

# CLIMBING & DESCENDING

## Climbing & Descending Flight

### Aim

To teach the student how to climb the aeroplane at a given airspeed and power setting. To teach the student how to descend the aeroplane at given airspeeds, rates of descent and power settings.

### Objectives:

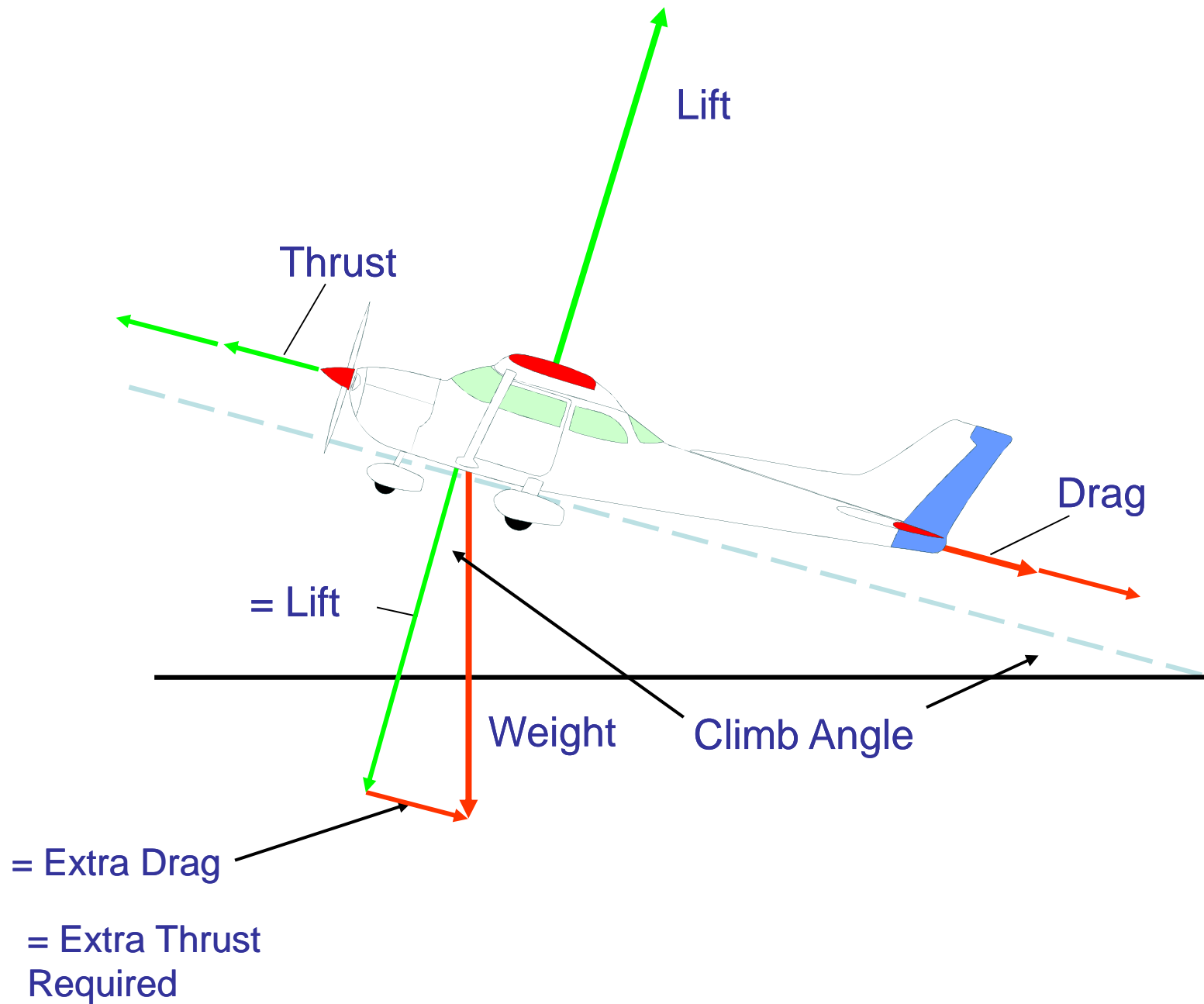
At the end of this briefing the student should be able to....

1. Describe with the aid of a model, the forces acting on an aircraft in a steady, stabilised climb.
2. Using the *flight manual* for the aircraft, determine the airspeeds for-
  - Maximum angle climb ( $V_x$ ), Maximum rate climb ( $V_y$ ), Cruise climb ( $V_{cc}$ )
3. Describe with the aid of the model, the forces acting on an aircraft in a glide.
4. Using the *flight manual* for the Cessna 152 determine the best gliding airspeed.
5. State the effect on climb and glide performance of
  - Flap extension
  - Head and Tail winds
  - Power available

# CLIMBING

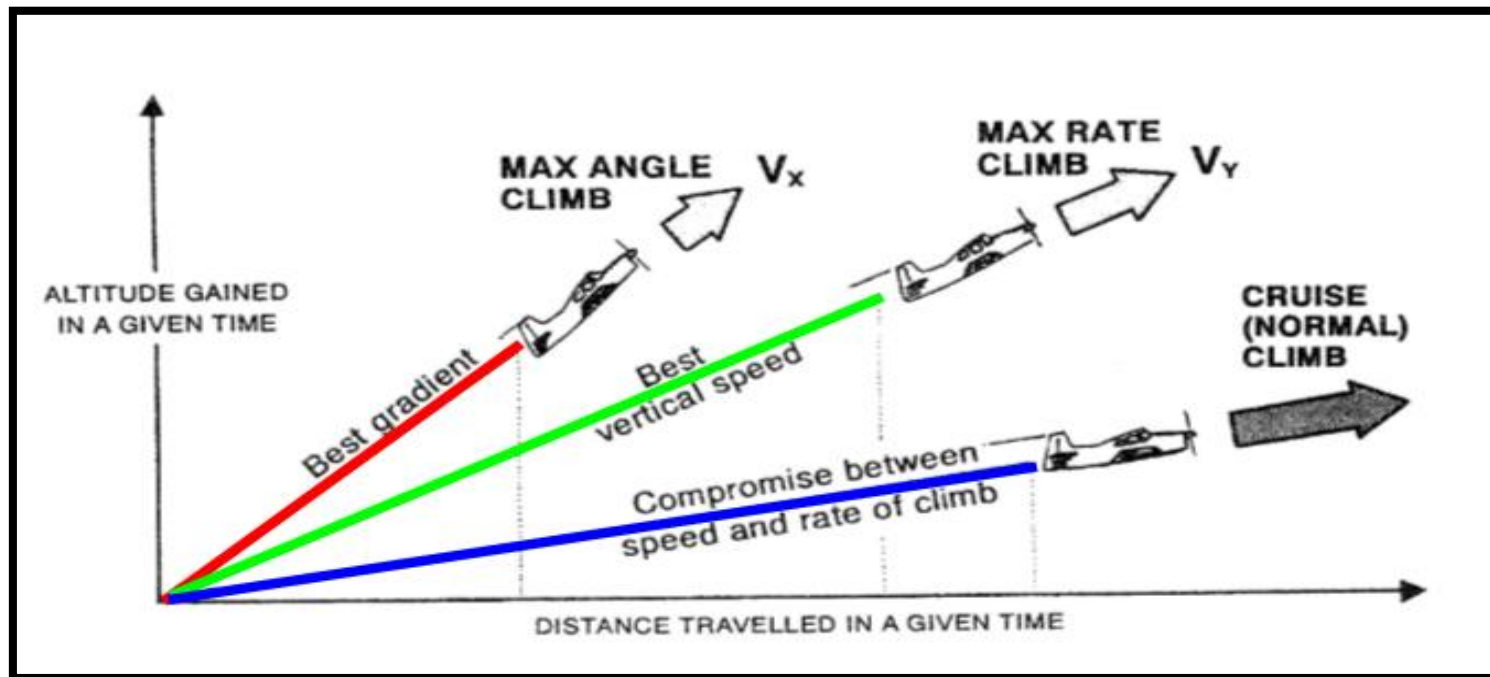


# FORCES IN A STEADY CLIMB AT A CONSTANT AIRSPEED

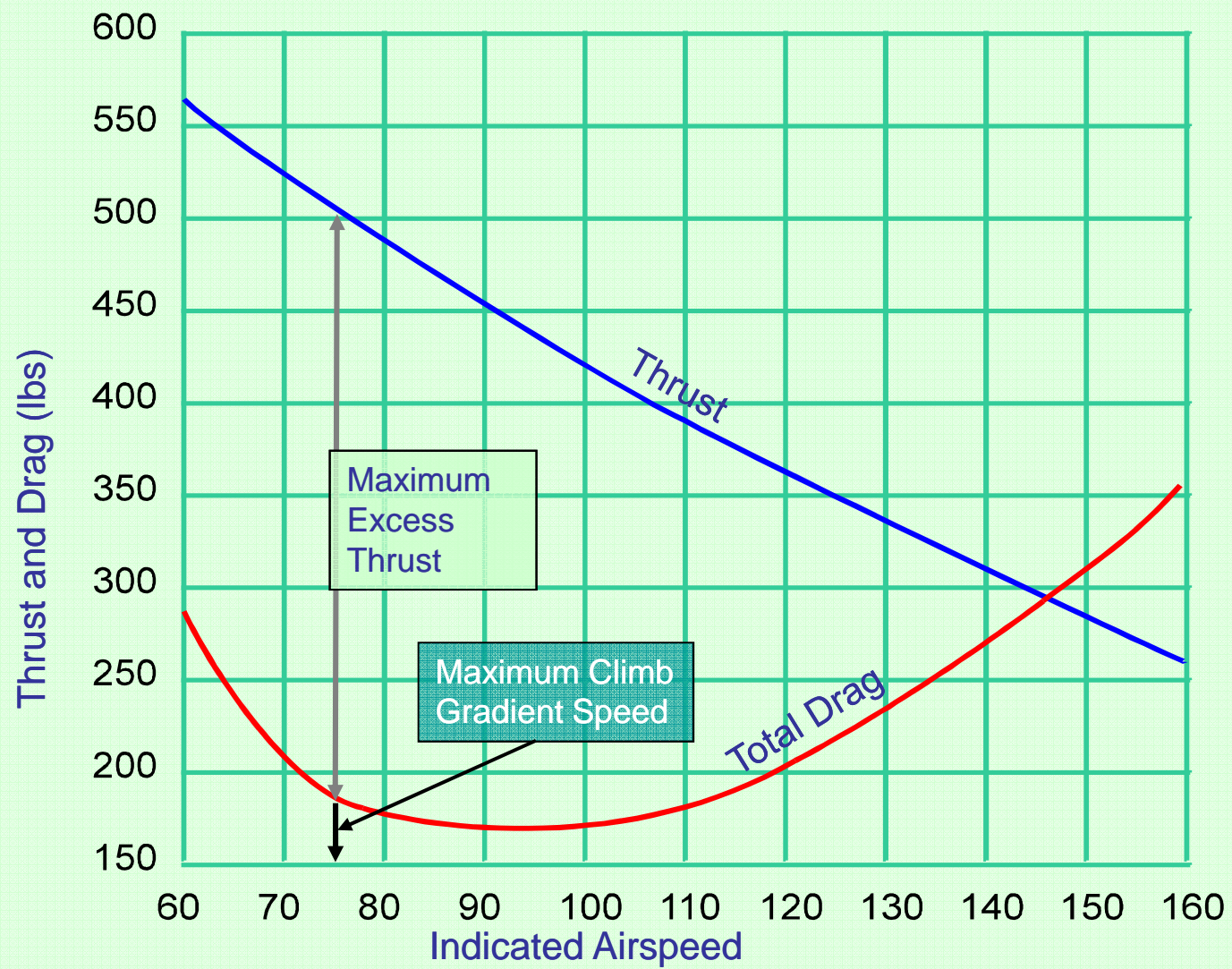


# Climb Types

1. Best rate of climb ( $V_y$ )
2. Best angle of climb ( $V_x$ )
3. Cruise Climb ( $V_{cc}$ )



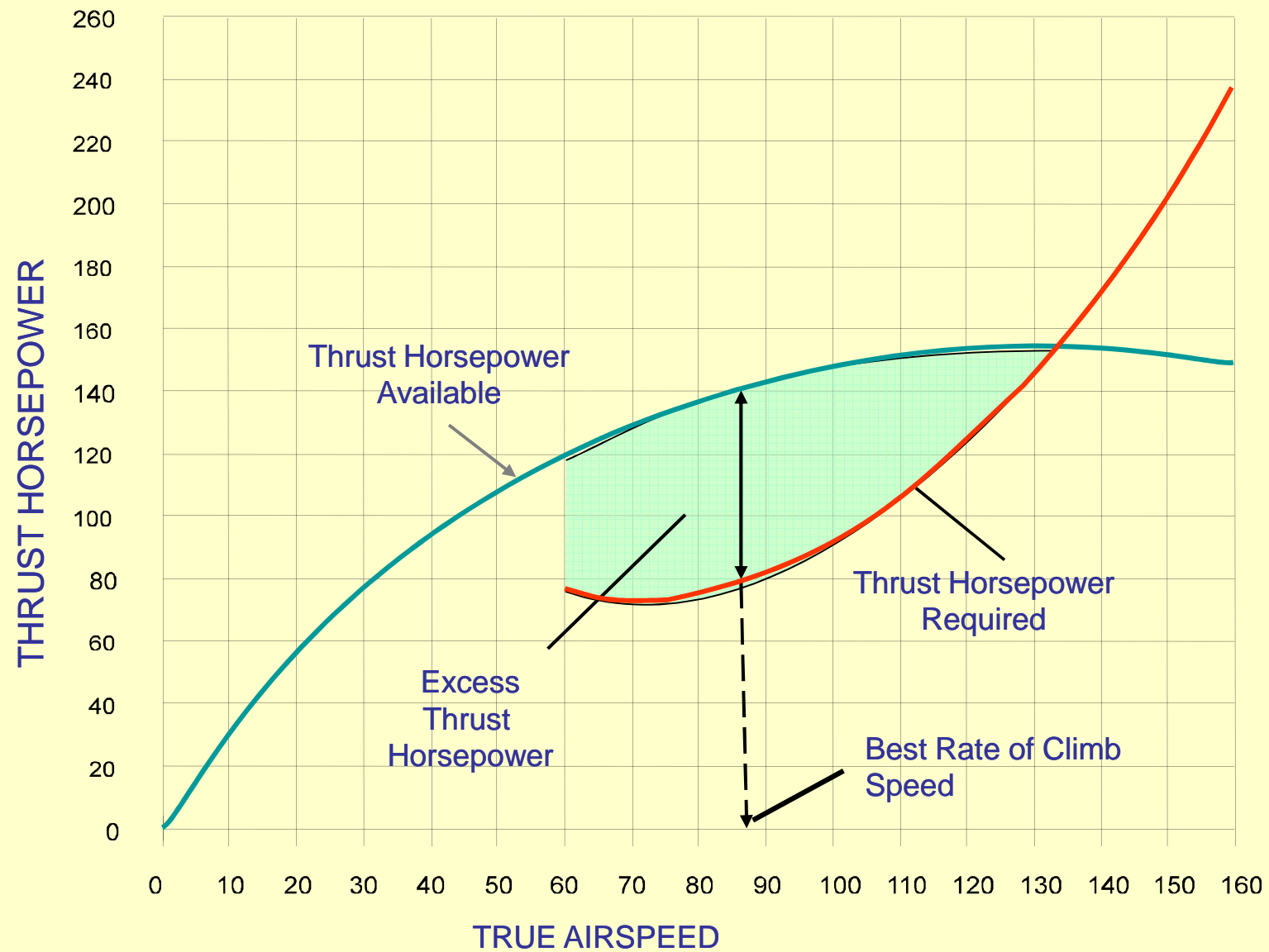
**MAXIMUM ANGLE CLIMB**





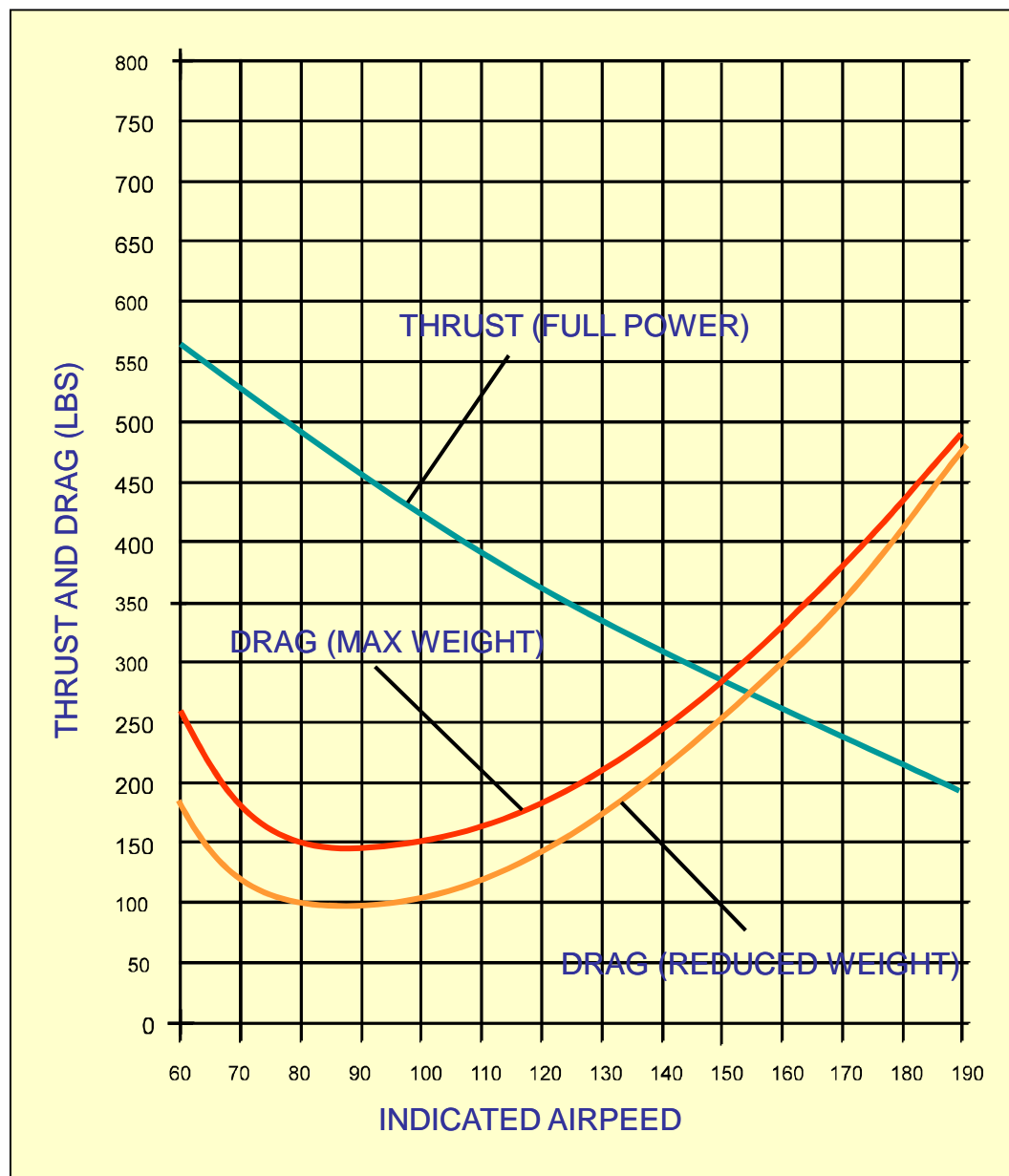
MAXIMUM CLIMB  
GRADIENT IS ACHIEVED AT  
THE IAS WHICH GIVES THE  
GREATEST EXCESS  
THRUST

**MAXIMUM RATE OF CLIMB**



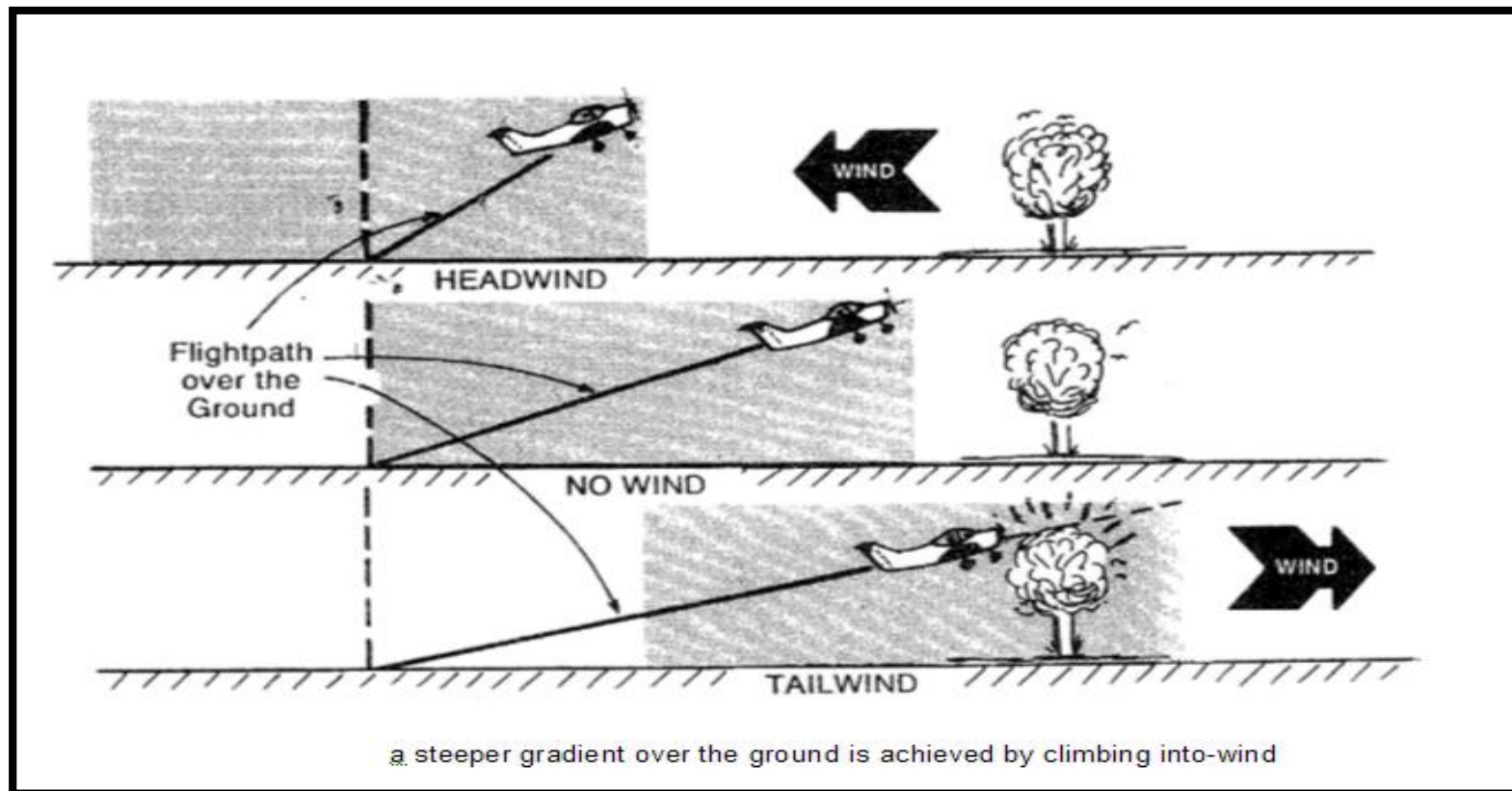
MAXIMUM RATE OF CLIMB IS  
ACHIEVED AT THE IAS  
WHICH GIVES GREATEST  
EXCESS THP

# WEIGHT VARIATIONS



# EFFECT OF WIND ON CLIMB PERFORMANCE

# Effects of Wind

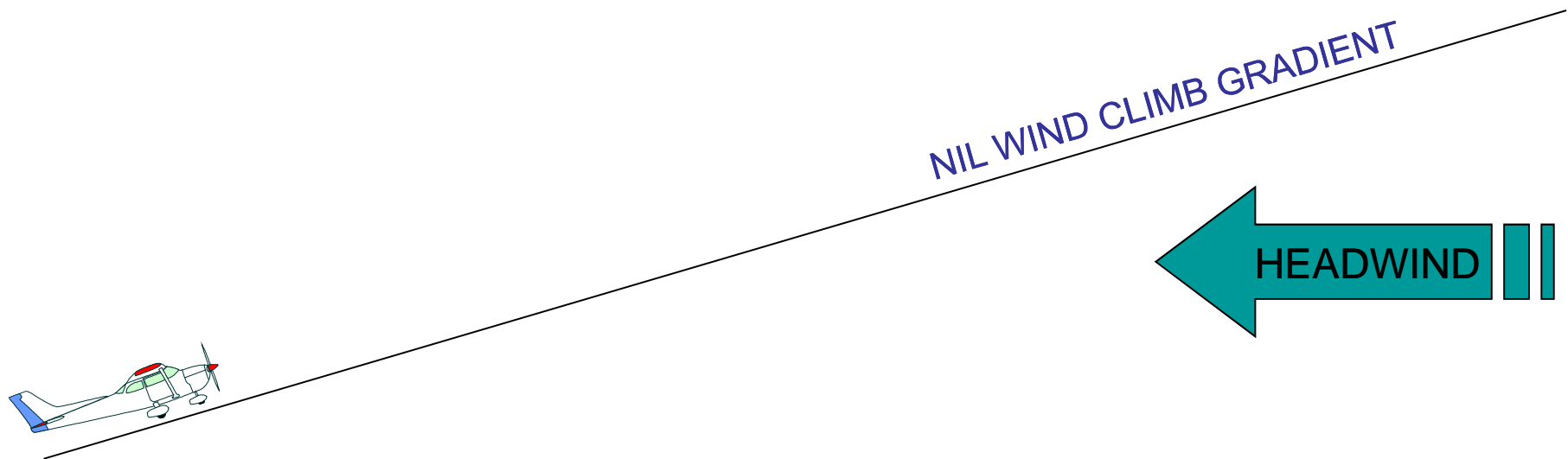


**Headwind** – Gives us a higher angle of climb but a slower ground speed. ROC is unchanged.

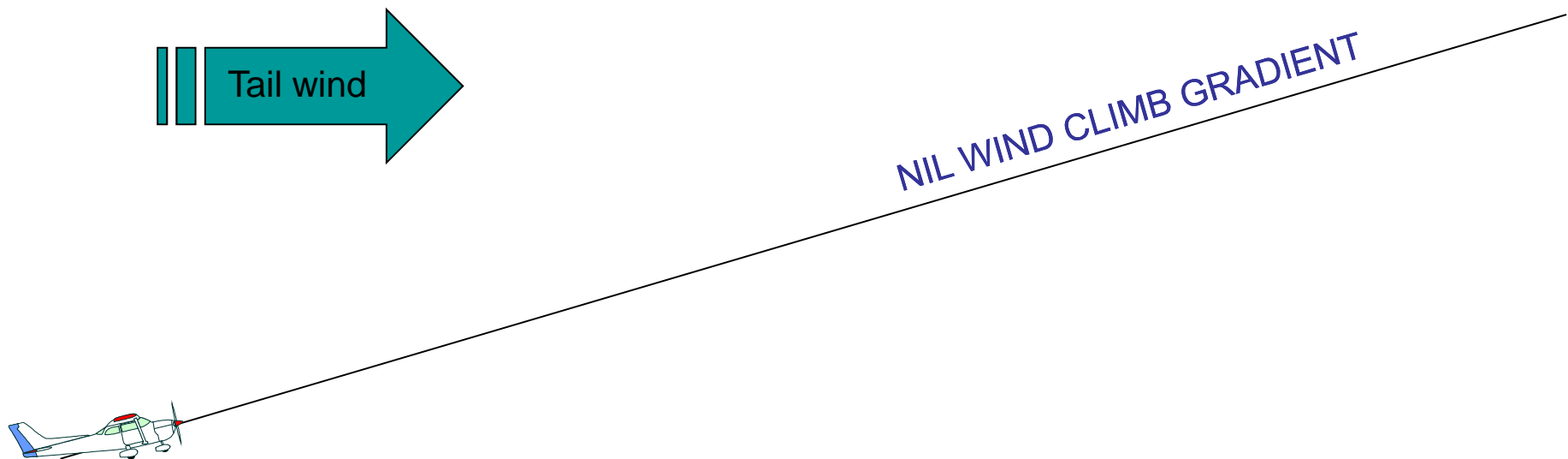
**Tailwind** – Angle of climb is reduced. Ground speed is higher. ROC is unchanged.



## EFFECT OF HEADWIND ON CLIMB GRADIENT



## EFFECT OF TAILWIND ON CLIMB GRADIENT

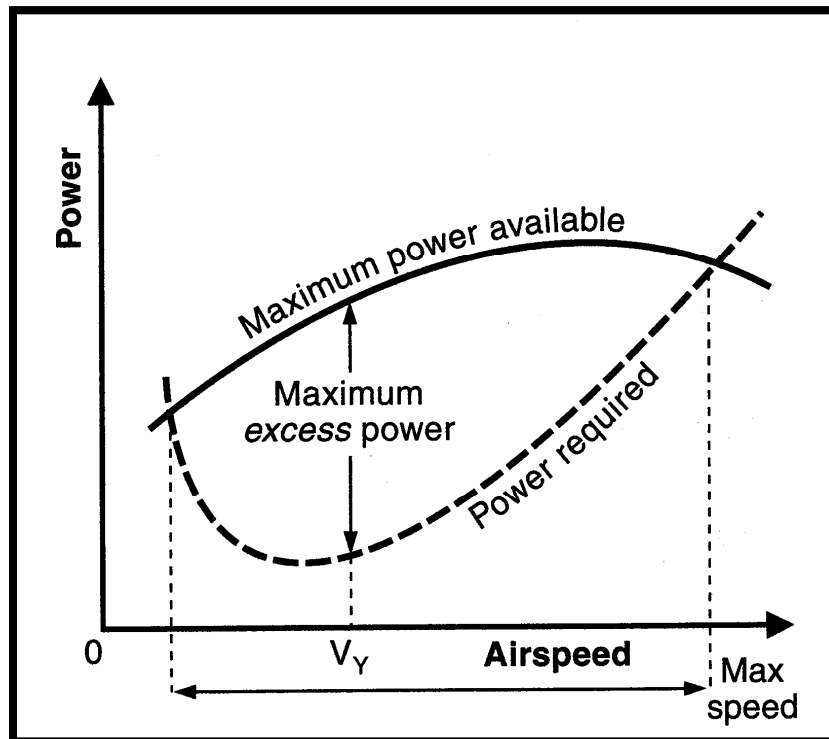


WIND HAS NO EFFECT  
ON RATE OF CLIMB

# Effect of Flap

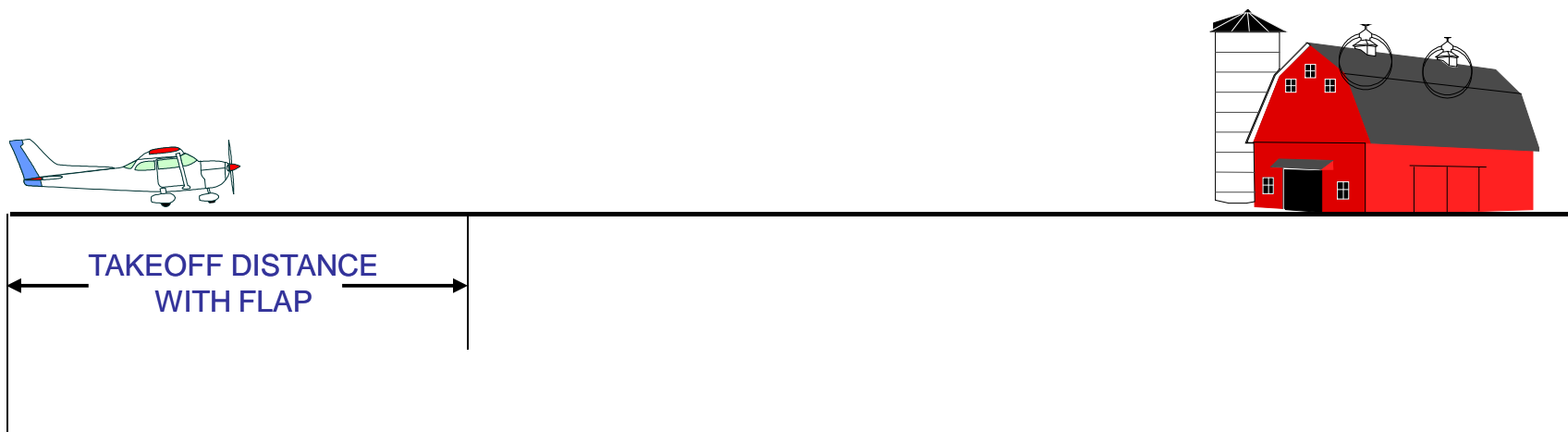
Using flaps increases the lift produced by the wing but also increases the amount of drag.

Increased drag, rate climb is reduced. Angle of climb is also reduced.

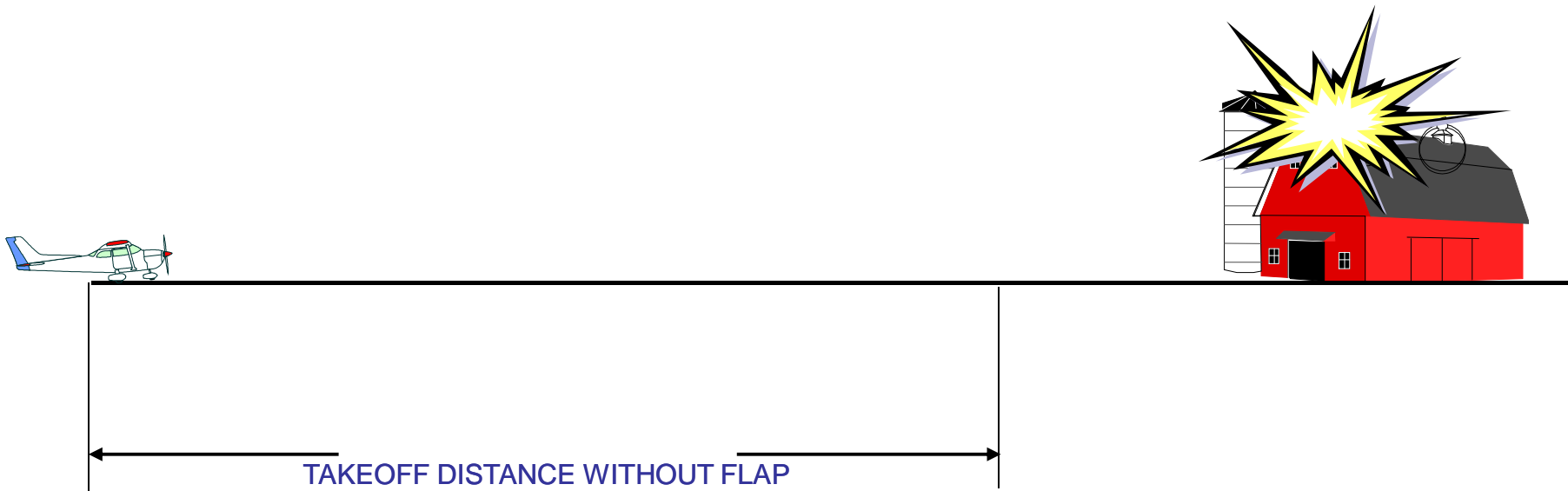


# EFFECT OF FLAP ON CLIMB PERFORMANCE

## EFFECT OF FLAP ON TAKE-OFF

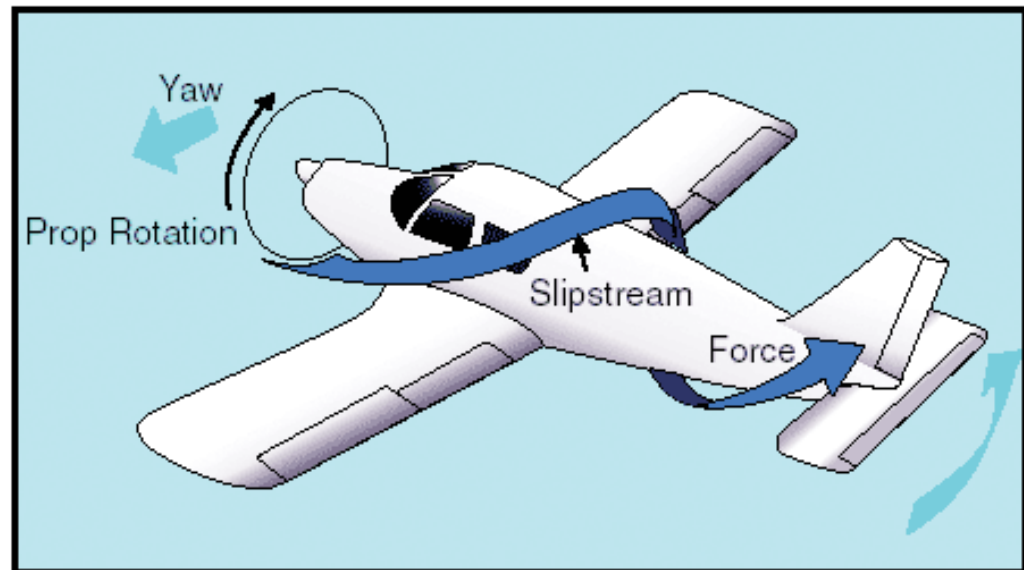
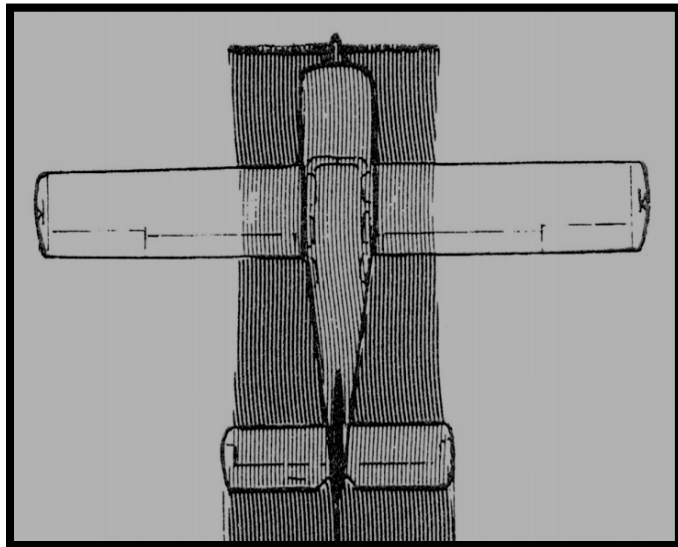


## EFFECT OF FLAP ON TAKE-OFF



# Effect of Slipstream

- Effect of slipstream is more pronounced at high power and low indicated air speed.
- Increased air flow over elevator and rudder so they are more effective.
- Less airflow over ailerons are less effective.
- Right rudder required for this to remain in balance.





# Instruments for Climbing & Descending

Airspeed indicator

Vertical speed indicator

Altimeter

Balance Ball



APPLICATION

# CLIMB ENTRY TECHNIQUE

# Air Exercise- Climbing

## AIRMANSHIP

Lookout

Smooth Control Operation

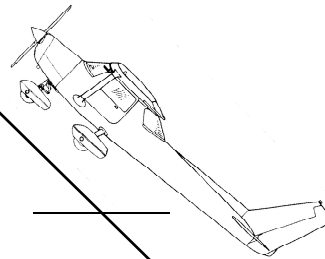
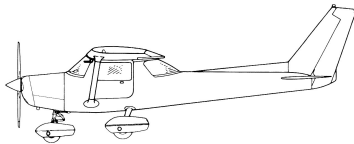
Balance

**A**ttitude

**P**ause

**P**ower

**T**rim



Every 500'

Lower nose

Lookout

Check T & P's

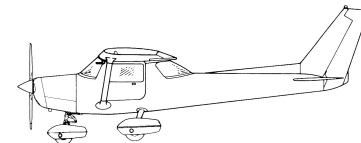
Pick Reference Point

Lookout

**P**ower

**A**ttitude

**T**rim



## Notes-

1. Wings level
2. Balance
3. Airspeed with Attitude

Cruise Climb Vcc - 75Kts





Best Rate  $V_y$  – 67Kts



ATTITUDE - TRIM -  
ATTITUDE - TRIM -  
POWER - TRIM

# Airmanship

- Look out
- Clear the nose every 500 ft
- Checking engine temperatures and pressures
- Handing over and taking over drill



# DESCENDING



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# Types of Descent

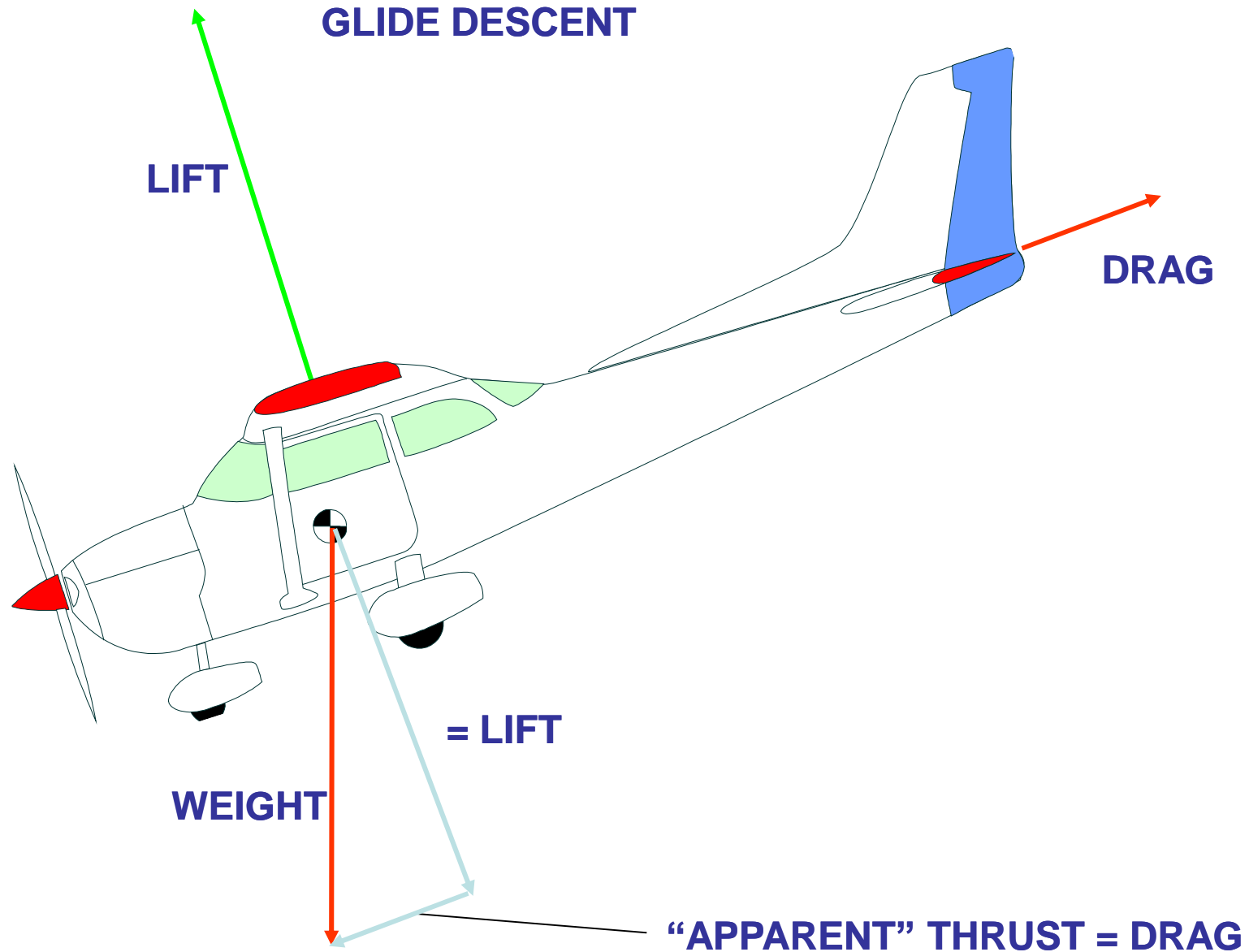
1. Glide Descent – without power

2. Power Assisted Descent

- Aiming point descent
- Cruise Descent

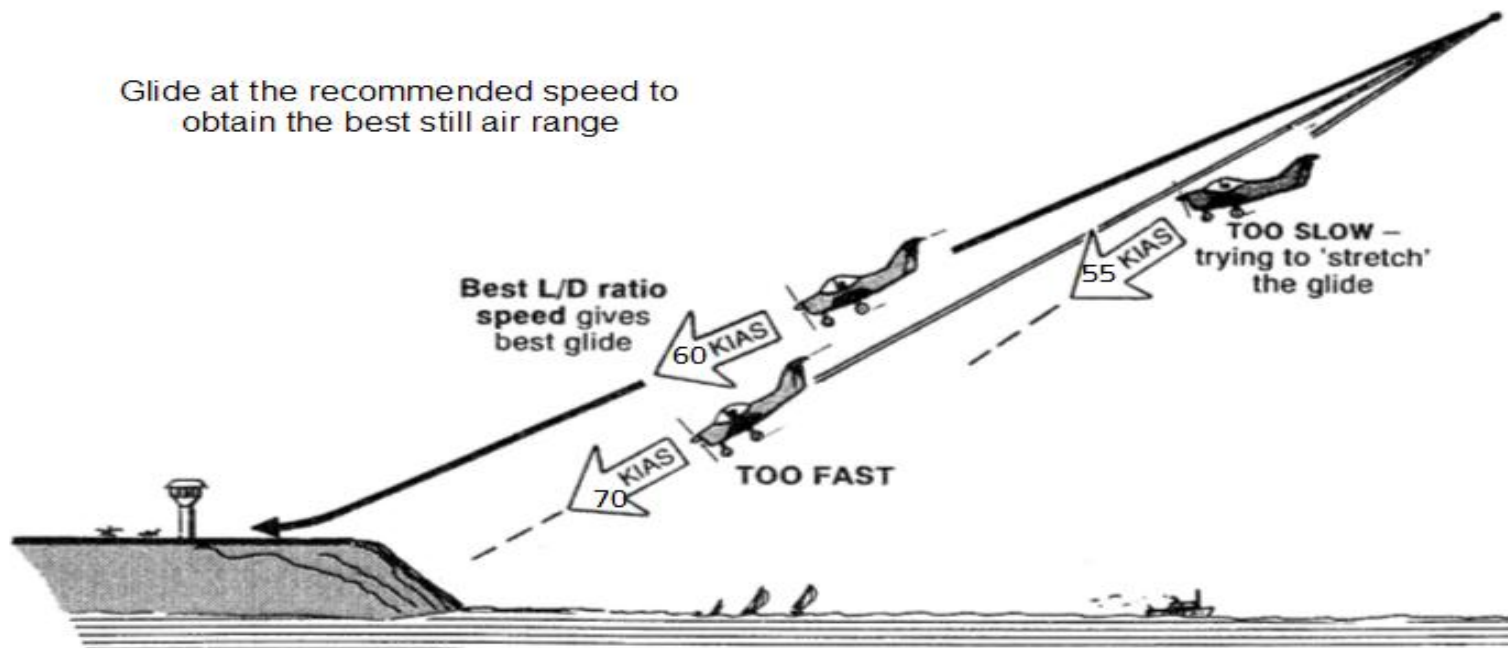
# **FORCES IN A GLIDE DESCENT**

## GLIDE DESCENT



# Effect of Airspeed

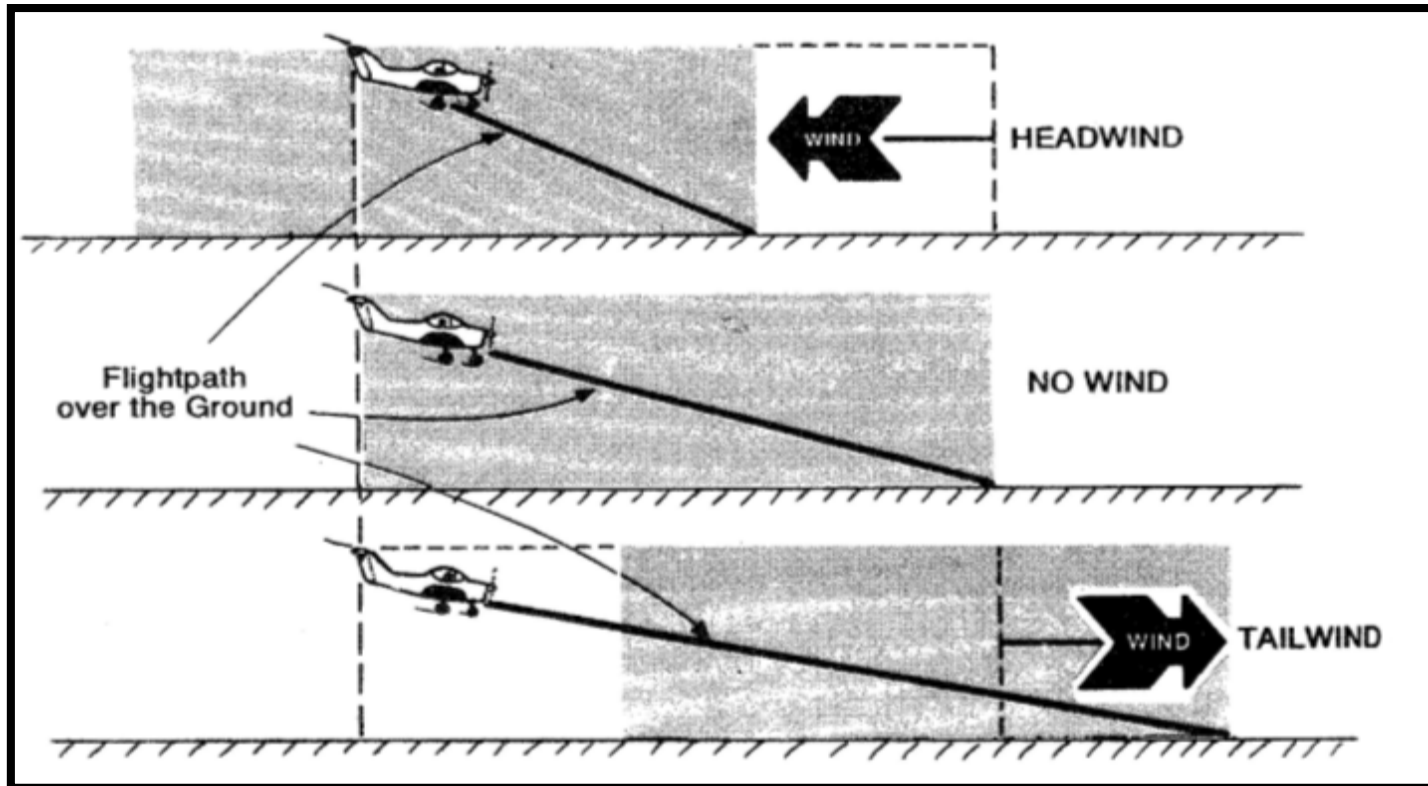
- Changing airspeed will affect the glide performance of the aircraft.
- Increase in speed will reduce the range.
- Decrease in speed will reduce the range.
- Best L/D ratio will give the maximum gliding range.



# Effect of Power

- Power controls rate of descent.
- Attitude controls indicated airspeed.
- Vertical speed indicator gives rate of descent in ft/min.
- Aiming point – attitude controls rate of descent, power controls airspeed.

# Effect of Wind



## **Headwind**

Headwind will steepen the angle but reduce the range.  
The rate of climb is unchanged

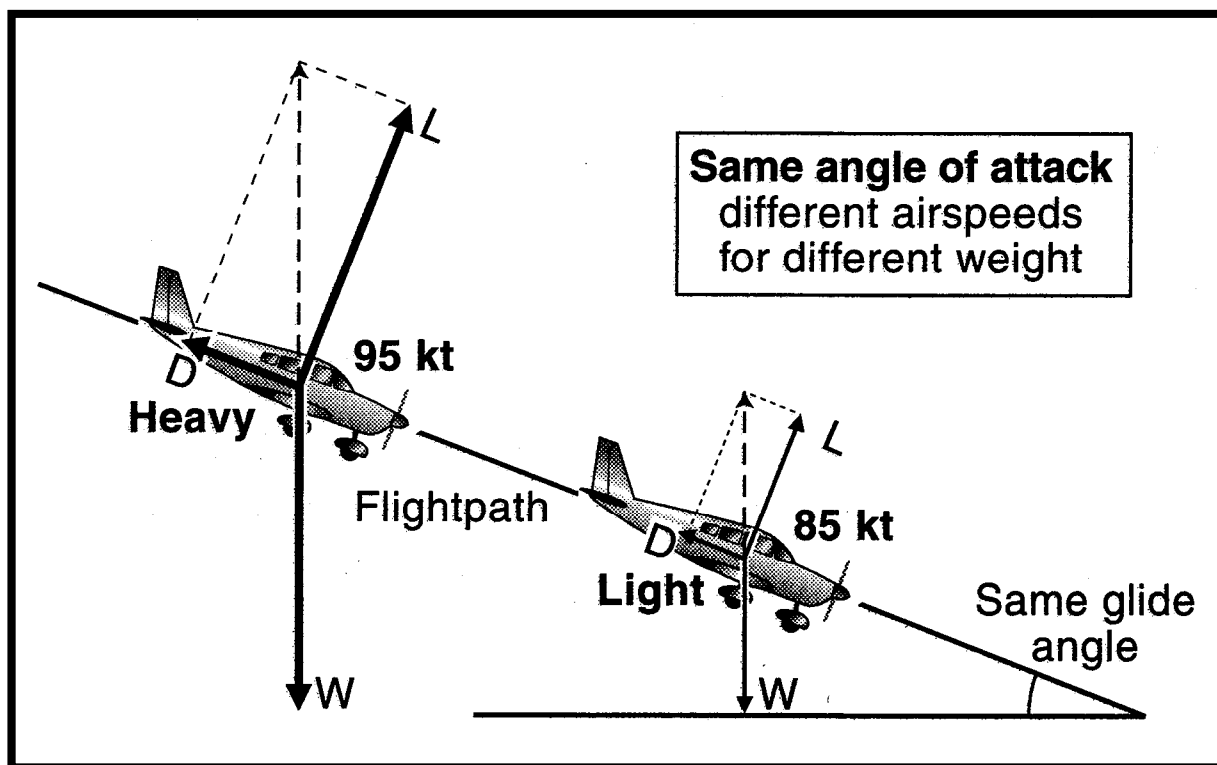
## **Tailwind**

Tailwind will decrease the angle but increase the range.  
The rate of climb is unchanged.



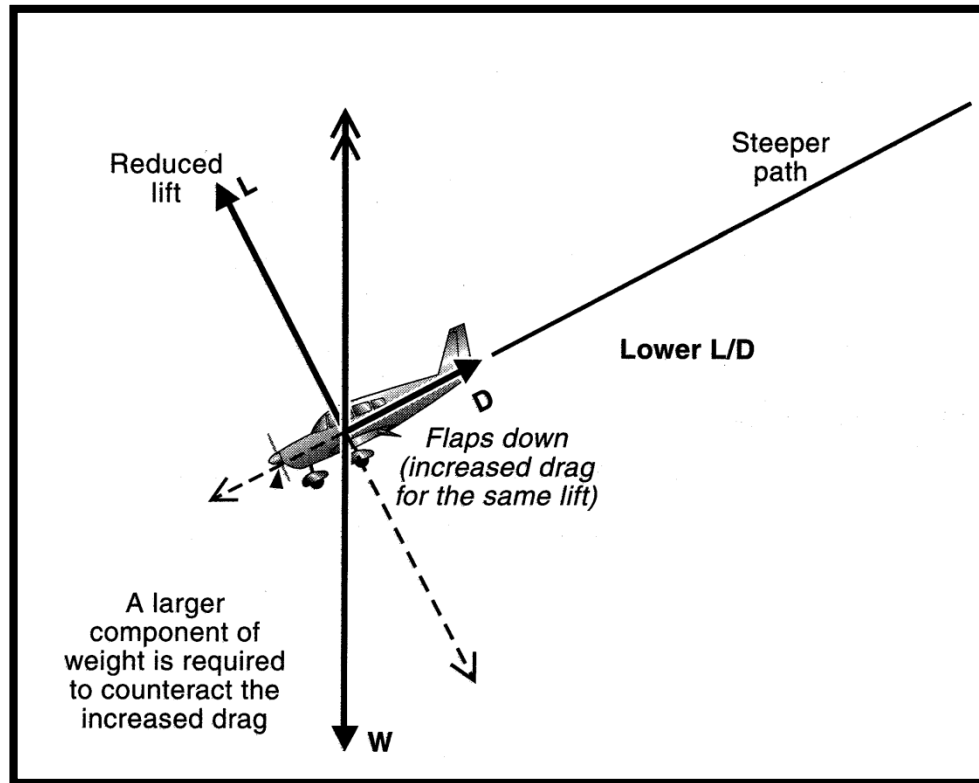
# Effect of Weight

- Any increase in weight will require an increase in lift. The increase in lift must occur through thrust and power.
- Angle of descent is increased.
- Rate of descent is also increased.



# Effect of Flap

- The use of flaps increases drag and lowers the L/D ratio
- An increase in drag gives us a higher rate of descent with better forward visibility but severely reduces our range.



# Engine Handling

- Carby heat selected before operating engine out of green arc 1900RPM
- Warm engine every 1000 Ft during gliding descents (this keeps Carby heat effective and engine temperatures warm)
- Operate throttle smoothly

# Instruments

- Airspeed indicator
- Vertical speed indicator
- Altimeter
- Balance Ball



APPLICATION

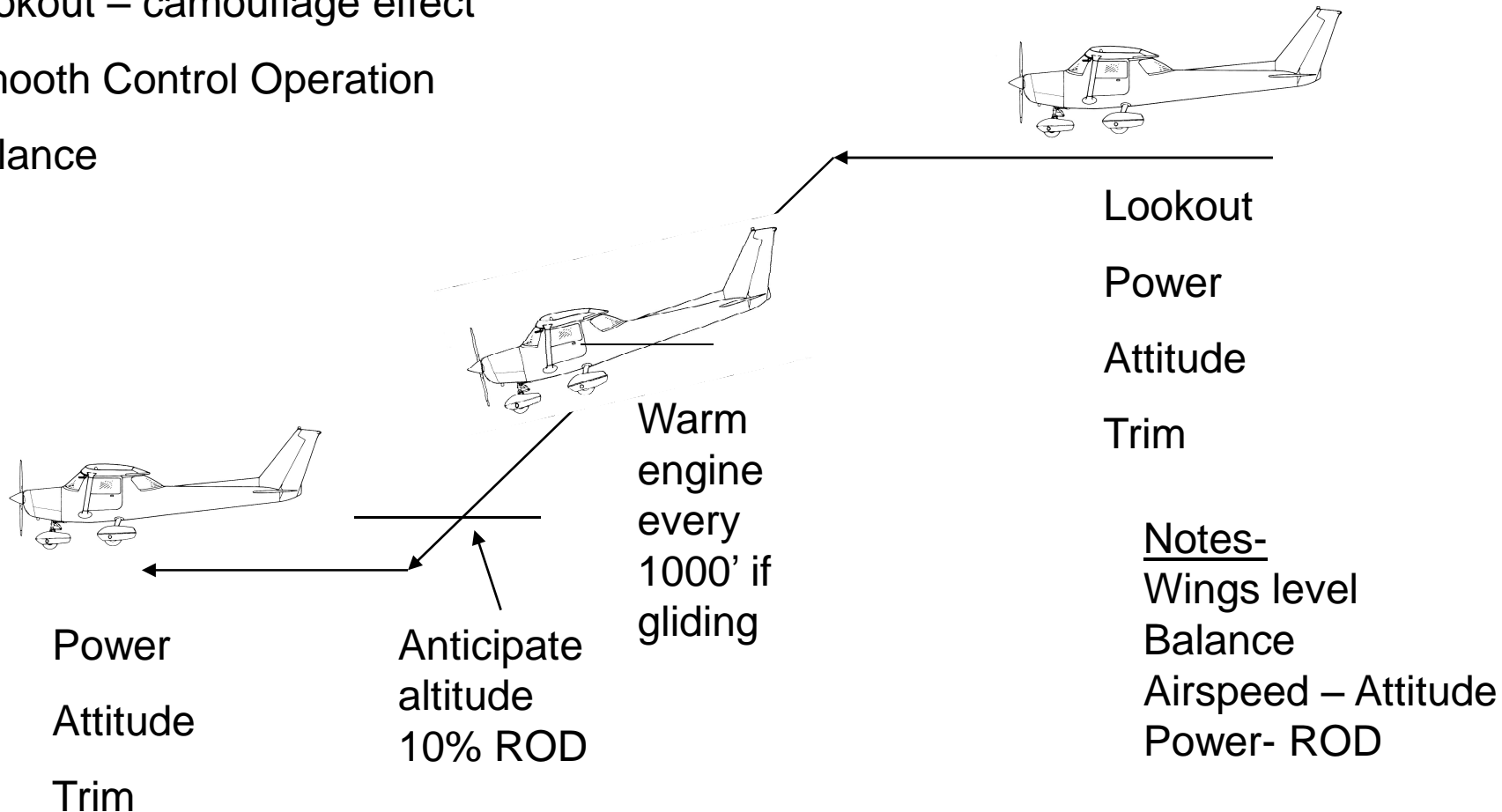
# Air Exercise- Descending

## AIRMANSHIP

Lookout – camouflage effect

Smooth Control Operation

Balance



Glide Descent – Best glide  
60kts





Glide Descent – Best glide  
60kts





Cruise Descent  
95kts



**RECOVERY TO LEVEL FLIGHT**

# **AIMING POINT DESCENT**





# Airmanship

- Lookout
- Handing over/Taking over
- Awareness of other traffic
- Engine handling