake

When ‘Opened’ what happens to the Drag?
The Drag Increases.

What Must be done to maintain Airspeed?
Lower the Nose.
Effect of Airbrake
Effect of Airbrake

Airbrake In
Airbrake Out

=Steeper Descent
+Shorter Ground Distance
Airbrakes
Any Questions?
Gliding

Objectives:
1. List and describe the Forces acting on Glider during balanced flight.
2. State the effect of Wind on the distance travelled over the ground.
3. Explain the effects of Airbrakes on Glide Performance.
Name the Forces Acting on a Glider in Normal Flight.

b. Drag, Weight and Thrust.
c. Drag, Weight and Lift.
d. Drag, Thrust and Lift.
Questions

How does a Glider Pilot Increase the Airspeed?

a. Operate the Airbrakes.
b. Lower the Nose by pushing the Stick Forward.
c. Raise the Nose by pulling the Stick Back.
A Viking Glider descends from 1640 ft (0.5 km).
How far over the ground does it Travel (in still air)?

a. 17.5 kms.
b. 35 kms.
When flying into a Headwind, the distance covered over the ground will:

a. Be the same.
b. Decrease.
c. Increase.
d. Take you to Burger King.