EO M231.02 – DESCRIBE THE PRODUCTION OF LIFT BY AN AIRCRAFT WING

1. **Performance**: Describe the Production of Lift by an Aircraft Wing

2. **Conditions**:

   a. Given:

      (1) Supervision; and

      (2) Assistance as required.

   b. Denied: N/A.

   c. Environmental: Suitable classroom facilities or training area large enough to accommodate the entire group.

3. **Standard**: In accordance with specified references, the cadet shall describe the production of lift by an aircraft wing, to include:

   a. the airfoil camber; and

   b. angle of attack.

4. **Teaching Points**:

TP	Description	Method	Time	Refs
TP1	Explain that air acts like a fluid insofar as it has: a. inertia; b. speed; and c. pressure.	Interactive Lecture	5 min	C3-116 (p. 21)
TP2	Introduce Bernoulli's Principle, which states that a liquid's pressure drops when its speed increases (venturi effect).	Interactive Lecture	10 min	C3-116 (p. 22)
TP3	Have the cadets explore Bernoulli's Principle by blowing: a. over a curved sheet of paper; and b. between two suspended balloons. **Note:** Explain that airfoil camber increases air speed above the wing, thereby reducing pressure; the venturi effect.	In-Class Activity	10 min	C3-017 (p. 18) C3-116 (p. 26)
TP4	Introduce angle of attack. Explain that: a. when air particles encounter the wing, air pressure increases under the wing; and b. the greater the angle of attack and the greater the wing's speed, the more lift will be produced, until the wing stalls.	Interactive Lecture	5 min	C3-116 (p. 22)

TP	Description	Method	Time	Refs
TP5	Have each cadet: a. create an airfoil from an index card; and b. experiment with lift using a fan or hair dryer to “fly" the airfoil from a "sting” launch pad.	In-Class Activity	25 min	C3-091 (p. 31)

5. **Time**:

a.	Introduction / Conclusion:	5 min
b.	Interactive Lecture:	20 min
c.	In-Class Activity:	35 min
d.	Total:	60 min

6. **Substantiation**:

a. An interactive lecture was chosen for TP1, TP2 and TP4 to introduce the production of lift and give an overview of it.

b. An in-class activity was chosen for TP3 and TP5 as it is an interactive way to provoke thought and stimulate interest among cadets.

7. **References**:

a. C3-017 (ISBN 1-895569-23-0) Schmidt, N. (1998). *Fabulous Paper Gliders.* New York, NY: Sterling Publishing.

b. C3-058 (ISBN 1-4027-3034-9) Schmidt, N. (2005). *Paper Creations Paper Airplanes.* New York, NY: Sterling Publishing.

c. C3-091 (ISBN 1-55652-477-3) Carson, M. K. (2003). *The Wright Brothers for Kids: How They Invented the Airplane.* Chicago, IL: Chicago Review Press.

d. C3-116 A-CR-CCP-263/PT-001 (ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

8. **Training Aids**:

a. Presentation aids (e.g. whiteboard/flipchart/OHP) appropriate for the classroom/training area;

b. Model of a light fixed-wing aircraft with wing struts, fixed gear and control surface detail; and

c. Electric fan or hairdryer.

9. **Learning Aids**:

a. Index cards;

b. Tape;

c. Hole punch or sharp pencil;

d. Scissors;

e. Plastic drinking straw;

f. Bamboo skewers or large straightened paper clips;

g. Styrofoam or corrugated cardboard;

h. Balloons; and

i. String.

10. **Test Details**: N/A.

11. **Remarks**: It is recommended that the two periods required for this EO be scheduled consecutively.

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