ROYAL CANADIAN AIR CADETS

LEVEL ONE

INSTRUCTIONAL GUIDE

SECTION 3

EO M130.03 – CONSTRUCT A MODEL AIRPLANE

Total Time: 60 min

INTRODUCTION

PRE-LESSON INSTRUCTIONS

A complete list of resourced needed for the instruction of this EO is located at Chapter 2 of the QSP. Specific uses for said stores are identified throughout the Instructional Guide, within the teaching point for which they are required.

Prior to instructing this lesson the instructor shall:

- review the lesson content, and become familiar with the material;
- prepare a completed model airplane;
- collect model material, to include:
  - pre-printed paper model template;
  - thumbtacks (one per cadet); and
  - one inch binder clips (one per cadet); and
- collect model building tools, to include:
  - scissors (one pair per cadet);
  - glue sticks (one stick per two cadets); and
  - markers (to be shared by all cadets).

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

The activity was selected to allow for maximum participation in the learning process. It is an interactive way to illustrate and substantiate the material taught in EO M130.02 (Section 2).

The group discussion method was chosen to allow the cadets to share their knowledge, opinions, and feelings about the subject matter while still allowing the instructor to control the direction of the discussion. The instructor must ensure that points not brought forth by the class are presented. If the instructor follows the Instructional Guide, including the questions posed, this will allow the cadets to express, in their own words, what they learned from this lesson and how they may apply the information.

REVIEW

The pertinent review for this lesson will include:

- describe the fuselage (EO M130.02 [Section 2] TP2);
- describe the wings (EO M130.02 [Section 2] TP3);
- describe the empennage (EO M130.02 [Section 2] TP4);
- describe the landing gear (EO M130.02 [Section 2] TP5); and
- describe the propulsion system (EO M130.02 [Section 2] TP6).

OBJECTIVES

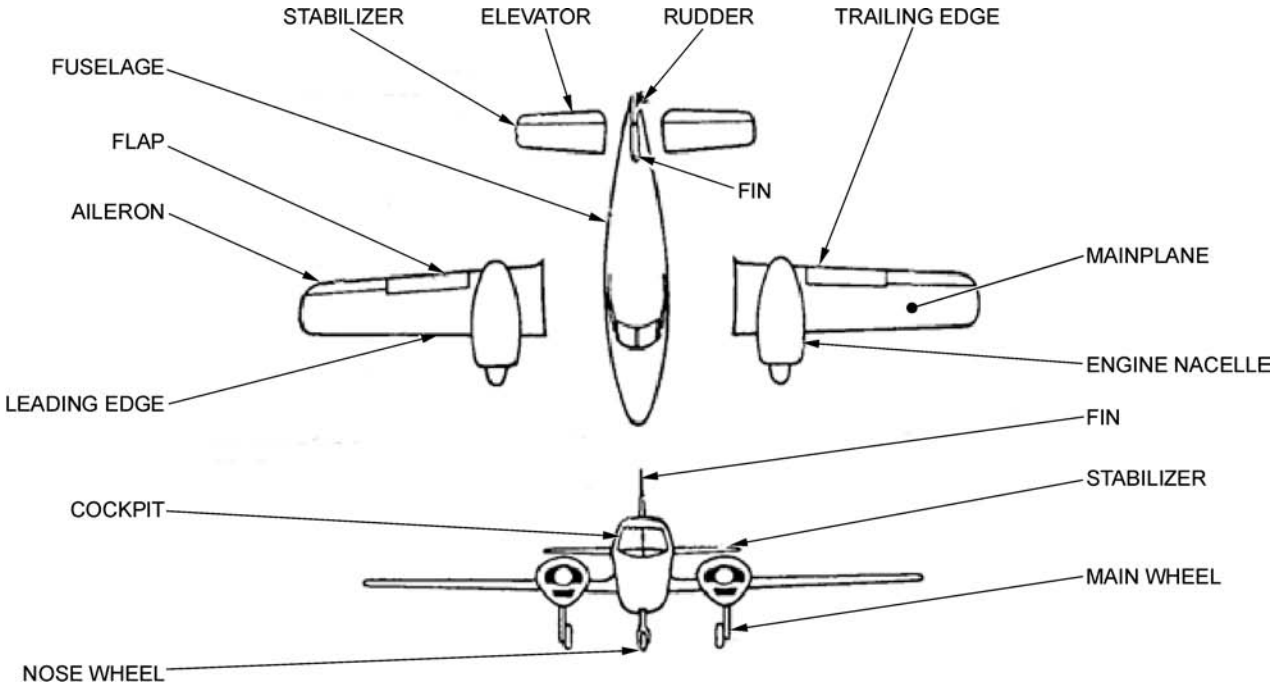
By the end of this lesson the cadet shall be expected to construct a model airplane, that will have the following components:

- fuselage (cockpit);
- wings (ailerons, flaps, leading edge, trailing edge, wing root, wing tip);
- empennage (horizontal stabilizer, vertical stabilizer, rudder, elevators);
- landing gear; and
- propulsion system (propeller, cowling).

IMPORTANCE

Cadets have learned to identify the components of an airplane. This knowledge will be useful during familiarization flights, hangar visits, and other aviation EOs. Being able to construct an airplane model provides cadets a method of confirming their knowledge of airplane components.

BACKGROUND KNOWLEDGE



Level 1 Royal Canadian Air Cadet Handbook – A-CR-CCP-266/PT-001

Figure 12-3-1 Airplane Components

FUSELAGE

The fuselage is the body of the aircraft, designed to accommodate the crew, passengers and cargo. The cockpit or crew flight deck is the part of the fuselage where the pilot and flight crew operate the aircraft. The fuselage is the structural body to which the wings, the tail section, landing gear and (in most small aircraft) the engine are attached.

WINGS

The fuselage is fitted with a wing on both sides. The primary purpose of the wings is to support the aircraft in flight by producing lift.

The wing root is where the wing meets the fuselage. The wing tip is the part farthest from the fuselage.

The leading edge is the front edge of the wing running from wing root to wing tip. The trailing edge is the back edge of the wing running from wing root to wing tip.

Ailerons are moveable surfaces that are hinged to the trailing edge of each wing, close to the wing tip. The ailerons control roll. Roll is the banking of the aircraft to the left and the right. The ailerons move in opposite directions to each other.

Flaps are moveable surfaces that are hinged to the trailing edge of each wing, close to the wing root. They can be used during landing and take-off to provide more controlled flight at slower airspeeds. Flaps are operated with a lever or hand wheel in the cockpit.

EMPENNAGE

The empennage refers to the whole tail section of a plane. It includes the horizontal stabilizer, elevator, vertical stabilizer, and rudder.

The horizontal stabilizer is at the back of the aircraft, and helps keep the aircraft stable as it flies through the air. The horizontal stabilizer does not move.

The elevator is hinged to the horizontal stabilizer and is operated by moving the control column forward and backward. The elevator controls pitch. Pitch is the up and down movement of the aircraft's nose.

The vertical stabilizer, also called the fin, is an upright surface on the empennage. It helps keep the aircraft stable as it flies through the air. The vertical stabilizer does not move.

The rudder is hinged to the fin and is operated by the rudder pedals in the cockpit. The rudder controls yaw. Yaw is the side-to-side movement of the aircraft.

LANDING GEAR

Landing gear on an airplane is like the tires on a car. The landing gear supports the aircraft when it is on the ground and absorbs the shock of landing. All aircraft have their landing gear under the main part of the fuselage or wings. Landing gear can be fixed or retractable. Fixed gear is attached to the airplane in a permanent position. Retractable gear can fold up into the wings or the fuselage.

There are two main landing gear configurations. Both configurations have the main wheels or main gear toward the middle of the aircraft. In a nose wheel configuration (also called tricycle) there is another wheel or gear under the nose. In a tail wheel configuration (also called conventional or tail dragger) there is another wheel or gear under the tail.

PROPULSION SYSTEM

Power is produced by an internal combustion engine (the same as a car) with a two or three bladed propeller or a gas turbine (jet) engine. A jet can be used to power a propeller – this is called a turboprop engine.

The cowling (also called the nacelle) is like the hood of a car. It encloses the engine and streamlines the airplane to reduce drag. The cowling provides cooling of the engine by ducting cool air around the engine.

ACTIVITY – CONSTRUCT A MODEL AIRPLANE

Time: 45 min

OBJECTIVE

The objective of this activity is to confirm the cadets' comprehension of the information taught during EO M130.02 (Section 2). Cadets are to use their knowledge of components of an airplane and the materials provided to construct a model airplane.

The purpose of this model is to incorporate the major components as discussed in EO M130.02 (Section 2), NOT to build a flying model. With the propeller and landing gear attached, this model will be too heavy to fly. The assembly time provided in this lesson does not allow sufficient drying time to produce an airworthy model. Aerodynamic features of assembly have been omitted for simplicity.

RESOURCES

- Paper model templates (one per cadet).

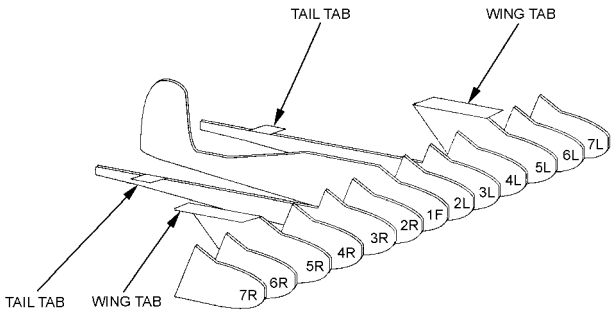
- Instruction sheet found in Annex G (one per cadet).
- Thumbtacks (one per cadet).
- One inch binder clips (one per cadet).
- Scissors (one pair per cadet).
- Glue sticks (one stick per two cadets).
- Markers (to be shared by all cadets).

The instructor should have a completed paper model for demonstration/confirmation purposes.

ACTIVITY LAYOUT

Cadets are to complete the models on their own by following the instruction sheets provided in Annex G.

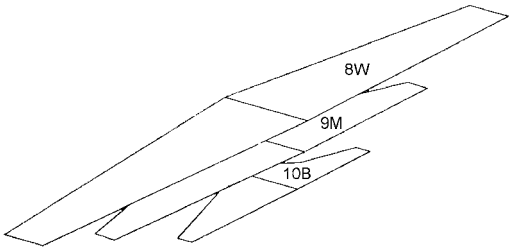
- Each cadet will construct their own model airplane. The materials for each model include:
  - a template;
  - a thumbtack; and
  - a one inch binder clip.
- Each cadet will also need to use scissors, a glue stick, and markers. Provide cadets with the instructions sheet provided in Annex G. The instructions include the following steps:
  1. Cut out all the airplane pieces. Cadets must be careful not to mix their pieces with others around them.
  2. To assemble the fuselage, glue pieces 1F through 7R and 7L to build-up fuselage layers, carefully aligning parts. Ensure that the entire contacting surface of a smaller piece being fastened to a larger one is completely covered with glue.



Adapted From Fabulous Paper Gliders

Figure 12-3-2 Fuselage Assembly

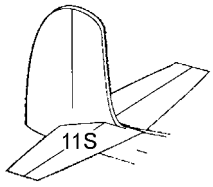
3. To assemble the wings, glue 9M to the bottom of wing part 8W. Then glue 10B to the bottom of 9M. Make sure the wing parts are aligned along the centre line. Fold down the wing tabs on the fuselage, and apply glue to them. Fasten the wing assembly to the fuselage.



Adapted From Fabulous Paper Gliders

Figure 12-3-3 Wing Assembly

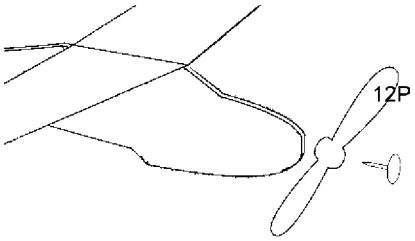
4. To assemble the tail, fold down the tail tabs on the fuselage, and apply glue to them. Fasten the horizontal stabilizer 11S to the fuselage.



Adapted From Fabulous Paper Gliders

Figure 12-3-4 Tail Assembly

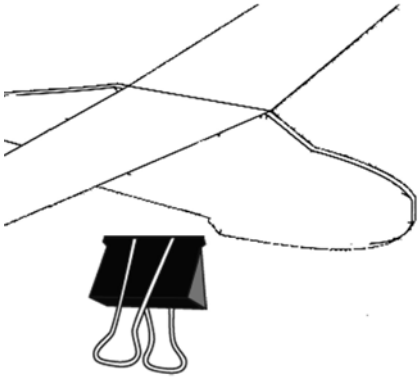
5. To attach the propeller, pierce the centre of 12P with the thumbtack, and push the thumbtack into the centre of the fuselage assembly.



Adapted From Fabulous Paper Gliders

Figure 12-3-5 Propeller Assembly

6. To attach the landing gear, clip the binder clip to the bottom of the fuselage, underneath the wings.



Adapted From Fabulous Paper Gliders

Figure 12-3-6 Landing Gear Assembly

7. Color the model as desired.
8. Clean-up, discarding all scrap paper and returning materials to the instructor.

SAFETY

Care should be taken when handling the thumbtacks, scissors, and glue.

INSTRUCTOR GUIDELINES

- Supervise the cadets' work to ensure that they are following the instructions provided.
- While supervising and assisting as needed, ask cadets to identify parts of the airplane.
- Ensure cadets identify the leading and trailing edges of the wings and attach the wings facing the correct direction.
- Once the activity has been completed, examine the model airplanes to ensure that all of the components are assembled correctly.
- After this activity has been completed, carry on with the reflection/questioning stage.
- Ask other instructors to assist in supervising the activity and assisting in answering questions.

REFLECTION

Time: 5 min

GROUP DISCUSSION

Instructor shall ensure that all lesson objectives are drawn out towards the end of the reflection stage.

DISCUSSION QUESTIONS

TIPS FOR ANSWERING/FACILITATING DISCUSSION

- Ask questions that help facilitate discussion; in other words, avoid questions with yes or no answers.
- Prepare questions ahead of time.
- Be flexible (you are not bound to only the prepared questions).
- Encourage cadets to participate by using praise such as “great idea” or “excellent response, can anyone add to that?”.
- Try to involve everyone by directing questions to non-participants.

SUGGESTED QUESTIONS

Q1. What did you learn about airplane parts from this activity?

Q2. How did this activity help you understand airplanes better?

CONCLUSION

REVIEW

Review the components of an airplane with the following questions, using the model created by the cadets as a training aid. Point out the various components of an airplane discussed in the previous class. Below are some questions that can supplement this review.

SUGGESTED QUESTIONS

Q1. What is the purpose of the landing gear?

Q2. Where are the ailerons located?

Q3. What movement does the rudder produce?

Q4. What is the purpose of the cowling?

SUGGESTED ANSWERS

A1. The landing gear supports the aircraft when it is on the ground and absorbs the shock of landing.

A2. Ailerons are hinged to the trailing edge of each wing, close to the wing tip.

A3. The rudder controls the movement called yaw. Yaw is the side-to-side movement of the aircraft.

A4. The cowling encloses the engine and streamlines the airplane to reduce drag. The cowling provides cooling of the engine by ducting cool air around the engine.

MAIN TEACHING POINTS

TP1. Describe the components of an airplane.

Instructors shall reinforce those answers and comments discussed during reflection, but must ensure that the main teaching points have been covered. Any main teaching point not brought out during the guided discussion shall be inserted during review.

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

There is no formal assessment of this EO.

CLOSING STATEMENT

Model building is an excellent opportunity to apply theoretical knowledge. Being able to identify and describe the main components of an airplane will allow cadets to more actively participate in further aviation topics.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

A3-001 A-CR-CCP-263/PT-001, *From the Ground Up: Millennium Edition (2000).* Ottawa, ON: Aviation Publishers Co. Limited.

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

THIS PAGE INTENTIONALLY LEFT BLANK