ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 1

EO C170.01 – WATCH *HOW IT'S MADE* SEGMENTS

Total Time: 60 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-801/PG-001, *Proficiency Level One Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the instruction guide within the TP for which they are required.

Review the lesson content and become familiar with the material prior to delivering of the lesson.

Review the *How It's Made* segments and select seven segments to show during the lesson.

Prepare a suitable classroom area with an available media.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

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

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have watched *How It's Made* segments.

IMPORTANCE

Discovering the aircraft maintenance and manufacturing industry will give the cadets a better understanding of how aircraft are prepared for and serviced for flight, including different career opportunities.

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BACKGROUND KNOWLEDGE

SEGMENT: AIRCRAFT ENGINES

See how aircraft engines are built.

Length (00:05:05)

SEGMENT: AIRCRAFT PROPELLERS

See how aircraft propellers are made.

Length (00:04:59)

SEGMENT: AIRCRAFT WOODEN PROPELLERS

See how aircraft wooden propellers are built.

Length (00:06:00)

SEGMENT: AIRPLANE CONSTRUCTION

See how the construction of a small airplane is done.

Length (00:04:45)

SEGMENT: AIRPLANE LANDING GEAR

See how the construction and assembly of an airplane landing gear is done.

Length (00:04:46)

SEGMENT: HELICOPTERS

See how the construction and assembly of a helicopter is done.

Length (00:04:42)

SEGMENT: GLIDERS

See how the construction and assembly of a glider is done.

Length (00:05:01)

SEGMENT: JET TURBINE BLADES

See how the production of jet turbine blades is done.

Length (00:04:53)

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Teaching point 1 **Discuss major components of the aircraft maintenance and manufacturing industry.**

Time: 5 min Method: Interactive Lecture

The terms maintenance and manufacturing refer to very clearly defined fields.

MAINTENANCE

Aircraft maintenance refers to any work being done on an aeronautical product after the issuance of a certificate of airworthiness, to include:

- overhaul,
- repairs,
- required inspection or modification, and
- removal or installation of components.

This does not include elementary work or servicing.

MANUFACTURING

Aircraft manufacturing refers to any work being done on an aeronautical product before the issuance of a certificate of airworthiness, to include:

- making,
- assembly, and
- fabrication.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS:

Q1. What is considered aircraft manufacturing?

Q2. What kind of work is included in aircraft maintenance?

ANTICIPATED ANSWERS:

A1. Any work done on an aeronautical product before the issuance of a certificate of airworthiness.

A2. Overhaul, repair, required inspection or modification, and removal or installation of components on an aeronautical product.

Teaching point 2 **Watch and discuss *How It's Made* segments.**

Time: 40 min Method: In-Class Activity

Before the start of the lesson review the *How It's Made* segments. This will facilitate the discussion after each segment and will enable an optimal use of the time allotted for this TP.

After each segment, using the questions and answers provided below, confirm the cadets' comprehension of the segment.

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SEGMENT: AIRCRAFT ENGINES

Q1. Why is redundancy built in an aircraft engine?

Q2. Why is a testing propeller attached to engine during testing?

Q3. What is checked in the oil filter after testing?

A1. To ensure that each system as a backup to maximise safety.

A2. To keep the engine cool during the testing phase.

A3. The oil filter is checked for foreign debris.

SEGMENT: AIRCRAFT PROPELLERS

Q1. Why are propellers made of aluminum?

Q2. What happens to defective pieces during the manufacturing process?

Q3. Why are the back of the blades painted black?

A1. Because aluminum is a light-weight and durable material.

A2. The defective pieces are either repaired or scrapped if they cannot be repaired.

A3. To prevent the sun from reflecting off the propeller and blinding the pilot.

SEGMENT: AIRCRAFT WOODEN PROPELLERS

Q1. What are wooden propellers made of?

Q2. What is the airfoil on a propeller?

Q3. What are the two sides of a propeller blade?

A1. The propellers are made of laminated maple.

A2. The airfoil is the side of the propeller blade that is shaped like aircraft wing.

A3. The pitch and the airfoil.

SEGMENT: AIRPLANE CONSTRUCTION

Q1. What are the airplanes made of and why?

Q2. What is the process called curing?

Q3. What is used to cut holes in the planes fuselage?

A1. An airplane can be made out of fiber glass and Carbone fiber.

A2. Curing refers to the process of cooking the different materials at very high temperature in order to solidify the glue.

A3. The holes in the airplanes fuselage are cut using a very high pressure jet of water and sand.

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SEGMENT: AIRPLANE LANDING GEAR

Q1. What is the oil used for during the machining process?

Q2. What is recycled during the manufacturing of the landing gear?

Q3. What is used to protect the landing gear from corrosion?

A1. Oil is used to reduce the heat produce by friction during the machining process.

A2. Metal chips created during the machining process.

A3. The different parts of the landing gear are plated with Cadmium in order to protect them from corrosion.

SEGMENT: HELICOPTERS

Q1. How many hours of work are required to build a helicopter?

Q2. What is the body of the aircraft made of?

Q3. What is brake cable used for?

A1. The construction of a helicopter requires about 700 hours or 110 days.

A2. The fuselage of the helicopter is made out of carbon fibre.

A3. Brake cable is used to prevent bolts from loosening due to vibrations.

SEGMENT: GLIDERS

Q1. What created the bases for the fuselage of the glider?

Q2. What kind of glue is used to bond the wings together?

Q3. Why is the wing cut in two after its assembly?

A1. The bases for the fuselage is created using Kevlar fibre.

A2. The wings are bonded together using epoxy resin.

A3. The wing is cut in two in order to facilitate transportation.

SEGMENT: JET TURBINE BLADES

Q1. What are the blades of a jet engine used for?

Q2. Are the blades machined or moulded?

Q3. What indicates imperfections during the inspection process?

A1. The turbine blades are used to generate air pressure inside the jet engine in order to create a mixture of air and gas that will be ignited to create thrust.

A2. The blades are moulded using a dye.

A3. The imperfections will show up as little fluorescent spots under a black light.

CONFIRMATION OF TEACHING POINT 2

The cadets' participation in the in-class activity will serve as the confirmation for this TP.

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END OF LESSON CONFIRMATION

The cadets' participation in the activity in will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

CLOSING STATEMENT

The field of aircraft manufacturing and maintenance is ripe with exciting careers in building and maintaining aircraft. The *How It's Made* segments introduce you to some of the possibilities. You will explore these areas more in other proficiency level and summer training activities.

INSTRUCTOR NOTES / REMARKS

Nil.

REFERENCES

C3-288 Production MAJ, *How It's Made* capsules, Canada.

C3-345 Transport Canada. (2011). *Canadian Aviation Regulations 2011-1*. Retrieved October 25, 2011, from http://www.tc.gc.ca/eng/civilaviation/regserv/cars/part1-subpart1-1104.htm

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