

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:

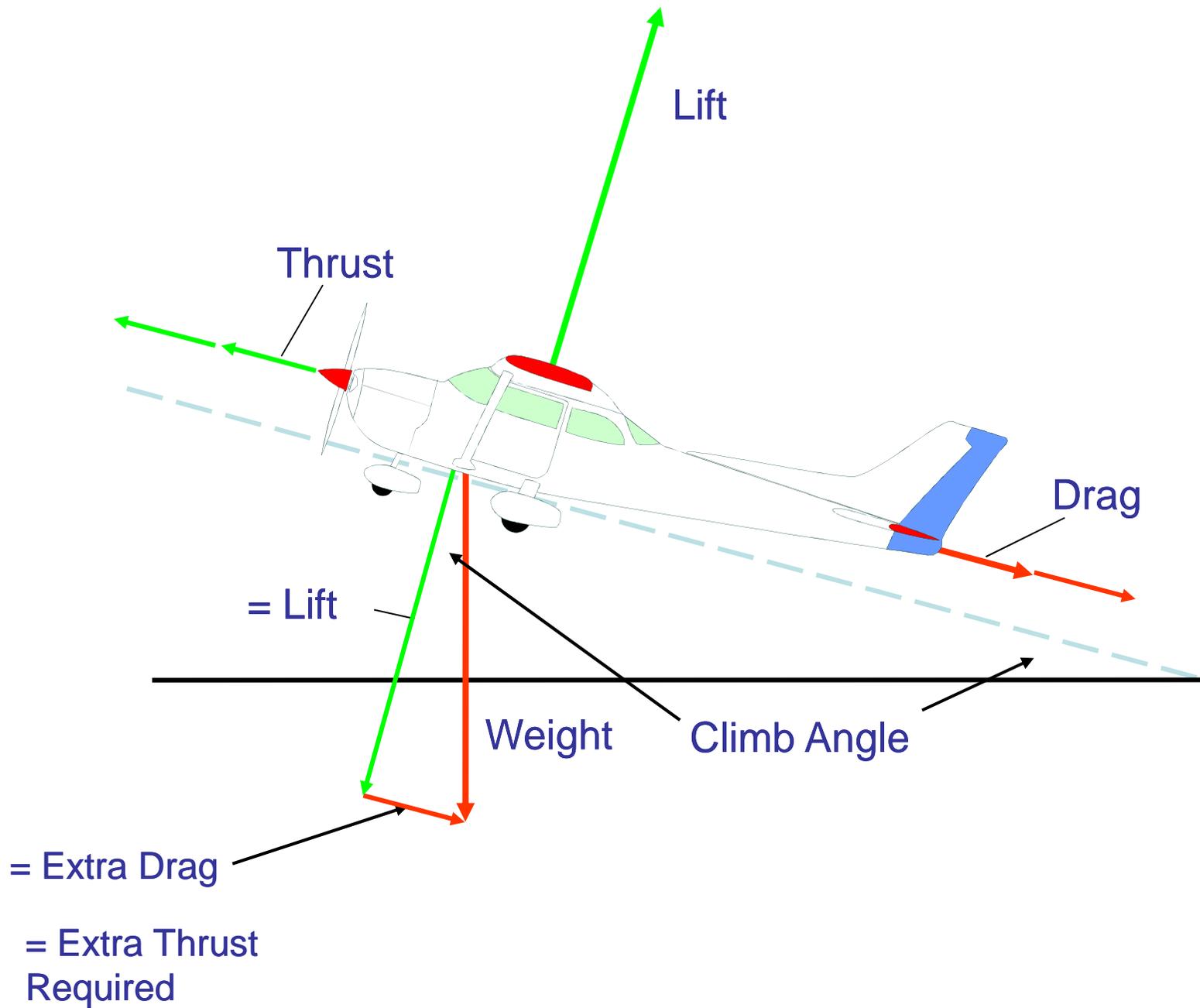
At the end of this briefing the student should be able to....

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

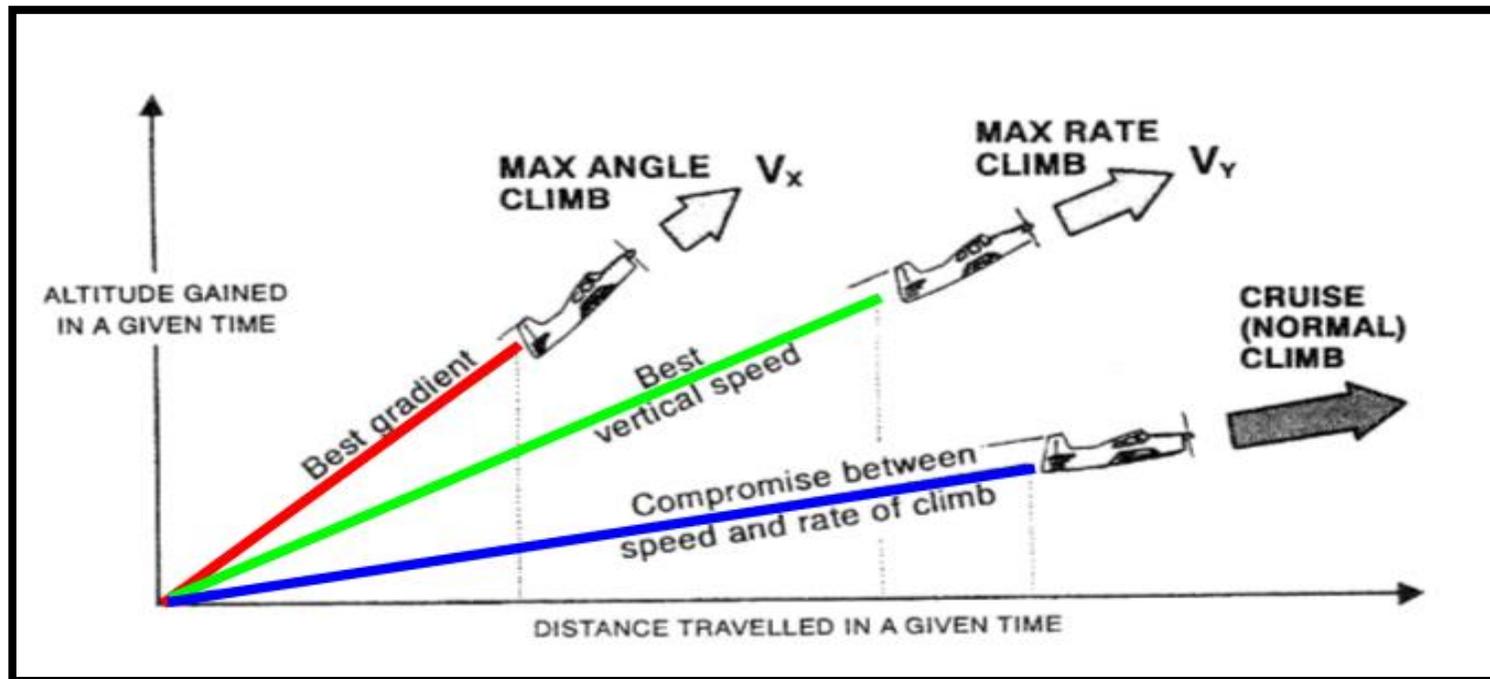


FORCES IN A STEADY CLIMB AT A CONSTANT AIRSPEED

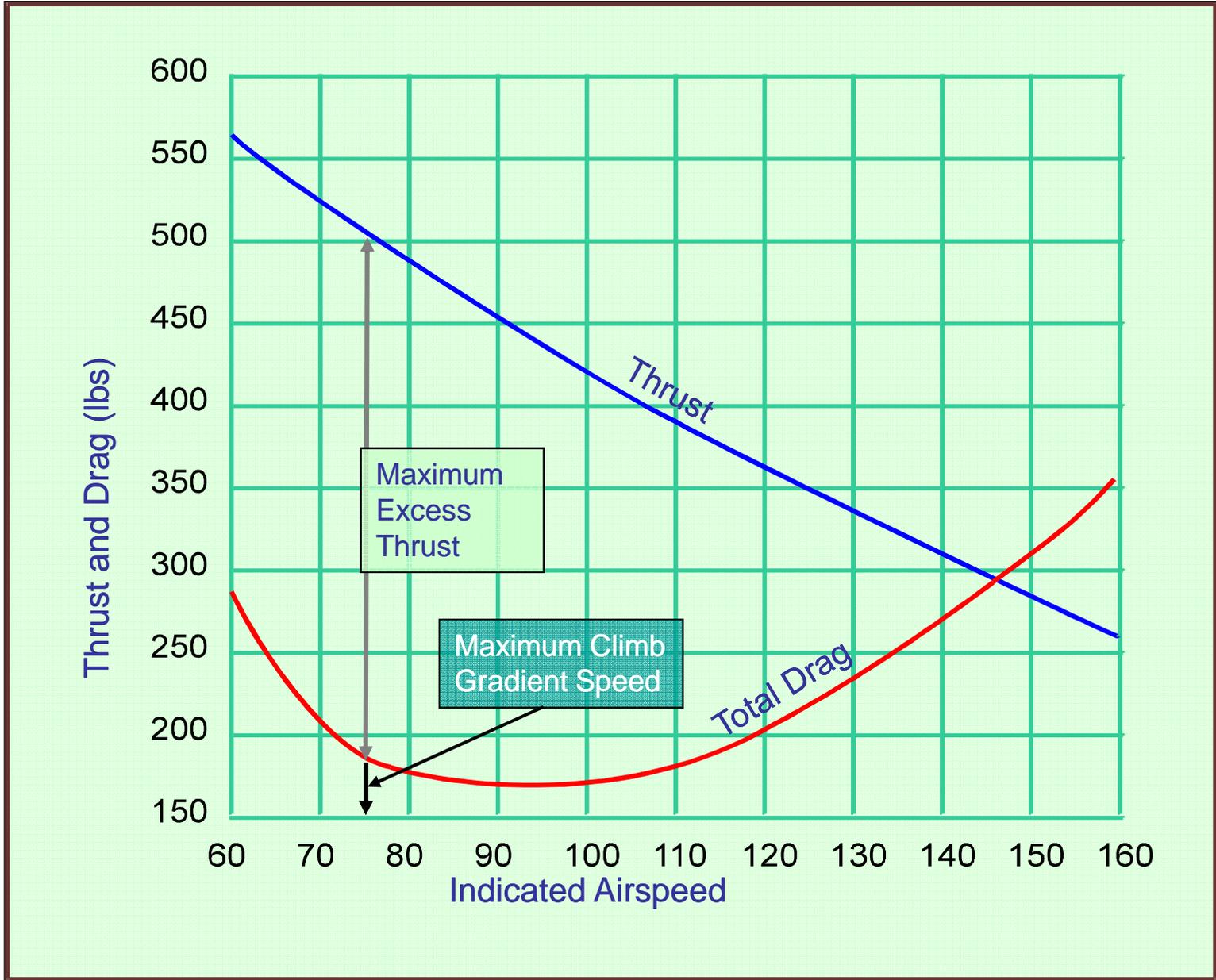


Climb Types

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

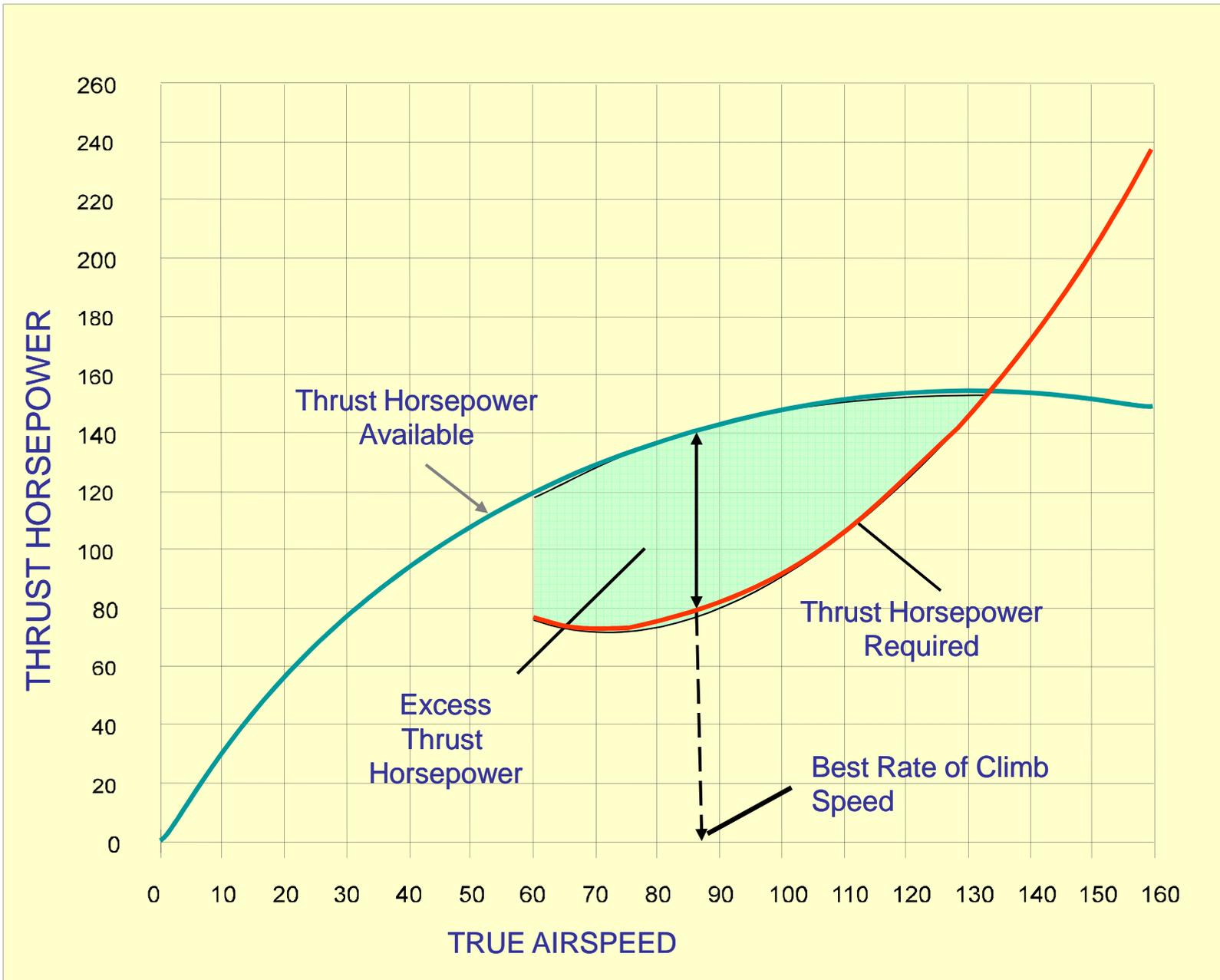


MAXIMUM ANGLE CLIMB



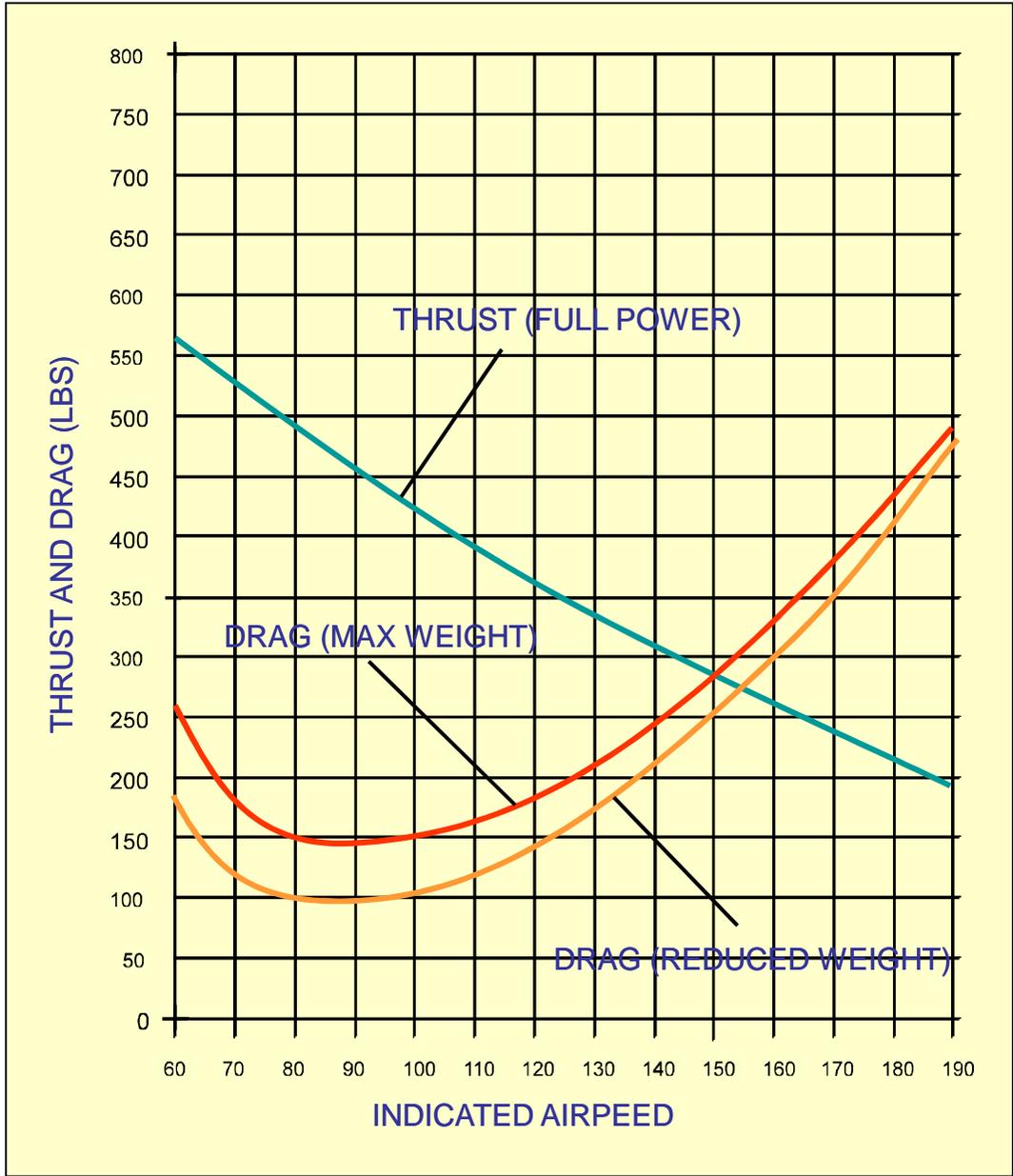
**MAXIMUM CLIMB
GRADIENT IS ACHIEVED AT
THE IAS WHICH GIVES THE
GREATEST EXCESS
THRUST**

MAXIMUM RATE OF CLIMB



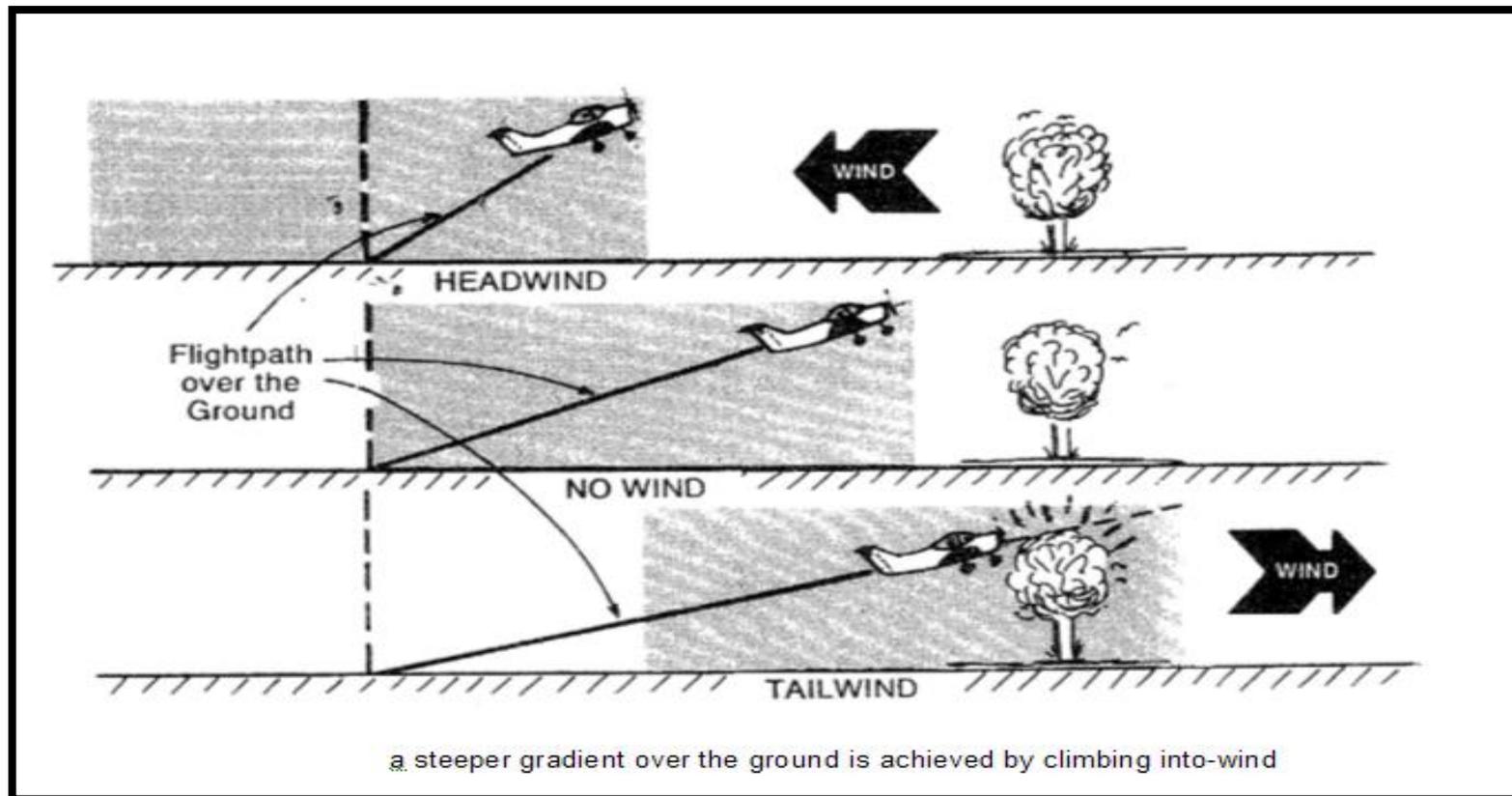
MAXIMUM RATE OF CLIMB IS
ACHIEVED AT THE IAS
WHICH GIVES GREATEST
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WEIGHT VARIATIONS



EFFECT OF WIND ON CLIMB PERFORMANCE

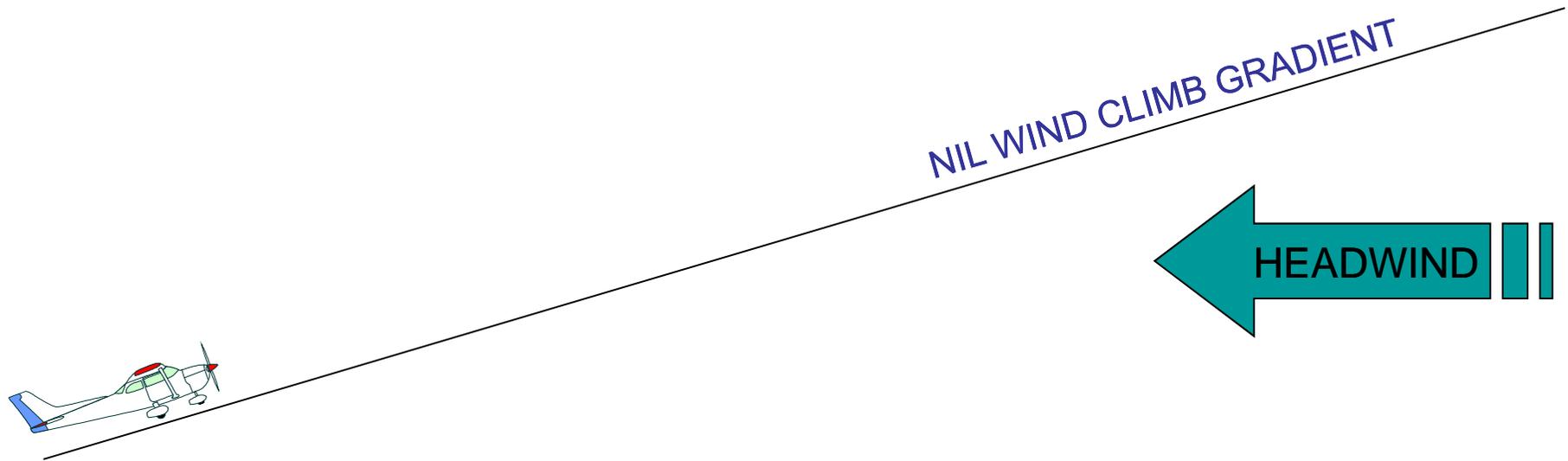
Effects of Wind



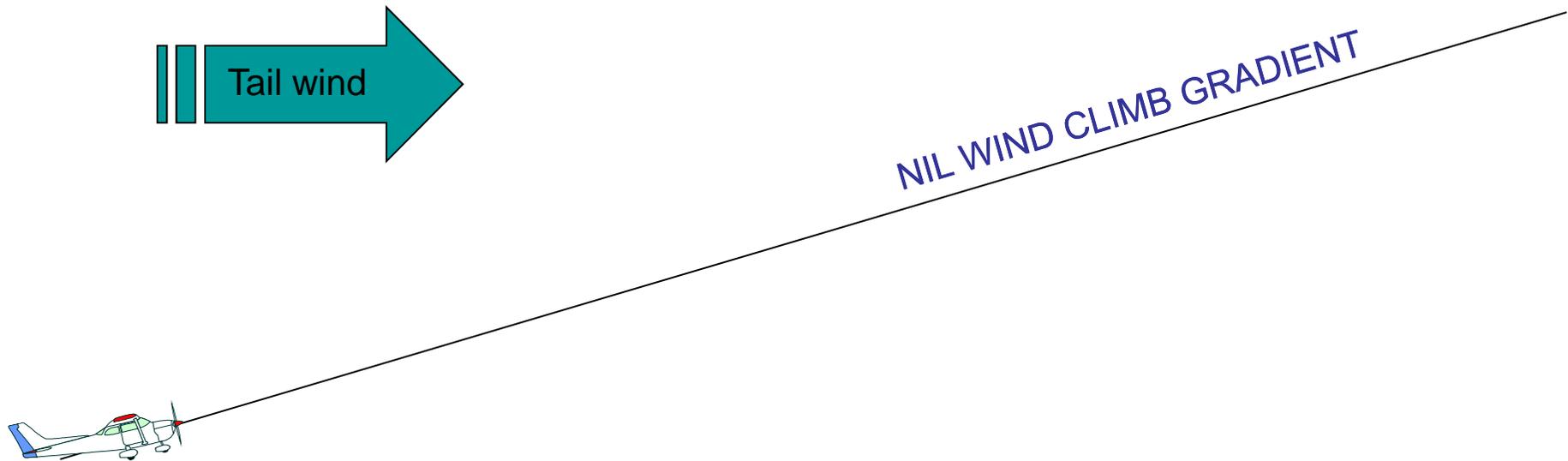
Headwind – Gives us a higher angle of climb but a slower ground speed. ROC is unchanged.

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

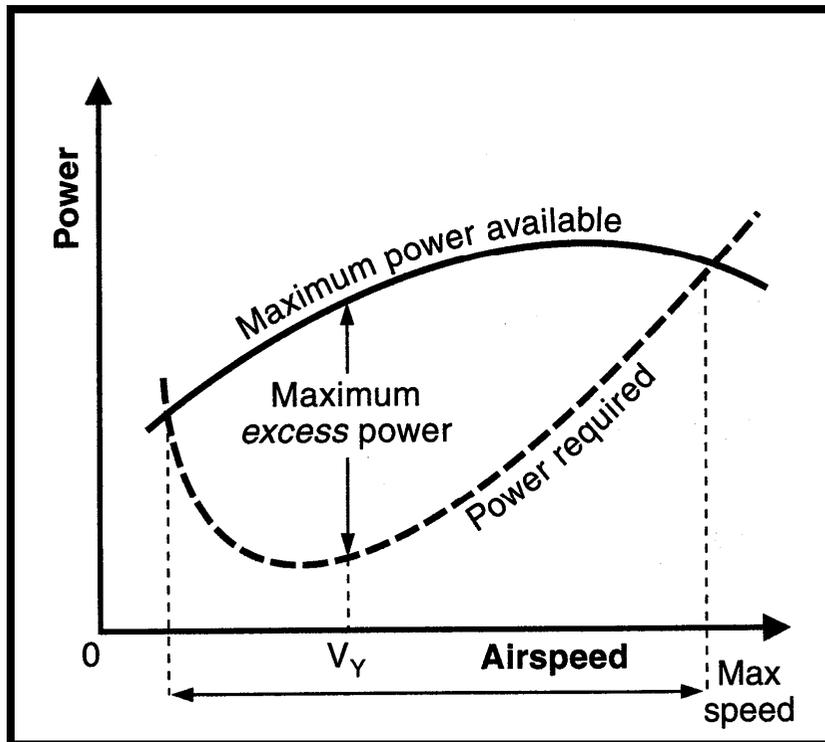


WIND HAS NO EFFECT
ON RATE OF CLIMB

Effect of Flap

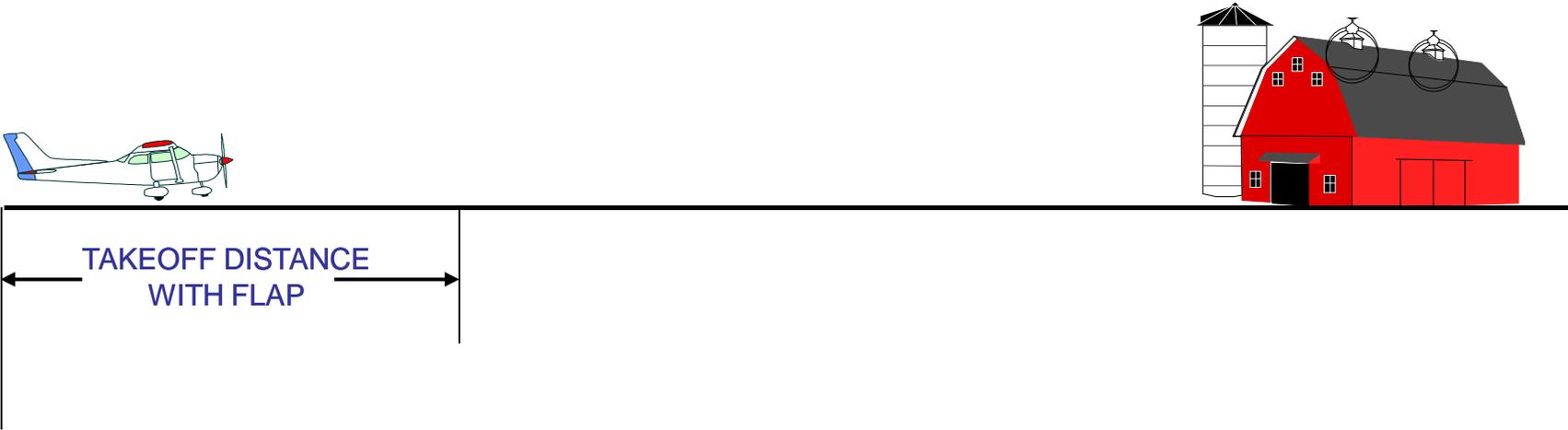
Using flaps increases the lift produced by the wing but also increases the amount of drag.

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

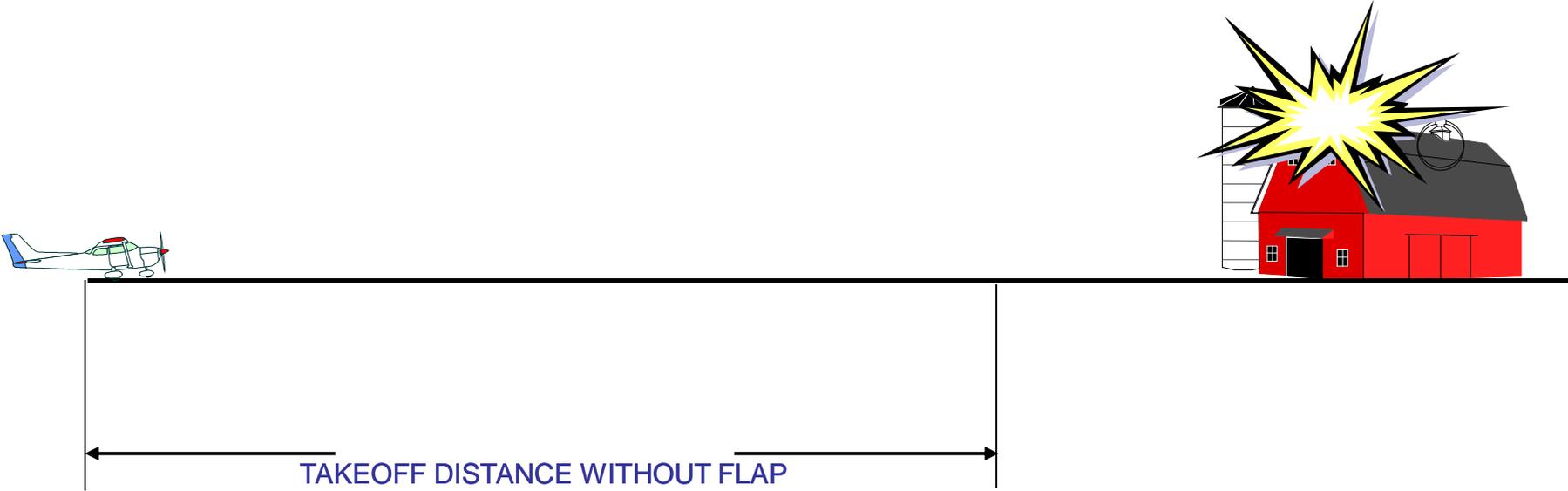


EFFECT OF FLAP ON CLIMB PERFORMANCE

EFFECT OF FLAP ON TAKE-OFF

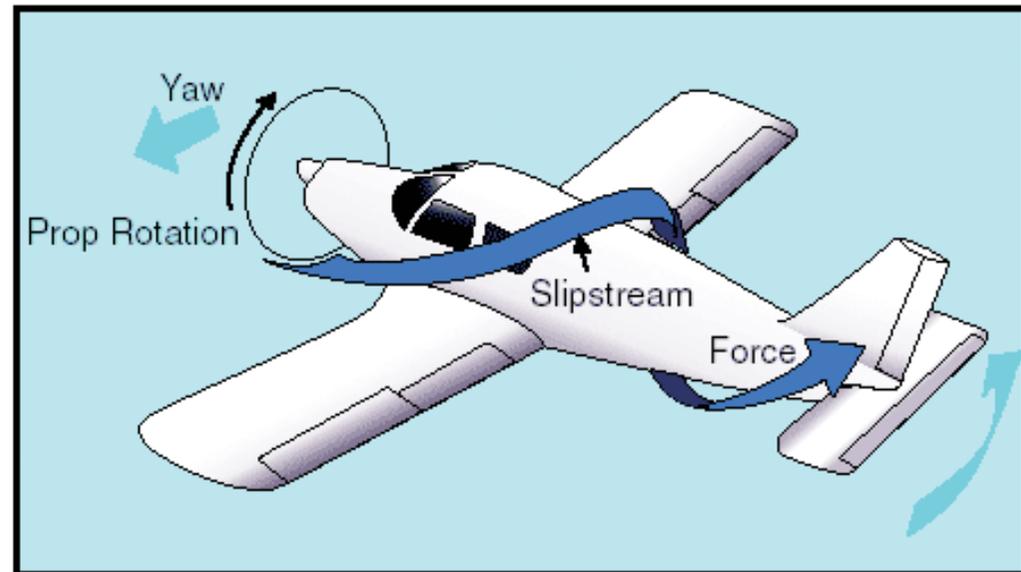
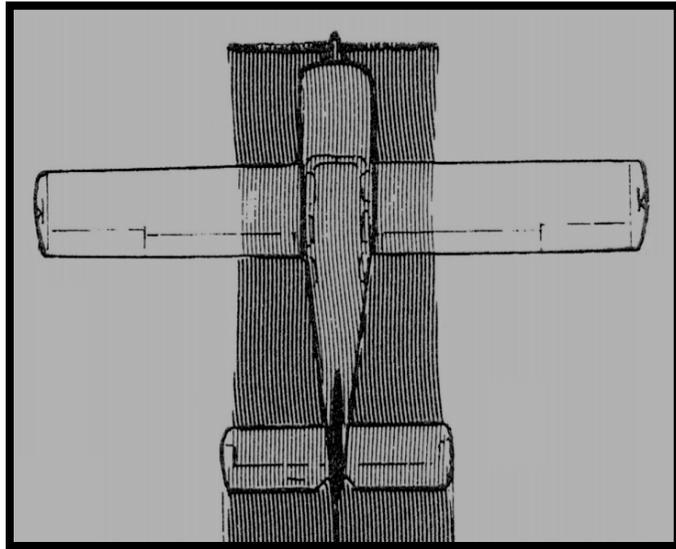


EFFECT OF FLAP ON TAKE-OFF



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

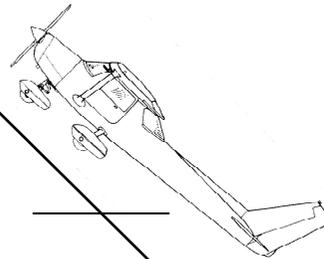
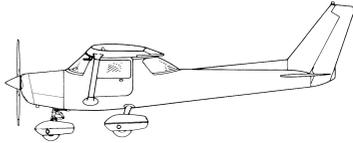
Balance

Attitude

Pause

Power

Trim



Every 500'

Lower nose

Lookout

Check T & P's

Pick Reference Point

Lookout

Power

Attitude

Trim



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



Climbing & Descending Flight

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Types of Descent

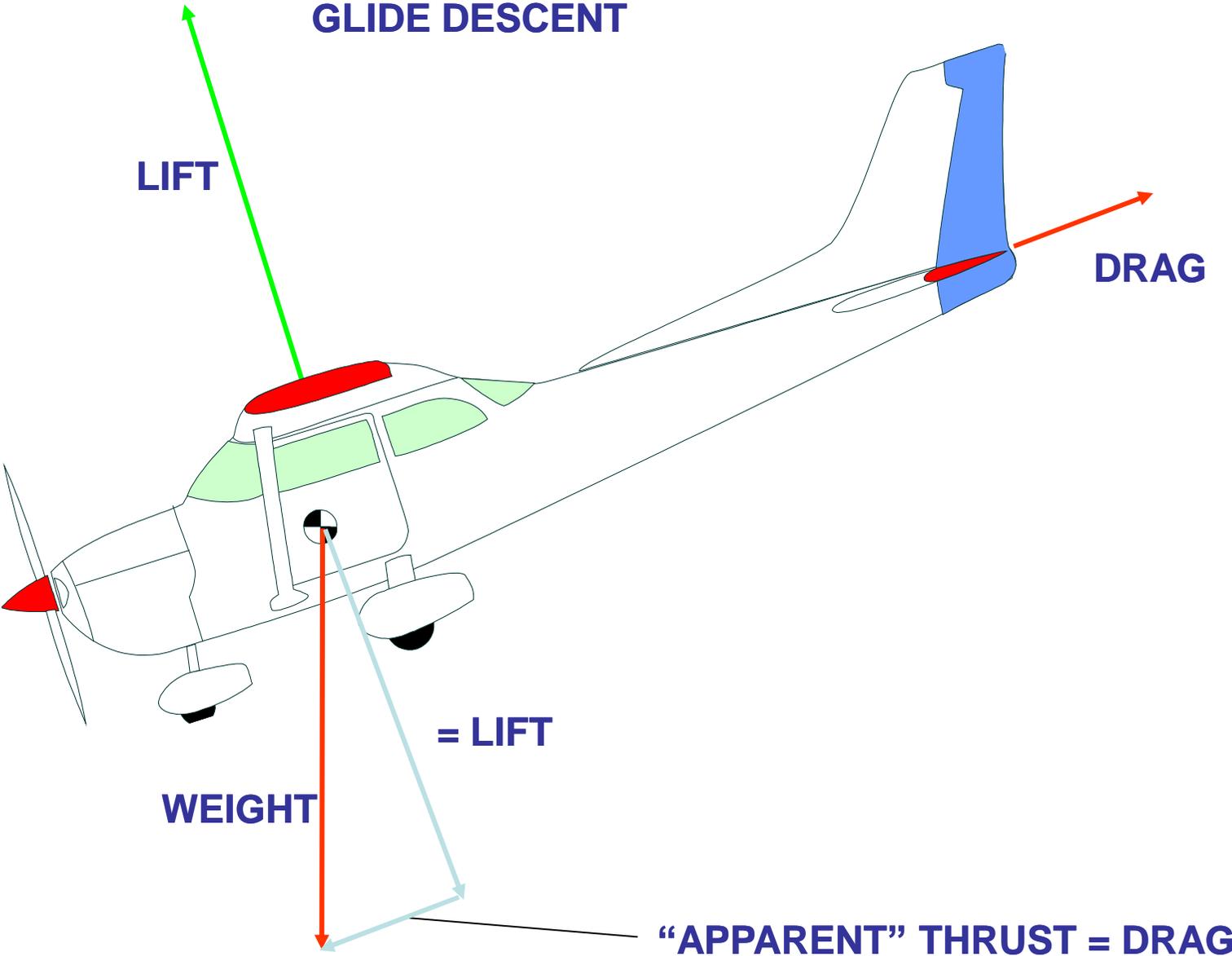
1. Glide Descent – without power

2. Power Assisted Descent

- Aiming point descent
- Cruise Descent

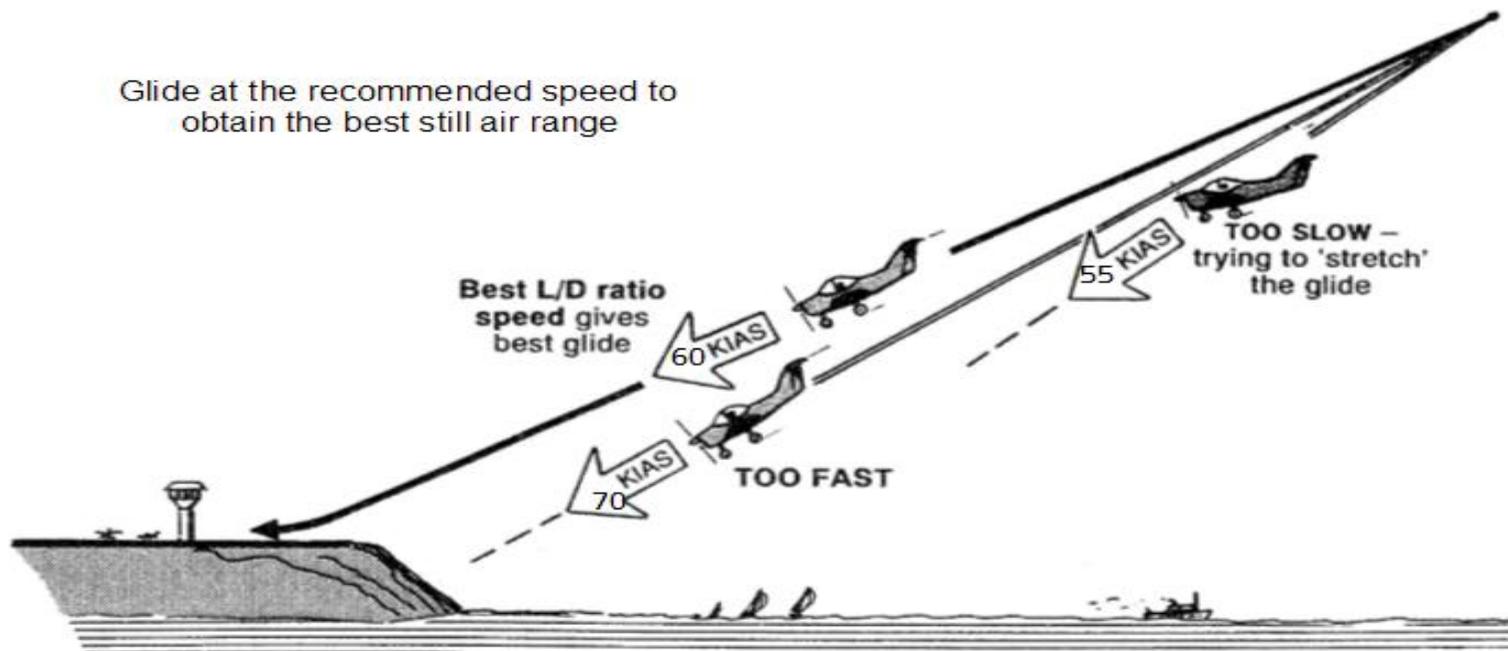
FORCES IN A GLIDE DESCENT

GLIDE DESCENT



Effect of Airspeed

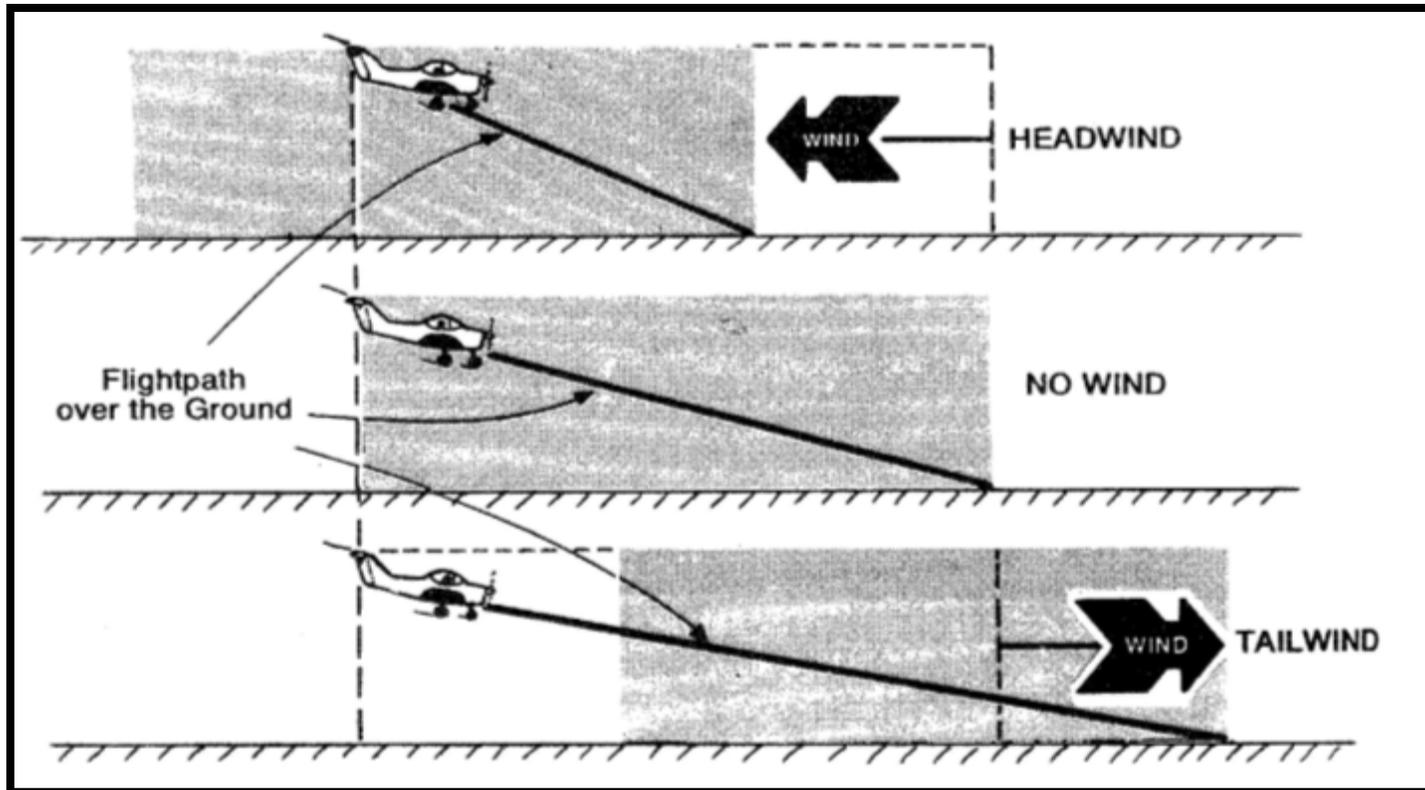
- Changing airspeed will affect the glide performance of the aircraft.
- Increase in speed will reduce the range.
- Decrease in speed will reduce the range.
- Best L/D ratio will give the maximum gliding range.



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

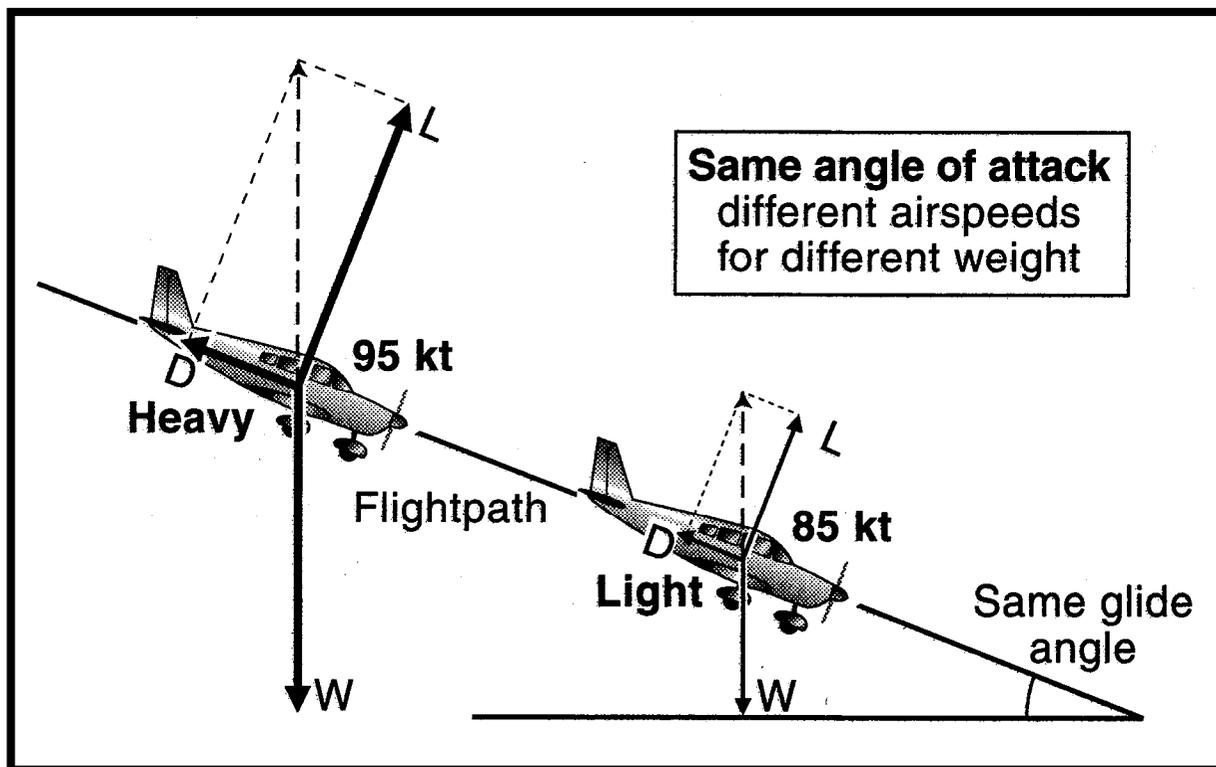
Headwind will steepen the angle but reduce the range.
The rate of climb is unchanged

Tailwind

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

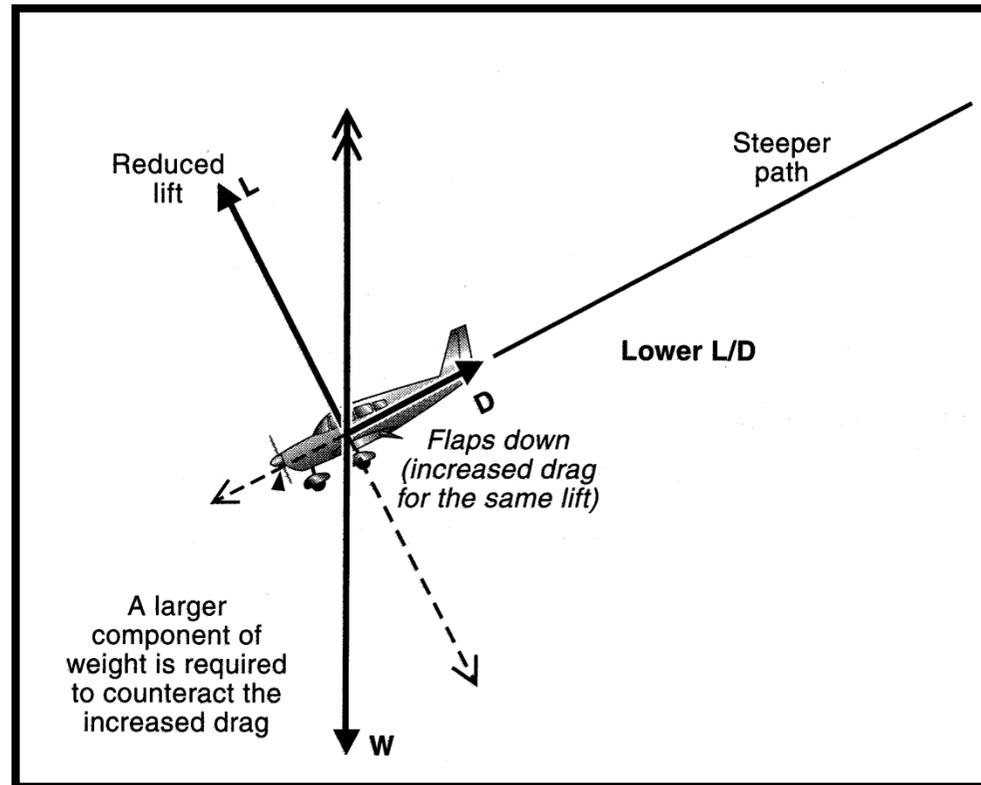
Effect of Weight

- 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

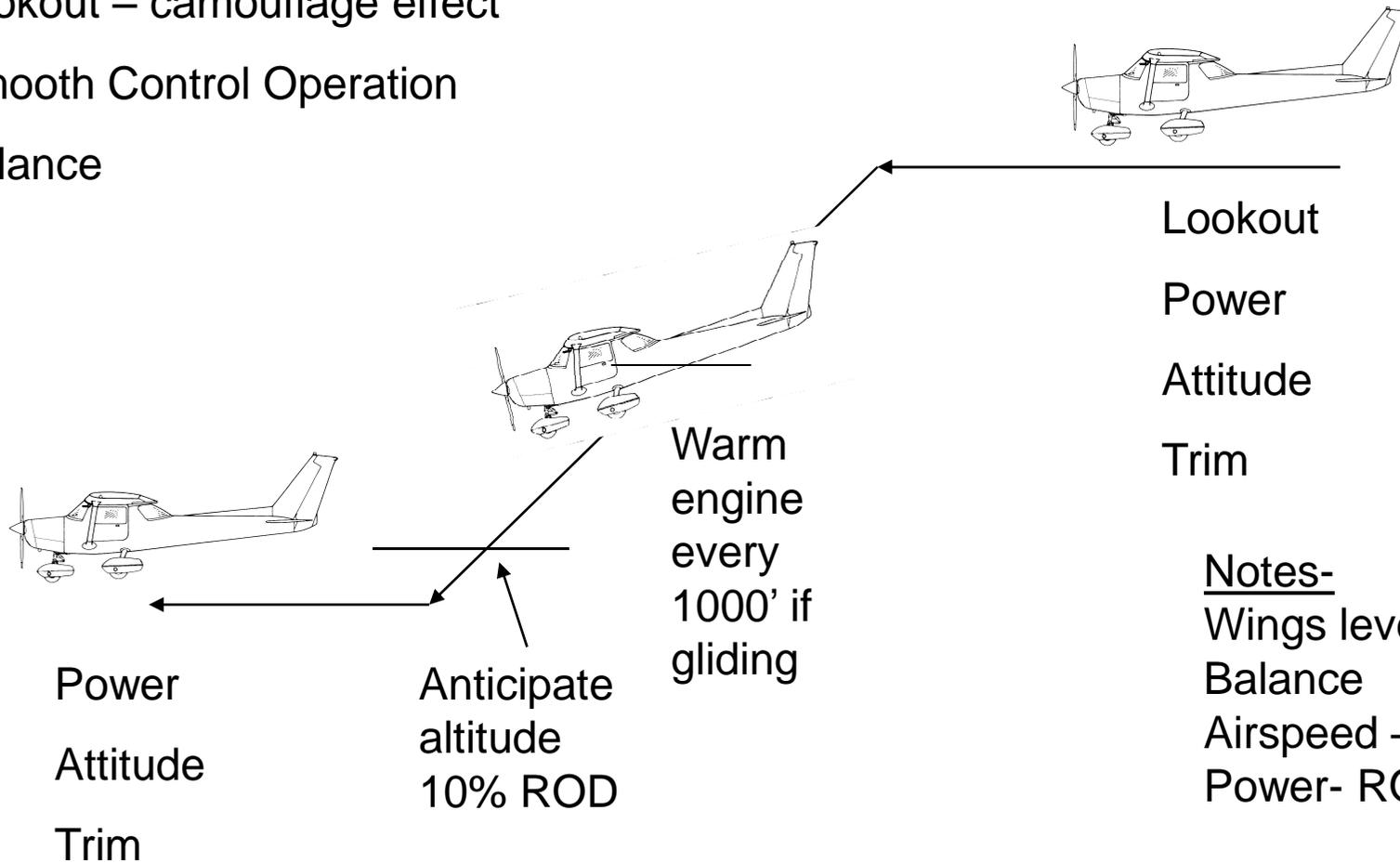
Air Exercise- Descending

AIRMANSHIP

Lookout – camouflage effect

Smooth Control Operation

Balance



Notes-
Wings level
Balance
Airspeed – Attitude
Power- ROD

Glide Descent – Best glide
60kts



Glide Descent – Best glide
60kts



Cruise Descent
95kts



RECOVERY TO LEVEL FLIGHT

AIMING POINT DESCENT



BRIDGE IS THE AIMING POINT

Airmanship

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