



LESSON PLANS

WRITTEN FOR STEMPILOT'S K-12 S.T.E.M. CURRICULUM
& ALIGNED WITH N.G.S.S.

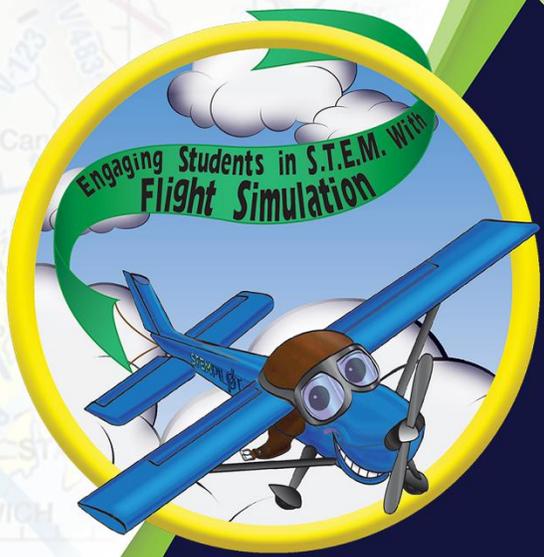


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Remember

This is a living document. Please check with STEMPilot for any updates that may have been released since the arrival of your simulators.

Email: sales@stempilot.com or Call: (203) 527-5747 between 8 am & 4 pm (EST)

Unit 1

Lesson 1: Introduction to STEMPilot

Grade	"Estimated" Time spent on Lesson	"Estimated" Time spent on Simulator
K-12	3 (40 minute) Class(es)	1 (40 minute) Class(es)

Learning Targets & Sub-Targets

- Understanding how Math, Science & Engineering can explain why a plane is able to fly.
 - Thrust, Lift, etc...
- Have a basic understanding of how an aircraft functions & what you need to know before flight
 - Knots conversion to/from MPH, Cessna 172 Specifications
- Have a basic understanding of the flight surfaces, their purpose & the controls that adjust them
 - Rudder Pedals/Rudder/Yaw, Yoke Rotation/Ailerons/Roll, Yoke in & out/Elevators/pitch
- Understand how to read and navigate the map
 - Compass rose, Scales, Nautical miles

Cross-Cutting Concepts		Science and Engineering Practices	
	Patterns	X	Asking questions & defining problems
X	Cause & effect	X	Developing & using Models
	Scale, proportion & quantity	X	Planning & carrying out investigations
X	Systems & system models		Analyzing & interpreting data
X	Energy & Matter in Systems	X	Using mathematics & computational Thinking
X	Structure & function	X	Constructing explanations & designing solutions
	Stability & Change of Systems		Engaging in argument from evidence
			Obtaining, evaluating & communicating information
Nature of Science			
X	Science is a way of knowing	X	Scientific Investigations Use a Variety of Methods
X	Scientific Knowledge Assumes an Order and Consistency in Natural Systems	X	Scientific Knowledge is Based on Empirical Evidence
X	Science is a Human Endeavor	X	in Light of New Evidence, Scientific Knowledge is Open to Revision
X	Scientific Addresses Questions About the Natural and Material World	X	Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

Teachers Preparation

- Read, "Introduction" and "Starting your STEMPilot Flight Simulator" (pg. 4)
- Read, "Classroom Settings" (pg. 5-6)
- Review the "Activities & Discussions" section below.
- Review the "Vocabulary" section below.
- Fly the PBL lessons/flights in "PBL-Simulator Tasks & Assessments"
 - For pre-made tutorial flights, Watch the Flight recordings of the STEMPilot tutorials in "STEMPilot Tutorial and Activity Flight Vid" (in the "videos" folder on your desktop)
- Review & print out the Mission & Assessment pages in "PBL-Simulator Tasks & Assessments"
- Watch/Review the videos listed for this lesson in "Videos & their Locations"
- Watch/Review the Documents listed for this lesson in "Power Points, Referenced Material & their Locations"
 - Print out any pages/ slides you feel should be handed out to students
- Review and print out the Handouts/Worksheets listed for this lesson in "Handouts & Worksheets"
- Collect the items listed under "Classroom Materials" as well as any additional materials you feel may be needed for the lessons

Classroom Materials Needed

- Glider (Paper, balsa wood, foam)
- Folders for student's flight logs
- Simulator (powered on)

Videos & their Locations

Video Name	Location on PC	Web URL
STEMPilot P.D.1 Introduction	Desktop > Videos	https://www.youtube.com/watch?v=YlR2EcC5rZQ&t=1s&index=5&list=PLV_RrA2Wt269MaUYmeLmdAwKu-eTBJPHY
STEMPilot 2 min. Intro	Desktop > Videos	https://www.youtube.com/watch?v=e29hT6B78g0&list=PLV_RrA2Wt269MaUYmeLmdAwKu-eTBJPHY&index=6
How Do Planes Fly?	Desktop > Videos > Lesson Plan Referenced Videos	https://www.youtube.com/watch?v=bGtyR6Ah5xQ

Power Points, Referenced Material & their Locations

P.P. Title	Location on PC
A Visit to Kitty Hawk	Desktop > Curriculum, Guides and More > Power Points
Team Building and Communication	Desktop > Curriculum, Guides and More > Power Points

Handouts & Worksheets

(print from the PDF in the "Curriculum" folder, located in the "Curriculum, Guides and More" folder on the desktop.)

Handout	Worksheet	Title	Page (Cur.)
X		Classroom Setting Rubric	6
X		Cessna 172 Specifications	8
X		Flight Controls	15-16
	X	Worksheet 1- Flight Controls	123
X	X	Flight Plan Log	82

PBL-Simulator Tasks and Assessments

Flight Name	Description	Assessment	Video
A-Home Field	Familiarize yourself with the controls and flight surfaces. Take-off and fly around your local airport.	N/A	N/A

Vocabulary

Word	Definition
Aeronautics	The study of flight and the science of building & operating an aircraft.
Aviation	The study or applications of flight <i>There are three types of Aviation; general, commercial and military</i>
Compass	An instrument with a magnetic pointer that displays the direction of magnetic north and your bearings from it
Engineering	A branch of science and technology concerned with the design, building, and use of engines, machines, and structures.
Knot	The unit in which the speed of a vessel is measured relative to the fluid it is traveling through. <i>1 knot/hr. is equivalent to 1.15078 Mph</i>
Latitude	Measurement used on a map to express the angular distance of an object North or South of the (celestial) equator. <i>Expressed in degrees and minutes</i>
Lift	When the force upon the surface of an object created by the airflow over it becomes weaker above (pushing down) than below (pushing up) enough that the object begins to lift off the ground.
Longitude	Measurement used on a map to express the angular distance of an object East or West of the (celestial) meridian. <i>Expressed in degrees and minutes</i>
Nautical Mile	A unit of measurement derived from its use at sea and defined as exactly 1,852 meters. <i>Historically speaking it was the distance of latitude that could be traveled in 1 minute, also equivalent to 1/16th of a degree of Latitude.</i>
Simulation	An artificial environment (designed most commonly within a computer program) for the purpose of study
Thrust	push (something or someone) suddenly or violently in the specified direction. <i>(the propulsive force of a jet or rocket engine.)</i>
Topography	The arrangement of the natural and artificial physical features of an area

Activities & Discussions

- Fold a paper airplane, or assemble a glider and fly it across the room
 - Discuss- Why does it fly?
 - **Thrust**, or the directional force applied to the glider from your arm and the generation of **Lift** from the shape of the wing.
- Hand out Folders with student name.
 - This is for all handouts and Personal Flight Logs (*Recommend; to keep in classroom*)
- Give each student a Flight Plan Log to record their progress (*pg.82*)
- Review the following sections in the STEMPilot Curriculum book together
 - Introduction & Starting your STEMPilot Flight Simulator (*pg.4*)
 - Classroom Setting (*pg. 5-6*)
 - Flight Plan Chart Guide (*pg. 7*)
 - Cessna 172 Specifications (*pg. 8*)
- Watch the video, "STEMPilot 2 min. Intro"
- Watch Training Video, "STEMPilot P.D. 1 Introduction"
- Form Flight Crews (*Recommend; 3 students*)
 - Assign (or let the students create) a name for their crew (*Recommend; these students will stay together for all mission planning, flying, evaluation and projects*)
- View the Power Point "Team Building and Communication"
- Watch the Video "How do Planes Fly"
- Open and review the FAA aviation chart of both NYC and your local area. (*Recommend; Laminate these and post on an accessible wall for charting flights.*)
 - Point out and discuss;
 - Latitude and Longitude lines
 - What is a Compass Rose and how do you use it
 - Map scales and measuring distance
 - How topography is shown on the chart (*elevations, waterways, mountains etc.*)
- Have the Students find their local airfield on your area chart.
 - What are some other local airfields
 - Locate them on the Chart, then on Google Earth
- Read about Nautical Miles, Knots and conversions (*pg. 27*)
- Hand out the Cessna 172 Specifications sheet and review some of the important facts:
 - "Take-off" VR (Velocity Rotation) Speed: 55 Knots
 - Cruise Speed: 100 Knots
 - Fuel Burn: 7 GPH (Gallons per Hour)
 - Fuel Weight: 6 lbs./Gal (pounds per gallon)
- Have your students practice filling out the "Flight Plan Chart" and make their own Flight Plan.
- Have the students gather around the simulator.
 - Boot it up and open Prepar3D. Press OK to load your Default Flight/"A-Home Field"
- Demonstrate how to use the simulator for your students
 - Make sure the flight is un-paused (*button assignments on pg. 9*)
 - Use the Hat Switch on the yoke's left arm to adjust your view. Look around the cabin.
 - Press the Red View Button to change the display until you are outside the plane.
 - Look around the plane. Adjust the view so you're facing the plane's tail.
 - Review controller movements on the Simulator
 - Gently move the yoke in and out and observe the Elevators moving UP (for Pitch Up) and Down (for Pitch Down).
 - Slide the rudder pedals forward and back (they move in tandem) and observe the rudder moving left and right (controls the aircrafts Yaw/ pivot point).
 - When steering on the ground, ONLY the Rudders are used. DO NOT try to steer with the yoke when on the runway.
 - Move the black throttle lever forward and back to increase & decrease power
 - Discuss what the red lever/ mixture on the throttle quad does (air/fuel)
- Have the students take turns flying.
- Have Students complete "Worksheet 1- Flight Controls"
- View the Power Point on the Wright Brothers, "A Visit to Kitty Hawk, NC"
- Review the vocabulary words you covered (*Vocabulary section*)

NGSS Alignment

Lesson	Activity Description	Mid. School	High School
• • • Aerospace • • •			
Gliders vs Airplanes	<p><u>Opening:</u> What is "gliding" and how is it different than flying?</p> <p><u>Learning Target:</u> I can fly best glide speed in several airplanes.</p> <p><u>Main Activity:</u></p> <ul style="list-style-type: none"> → Students review what they have learned about best glide speed (lesson done in class or given as reading assignment). → Students get directions for sim lesson (worksheet). → Students fly a glider. → Students fly several airplanes without power and at best glide speed. → Students discuss how gliding is different than powered flight and how glider design is different than airplane design. 	MS-PS2-1 MS-PS2-2 MS-PS2-4 MS-PS3-1 MS-PS3-2 MS-PS3-5 MS-ETS1-1 MSETS1-2 MS-ETS1-3 MS-ETS1-4	HS-PS2-1 HS-PS2-2 HS-PS3-1 HS-PS3-3 HS-ETS1-2

Lesson Expansions (Extra Time)

- (pg. 13 – 14) Each Flight Crew selects and builds one of the 3 Glider designs and you have a competition to see which plane flies the; farthest, highest.
 - Watch the height of the Arc.
- Explore types of aircraft: Fixed Wing. Helicopters,
 - Feel free to fly one of the 80+ aircrafts located in your software to expand your research