Ex. 7-8 Climbs & Descents

What you will learn to:

- ✓ climb at a variety of attitudes and airspeed, taking into account:

  - obstacle clearance - visibility - engine cooling - ATC instructions - passenger comfort

- ✓ accurately level off at desired altitude and establish cruise.

- ✓ descend at a variety of airspeed and power settings to a desired altitude.

- ✓ Descend to a specified Touch Down Point.

Why learn this?

- ✓ Learn to execute appropriate type of climb for a variety of scenarios
  - ! no one type of climb will work for all situations!
- ✓ Accurate Descents are even more important than accurate climbs

Links

You already have understanding of:

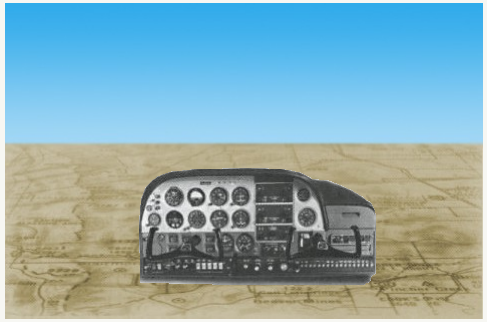
- ✓ attitudes and movements
- ✓ power control

Today we put all these tools together to make the plane go up…..and everything that goes up…. must come back down.

Climb: Entry from Cruise

Attitude

- pull back on the Control Column to set nose-up attitude

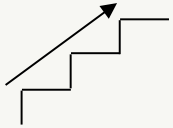


Power

- full power

Trim

- check airspeed at correct value
- retrim airplane



Go up to your **APT**

Climbing: Yaw Control

Whenever there is a change of aircraft attitude Yaw has to be controlled.

Step on the BALL.

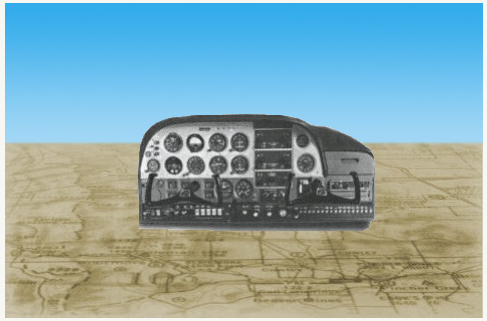
Climb: Leveling Out

If climbing up to 4500 feet at 500 feet per minute, begin leveling out at…

Begin leveling out at 10% of rate of climb

Attitude

- push Control Column forward to return to cruise attitude
- allow plane accelerate to cruise speed



Power

- power back to normal cruise setting

Trim

- re-trim airplane
- lean mixture as appropriate

Leveling: Yaw Control

Yaw

Step on the BALL.

TYPES OF CLIMBS

- Best Angle of Climb (V_x)
  Greatest gain in height in a given distance.

- Best Rate of Climb (V_y)
  Greatest Gain in height in a given time.

- Normal Climb

- Enroute Climb

V_x vs V_y

BUT!

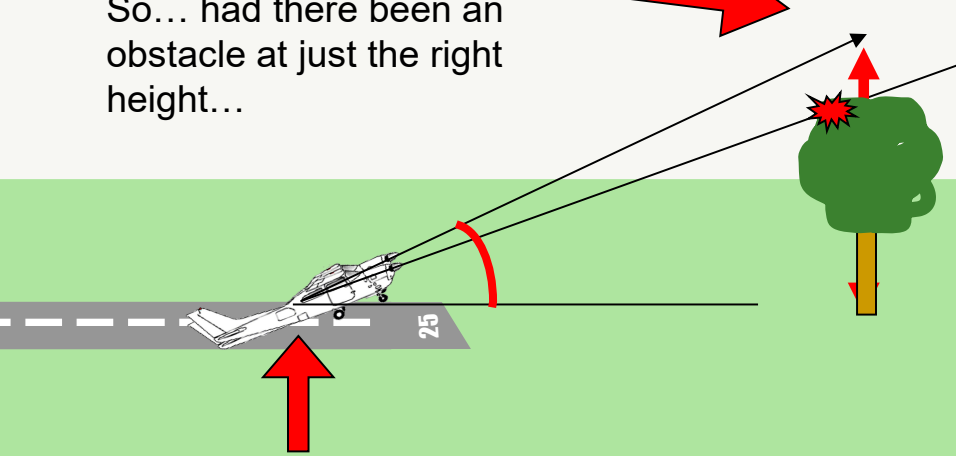
Can you actually SEE what angle they are talking about?

best rate = V_y

This plane's flight path stayed above the other plane's flight path the entire time

best angle = V_x

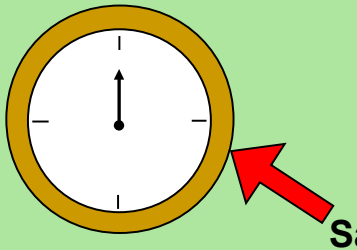
So… had there been an obstacle at just the right height…



This plane climbed higher in that amount of time

It also covered more distance, because V_y is a higher airspeed than V_x

Same starting point



Same amount of time passed

Instruments in Climb

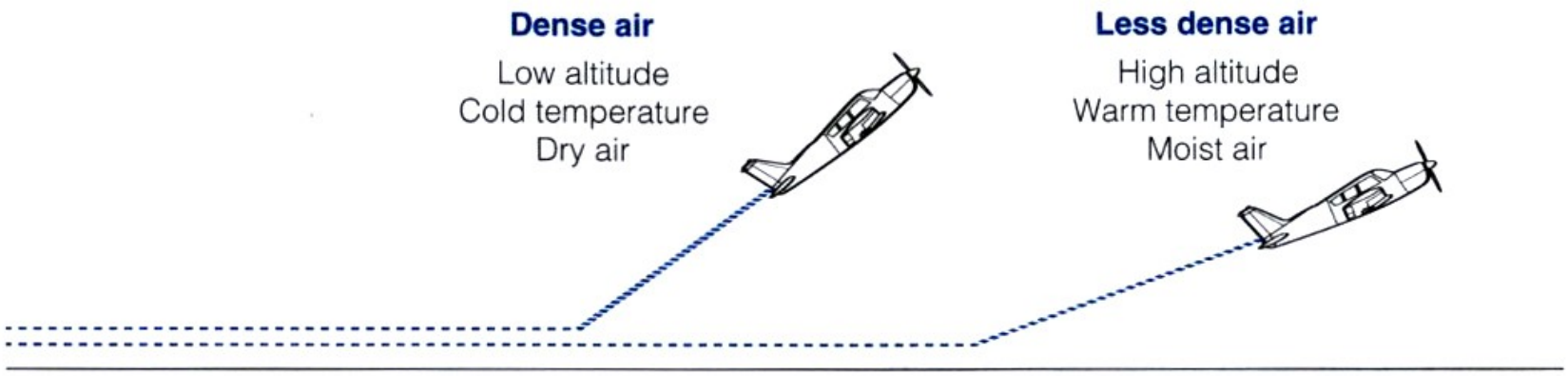
Air Density: Effect on Climb

The 3 Deadly H's

- **HEIGHT**
- **HEAT**
- **HUMIDITY**

What effect to they have on air density?

What effect does low air density have on climb performance?



Other Factors: Effect on Climb

- ✓ Weight — more work to bring heavier plane up
- ✓
- ✓ Flaps — add lift, but also drag
- ✓
- ✓ Landing Gear — adds drag

DECREASED CLIMB PERFORMANCE

Where can you look up climb performance?

Review

-Types of Descents

- ✓ Power-off Descents (Gliding)
- ✓ Power-on Descents
- ✓ Power-on Descent Types

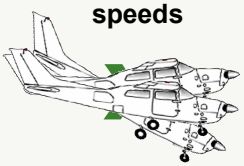
Power-off Descents (Gliding)

When might gliding be useful?

ATTITUDE + ~~POWER~~ = PERFORMANCE

- **airspeed** (how fast we're going)
- **rate of descent** (how fast we're going DOWN)

Gliding at different speeds



HOW FAR WE CAN GLIDE

Important assumption: NO WIND

Gliding: Estimating Range

ZERO WIND

Gliding: Estimating Range

NOTHING!

Plane is already flying at best gliding speed!

Raising the nose will:

- shorten your gliding distance

AND

- make your airspeed to dangerously low

NEVER TRY TO "STRETCH" A GLIDE.

Power-on Descents

How much power?

- ✓ Normal descents are power-assisted

- ✓ Power = more choice for performance
  - +/- 100 rpm = +/- 100 feet per minute

    or
  - +/- 100 rpm = +/- 5 knots.

With power off, each airspeed corresponded to a set rate of descent

Now you change rate of descent and airspeed independently

Power-on Descent Types

	Landing Approach stabilized descent at specific airspeed to touchdown at specific point	Enroute • no hurry to lose altitude • more comfortable for passengers
Power setting	Usually below green arc (about 1500-1900 rpm)	Above green arc (100-300 rpm below cruise power)
Carb heat	HOT	COLD
Airspeed	See POH (55-65 knots in Cessna 150)	Close to cruise speed
Flaps	Down (for better forward visibility and lower safe descent speeds)	Up (enroute descent done at high speed, low rate of descent – no need for additional lift and drag)

Power-off Descent: Entry

Cockpit check: oil T+P in the green, carb heat hot, mixture rich Look-out!

Power

How will power reduction affect yaw?

- **smoothly reduce power to idle**

Attitude

- **maintain cruise attitude until airspeed reaches best glide**
- **set descent attitude for that airspeed**

Trim

- **retrim airplane**

You have it down PAT

Approach Descent: Entry

Cockpit check: oil T+P in the green, carb heat hot, mixture rich Look-out!

Power

- **smoothly reduce power to 1500-1900 rpm**

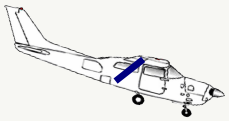
Attitude

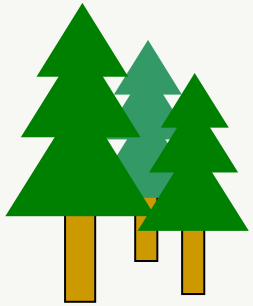
- **maintain cruise attitude until airspeed enters white arc**
- **once airspeed is "in white", extend flaps**
- **set descent attitude for approach airspeed (see POH)**

Trim

- **retrim airplane**

Effect of Flaps on Descent



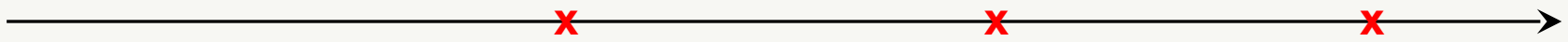


- ✓ More lift
  - can safely descend at lower airspeeds
- ✓ More drag
  - steeper descent given same airspeed
- ✓ More nose-down attitude
  - better forward visibility given same airspeed

Airspeed must be in white arc before flaps are extended!

Effect of Wind

- ✓ In headwind: can glide further by increasing airspeed slightly (offset effect of wind pushing you back)
- ✓ In tailwind: can glide further by decreasing airspeed slightly (take advantage of lower rate of descent at slightly lower airspeed)



SAFETY

- Cockpit check before all climbs and Descents
- Look-out before and during climb
  - lower nose every 500 feet to check for traffic
- Avoid excessive pitching up, especially near the ground
  - may lead to a stall
- Avoid climbs at V_x for long periods of time
  - inadequate engine cooling

Review For Climbs:

- What is the difference between best rate of climb, best angle of climb, and normal climb?

Should be memorized!

- What are your plane's airspeed for those climbs?
- What is the procedure for entering a climb from cruise?
- What is the procedure for leveling out?
- Why do we keep full power for several seconds after leveling out?

Review for Descents:

- What is your airplane's best glide speed?

  What is its significance?

- During an approach to landing your intended touchdown spot is drifting up. What does that mean and how do you fix the situation?

- Same as above, but the spot is drifting down.