

**WHICH WAY TO STEER?****FLIGHT SIMULATOR: WINDS, COURSES, AND HEADINGS**

Name \_\_\_\_\_

Class \_\_\_\_\_

**OBJECTIVE**

Experience the effects of wind on an airplane's heading, course, and groundspeed during a simulated cross-country flight.

**MATERIALS (Per Group)**

- Computer with flight simulation software or flight simulator
- Joystick or yoke
- Optional: Throttle quadrant, rudder pedals, additional monitors

**ASSEMBLY AND PREPARATION**

You are going to use the simulator to fly a route between two airports multiple times. Each flight will allow you to alter the wind velocity in order to observe the effect wind has on an aircraft in flight. You will also determine how to maneuver the aircraft to compensate for the effects of the wind.

Use SkyVector or any sectional chart to select two airports between which you will fly. Determine your magnetic course using the true course magnetic variation appropriate for the area where the two airports are located. Selecting airports roughly 20-50 NM apart should be sufficient for this exercise.

Configure the simulator so that you may fly between the two airports at approximately 6,000 feet AGL. Configure a display to see the plotted true course between the origin and destination, as well as the aircraft's track across the ground. You should also be able to see the aircraft's instrument panel while flying these missions. Set the power for the aircraft to fly at approximately 110 knots indicated airspeed.

For this exercise, assume no compass deviation.

**QUESTIONS**

Your first leg will be flown with no wind.

Use the magnetic heading you computed to fly from your starting airport to your destination airport.

1. How do the airspeed and groundspeed compare? How do the ground track and heading compare?



Reset the simulation so that you are again flying from your starting airport to your destination airport at 6,000 feet AGL.

Add a significant headwind (approximately 30 knots).

2. How does your groundspeed compare with the reading on the airspeed indicator? What impact does the change in groundspeed have on the flight time and fuel consumption?

Reset the simulation so that you are again flying from your starting airport to your destination airport at 6,000 feet AGL.

Change the wind to a significant tailwind (approximately 30 knots).

3. How do the airspeed and groundspeed compare? What impact does the change in groundspeed have on the planned flight's flight time and fuel consumption?

Reset the simulation so that you are again flying from your starting airport to your destination airport at 6,000 feet AGL.

Change the wind to a significant wind (approximately 30 knots) from 90 degrees off the plotted course. Without using a wind triangle, try to determine the heading required to maintain your plotted course. This is done in flight through "bracketing."

- Choose a heading into the wind, and fly that heading (you may want to write down the heading you selected). Monitor the ground track to see if your selected heading holds the desired track or causes a deviation into the wind or away from the wind.
- If the heading is too great of a wind correction, reduce the correction angle and note the new heading; if the heading is insufficient and the aircraft is being blown off course, increase the angle and note the new heading.
- Continue this analysis, noting the heading and making progressively smaller corrections until the heading converges on one that allows you to maintain your desired track. If time allows, repeat this exercise with smaller winds (10 knots) and much larger winds (90 knots) to observe the effect on the aircraft flight path.



4. How does this nearly pure crosswind affect groundspeed?

Reset the simulation so that you are again flying from your starting airport to your destination airport at 6,000 feet AGL.

Have the person controlling the simulator zero out the wind so the student flying can easily fly their desired track. Then, without informing the student flying which way the wind is coming from, have them add a significant quartering headwind (approximately 40 knots).

5. Use bracketing to correct for the wind and analyze the groundspeed. Where is the wind coming from? How does this affect the flight time and fuel burn?

Have the person controlling the simulator zero out the wind so you can stabilize your flightpath, and then, without informing the student flying which way the wind is coming from, have them add a significant quartering tailwind (approximately 40 knots).

6. Use bracketing to correct for the wind and analyze the groundspeed. Where is the wind coming from? How does this affect the flight time and fuel burn?

With the quartering winds from the prior exercise, overfly your destination and then turn to another airport 90 to 120 degrees off course. Without changing the winds, turn on the new course to the next airport and compensate for the new wind effects on their new course.

7. How did the aircraft respond to the crosswinds? What did you do to compensate for the winds?

8. Can a pilot compensate for headwinds or tailwinds? What might happen if a pilot planned for a tailwind, but instead experienced a headwind?