

AE Agenda

- Quick Review (from last time)
- Extension of Flight Controls
- FAA Instrument Rating
- Flight Instruments
- Navigation/Runway Identification

| Motion | Axis | Caused by | Controlled by |
|--|----------|-----------|---------------|
| 1) _____ Nose up & down | 2) _____ | 3) _____ | Yoke |
| Yaw 4) _____ | 5) _____ | 6) _____ | 7) _____ |
| 8) _____ Wings up & down | 9) _____ | 10) _____ | Yoke |

| Motion | Axis | Caused by | Controlled by |
|--|------------------------|---------------------|-------------------------|
| 1) Pitch Nose up & down | 2) Lateral | 3) Elevator | Yoke |
| Yaw 4) Nose side to side | 5) Vertical | 6) Rudder | 7) Rudder pedals |
| 8) Roll Wings up & down | 9) Longitudinal | 10) ailerons | Yoke |

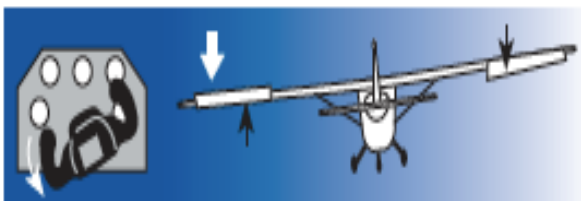
Flight Controls

- Basic principles for any plane
- Airplanes turn by directing the lift of their wings more to one side or the other
 - Move aileron by turning yoke right or left
 - Turn yoke right: R aileron goes up; L goes down
 - R wing goes down; PLANE BANKS RIGHT
 - Aileron UP means wing goes DOWN
 - Turn yoke in direction you want to bank

Climbing and Descending

- Elevators are activated by pushing yoke forward or backward.
 - Forward: elevator goes down; tail goes up & nose goes down
 - Backward: elevator goes up; tail goes down & nose goes up
 - So PUSH for nose DOWN; PULL for nose UP

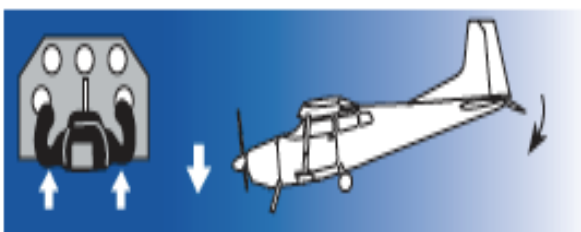
YOKE CONTROLS



When you turn the yoke left, the left aileron goes up, the right aileron goes down (black arrows), the left wing goes down (white arrow), and the airplane banks left.



When you turn the yoke right, the right aileron goes up, the left aileron goes down (black arrows), the right wing goes down (white arrow), and the airplane banks right.



When you push the yoke forward, the elevator goes down (black arrow), forcing the tail up, and the nose goes down (white arrow).

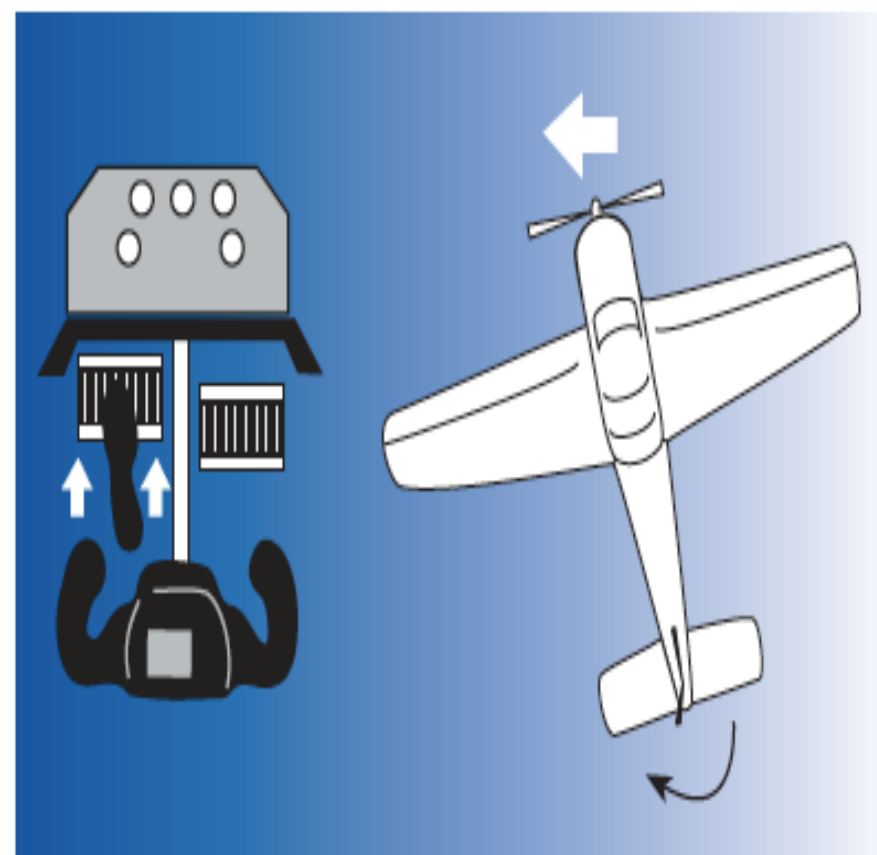


When you pull the yoke back, the elevator goes up (black arrow), forcing the tail down, and the nose goes up (white arrow).

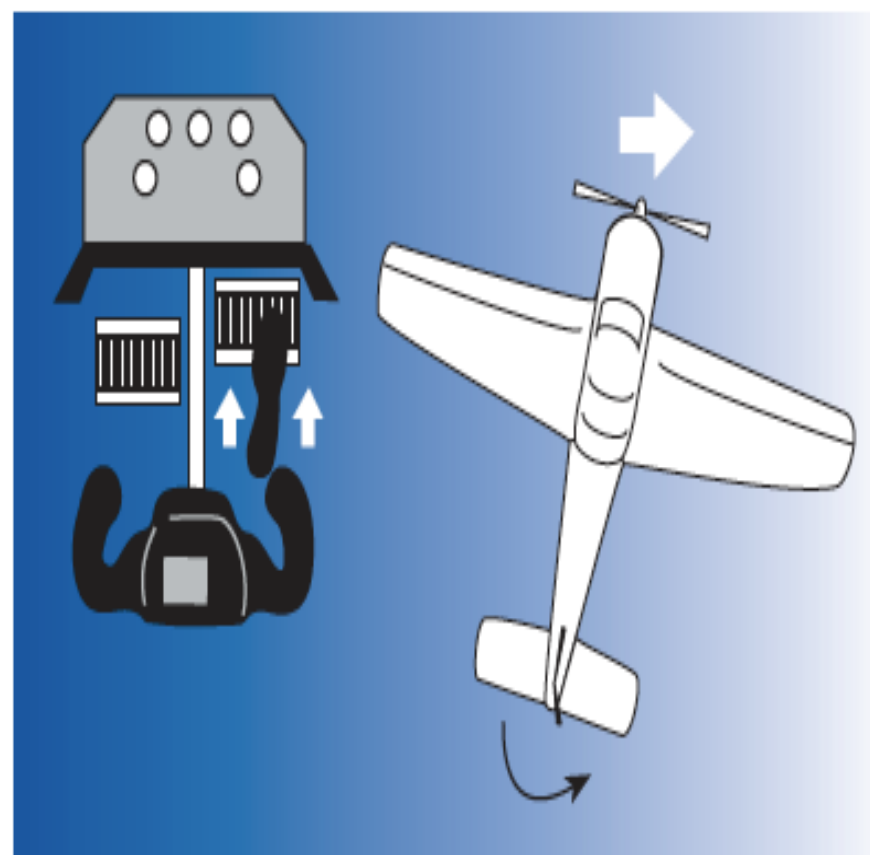
Plane Alignment

- Rudder alone does not steer plane
- Push L pedal: rudder moves L; nose moves L

RUDDER PEDAL CONTROLS



Push the left rudder pedal and the rudder on the tail moves left (black arrow), forcing the tail to the right and the nose moves left (white arrow).



Push the right rudder pedal and the rudder on the tail moves right (black arrow), forcing the tail to the left and the nose moves right (white arrow).



FAA Instrument Rating

- ***What does VFR and IFR mean?***
- FAA pilot guidelines
- VFR stands for visual flight rules
 - a pilot has to follow certain FAA flight rules operating by using only their eyesight while flying
- IFR stands for “Instrument Flight rules”
 - a pilot is basically flying by using their instruments for navigation, radar, weather tracking, flight path monitoring, take off and landing purposes, etc

VFR: FAA Visual Flight Rules

- Pilot is predominately looking out their window flying by landmarks, roads, highways, bodies of water, etc.
- The main VFR criteria deal with the pilot's fuel allowances, pilot visibility, general distance from ground, distance from clouds, and/or flying in inclement weather.



Basic VFR Requirements

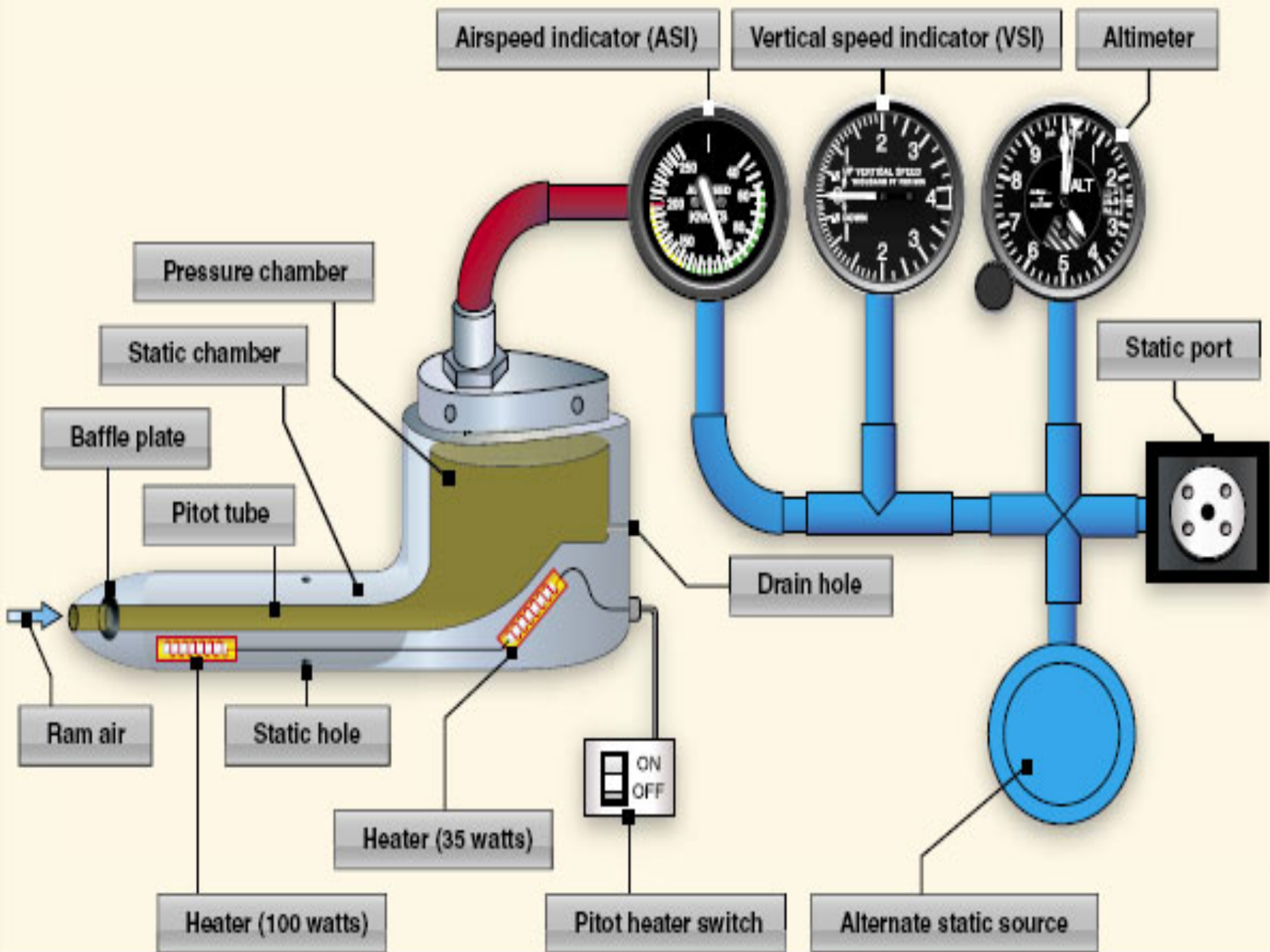
- Flight Visibility and Weather Minimums:
 - Must be able to see clearly for 3 statute miles.
 - Distance from clouds: In most cases, the pilot needs 500 ft below clouds, or 1,000 ft above clouds, while keeping a 2,000 ft horizontal distance from clouds.
- Prepare and file a flight plan
- VFR Cruising Altitude and Speeds
- Special VFR Conditions
- Special or Restricted Air Space Travel

(IFR) Instrument Flight Rules

- Prevent and protect pilots without instrument ratings from accidents, flying too high, flying far distances, flying in low visibility, flying in clouds, flying in inclement weather or in any other condition where a pilot has poor visibility and has to purely rely on their instruments to fly and land the plane safely.
- Pilot has the necessary skills to be able to fly “blind” by using only their instruments, navigation, radar, and ATC guidance.
- In order to be able to fly under IFR rules you will need to successfully go through instrument rating pilot training school and pass FAA exams to be able to legally do so.

Flight Instruments

In order to safely fly any aircraft, a pilot must understand how to interpret and operate the flight instruments



Six Primary Flight Instruments (6-Pack)



The Airspeed Indicator (ASI)

- Speed at which the aircraft is traveling through the air.
 - Nothing more than a spring which opposes the force of the air blowing in the front of a tube attached under the wing or to the nose of the aircraft.
 - The faster the airplane is moving the stronger the air pressure is that acts to oppose the spring and the larger the deflection of the needle from which the pilot reads the craft's speed.

The Attitude Indicator (AI)

- Informs pilot of his/her position in space relative to the horizon.
- This is accomplished by fixing the case of the instrument to the aircraft and measuring the displacement of the case with reference to a fixed gyroscope inside.

The Altimeter (ALT)

- Serves to display altitude.
- This is measured by the expansion or contraction of a fixed amount of air acting on a set of springs.
- As the airplane climbs or descends, the relative air pressure outside the aircraft changes and the altimeter reports the difference between the outside air pressure and a reference, contained in a set of airtight bellows.

The Turn Coordinator (TC)

- Measures rate of turn for the aircraft.
 - only accurate when the turn is coordinated—that is, when the airplane is not skidding or slipping through the turn.
- Skid is the aeronautical equivalent to a car that is understeering, where the front wheels do not have enough traction to overcome the car's momentum and the front of the car is thus plowing through the turn.
 - In a car, this results in a turn radius that is larger than that commanded by the driver.
- Slip results from an aircraft that is banked too steeply for the rate of turn selected.
 - To correct the slip, all the pilot has to do is increase back pressure on the yoke, pulling the airplane 'up' into a tighter turn, such that the turn rate is in equilibrium with the bank angle.

The Directional Gyro (DG)

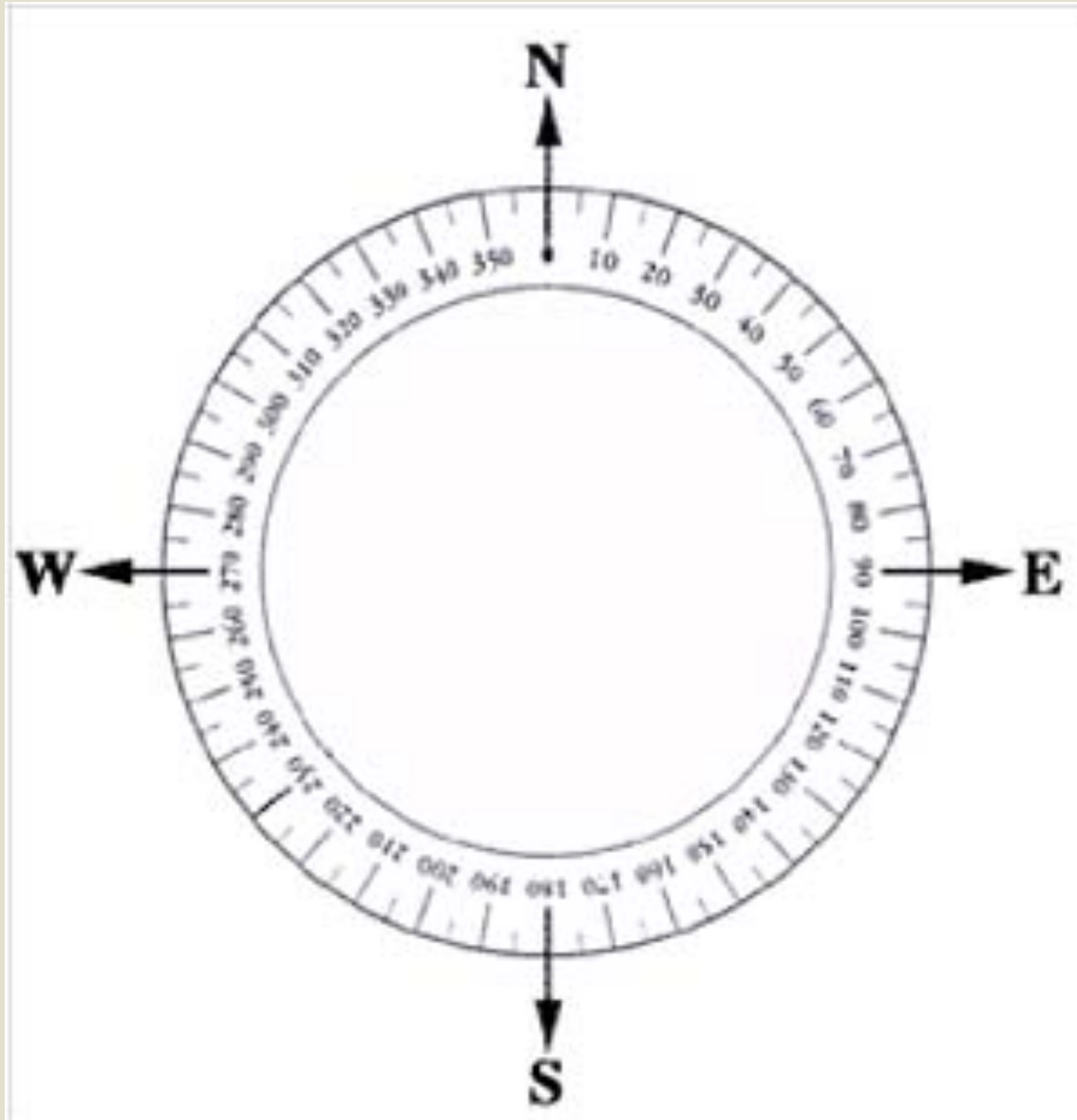
- Points north and allows the pilot to tell which way she or he is flying.

The Vertical Speed Indicator (VSI)

- Reports the craft's climb or descent rate in feet per minute.
- Typically, non-pressurized airplanes will climb comfortably at about 700 fpm (if the plane is capable) and descend at about 500 fpm.
 - Descent rates faster than this cause discomfort on the occupants which is felt in passengers' ears.
- Pressurized airplanes can climb and descend much more rapidly and still maintain the cabin rate of change at about these levels, since the cabin altitude is not related to the ambient altitude unless the pressurization system fails.

NAVIGATION

- In navigation and surveying all measurement of direction is performed by using the numbers of a compass.
- 360° circle
 - 0/360° is North
 - 90° is East
 - 180° is South
 - 270° is West
- Runways are laid out according to the numbers of a compass.



Runway Identification

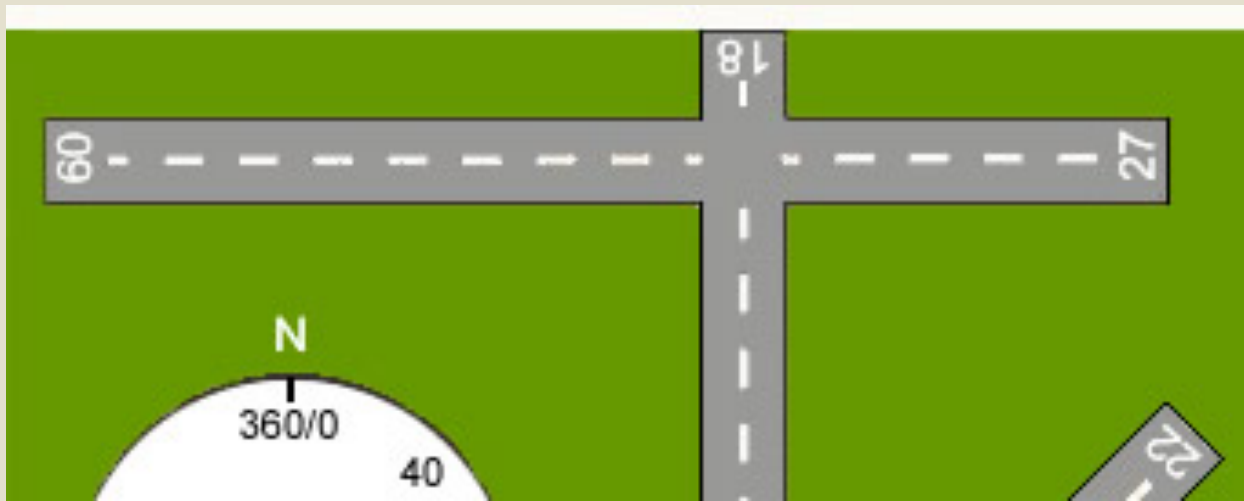
- Large number painted at end of each runway
- Preceding that number are 8 white stripes.
- Following that number by 500 feet is the "touchdown zone" which is identified by 6 white stripes.
- A runway's number is not written in degrees, but is given a shorthand format.



Runway Identification

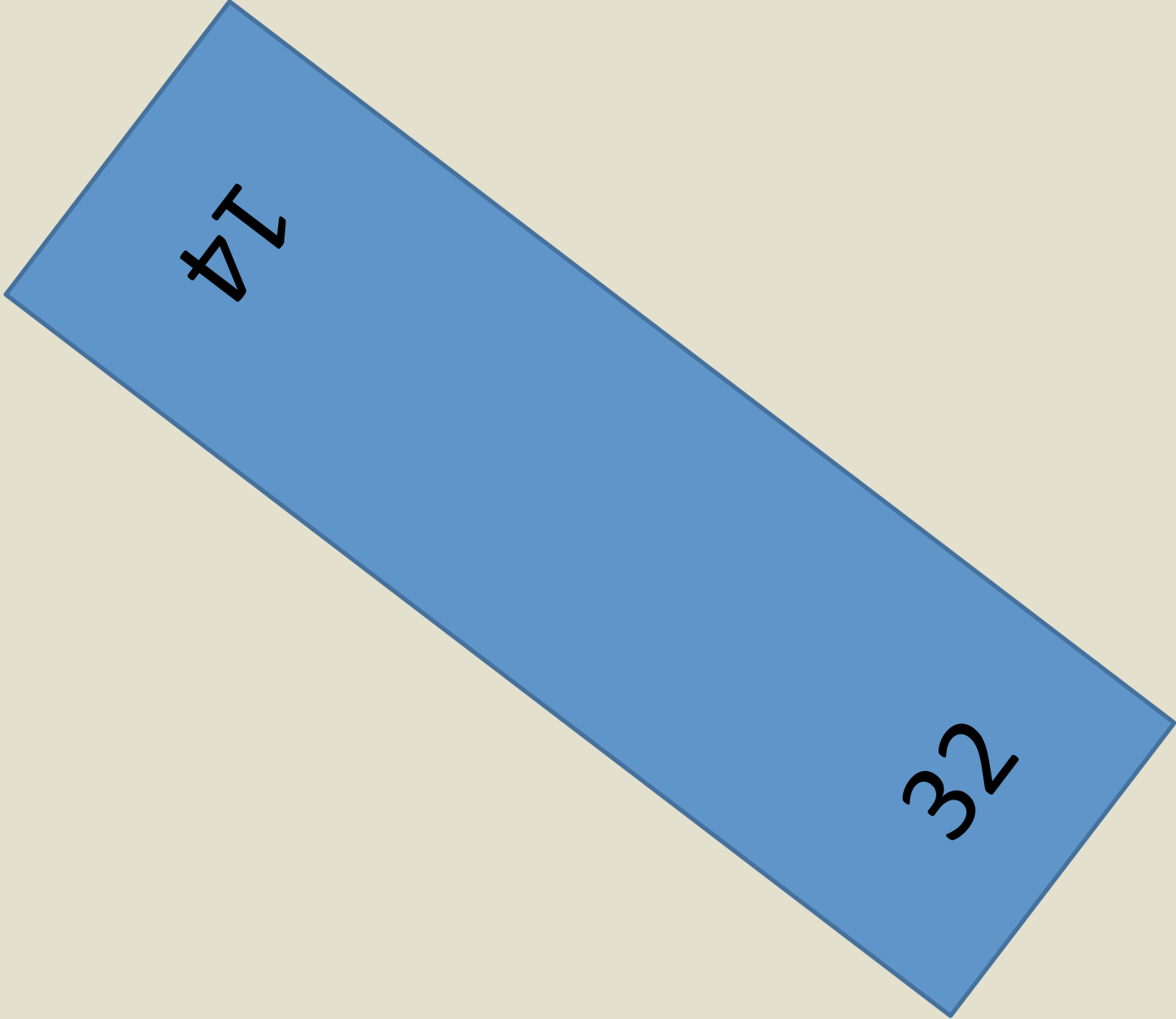
◆ Identified by a number

- First 2 digits of compass direction (rd to nearest 10^0)
- Ex/Runway faces west (265 to 274) = numbered 27
- Opposite direction changes to reciprocal
 - 09 (180 from 270 = 090)
- Multi runways in same direction
 - Given letter
 - 23L or 23R



Try it Out!

- A runway with a marking of "14"
 - What degree(s) on compass?
 - What direction is the compass heading?
 - Draw the runway (both ends)
- Compass reading close to (if not a direct heading of) 140 degrees.
- This is a southeast compass heading.

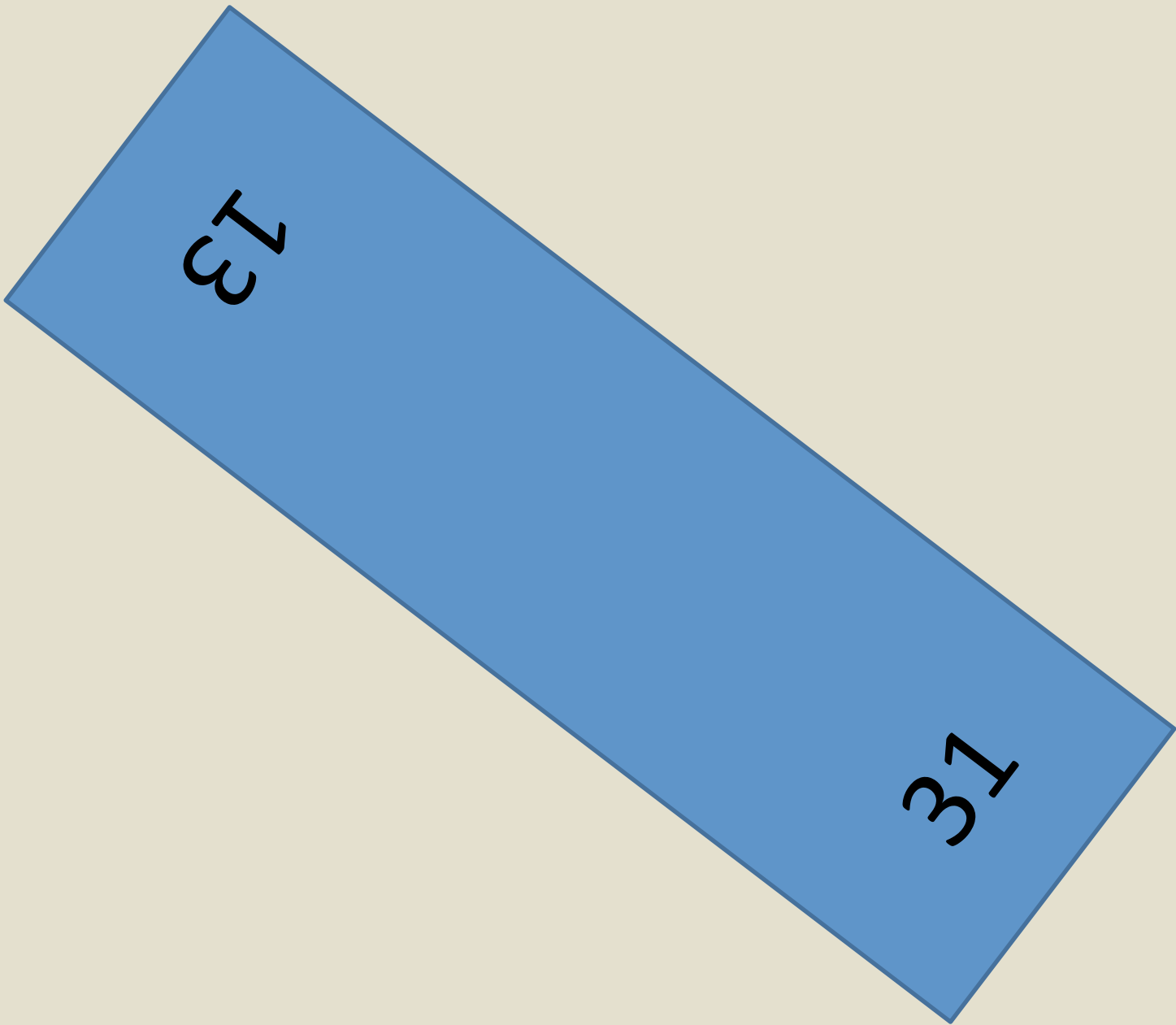


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Try Another!

- A runway with a marking of "31"
 - What degree(s) on compass?
 - What direction is the compass heading?
 - Draw the runway (both ends)
- Compass heading of 310 degrees
- Northwest direction



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Reverse It!

- Compass heading says 68 degrees
 - What direction is the compass heading?
 - Draw the runway (both ends)
- Heading Northeast

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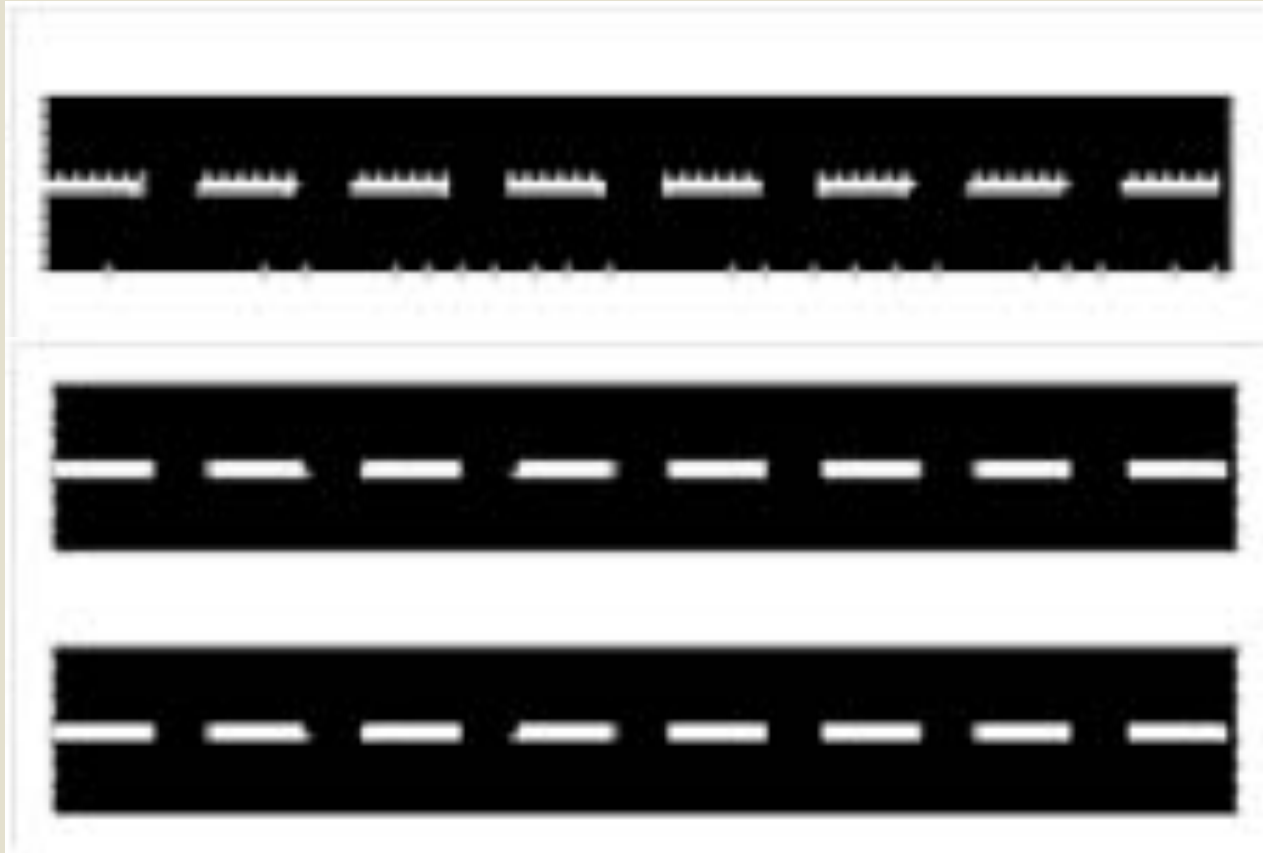
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Number these two parallel runways



Two parallel runways oriented 90 and 270 degrees would be numbered "9L" and "9R" and "27L" and "27R."

What About These Three?



Center runways would be "9C" and "27C."