



PLTW Flight and Space Virtual Learning

8th Grade/Rudder - Yaw

May 20, 2020



8th Grade/Flight and Space
Lesson: May 20, 2020
Day 1 of 2

Objective/Learning Target:
Students will learn about the movement of Yaw that the Rudder creates.

Warm-Ups:

Review the airplane parts and the movements they create with this [Quizlet](#).

Lesson Introduction/Background Information:

The empennage is the name given to the entire tail section of the aircraft. The empennage includes the vertical stabilizer with the rudder and the horizontal stabilizer with the elevators. It's purpose is stability and control of the yaw and pitch.

In this lesson you will build a glider. In the next lesson you will adjust rudder of the glider to see the flight path changes the rudder controls.

Practice:

Materials:

Styrofoam meat tray or breakfast tray similar to ones from McDonalds

Cutting tool

Glue

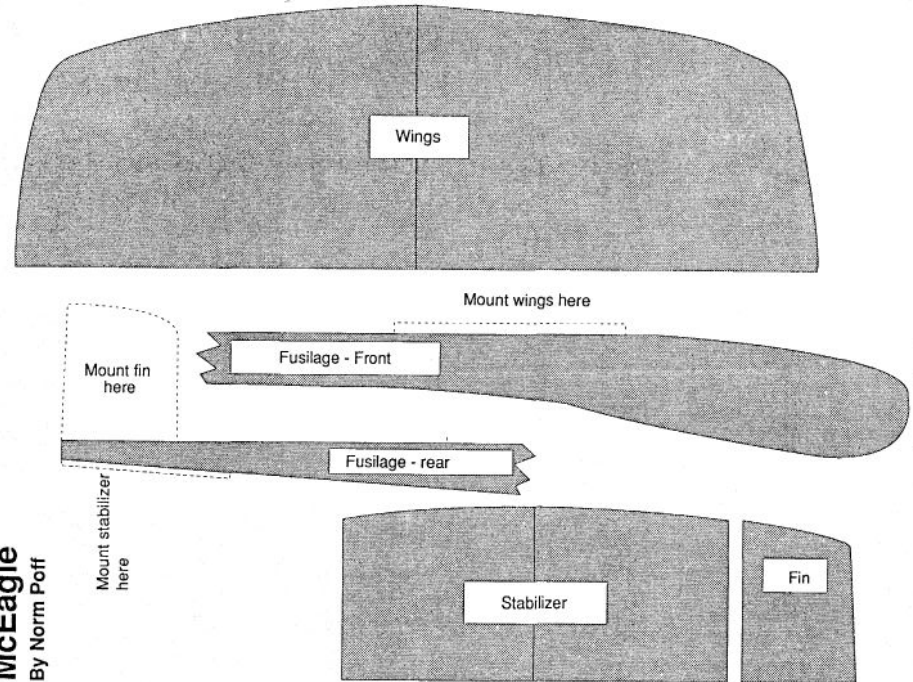
Marker

Tape

Dime or other small coin

1. Cut out the needed pieces and join the fuselage pieces end to end.

You can use this [template](#) if you have a printer or just draw these pieces on your foam board.

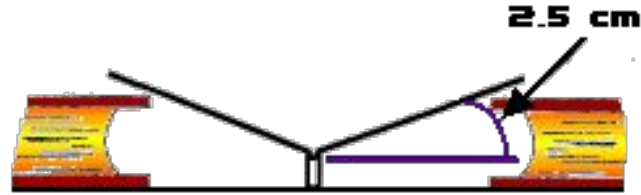


Practice:

2. Cut two long rectangles slightly larger than the fuselage pattern from the flat surface of the Styrofoam meat tray. Laminate the Styrofoam pieces with double - sided tape or glue together and press. If gluing, lightly roughen the contact surfaces with sand paper or emery board to improve adherence. (Balsa wood may be substituted for the fuselage.)
3. Lay the pattern pieces for the wings, stabilizer, and fin on flat surfaces of the Styrofoam tray. Trace the patterns and cut out each piece with the Exacto knife. Be sure to protect your table top. Also cut out the fuselage piece from step 2. Label the forward direction on each piece. Lay the fuselage pattern on the laminated Styrofoam piece you made in step 2 and trace and cut.
4. Glue the fin, and stabilizer to the fuselage at the places indicated in the plans. Lightly roughen the contact surfaces to improve adherence. Refer to the diagram for placement.
5. Before gluing the wings, divide them in two along the cut line. Lightly sand the the upper and lower surfaces of the wings to a width of about 1 cm along the cut lines.

Practice:

6. Lay a bead of glue along the upper edge of the fuselage in the indicated place. Touch wings pieces together again and set on top of the glue bead. Using books or some other support, elevate the wing tips about 2.5 cm (1 in) higher than the middle to form a dihedral angle (see diagram). Lay another bead of glue along the top of the cut line and smooth with your finger. Let the glue dry for all pieces before continuing.



DIHEDRAL ANGLE OF WINGS

BALANCING McEAGLE:

When the McEagle is dry, temporarily tape the dime to one side of the fuselage at a point just behind the leading edge of the wings. Toss the glider and observe its flight. If the plane climbs too steeply, move the dime slightly forward. If the plane dives too steeply, move the dime backward. Try to achieve a gentle glide. Permanently mount the dime with tape when satisfied with the glide. Make adjustments to McEagle's right or left movements by slightly warping the rear edge of the fin in the opposite direction .

Self-Assessment:

Placing the dime on the fuselage changed the center of gravity of the plane. What effect did changing the center of gravity have on your plane?

Extend Your Learning/Continued Practice:

Learn more about the effects of [aircraft center of gravity](#).

Here's another way to make a [simple glider](#).