

## Instruments

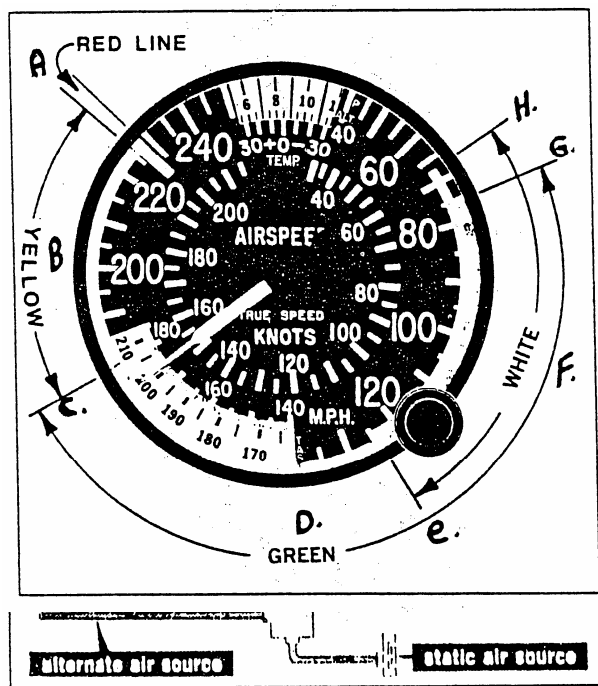
### Pitot Static System

The pitot tube provides impact pressure for only the airspeed indicator. If the pitot tube is clogged, the airspeed indicator will be inoperative.

The static vents provide information to the altimeter, vertical speed indicator and airspeed indicator. If the static vents become clogged, the airspeed indicator, altimeter and vertical speed indicator will be inoperative.

Airspeed indicator markings show:

### Airspeed Indicator



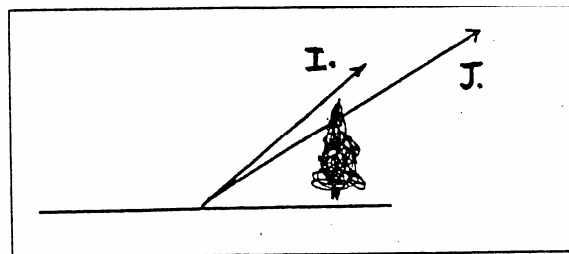
- A. Never exceed speed is the maximum speed the airplane can be operated in smooth air (red radial line).
- B. Caution range (yellow arc).
- C. Maximum structural cruising speed (higher airspeed limit of green arc) -  $V_{no}$ .

### Airspeed Indicator (Cont)

- D. Normal operating range (green arc).
- E. Maximum flap extended speed (higher airspeed limit of white arc) -  $V_{fe}$ .
- F. Flap operating range (white arc).
- G. Power off stalling speed, flaps and landing gear retracted (lower limit of green arc).
- H. Power off stalling speed, flaps and landing gear in landing position (lower airspeed limit of white arc) -  $V_{so}$ .

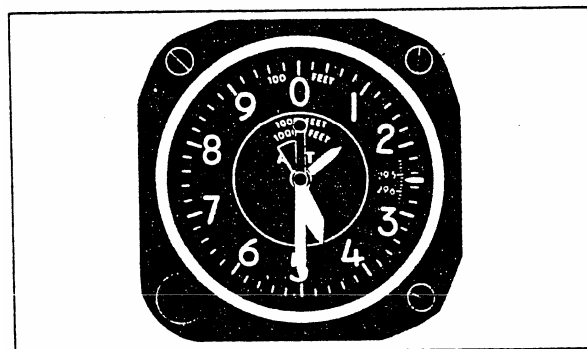
Airspeeds not marked on the airspeed indicator:

- I. Best angle of climb speed gives the greatest



gain in altitude over the shortest horizontal distance -  $V_x$ .

- J. Best rate of climb speed gives the greatest gain in altitude in the least time -  $V_y$ .
- K. Maneuvering speed is the best speed for severe turbulence -  $V_a$ .



- L. Maximum landing gear extended speed -  $V_{le}$ .

### Altimeter

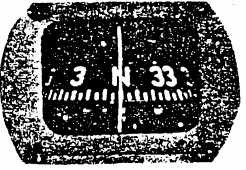
Absolute altitude is the altitude above the surface. True altitude is the actual height above sea level. Indicated altitude is the same as true altitude when at sea level under standard conditions. True altitude is lower than indicated altitude in colder than standard air temperature.

### Altimeter (Cont)

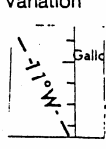
If the altimeter is set to the current altimeter setting, it will indicate true altitude at airport elevation. If you do not have the altimeter setting available before takeoff, set the altimeter to airport elevation.

HIGH TO LOW, or HOT TO COLD, LOOK OUT BELOW. Pressure levels are raised on warm days and the indicated altitude is lower than true altitude. If you change the altimeter setting from 29.15 UP to 29.85 (.70 increase), the altimeter will go UP, and show a 700 foot increase, It increases 1000 feet per inch.

### Magnetic Compass



Variation



Compass	FOR (Magnetic)	N	30	60	E	120	150
Deviation	STEER (Compass)	0	27	56	85	116	148
Card	FOR (Magnetic)	S	210	240	W	300	330
	STEER (Compass)	181	214	244	274	303	332

Magnetic compass indications are accurate only in straight-and-level unaccelerated flight.

Magnetic variation is the angle between true north and magnetic north, and is found on Sectional charts. It is shown by a dashed line.

Compass deviation is the angle between magnetic north and compass north (where the compass points). It is caused by magnetic fields within the airplane distorting the lines of magnetic force.

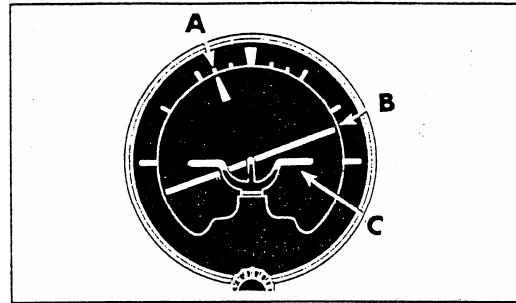
Errors in the compass include:

Turning error - Turning on a south heading in either direction, the compass will lead your turn. Turning on a north heading in either direction, the compass will lag your turn.

Acceleration error - On an east / west heading, if you accelerate, the compass turns north; if you decelerate, the compass turns south.

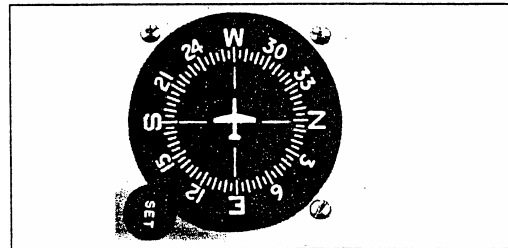
The compass indications are accurate only in straight and level flight.

### Attitude Indicator



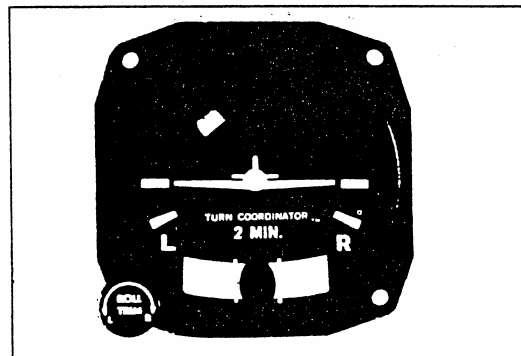
The proper adjustment is to align the miniature airplane (C) to the horizon bar (B). Direction/amount of bank are indicated by angle between miniature airplane and horizon bar.

### Heading Indicator

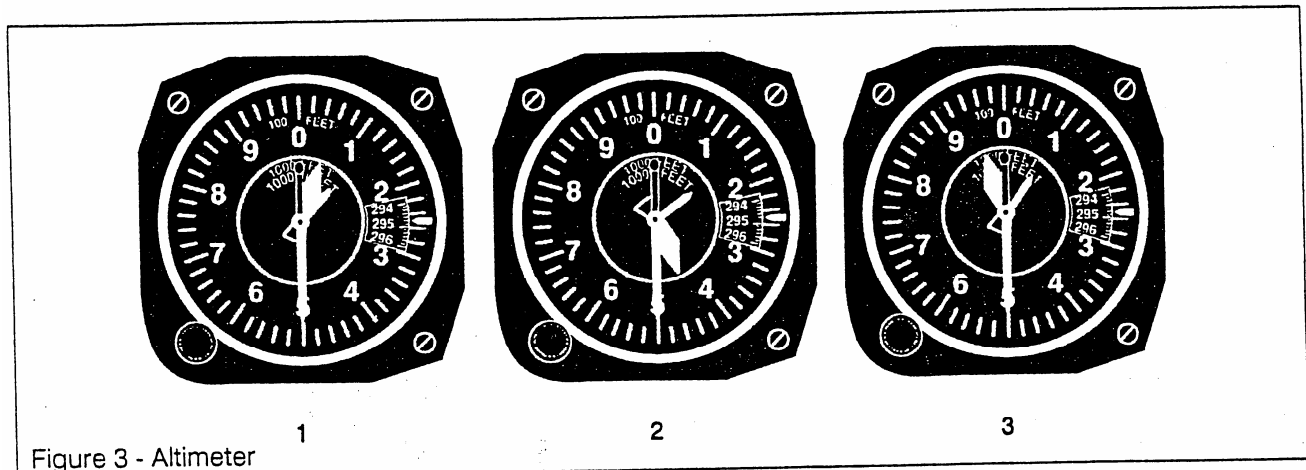


To be accurate, the heading indicator must be periodically aligned with the magnetic compass as the gyro precesses.

### Turn Coordinator



The turn coordinator shows movement of the aircraft about the yaw and roll axes.



3006. A02

Which V-speed represents maneuvering speed?

- A) VA.
- B) VLO.
- C) VNE.

3007.

Which V-speed represents maximum flap extended speed?

- A) Vfe
- B) Vlof
- C) Vfc

3008.

Which V-speed represents maximum landing gear extended speed?

- A) Vle
- B) Vlo
- C) Vfe

3009.

Vno is defined as the

- A) normal operating range.
- B) never-exceed speed.
- C) maximum structural cruising speed.

3010.

Vso is defined as the

- A) stalling speed or minimum steady flight speed in the landing configuration.
- B) stalling speed or minimum steady flight speed in a specified configuration.
- C) stalling speed or minimum takeoff safety speed.

3011. A02

Which would provide the greatest gain in altitude in the shortest distance during climb after takeoff?

- A) VY.
- B) VA.
- C) VX.

3012. A02

After takeoff, which airspeed would the pilot use to gain the most altitude in a given period of time?

- A) VY.
- B) VX.
- C) VA.

3247. H931

If the pitot tube and outside static vents become clogged, which instruments would be affected?

- A) The altimeter, airspeed indicator, and turn-and-slip indicator.
- B) The altimeter, airspeed indicator, and vertical speed indicator.**
- C) The altimeter, attitude indicator, and turn-and-slip indicator.

3248. H931

Which instrument will become inoperative if the pitot tube becomes clogged?

- A) Altimeter.
- B) Vertical speed.
- C) Airspeed.

**NOTE: CORRECT ANSWER IS IN BOLD ITALICS**

3249. H931

Which instrument(s) will become inoperative if the static vents become clogged?

- A) Airspeed only.
- B) Altimeter only.
- C) Airspeed, altimeter, and vertical speed.**

3250. H931

(Refer to figure 3.) Altimeter 1 indicates

- A) 500 feet.
- B) 1,500 feet.
- C) 10,500 feet.**

3251. H931

(Refer to figure 3.) Altimeter 2 indicates

- A) 1,500 feet.
- B) 4,500 feet.
- C) 14,500 feet.**

3252. H931

(Refer to figure 3.) Altimeter 3 indicates

- A) 9,500 feet.**
- B) 10,950 feet.
- C) 15,940 feet.

3253. H931

(Refer to figure 3.) Which altimeter(s) indicate(s) more than 10,000 feet?

- A) 1, 2, and 3.
- B) 1 and 2 only.**
- C) 1 only.

3254. H931

Altimeter setting is the value to which the barometric pressure scale of the altimeter is set so the altimeter indicates

- A) calibrated altitude at field elevation.
- B) absolute altitude at field elevation.
- C) true altitude at field elevation.**

3255. H931

How do variations in temperature affect the altimeter?

- A) Pressure levels are raised on warm days and the indicated altitude is lower than true altitude.**
- B) Higher temperatures expand the pressure levels and the indicated altitude is higher than true altitude.
- C) Lower temperatures lower the pressure levels and the indicated altitude is lower than true altitude.



3256. H931

What is true altitude?

- A) The vertical distance of the aircraft above sea level.**
- B) The vertical distance of the aircraft above the surface.
- C) The height above the standard datum plane.

3257. H931

What is absolute altitude?

- A) The altitude read directly from the altimeter.
- B) The vertical distance of the aircraft above the surface.**
- C) The height above the standard datum plane.

3261. H931

If it is necessary to set the altimeter from 29.15 to 29.85, what change occurs?

- A) 70-foot increase in indicated altitude.
- B) 70-foot increase in density altitude.
- C) 700-foot increase in indicated altitude.**

3262. H931

The pitot system provides impact pressure for which instrument?

- A) Altimeter.
- B) Vertical-speed indicator.
- C) Airspeed indicator.**

3263. H931

As altitude increases, the indicated airspeed at which a given airplane stalls in a particular configuration will

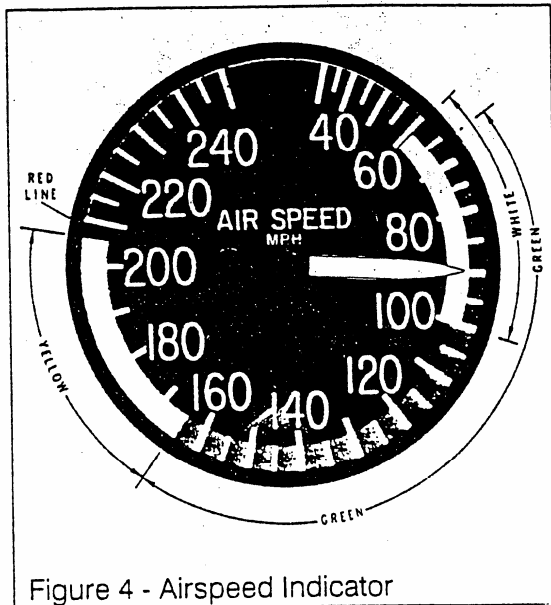
- A) decrease as the true airspeed decreases.
- B) decrease as the true airspeed increases.
- C) remain the same regardless of altitude.**

3264. H931

What does the red line on an airspeed indicator represent?

- A) Maneuvering speed.
- B) Turbulent or rough-air speed.
- C) Never-exceed speed.**

**NOTE: CORRECT ANSWER IS IN BOLD ITALICS**



3265. H931  
(Refer to figure 4.) What is the full flap operating range for the airplane?  
**A)** 60 to 100 MPH.  
B) 60 to 208 MPH.  
C) 65 to 165 MPH.

3266. H931  
(Refer to figure 4.) What is the caution range of the airplane?  
A) 0 to 60 MPH.  
B) 100 to 165 MPH.  
**C)** 165 to 208 MPH.

3267. H931  
(Refer to figure 4.) The maximum speed at which the airplane can be operated in smooth air is  
A) 100 MPH.  
B) 165 MPH.  
**C)** 208 MPH.

3268. H931  
(Refer to figure 4.) Which color identifies the never-exceed speed?  
A) Lower limit of the yellow arc.  
B) Upper limit of the white arc.  
**C)** The red radial line.

**NOTE: CORRECT ANSWER IS IN BOLD ITALICS**

3269. H931  
(Refer to figure 4.) Which color identifies the power-off stalling speed in a specified configuration?  
A) Upper limit of the green arc.  
B) Upper limit of the white arc.  
**C)** Lower limit of the green arc.

3270. H931  
(Refer to figure 4.) What is the maximum flaps-extended speed?  
A) 65 MPH.  
**B)** 100 MPH.  
C) 165 MPH.

3271. H931  
(Refer to figure 4.) Which color identifies the normal flap operating range?  
A) The lower limit of the white arc to the upper limit of the green arc.  
B) The green arc.  
**C)** The white arc.

3272. H931  
(Refer to figure 4.) Which color identifies the power-off stalling speed with wing flaps and landing gear in the landing configuration?  
A) Upper limit of the green arc.  
B) Upper limit of the white arc.  
**C)** Lower limit of the white arc.

3273. H931  
(Refer to figure 4.) What is the maximum structural cruising speed?  
A) 100 MPH.  
**B)** 165 MPH.  
C) 208 MPH.

3274. H931  
What is an important airspeed limitation that is not color coded on airspeed indicators?  
A) Never-exceed speed.  
B) Maximum structural cruising speed.  
**C)** Maneuvering speed.

3275. H932  
(Refer to figure 5.) A turn coordinator provides an indication of the  
**A)** movement of the aircraft about the yaw and roll axis.  
B) angle of bank up to but not exceeding 30°.  
C) attitude of the aircraft with reference to the longitudinal axis.

3276. H932

(Refer to figure 6.) To receive accurate indications during flight from a heading indicator, the instrument must be

- A) set prior to flight on a known heading.
- B) calibrated on a compass rose at regular intervals.
- C) periodically realigned with the magnetic compass as the gyro precesses.**

3277. H932

(Refer to figure 7.) The proper adjustment to make on the attitude indicator during level flight is to align the

- A) horizon bar to the level-flight indication.
- B) horizon bar to the miniature airplane.
- C) miniature airplane to the horizon bar.**

3278. H932

(Refer to figure 7.) How should a pilot determine the direction of bank from an attitude indicator such as the one illustrated?

- A) By the direction of deflection of the banking scale (A).
- B) By the direction of deflection of the horizon bar (B).
- C) By the relationship of the miniature airplane (C) to the deflected horizon bar (B).**

3279. H933

Deviation in a magnetic compass is caused by the

- A) presence of flaws in the permanent magnets of the compass.
- B) difference in the location between true north and magnetic north.
- C) magnetic fields within the aircraft distorting the lines of magnetic force.**

3280. H933

In the Northern Hemisphere, a magnetic compass will normally indicate initially a turn toward the west if

- A) a left turn is entered from a north heading.
- B) a right turn is entered from a north heading.**
- C) an aircraft is accelerated while on a north heading.

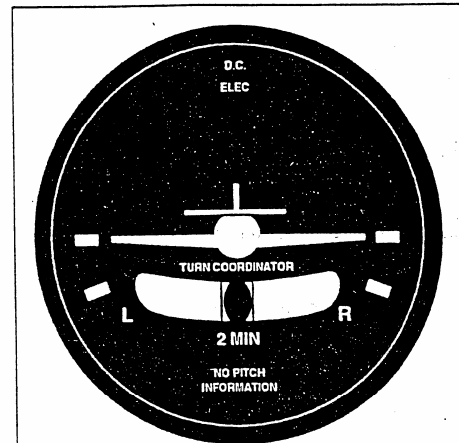


Figure 5 - Turn Coordinator

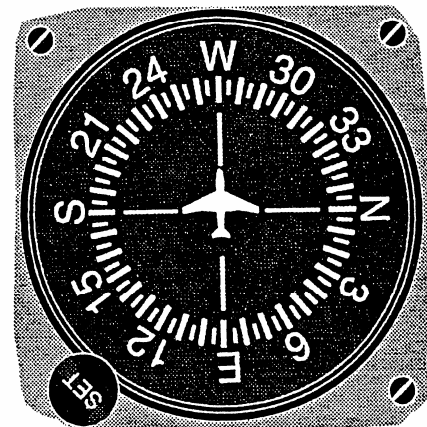


Figure 6 - Heading Indicator

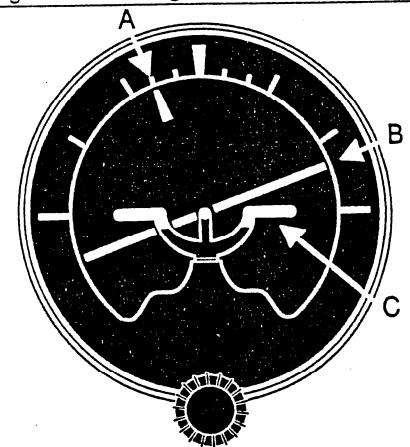


Figure 7 - Attitude Indicator

**NOTE: CORRECT ANSWER IS IN BOLD ITALICS**



3281. H933

In the Northern Hemisphere, a magnetic compass will normally indicate initially a turn toward the east if

- A) an aircraft is decelerated while on a south heading.
- B) an aircraft is accelerated while on a north heading.
- C) a left turn is entered from a north heading.**

3282. H933

In the Northern Hemisphere, a magnetic compass will normally indicate a turn toward the north if

- A) a right turn is entered from an east heading.
- B) a left turn is entered from a west heading.
- C) an aircraft is accelerated while on an east or west heading.**

3283. H933

In the Northern Hemisphere, the magnetic compass will normally indicate a turn toward the south when

- A) a left turn is entered from an east heading.
- B) a right turn is entered from a west heading.
- C) the aircraft is decelerated while on a west heading.**

3284. H933

In the Northern Hemisphere, if an aircraft is accelerated or decelerated, the magnetic compass will normally indicate

- A) a turn momentarily.
- B) correctly when on a north or south heading.**
- C) a turn toward the south.

3286. H933

During flight, when are the indications of a magnetic compass accurate?

- A) Only in straight-and-level unaccelerated flight.**
- B) As long as the airspeed is constant.
- C) During turns if the bank does not exceed 18°.

3287. H940

An airplane has been loaded in such a manner that the CG is located aft of the aft CG limit. One undesirable flight characteristic a pilot might experience with this airplane would be

- A) a longer takeoff run.
- B) difficulty in recovering from a stalled condition.**
- C) stalling at higher-than-normal airspeed.

3390. I22

If a flight is made from an area of low pressure into an area of high pressure without the altimeter setting being adjusted, the altimeter will indicate

- A) the actual altitude above sea level.
- B) higher than the actual altitude above sea level.
- C) lower than the actual altitude above sea level.**

3391. If a flight is made from an area of high pressure into an area of lower pressure without the altimeter setting being adjusted, the altimeter will indicate

- A) lower than the actual altitude above sea level.
- B) higher than the actual altitude above sea level.**
- C) the actual altitude above sea level.

3392. I22

Under what condition will true altitude be lower than indicated altitude?

- A) In colder than standard air temperature.**
- B) In warmer than standard air temperature.
- C) When density altitude is higher than indicated altitude.

3393.

Which condition would cause the altimeter to indicate a lower altitude than true altitude?

- A) Air temperature lower than standard.
- B) Atmospheric pressure lower than standard.
- C) Air temperature warmer than standard.**

**NOTE: CORRECT ANSWER IS IN BOLD ITALICS**