Georgian College

Flight Lab - Module Four

Lesson Objectives

Lesson Four - Instrument Flying

By the end of this lesson, you will have a firm understanding of:

- Basic instrument flying techniques, including:
  - Attitudes and movements
  - Straight and level flight
  - Climbing and descending
  - Turns
- Basic VOR understanding, including:
  - Determining aircraft position
  - Intercepting
  - Tracking
- Basic GPS theory

Lesson Objectives

Lesson Four - Instrument Flying

Instrument flying is part of both the Private Pilot and Commercial Pilot License training program.

For the purposes or Flight Lab, Instrument flying refers to flying the aircraft solely with reference to the flight instruments. The aircraft will not be operated in cloud or any other actual IFR weather conditions at any time.

Students will wear a view limiting device referred to as a ‘Hood’. The hood will prevent the student from seeing outside of the aircraft.

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When flying with reference to the flight instruments, control inputs required to produce a given movement are the same as those used in visual flight. However, due the the lack of direct visual feedback received by visual cues outside, pilots should make small, smooth control inputs. This will give the instruments time to 'settle' or catch up the the input from the pilot, some instruments such as the vertical speed indicator can take as long as 9 seconds to read reliably.

Removing your visual reference can also cause a number of illusion including loss of sense or direction and altitude. You may feel like you are turning when in fact you are flying straight and level. This is caused by the fluid in the inner ear settling during a turn.

Some students may also start to feel nauseous. If this happens, remove the hood and look straight ahead

Lesson Objectives

Lesson Four - Instrument Flying

Back in module one, you learned about the different attitudes and movements. As a quick review, they are:

Attitudes

- Cruise Attitude
- Nose Up Attitude
- Nose Down Attitude
- Bank Attitude

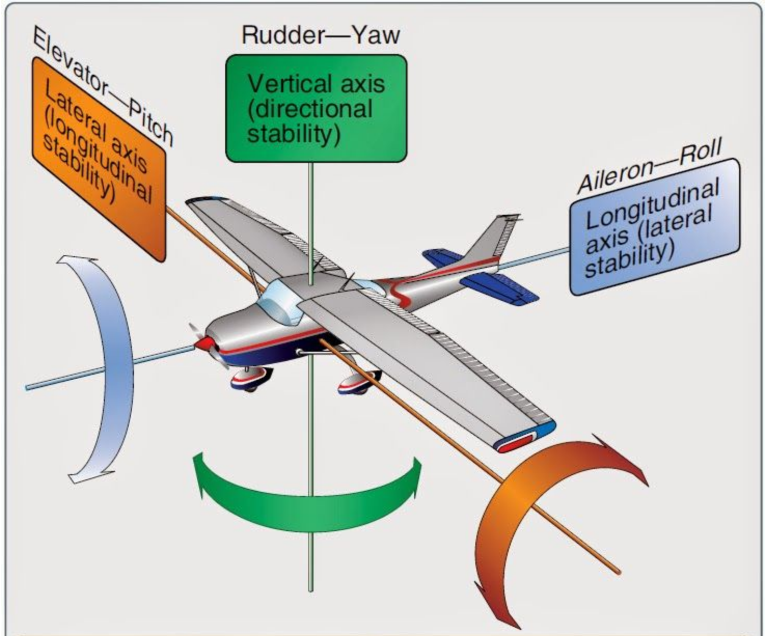
Movements

- Pitch
- Roll
- Yaw

These are all terms you can expect your instructor to be using while flying under the hood.

Lesson Objectives

Lesson Four - Instrument Flying



Primary Control Surface	Airplane Movement	Axes of Rotation	Type of Stability
Aileron	Roll	Longitudinal	Lateral
Elevator/ Stabilator	Pitch	Lateral	Longitudinal
Rudder	Yaw	Vertical	Directional

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Lesson Four - Instrument Flying

There are 3 main groups of instruments that we will focus on for this lesson.

Control Instruments - These are the attitude indicator and the tachometer. These provide the pilot with direct and immediate information on pitch and attitude as well as power information. With just these 2 instruments, the pilot can safely control the aircraft.

Performance Instruments - These instruments tell the pilot how the aircraft is behaving. They provide information such as airspeed, altitude, vertical speed and heading.

Navigation Instruments - Used for navigation. Can include VOR, ADF, GPS, etc.

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Instrument Scan

Continuously scanning the flight instruments is very important while flying with reference to the flight instruments. The scan is referred to as a radial scan.

Think of the instruments like spokes on a bicycle wheel. The centre hub would be the attitude indicator and your scan would branch out from the hub to the other instruments, returning to the attitude indicator after each instrument.

It is important to keep scanning and not fixate. Fixating on any one instrument will usually cause another to wander. For example, Students quite often fixate on holding their assigned heading and when doing so, start to loose or gain altitude.

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Lesson Four - Instrument Flying

Selective Radial Scan

Depending on which maneuver you are trying to perform, you can establish what is called the selective radial scan. This puts additional focus on the more important instruments by scanning them more often. In straight and level flight, the Altitude and Heading are the most necessary so additional focus on them is required. Your scan will look like this:

Attitude - Altitude - Attitude - Heading (Selective radial scan)

Attitude - Vertical Speed

Attitude - Altitude - Attitude - Heading (Selective radial scan)

Attitude - Turn Coordinator

After scanning the selected instruments, add one additional instrument before permoning the selective radial scan again

Lesson Objectives

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What instruments would be more important in a straight climb?

Lesson Objectives

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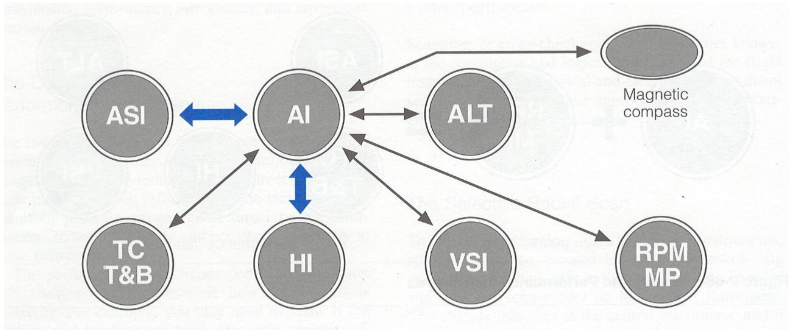
Straight Climb

In this case the Heading and Airspeed are more important and will therefore be scanned more often.



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VOR

VOR stands for VHF (Very High Frequency) Omni-directional Range. The system consists of many strategically placed ground stations that transmit signals on the frequency range between 108.10 - 117.95. Aircraft that are equipped with an VOR receiver converts these signals into visual indications on the VOR indicator.

Because the VOR uses radio signals, they are limited to line of sight. If the aircraft is too low and too far away or when flying in mountainous regions, it may not receive them.

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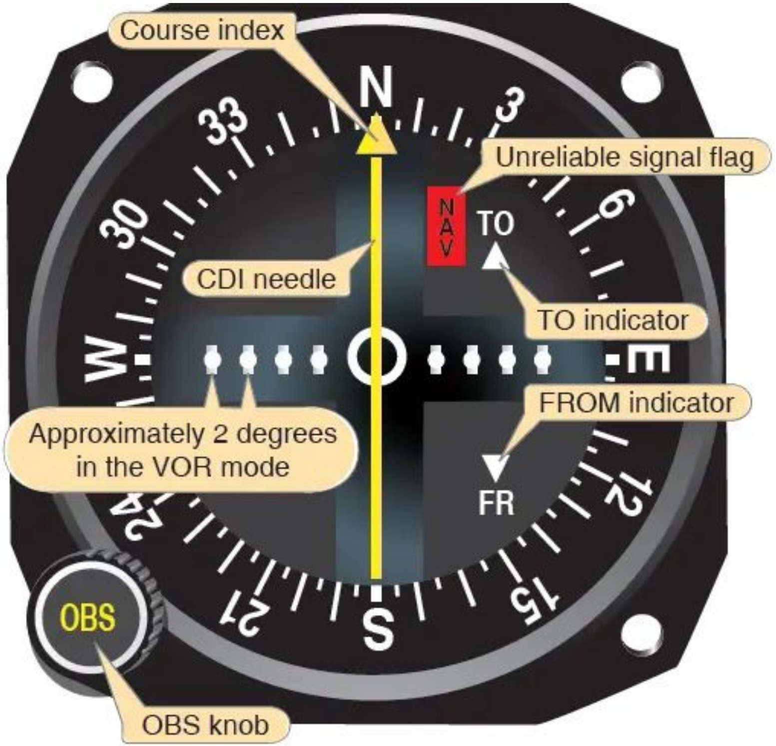
Parts of a VOR



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Determining Aircraft Position using a VOR

Step 1 - Tune and Identify. - The first step when using a VOR is ALWAYS tune and identify. Tune in the VOR frequency on the receiver and turn the volume up. You want to make sure that the Morse Code you are hearing through the radio matches what is shown on your map. If it does not match or you do not hear the morse code, do not use the VOR.

Step 2 - Centre the CDI - Once you have determined that the VOR is working correctly. Turn the OBS knob until the CDI centres with a FROM indication. This will tell you in which direction you are travelling FROM the VOR.

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Determining Aircraft Position using a VOR

Step 3 - Draw a line on your map on your current radial from the VOR station out past your approximate distance from the station.

Step 4 - Repeat steps 1 -3 using another VOR.

After completing these steps, you should have drawn an X on your map. This X represents your position.

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Intercepting a VOR Radial FROM a station

Step 1 - Tune and Identify

Step 2 - Determine the radial to intercept.

Step 3 - Using the OBS, set this radial at the top of the VOR indicator.

Step 4 - If the TO/FROM Flag show FROM and the CDI is deflected left, subtract 90 degrees from the OBS reading. If the CDI is deflected right, add 90 degrees.

Step 5 - Fly this new heading until the CDI starts to move towards the centre.

Reduce intercept heading until CDI centres and aircraft heading matches the what is at the top of the VOR indicator.

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VOR Tracking

In a zero wind situation, tracking a VOR radial is a simple as making sure that aircraft heading matches whatever is displayed on the indicator. For example, if you have 180 set on the VOR, flying a heading of 180 will keep you on the radial.

Zero wind conditions however, are not something that we can rely on.

In this situation we must correct for the wind using a technique called bracketing. One advantage of the VOR is that it helps us correct for drift.

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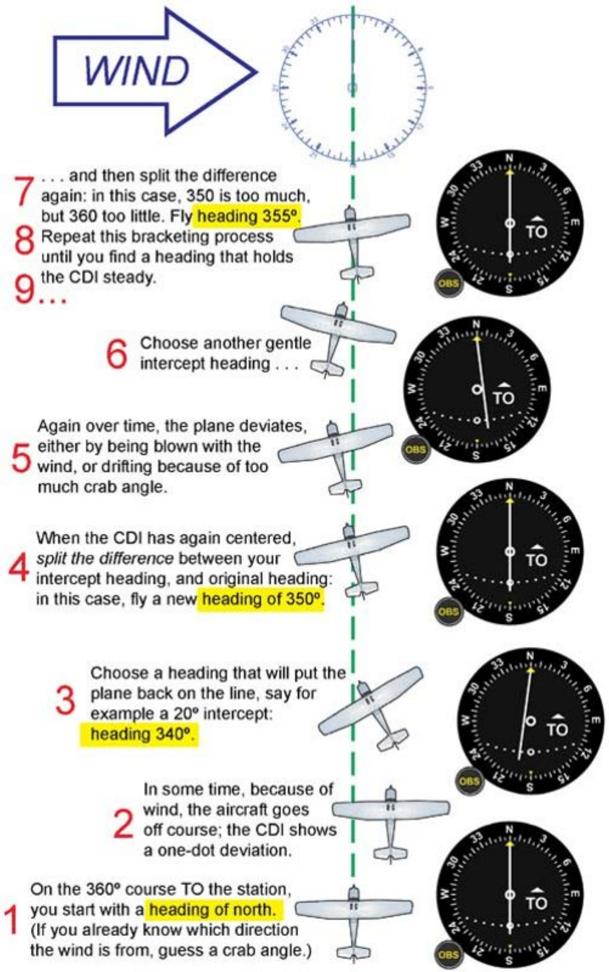

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Global Positioning System (GPS)

The system consists of 24 satellites orbiting at 11,000 nautical miles above the earth.

Distance is determined by calculating the time it takes for the radio signal to travel from the satellite to the aircraft receiver. Since radio waves travel at the speed of light, the distance is calculated as a function of time.

In aviation, 4 satellites are required to triangular the aircraft's position.

There are many different GPS receivers available, Ontario Flight Centre uses a combination of panel mounted units and Foreflight, which is available for Apple IPads and IPhones.

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Conclusion

That concludes the ground portion for Flight Lab module 4.

If after reviewing this you have any questions, we suggest you write them down and bring them with you to your lesson. Your instructor will be happy to go over them with you.

Remember to check the schedule often at:

https://ontarioflightcentre.ca/georgian-college/

Due to a number of factors, your flight may get changed.

If you are not feeling well on the day you are scheduled for flight lab or if you suspect you may have come in contact with Covid-19, please notify us as soon as possible and try to switch with another student.

We look forward to seeing you soon.

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