EO M231.01 – IDENTIFY THE FOUR FORCES THAT ACT UPON AN AIRCRAFT

1. **Performance**: Identify the Four Forces That Act Upon an Aircraft

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 identify the four forces that act upon an aircraft, to include:

   a. weight;

   b. drag;

   c. thrust; and

   d. lift.

4. **Teaching Points**:

TP	Description	Method	Time	Refs
TP1	Explain that every aircraft has weight and that a glider on tow gains energy as it gains altitude.	Interactive Lecture	5 min	C3-116 (p. 22, p. 34) C3-090
TP2	Explain that a glider experiences drag from the air as it returns to Earth after being released.	Interactive Lecture	5 min	C3-017 (p. 20)
TP3	Fold and fly a simple paper glider. Introduce Newton's first law of motion, "an object in motion tends to stay in motion", with regard to aircraft.	In-Class Activity	15 min	C3-058 C3-116 (p. 21)
TP4	Explain that a descending glider converts the energy of raised weight into forward thrust by acting upon the passing air.	Interactive Lecture	10 min	C3-116 (p. 23) C3-017 (p. 21)
TP5	Explain that a glider's wings are designed to convert the energy of the glider's descent from downward motion to lift.	Interactive Lecture	5 min	C3-017 (p. 20)
TP6	Explain that a powered aircraft has weight and, when in flight, also experiences: a. drag; b. thrust; and c. lift.	Interactive Lecture	10 min	C3-116 (p. 22)

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TP	Description	Method	Time	Refs
TP7	Explain that thrust and lift allow an aircraft to fly by overcoming drag and weight.	Interactive Lecture	5 min	C3-116 (p. 21)

5. **Time**:

a.	Introduction / Conclusion:	5 min
b.	Interactive Lecture:	40 min
c.	In-Class Activity:	15 min
d.	Total:	60 min

6. **Substantiation**:

   a. An interactive lecture was chosen for TP1 and TP2 and TP4 to TP7 to introduce the forces that act on an aircraft and give an overview of them.

   b. An in-class activity was chosen for TP3 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. C3-090 National Aeronautics and Space Administration (NASA). (2007). *Virtual Skies.* Retrieved 22 February 2007, from http://virtualskies.arc.nasa.gov/aeronautics/tutorial/intro.html

   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; and

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

9. **Learning Aids**: 8.5 x 11 inch paper.

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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