EO C232.01 – IDENTIFY THE CHARACTERISTICS OF GAS TURBINE ENGINES

1. **Performance**: Identify the Characteristics of Gas Turbine 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 gas turbine engines, to include:

   a. describing general gas turbine theory; and

   b. identifying various aspects of gas turbines.

4. **Teaching Points**:

TP	Description	Method	Time	Refs
TP1	Explain that a jet engine is a reactive engine that propels by ejecting material as per Newton's third law of motion.	Interactive Lecture	5 min	C3-116 (p. 85)
TP2	Have the cadets explore Newton's third law of motion by making and operating a Pop Can Hero Engine.	In-Class Activity	15 min	C3-016 (p. 29) C3-057 (p. 11)
TP3	Describe the history of reaction engine development, to include: a. Hero's aeolipile toy; b. Chinese gunpowder rockets; c. Leonardo Da Vinci's chimney jack; d. Branca's stamping mill; e. Stolze's first gas turbine engine; f. Whittle's gas turbine for jet propulsion; g. the flight of the Heinkel HE-178; h. Whittle's Gloster Meteor turbojet; and i. Anslem's axial-flow turbojet.	Interactive Lecture	10 min	C3-088
TP4	Explain the advantages of using a turbine, to include: a. compression requirement; b. running at static conditions; and c. power to operate ancillary systems.	Interactive Lecture	5 min	C3-084 C3-087

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TP	Description	Method	Time	Refs
TP5	Identify and describe the parts of a gas turbine turbofan engine, to include: a. fan; b. compressor; c. combustor; d. turbine; e. nozzle; and f. afterburner.	Interactive Lecture	5 min	C3-086
TP6	Conduct a crossword game based on jet power.	In-Class Activity	15 min	C0-003 (p. 70)

5. **Time**:

a.	Introduction / Conclusion:	5 min
b.	Interactive Lecture:	25 min
c.	In-Class Activity:	30 min
d.	Total:	60 min

6. **Substantiation**:

a. An interactive lecture was chosen for TP1 and TP3 to TP5 to introduce the characteristics of gas turbine engines and give an overview of them.

b. An in-class activity was chosen for TP2 and TP6 as it is an interactive way to provoke thought and stimulate interest among cadets.

7. **References**:

a. C0-003 (ISBN 0-943210-44-5) Pike, B. and Busse, C. (1995). *101 More Games for Trainers.* Minneapolis, MN: Lakewood Books.

b. C3-016 EG-2003-01-108-HQ NASA. (2003). *Rockets: A Teacher's Guide With Activities in Science, Mathematics, and Technology.* Washington, DC: NASA.

c. C3-057 ISBN-10 1-59647-055-0 Sobey, E. (2006). *Rocket-powered Science.* Tucson, AZ: Good Year Books.

d. C3-084 NASA Glenn Research Center. *Engines 101 – Ultra-Efficient Engine Technology (UEET).* Retrieved February 21, 2007, from http://www.ueet.nasa.gov/Engines101.html#Aeronautics.

e. C3-086 NASA Glenn Research Center. *Engines 101.* Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/icengine.html.

f. C3-087 NASA Glenn Research Center. *Propulsion Index.* Retrieved 21 February 2007, from http://www.grc.nasa.gov/WWW/K-12/airplane/shortp.html.

g. C3-088 NASA Glenn Research Center. *Beginner's Guide to Rockets.* Retrieved 21 February 2007, from http://exploration.grc.nasa.gov/education/rocket/bgmr.html

h. 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.

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8. **Training Aids**:
    a. Presentation aids (e.g. whiteboard/flipchart/OHP) appropriate for the classroom/training area; and
    b. Coloured marking pens.
9. **Learning Aids**:
    a. Straight pin;
    b. Empty pop can;
    c. Nail;
    d. Scissors; and
    e. Pencils with erasers.
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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