Attention

When you are in the brown…you are going down. Who had to figure out that Vne would break the plane?

Objective

To understand what all the instruments tell us.

Schedule

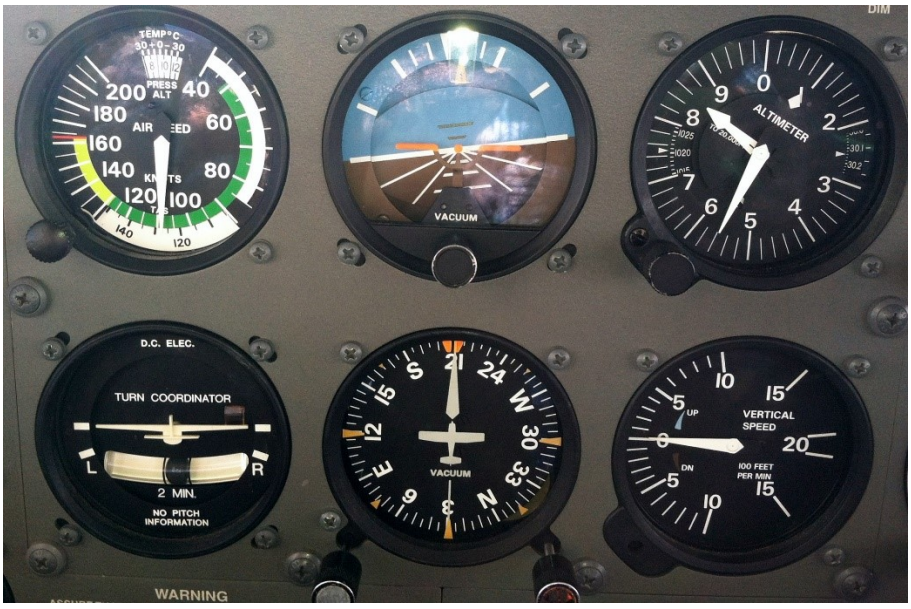
Ground instruction – 15 minutes

Reference Material

Wikipedia.org
https://learntofly.ca/six-pack-primary-flight-instruments/
http://www.boldmethod.com/learn-to-fly/aircraft-systems/how-does-a-vsi-work/

Material

The Six Pack



1. Airspeed indicator
2. Attitude Indicator
3. Altimeter
4. Turn Coordinator
5. Heading Indicator
6. Vertical Speed Indicator

Airspeed indicators in many Light and Recreational aircraft can only show the pilot Indicated Airspeed (IAS). For True Airspeed (TAS) other components would have to be added by the manufacturer. Airspeed Indicator markings use a set of standardized colored bands and lines on the face of the instrument. The white range is the normal range of operating speeds for the aircraft with the flaps extended as for landing or takeoff. The green range is the normal range of operating speeds for the aircraft without flaps extended. The yellow range is the range in which the aircraft may be operated in smooth air, and then only with caution to avoid abrupt control movement. A redline mark indicates VNE, or velocity (never exceed).

See Types of Speeds – Ground Lesson for more detail.
White arc = Vso to Vfe (stall speed to max for flaps extended)
Green arc = Vs1 to Vno (stall speed to max cruising speed)
Yellow arc = Vno to Vne (max cruising speed to never exceed speed)
Above the Red line = crash

An attitude indicator (AI), also known as gyro horizon or artificial horizon is an instrument used in an aircraft to inform the pilot of the orientation of the aircraft relative to Earth's horizon. It indicates pitch (fore and aft tilt) and bank (side to side tilt) and is a primary instrument for flight in instrument meteorological conditions.

The essential components of the indicator are:
- The "miniature airplane", horizontal lines with a dot between them representing the actual wings and nose of the aircraft.
- The center horizon bar separating the two halves of the display, with the top half usually blue in color to represent sky and the bottom half usually dark to represent earth.

-The degree indices marking the bank angle. They run along the edge of the dial. On a typical indicator, there is a zero angle of bank index, there may be 10 and 20 degree indices, with additional indices at 30, 60 and 90 degrees.

The altimeter simple indicates the height in feel above sea level. Altitude can be determined based on the measurement of atmospheric pressure. The greater the altitude, the lower the pressure. When a barometer is supplied with a nonlinear calibration so as to indicate altitude, the instrument is called a pressure altimeter or barometric altimeter.

You must be cautious and keep the altimeter setting current to wherever you may be at the time. Before you even taxi out you should listen to the ATIS/AWOS for the current setting and change the altimeter to indicate it. As you travel, ATC will give you the local setting as you are handed off.

In aviation, the turn and slip indicator (T/S, a.k.a. turn and bank indicator) and the turn coordinator (TC) variant are essentially two aircraft flight instruments in one device. One indicates the rate of turn, or the rate of change in the aircraft's heading, the other part indicates whether the aircraft is in coordinated flight, showing the slip or skid of the turn.

Turn Coordinators display the rate of turn and roll information, as well as quality and coordination of the turn

Slipping and skidding within a turn is sometimes referred to as a sloppy turn, due to the perceptive discomfort it can cause to the pilot and passengers. When the aircraft is in a balanced turn (ball is centered), passengers experience gravity directly in line with their seat (force perpendicular to seat). With a well balanced turn, passengers may not even realize the aircraft is turning unless they are viewing objects outside the aircraft.

While aircraft slipping and skidding are often undesired in a usual turn that maintains altitude, slipping of the aircraft can be used for practical purposes. Intentionally putting an aircraft into a slip is used as a forward slip and a sideslip. These slips are performed by applying opposite inputs of the aileron and rudder controls. A forward slip allows a pilot to quickly drop altitude without gaining unnecessary speed, while a sideslip is one method utilized to perform a crosswind landing.

The magnetic compass is the primary direction indicator in an aircraft, but it is prone to a number of errors due to acceleration and turbulence. The can also be hard to read especially when the sun is bright or it is night. We use a direction indicator based on a gyro. They are stable, usually accurate, and easy to read. The can be synced to a magnetic compass in some cases.

During preflight and at intervals throughout flight, you will need to adjust the HI to the compass or by looking outside.

The Rate of Climb and Rate of Descent are indicated on the Vertical Speed Indicator (VSI). This is measured in Feet Per Minute, and displayed in Hundreds of FPM.

The VSI flight instrument measures the vertical speed (vertical velocity, or rate of climb). This instrument is connected to the static air pressure system.

The pilot relies on both the Altimeter and the Vertical Speed Indicator to monitor altitude and altitude changes. At a glance, the VSI shows the pilot if they are flying at a steady altitude, or if they are ascending or descending, and the rate at which their altitude is changing in feet per minute.

Because the VSI relies on air leaking out of (or into) the casing, it takes a second or two for everything to stabilize. That's where trend vs. rate comes into play.

When you initially start climbing or descending, your VSI needle will start moving, but it can't immediately indicate how fast you're climbing. This is what's called trend information. When you see the directing of the needle moving up, you know your climb rate is increasing, and when it moves down, you know your climb rate is decreasing. You just don't know how much...at least yet.