Semester 1 – The Flying Environment

Unit 1 – Aviation Weather Theory

Section B – Understanding Atmosphere

Lesson 1 – Makeup of the Atmosphere

Activity 2 – Build a Barometer

Alternate Activity – Students should be able to build the barometer with materials found at home. In lieu of plastic tubes, students can use straws. In lieu of putty, students can use chewing gum.

An alternative barometer that uses a straw, a glass container, a latex glove, and a rubber band can be found here: https://www.sciencemuseumok.org/smoathome/try-make-barometer.

Activity 3 – Build a Hygrometer

Alternate Activity – While not as accurate, a relative hygrometer can be built using some hair and a few stationary supplies. There are many variations on this theme; however, here is a set of instructions for building a simple hair hygrometer: https://diy.smartkids123.com/how-to-make-a-hygrometer-2/.

Lesson 2 – Atmospheric Circulation and Winds

Activity 1 – Convection in Action

Alternate Activity – This experiment would be very simple to construct at home if only there were no open flames! An alternate activity involving blue-dyed ice cubes and red-dyed hot water (heated in a microwave) can be found here: "Convection Currents with Ice Cubes Experiment" (Length 2:00): https://safeYouTube.net/w/vVNcb (For students unable to access safe YouTube links: https://www.youtube.com/watch?v=yBBVSTBLRNk).

Activity 2 – Uneven Heating

Alternate Activity – This is a group activity as written and will be difficult to conduct at home. An alternative activity that an individual can perform is to use a flashlight and sweep it in an arc from zero to ninety degrees and observe the change in shape of the light on the paper. A video of this experiment being conducted can be found here: "Angle of the Sun's Rays" (Length 5:08): https://safeYouTube.net/w/yiOcb (For students unable to access safe YouTube links: https://www.youtube.com/watch?v=0ktNo-l0dn8).

Activity 4 – Coriolis Force

Alternate Activity – This is written as a team activity but can be accomplished by two people. A video of this experiment being conducted can be found here: "The Coriolis effect in action" (Length 1:53): https://safeYouTube.net/w/ybOcb (For students unable to access safe YouTube links: https://www.youtube.com/watch?v=WB4dxpUS530).

Activity 5 – See How Much You've Learned

Alternate Activity – Most of this activity can be done without providing alternate directions. For question 12, students can use http://earth.google.com and use the distance measuring tool to draw the great circle route between Bogota, Columbia and Seattle, Washington. They can then rotate the globe in Google Earth as they would a physical globe.

Students who have a downloaded version of Google Earth Pro for Desktop and an internet connection can load surface temperature, current weather, etc. using the weather layer.

Lesson 3 – Clouds and Precipitation

Activity 2 – Dew Point and Moisture

Alternate Activity – The syringe listed in the directions for this activity is not a requirement—small amounts of cold water may be added using a teaspoon for example. If a student has a glass thermometer at home, they can complete this activity. Students without a glass thermometer may elect to try the activity with a meat thermometer, candy thermometer, or similar device. A video of how the experiment works can be found here: "Lab 4 dew point" (Length 7:54): https://safeYouTube.net/w/g0Ocb (For students unable to access safe YouTube links:https://www.youtube.com/watch?v=txV9XOimDEE).

Activity 4 – Create a Cloud in a Bottle

Alternate Activity – There is a strong likelihood that students will have the basic materials available to conduct this activity at home; however, you may not wish to advocate the use of matches outside the classroom. This video demonstrates and explains the cloud-in-a-bottle effect: "Instant Cloud Science Experiment" (Length 1:46): https://safeYouTube.net/w/ElRcb (For students unable to access safe YouTube links: https://www.youtube.com/watch?v=Aiw4sp0dqkI).

Lesson 5 – Thunderstorms

Activity 3 – Make Your Own Lightning

Alternate Activity – The materials in this activity are common; however, students may not have the specific materials listed. At the very least, students can easily create static charges using any synthetic material (a fleece is a perfect example) and their hair. Human hair easily gives up its electrons to plastic materials (a fleece is usually polyester and plastic), so the fleece becomes negatively charged, and the hair becomes positively charged.

Unit 2 – Aviation Weather Services

Section B – Getting Weather Information

Lesson 2 – In-flight Weather and Tactical Weather Decision Making

Activity 1 – In-flight Weather Tools

Alternate Activity – The activity is written for pairs but can be completed by individual students.

Activity 2 – In-flight Weather Decisions and Impacts

Alternate Activity – The activity is written for pairs but can be completed by individual students.

Unit 3 – Airport Operations

Section A – Understanding Airports

Lesson 2 – Airport Markings and Signs

Activity 3 – Build Your Own Airport

Alternate Activity – Rather than use the wide variety of craft materials in the activity's material list, students may be given the opportunity to draw the airport layout. Allow students the flexibility to use whatever medium they like. Paper and pen illustrations may be photographed and shared online. Designs made with online drawing tools or shapes and text boxes in a slide show program may also be submitted online.

Lesson 3 – Airport Lighting

Activity 3 – Finding Airport Lighting

Alternate Activity – This lesson refers to the Build Your Own Airport activity. Modifications here will depend on the modifications made to that lesson.

Activity 4 – Build a Glide Slope Indicator

Alternate Activity – Students may not have sticky note pads and they may not have a protractor. Students can substitute any three objects that are the same size (three short cups or drinking glasses, three spice jars, three books, etc.) for the sticky note pads. If a student does not have a protractor, a 3-degree angle may be estimated by using a 20-inch piece of string. Connect one end of the string to the runway. Lift the other end one inch above the table to which the string is connected. A rise of 1 inch for a run of 20 inches is about a 3-degree angle.

Lesson 4 – Traffic Patterns

Activity 1 – Managing Airport Traffic

Alternate Activity – Since this activity is designed for groups of students in school, we suggest using an air traffic control simulator such as one of those below. While students will not have the radio communication element of the activity, the concept of traffic flow and management is learned.

Examples include, but are not limited to:

Google Play Store: Air Control Lite
https://play.google.com/store/apps/details?id=dk.logisoft.aircontrol&hl=en_US

Apple Store: ATC 4.0 Lite
https://apps.apple.com/us/app/atc-4-0-lite/id303472036

Activity 4 – Identifying Traffic Patterns

Alternate Activity – This activity refers to the team-based Activity 1 in this lesson. Two alternatives are possible: 1. Students use the same applications described above and attempt to set up traffic patterns for incoming aircraft, or 2. Students go back to their result in Lesson 2 Activity 3 – Build Your Own Airport and overlay traffic patterns, a windsock, and a segmented circle.

Lesson 5 – Communications

Activity 4 – Student Controllers and Student Pilots

Alternate Activity – Since this activity is meant to be conducted with classmates in a large area, we suggest the following alternative:

Using two websites, students may be able to hear air traffic controllers and pilots while observing aircraft at a particular airport. Communications may be monitored using www.liveatc.net, and air traffic may be monitored using www.flightaware.com.

The first step will be to select an airport with regular air traffic. Class C airports in your area may work. For this example, we will use KFRG, the Republic Airport on Long Island, New York. Open a browser tab and visit www.liveatc.net. At LiveATC.net, enter KFRG in the Airport/ARTCC Code box in the upper-left corner. Scroll down to the KFRG Tower area and click one of the LISTEN boxes (the HTML5 link is fine). Allow up to a minute for the connection to be made, and inform students that they may hear nothing because the air traffic controllers may not be transmitting at that moment if no aircraft are in the area. Patience is important.

The next step is to open a new browser tab or window for the www.flightaware.com site. Enter KFRG in the search bar at the top-center of the page and click the Track button. The map on the page should center on the KFRG airport. Zooming in will allow students to see individual aircraft easily.

Ideally, students will be hearing communication between pilots and air traffic controllers while watching the representations of the aircraft on the FlightAware map. There may be some delay, but following the action at the airport should be possible. Have students hover the mouse pointer over a particular aircraft to see its data block which includes the call sign for the aircraft. Listening for the pilot and air traffic controller to use the call sign (or the last few characters of the call sign) is a good challenge and allows students to see how pilots fly in response to air traffic control instructions.

Once students are familiar with this process, they may choose to monitor other frequencies and airports. It may be worthwhile to have students write a reflection about their experience.

Lesson 6 – ATC

Activity 1 – Marco Polo

Alternate Activity – As written, this activity requires six students, and is not feasible in an at-home environment. Since the activity relates to factors that influence radar performance, you might have students read the following article about radar interference: https://www.theproche.com/2019/04/10/what-are-the-major-factors-affecting-a-radars-

performance/. They can then prepare a brief written report on the five factors that influence the performance of a radar system.

Activity 3 – Responding to Traffic Calls

Alternate Activity – As written, this activity requires an entire class of students and is not feasible in an at-home environment. Since the activity refers to air traffic advisories, there are many videos that demonstrate such calls and how to look for traffic. One example is an AOPA Live video segment with Jason Schappert of MZeroA.com which can be found at https://safeYouTube.net/w/VeUcb (For students unable to access safe YouTube links: https://www.youtube.com/watch?v=NWYZqXOvwTM).

Lesson 7 – Pilot Communications in the Airport Environment

Activity 2 – Working the Radio in the Airport Environment

Alternate Activity – The activity is written for pairs and groups to have discussions while answering questions. The level to which students can interact will vary based on the technology available to classes. One alternative is for students to submit their own answers and, technology permitting, write responses to other students' answers.

Lesson 8 – Airport Safety and Pilot Considerations

Activity 1 – Scanning Techniques

Alternate Activity – While this is written as a group activity, students can do this activity at home with the help of a family member or friend who plays the role of the controller. The controller calls out an object, and the student scans the room to find the object.

Activity 3 – Create Your Own Vortices

Alternate Activity – This activity, at its most basic, only requires a student to have about one square foot of aluminum foil and some material to represent an airplane's wings. Using information from the slide presentation, students should be able to create an approximation of the vortices. Additional imagery and explanations of vortices is available on pages 26 to 29 of Chapter 14 in the PHAK: https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/phak/media/16_phak_ch14.pdf

Unit 4 – Introduction to Aeronautical Charts and Airspace

Section A – Introducing Aeronautical Charts and Airspace

Lesson 1 – Introduction to Aeronautical Charts

Activity 2 – Chart Scavenger Hunt

Alternate Activity – The lesson can be accomplished by individual students at home with the appropriate materials.

Activity 4 – Valuable VFR Chart Data

Alternate Activity – While this activity is listed as a pair exercise, individual students can complete the activity as written.

Activity 5 – Chart the Globe

Alternate Activity – Students may be able to complete this activity at home using any spherical object. An orange, a soccer ball, a balloon, etc. will work. For students who need assistance finding the lines of longitude and latitude in the activity, inform them that they may use any electronic map (Google Maps or Google Earth Pro, for example). Latitude and longitude lines can be displayed (directions at https://support.google.com/earth/answer/148068?hl=en) and great circle routes can be drawn using the measurement tool (directions at https://support.google.com/earth/answer/148134?hl=en).

Activity 7 – Chart Symbol Matching Memory Game

Alternate Activity – Students can complete this activity by using any paper available at home. As an alternative, printable flashcards can be downloaded and printed from multiple online sites. To find the sites, simply search for "printable VFR chart symbol flash cards".

Students may wish to create their own study aid by using a website such as www.quizlet.com.

Lesson 2 – Introduction to the National Airspace System

Activity 3 – Examining Class B Airspace

Alternate Activity – Students should plan to use www.skyvector.com to complete this activity.

Activity 5 – Build your Own Airspace

Alternate Activity – The goal of this activity is to model Class C and/or Class B airspace. While students may not have foam or foam cutters at home, you may ask them to select a Class C or a Class B airspace of their choice and create a model of it. For additional assistance in visualizing airspace, students with internet access can see Kansas City (KMCI) Class B Airspace visualized in 3d that can be zoomed and rotated at this site: https://3dwarehouse.sketchup.com/model/u9ed1b702-b4d2-43fa-91e9-8cecab54130e/Class-B-Airspace-KMCI-Kansas-City-Int-Airport?hl=en.

Activity 6 – Flash Card Time!

Alternate Activity – None needed. Students may view their own copy of the flashcards by visiting this site: https://www.aopa.org/-/media/Files/AOPA/Home/Online-Education/Flash-Cards/airspace.pdf

Unit 5 – Post-Course Exam Review

Section A – Post-Course Exam Review

Lesson 1 – Review or Project – Student/Teacher Choice

Review Activity – Review or Project

General Notes:

In technology environments that permit team collaboration, students can complete this culminating activity as a group. Some students may be forced to work alone due to technology constraints.

If students select a project as their final activity, all the caveats of managing projects in an online learning environment are as valid for an aviation class as they are for any other class. There is no one-size-fits-all alternate activity for this lesson. Teachers will have to find ways to manage these projects in their own ways based on their students' and schools' specific circumstances.