Facilitating the STEMPilot Curriculum

This document is intended to help guide teachers in constructing lesson plans with the STEMPilot Curriculum and flight simulators. Sections can be customized or omitted based on time constraints and student skill level. "Teacher Notes" are included throughout the curriculum book for teachers to expand on.

Our goal is to create a fun, meaningful learning experience where students can apply what they have learned in class about Science, Technology, Engineering and Mathematics to aviation.

1. **Introduction To The Flight Simulator**
   - Turn the simulator on and play the introduction video on the desktop folder labeled "Videos"
   - Demonstrate yoke movements - in and out, left and right
   - Demonstrate how the throttle, propeller pitch, and fuel mixture controls slide up and down
   - Indicate where the 100%, 75%, 50%, 25% and 0% is for each slider
   - Demonstrate how the rudder pedals move
   - Exhibit how the toe brakes work by pressing your toes down on the top of the pedals
   - Launch the flight simulation software from the desktop and open Mission 1: Fundamentals of the Control Surfaces; fly it for the students to observe

2. **Classroom Setting**
   - Establish teams of 3-5 students
   - Assign responsibilities: Pilot, Copilot, Navigator / Assessor for the operating pilot
   - Review the skills accomplishments in the Rubric

3. **Flight Plan**
   - Review the concept of planning a flight
   - Explore: what are the components of a planned flight?

4. **Six Degrees Of Freedom (DOF)**
   - Explore: what are degrees of freedom, pitch, roll, yaw, vertical, longitudinal, lateral?
   - Review how the position of an airplane is monitored in DOF terms
   - Build a paper airplane to demonstrate the basic physics of flight

5. **Fundamentals Of Flight Controls**
   - Explore how to use the yoke to control pitch and roll
   - Explore how to use the rudder to control yaw
   - Explore how to use the throttle to control thrust
   - Review the switches on the yoke

6. **Anatomy Of An Airplane**
   - Explore a brief history flight and how the Wright Brothers changed the world forever
   - Review the components of an airplane
   - Explore how the different mechanical systems work together to make the airplane fly
   - Explore different types of aircrafts such as Balloons, Gliders, Fixed Wing Helicopters, Rockets and Jets

7. Forces Of Flight: Applying Physics

- Explore the forces and how they present themselves in the world
- Explore concepts of lift, thrust, drag, gravity and weight
- Discuss how to overcome one force with another
- Discuss how to achieve thrust and lift
- Discuss how Newton and others understood and applied the forces of nature
- Explore how to locate and define your position on earth

8. Flight Instruments: Applying More Physics

- Explore: what are instruments and how are they used to understand what is happening with the aircraft?
- Explore how instruments function and understand their read-outs
- Fly Mission 2: Fundamentals of Instruments

9. Takeoff

- Research and understand how much speed is needed to generate enough lift to take off
- Analyze what a 'stall' is; interrupted air flow is over the wing, reducing lift
- Examine the location of Republic Airport (KFRG) on Long Island, New York
- Locate Republic Airport on Google Maps
- Find this airfield on the aviation chart for New York
- Fly Mission 3: Fundamentals of Takeoff

10. Informational Writing: Aviation History

- Instruct students to research an aviator; compile images and pertinent information about the aviator's history and achievements
- Students create a PowerPoint presentation on the subject

11. Landing The Plane

- Investigate the stall speed for the specific aircraft selected
- Examine the chart of the airport's runways making note of the markings
- Prepare for landing the aircraft by using wing flaps to increase lift at low speed
- Control the aircraft's air speed on approach by using the throttle and flaps
- Fly Mission 4: Fundamentals of Landing in the simulator

12. Flying The Traffic Pattern

- Perform a takeoff and landing in one flight; research and study the flight plan
- Note the runway heading during takeoff and landing
- Examine the aviation skills of each student

13. Aviation Math Project

- Explore key facts about the selected aircraft and a planned flight
- Compute solutions for time, flight distance and fuel consumed
- Explore math applications in aviation

14. Writing Project: Family Heritage

- Instruct students to identify their family's region of ancestry and explore the location on Google Earth
- Study the geography, topography, weather patterns and conditions of this location
- Find an airfield near the location of ancestry and create a flight plan
- Fly the planned flight and note the geography that was researched
- Students create a PowerPoint or write a story about what they have learned

15. Navigation: Getting To Your Destination

- Note: This subject can be a very deep, so separate the content into pieces your students can absorb
- Research the Rules of Separation, which prevent planes from colliding
- Plan a flight from Republic Field in NY to the Statue of Liberty in New York Harbor
- Apply math in creating your flight plan and explore the compass heading
- Study the radio navigation aids: VOR, ILS and NDB
- Plan to fly the cross country flight mission in the simulator

16. Weather

- Note: This subject can be a very deep, so separate the content into pieces your students can absorb
- Observe and study different types of clouds and the formations they make
- Learn what prevailing winds are and how they impact flight
- Study the Jet Stream and its effect on weather patterns
- Research and explain the hazards of bad weather and how this affects flights

17. Weight And Balance (Advanced)

- Research the physics of why aircrafts cannot fly out of balance
- Study and explain what Center of Gravity (CG) is
- Learn what a Fulcrum is and how it is used
- Place weights and fulcrums in different locations and observe the center of gravity move
- Explore balancing the aircraft for flight with fuel and cargo