EO C232.03 – IDENTIFY THE CHARACTERISTICS OF HELICOPTER ENGINES

1. **Performance**: Identify the Characteristics of Helicopter Engines

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 characteristics of helicopter engines, to include:

   a. technical development of early helicopter engines;

   b. challenges of rotary-wing flight; and

   c. categories of engines in CF helicopters.

4. **Teaching Points**:

TP	Description	Method	Time	Refs
TP1	Explain technological developments that made helicopters viable.	Interactive Lecture	5 min	C3-061
TP2	Have the cadets make and fly a paper helicopter.	In-Class Activity	20 min	C3-056
TP3	Explain why helicopters have a top speed and why helicopter rotors have constant speed.	Interactive Lecture	10 min	C3-055
TP4	Explain how lift of the main rotor is changed during flight.	Interactive Lecture	5 min	C3-061 C3-054
TP5	Explain that most helicopters use turboshaft engines.	Interactive Lecture	5 min	C3-061
TP6	Have the cadets identify the following CF helicopters and discuss each engine of: a. CH-149 Cormorant; b. CH-148 Cyclone; c. CH-146 Griffon; d. CH-139 Jet Ranger; and e. CH-124 Sea King.	Interactive Lecture	10 min	C3-050

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5. **Time**:

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

6. **Substantiation**:

   a. An interactive lecture was chosen for TP1 and TP3 to TP6 to introduce characteristics of helicopter engines and give an overview of them.

   b. An in-class activity was chosen for TP2 as it is an interactive way to provoke thought and stimulate interest among cadets.

7. **References**:

   a. C3-050 Department of National Defence. (2006). *Canada's Air Force, Aircraft Main Page.* Retrieved 11 October 2006, from http://www.airforce.forces.gc.ca/equip/equip1_e.asp.

   b. C3-054 Frost, M. (2004). *Force and Movement: Making a Helicopter.* Retrieved 11 October 2006, from http://www.teacherresourcesgalore.com/physics_files/helicopter.doc.

   c. C3-055 University of Sydney. *Helicopters.* (2006). Retrieved 12 October 2006, from http://alex.edfac.usyd.edu.au/blp/websites/Machan/heli.htm.

   d. C3-056 US Centennial of Flight Commission. *Helicopters.* (2003). Retrieved 12 October 2006, from http://www.centennialofflight.gov/essay/Dictionary/helicopter/DI27.htm.

   e. C3-061 Leishman, J.G. (2000). *A History of Helicopter Flight.* Retrieved 1 November 2006, from http://www.glue.umd.edu/~leishman/Aero/history/html.

8. **Training Aids**:

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

   b. Completed paper helicopter for demonstration purposes;

   c. Model helicopter with tail-rotor (e.g. Jet Ranger); and

   d. Helium-filled balloon.

9. **Learning Aids**:

   a. Directions to construct and fold a paper helicopter (A-CR-CCP-802/PF-001, Annex D); and

   b. Materials required to construct a paper helicopter.

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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