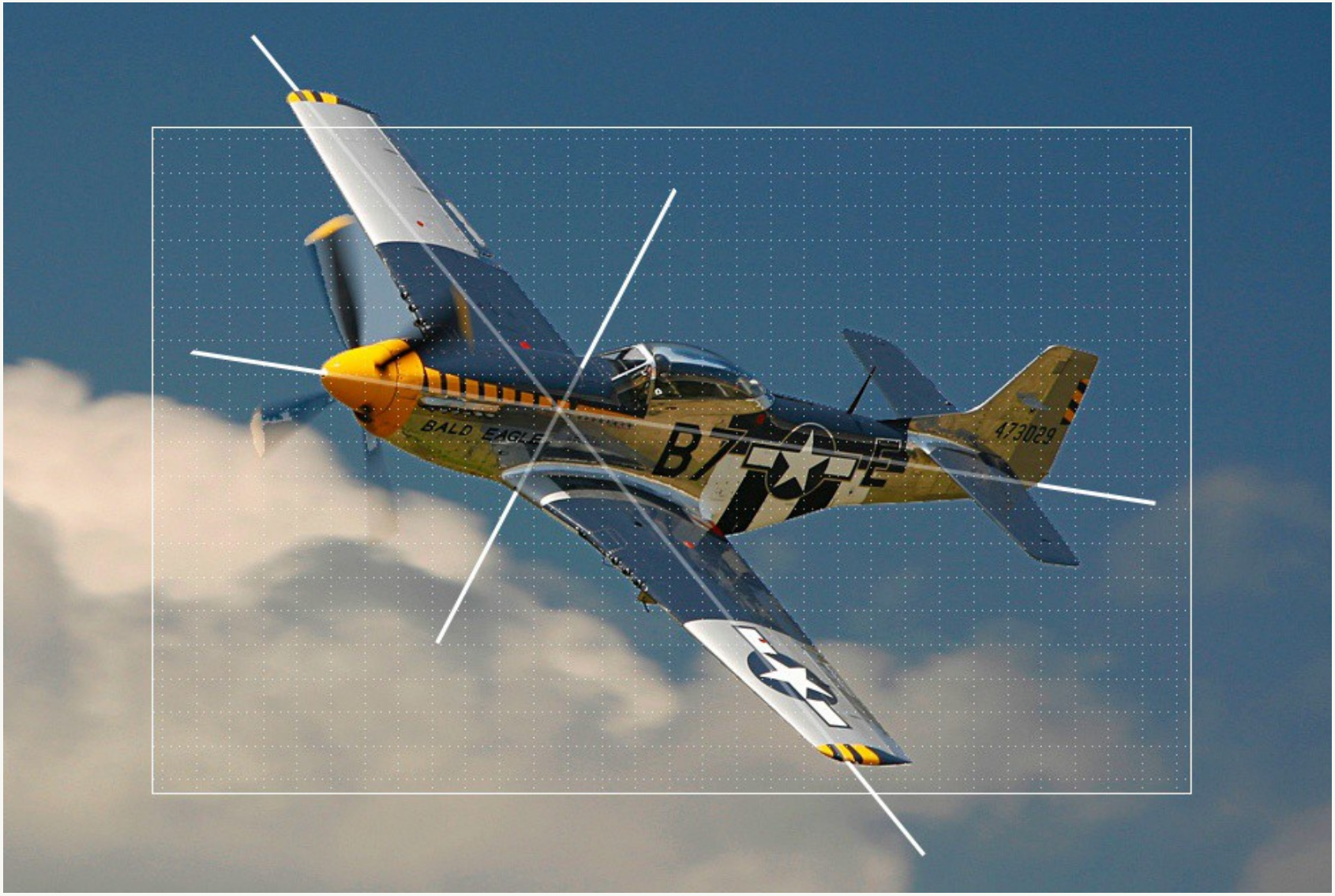
Ex. 5 – Attitudes and Movements



What you will learn:

What's an attitude?

- ✓ The range of the airplane's normal operating attitudes

- ✓ Producing and controlling airplane movements to achieve and maintain desired attitudes of flight.

Why learn all this:

- ✓ These basic concepts are the foundation of every maneuver you will ever perform as a pilot

- ✓ It’s important to get a solid grasp on them from the start.

Let's see how much you already know:

- What is lift?
- What is angle of attack?
- How does lift depend on angle of attack?
- What is airspeed?
- How does lift depend on airspeed?

Review the first few chapters in your FTM, or chat with your flight instructor for clarification on any of the above…

Theories & Definitions

- Attitudes
  - Cruise Attitude
  - Pitch Attitudes
  - Bank Attitudes
- Axes and Movements
  - Pitch
  - Roll
  - Yaw
- Instrument Indications
- Look-out.

Cruise Attitude:

- ✓ flight at:
  - the recommended cruise power setting
  - constant altitude
  - constant airspeed
  - wings parallel to the horizon

Found where?

All attitudes are relative to the horizon!

- ✓ datum (reference point) by which all other attitudes are defined.

Cruise Attitude

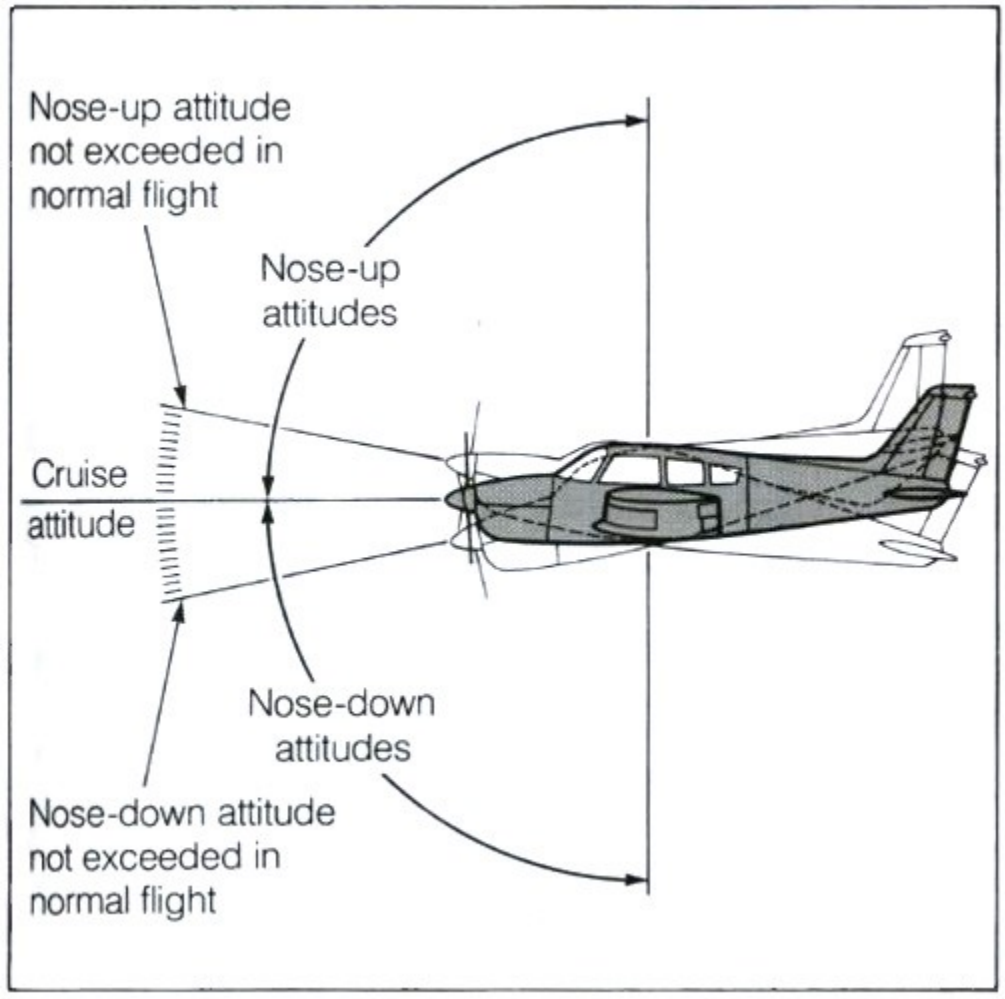
Cruise Attitude

View to the left

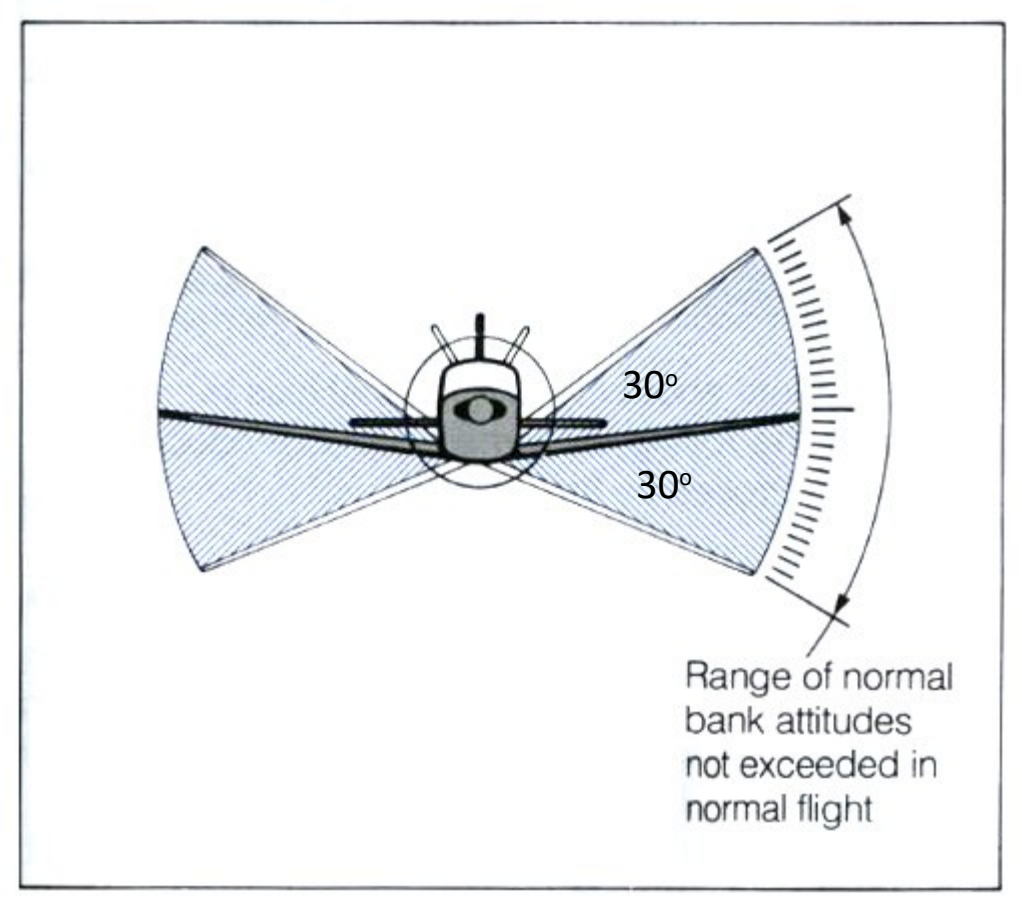
View to the right

- **wingtips nearly parallel to the horizon**
- **wingtips equidistant from the horizon**

Pitch Attitudes



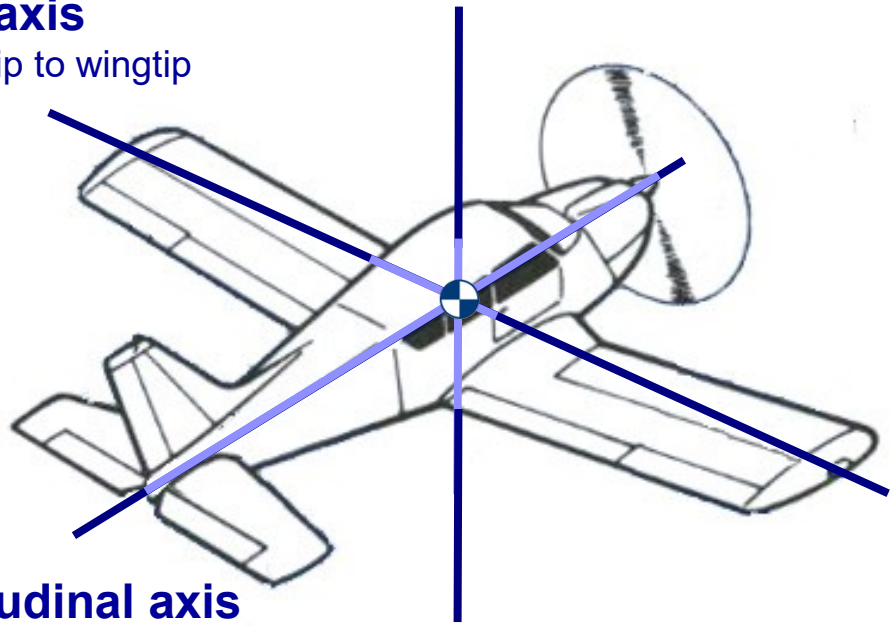
Bank Attitudes



Axes and Movements

Normal axis
vertically through center of gravity

Lateral axis
from wingtip to wingtip

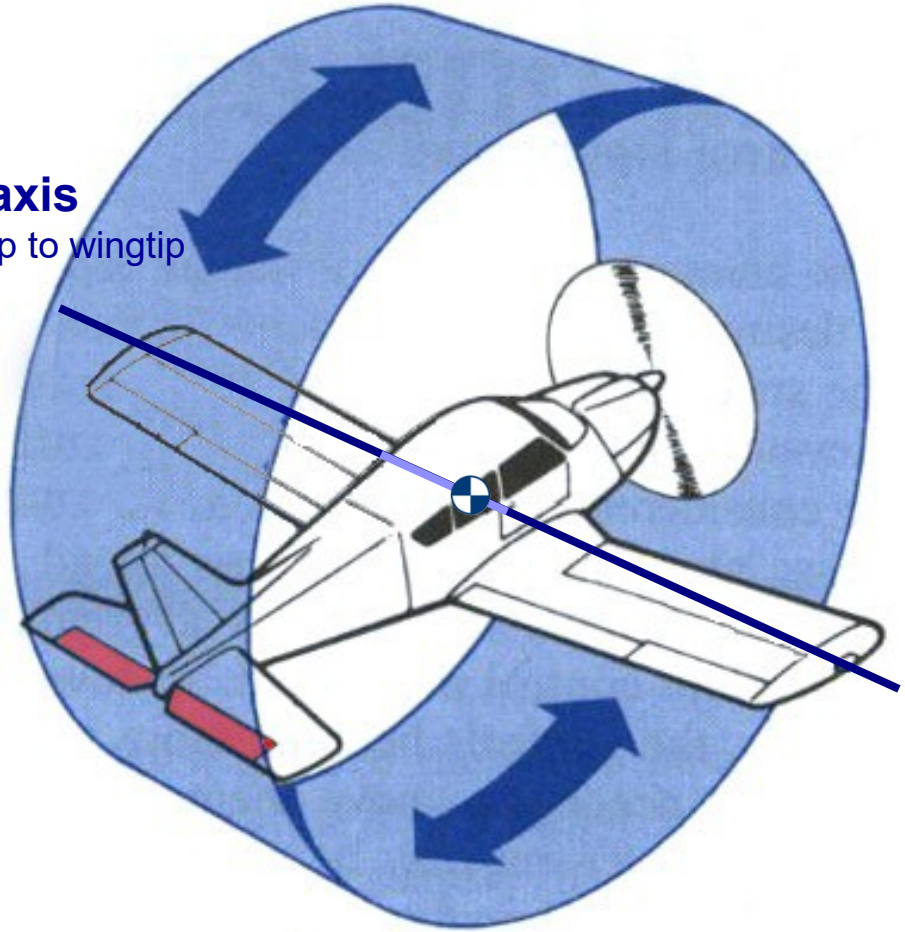


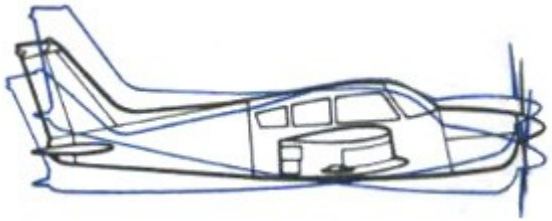
Longitudinal axis
from nose to tail

- ✓ Any aircraft movement is a combination of rotations about these axes.
- ✓ Movements are defined with respect to the airplane/pilot.

Pitch

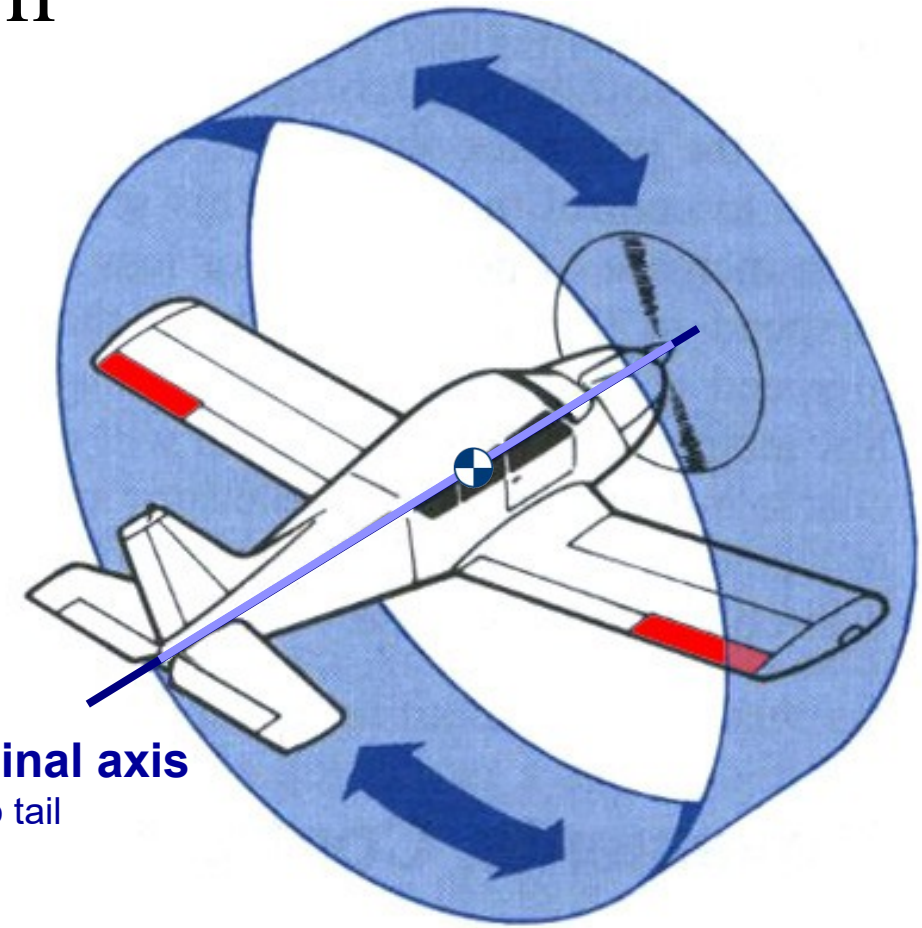
Lateral axis
from wingtip to wingtip





- ✓ Pitching movement – rotation about the lateral axis
- ✓ Produced and controlled by elevators.

Roll

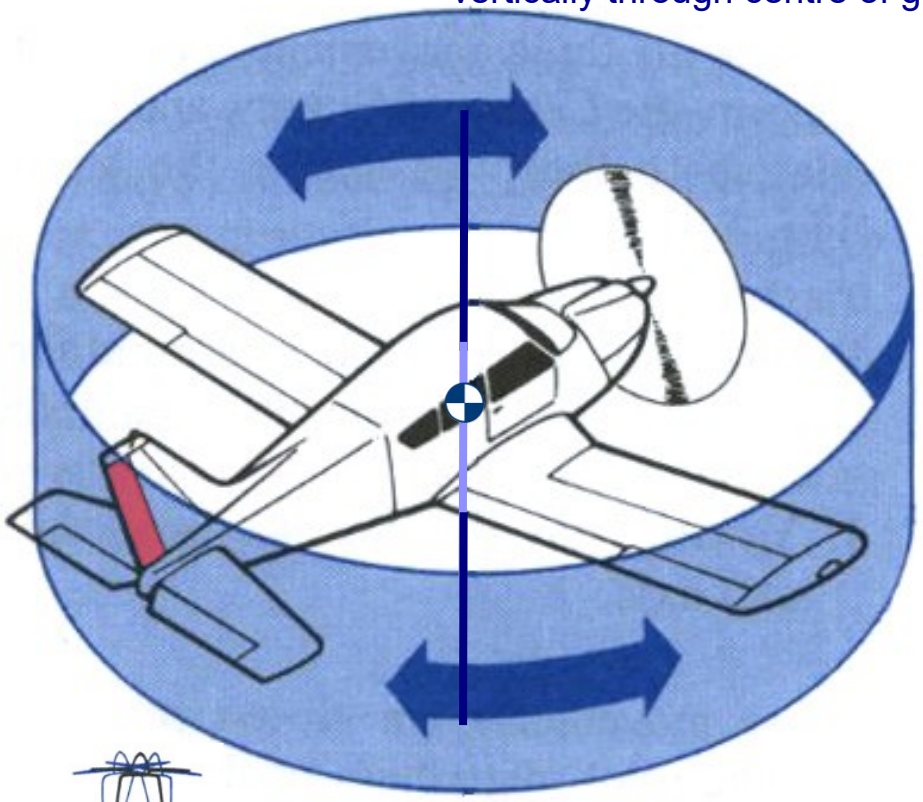


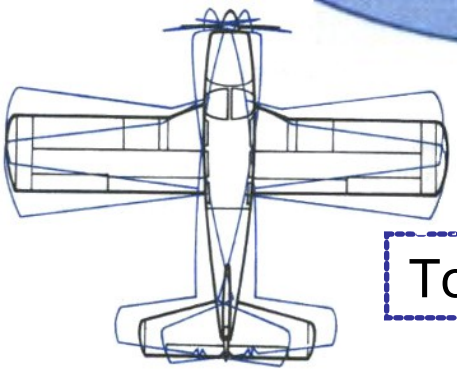
Longitudinal axis
from nose to tail

- ✓ Rolling movement – rotation about the longitudinal axis
- ✓ Produced and controlled by ailerons.

Yaw

Normal axis
vertically through centre of gravity





- ✓ Yawing movement – rotation about the normal axis
- ✓ Most of the time yaw undesirable
- ✓ Can be caused by banking, power changes, turbulence etc.
- ✓ If not corrected, may induce roll
- ✓ Controlled by the rudder

To control yaw, “step on the ball”.

Instrument Indications

Cruise attitude → Nose-up attitude

Airspeed decreasing

Miniature airplane moves above virtual horizon

Cruise attitude → Nose-down attitude

Airspeed increasing

Miniature airplane moves below virtual horizon

Cruise attitude → Banked attitude

Miniature aircraft indicates bank with respect to virtual horizon

Turn coordinator deflected in direction of the turn

Ball is centered (in coordinated turn)

Heading indicator rotates, showing change in direction

Lookout

- We fly VFR = **Visual Flight Rules**
- Operations are based on “see-and-avoid” principle
- Must be on constant lookout for other traffic (as well as weather, terrain, obstructions)

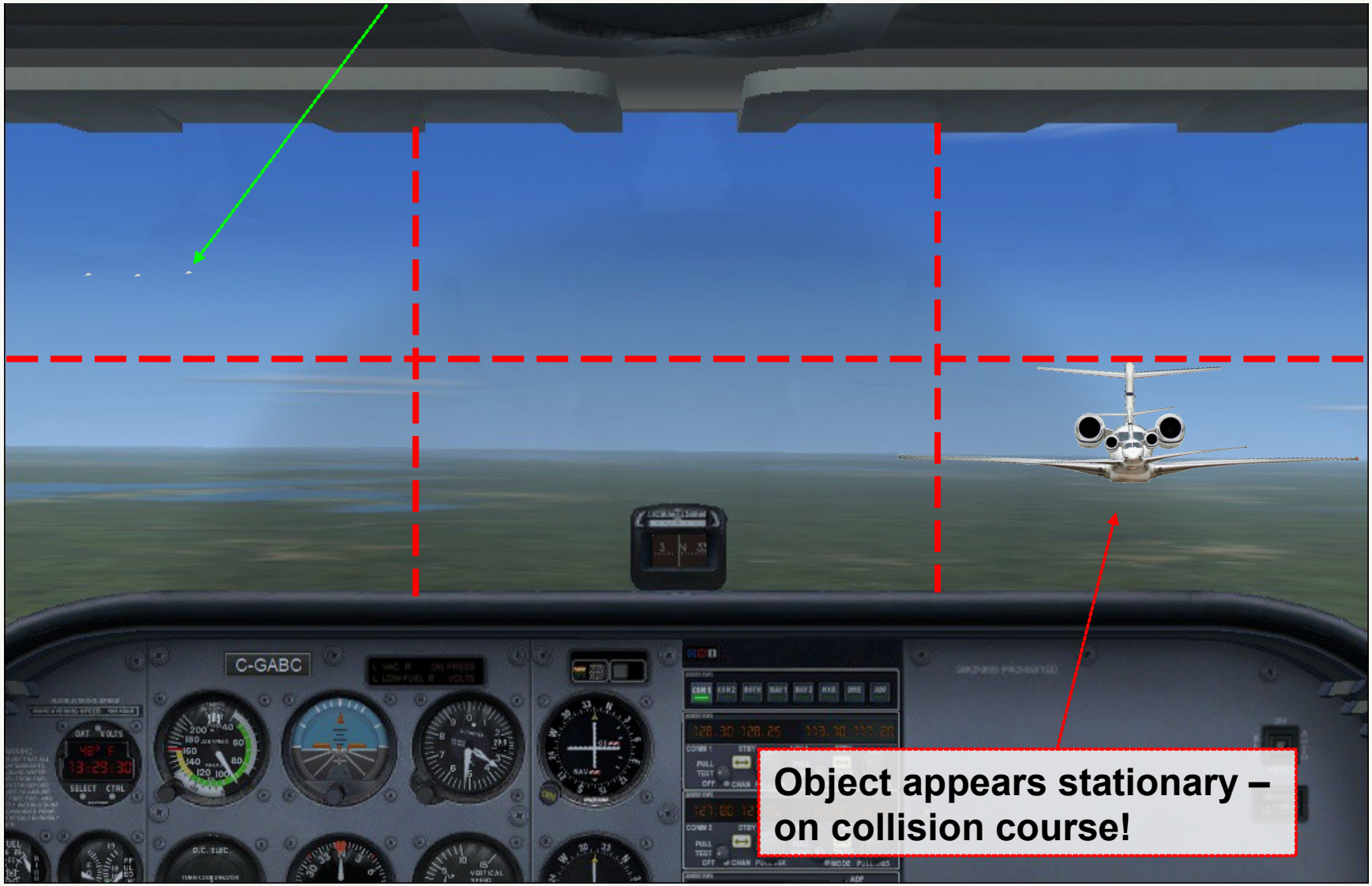
Lookout

Can you read this sentence?

(while looking at the dot?!)

- ✓ Only a small portion of the sky can be examined at a time
- ✓ Wide sweeping eye movements do not work
- ✓ Use a series of short, regularly spaced eye movements
- ✓ Divide windshield into several sections to help your scan

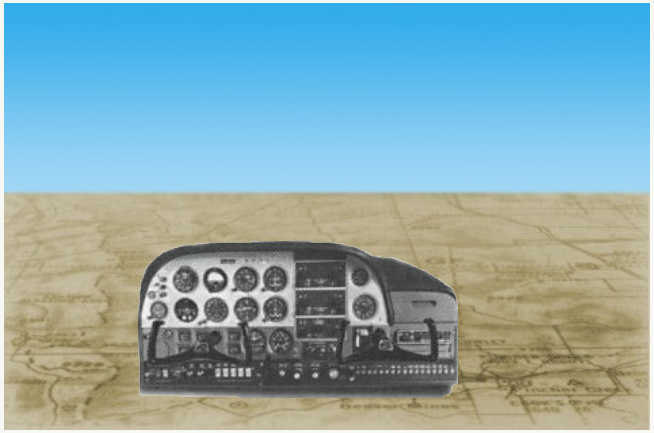
Lookout


Object appears moving – you will miss it
C-GABC
Object appears stationary – on collision course!

Procedures

- ✓ Pitch Up
  - Entry
  - During
  - Recovery
- ✓ Pitch Down
  - Entry
  - During
  - Recovery
- ✓ Roll
  - Entry
  - During
  - Recovery
- ✓ Yaw
  - Entry
  - Recovery.

Pitch Up: Entry



1. Look out!

2. Move Control Column slightly back so that nose pitches up until you see only sky out front

3. Hold slight back pressure on yoke to maintain nose-up attitude.

Pitch Up: During

- ✓ Keep good look-out!
- ✓ Keep slight back pressure on Control Column to maintain pitch-up attitude
- ✓ Maintain straight flight with ailerons
- ✓ Control yaw with rudder

Pitch Up: During

Pitch Up: During

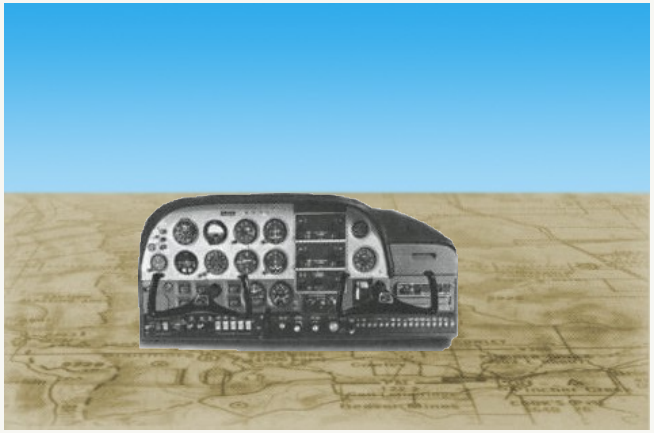
View to the left

View to the right

- **wingtips inclined with respect to the horizon**
- **wingtips equidistant from the horizon**

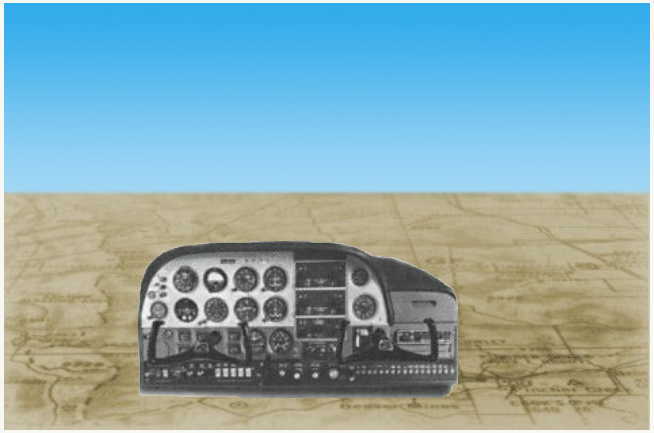
Pitch Up: Recovery

1. Look out!



2. Move Control Column slightly forward to return to cruise attitude (~3 fingers below the horizon)

Pitch Down: Entry



1. Look out!

2. Move Control Column slightly forward so that nose pitches down (~5 fingers below the horizon)

3. Hold slight forward pressure on Control Column to maintain nose-down attitude.

Pitch Down: During

- ✓ Keep good look-out!
- ✓ Keep slight forward pressure on Control Column to maintain pitch-down attitude
- ✓ Maintain straight flight with ailerons
- ✓ Control yaw with rudder

Pitch Down: During

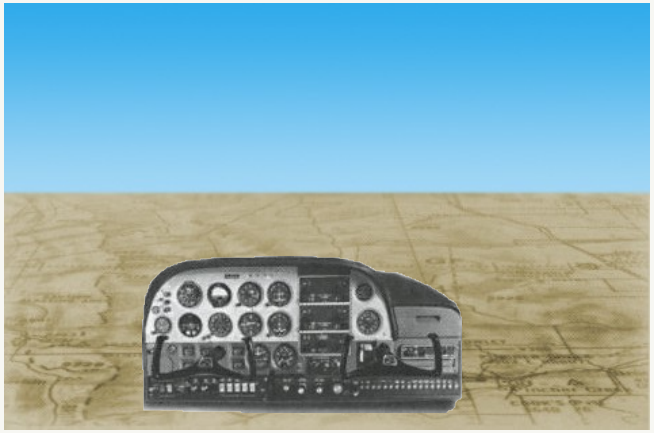
Pitch Down: During

View to the left

View to the right

- **wingtips inclined with respect to the horizon**
- **wingtips equidistant from the horizon**

Pitch Down: Recovery



1. Look out!

2. Move Control Column slightly back to return to cruise attitude (~3 fingers below the horizon)

Roll: Entry

1. Look out in direction of the roll

2. Move Control Col[illegible] initiate rolling movemen[illegible]ntain coordinated flight with rudder pedals

Remember: "step on the ball"

3. Once desired bank angle is established, return Control Column to neutral position

Roll: During

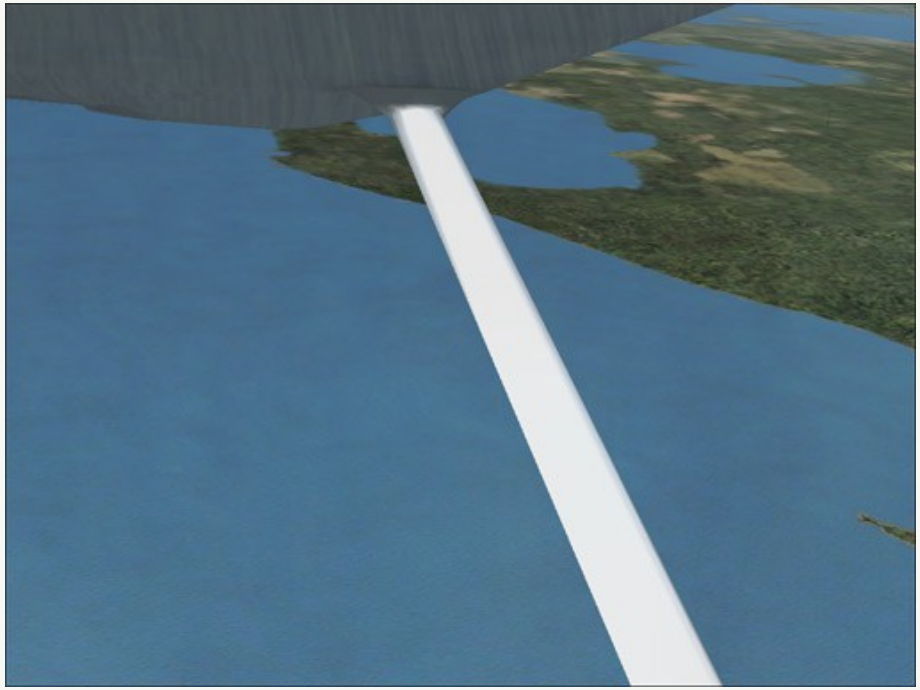
- ✓ Keep good look-out!
- ✓ Maintain bank angle with ailerons
- ✓ Control yaw with rudder
- ✓ Maintain level flight by controlling attitude with the Control Column

Roll: During


C-GABC
OAT VOLTS
42° F
12:00:36
SELECT CTRL
FUEL
D.C. ELEC.
TURN COORDINATOR
VACUUM
VERTICAL SPEED
COM1
COM2
BOTH
NAV1
128.30 128.25
STBY
PULL TEST
OFF
CHAN
127.80 127.90
COMM 2
NAV 2
0284.0
ADF
BFO

Roll: During

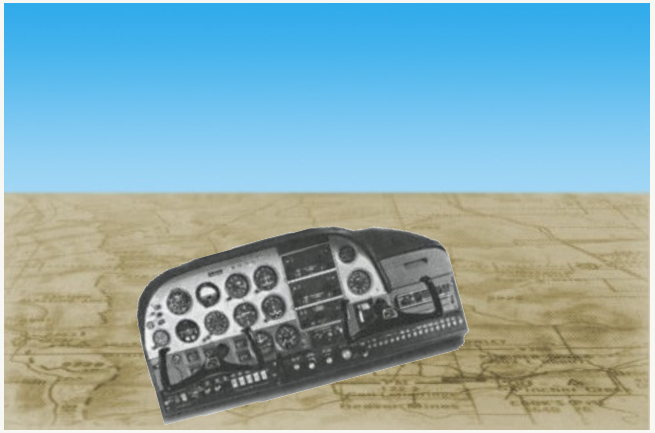
View to the left



View to the right

- **wingtips NOT equidistant from the horizon**

Roll: Recovery



1. Look out!

2. Move Control Column from neutral to direction opposite bank

3. As plane approaches cruise attitude, return Control Column to neutral position.

Yaw: Entry

1. Look out!

2. Put slight pressure on left/right rudder pedal to initiate yaw in desired direction

3. Hold the pressure to maintain ball deflection to the side.

Yaw: Recovery

1. Look out!

2. Relax rudder pressure on depressed pedal and put slight pressure on the opposite pedal as necessary to return ball to centre.

SAFETY: Control Transfer

- There must always be a clear understanding of who is handling the controls at any given moment

- Handing aircraft control over:
  - When handing over control, must say: “You have control”
  - Acceptance must be acknowledged by: “I have control”

- Taking control
  - When instructor needs to take over, will say: “I have control”
  - Student must acknowledge: “You have control”.

Conclusion

- ✓ This is your first real flight training exercise!

- ✓ Things may seem confusing and difficult at this point. Do not be discouraged: things will get better as you practice and gain experience ☺