MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TP 3 OF EO M231.02

A-CR-CCP-802/PG-001

EO M231.02 – DESCRIBE THE PRODUCTION OF LIFT BY AN AIRCRAFT WING

1. **Performance.** Describe the Production of Lift by an Aircraft Wing.

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.** The cadet shall describe the production of lift by an aircraft wing, to include:

   a. the airfoil camber; and

   b. angle of attack.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain that air acts like a fluid insofar as it has: a. speed; and b. pressure. Have the cadets explore Bernoulli's Principle by blowing over a curved sheet of paper.	In-class Activity	10 min	C3-017 (p. 18) C3-116 (p. 21, p. 26)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. In-class Activity: 10 min

   c. Total: 15 min

6. **Substantiation.** An in-class activity was chosen for TP1 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. C3-116 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/multimedia projector) appropriate for the classroom/training area;

   b. 8.5 x 11 in paper.

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9. **Learning Aids.** 8.5 x 11 in paper.

10. **Test Details.** N/A.

11. **Remarks.** N/A.

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 2

EO M231.02 – DESCRIBE THE PRODUCTION OF LIFT BY AN AIRCRAFT WING

Total Time: 15 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-802/PG-001, Chapter 4. Specific uses for said resources are identified throughout the Instructional Guide within the TP for which they are required.

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

Photocopy handout for each cadet of Figure 11D-2 Creating Lift, located at the end of this document.

Gather resources needed for the in-class activity in TP1.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An in-class activity was chosen for TP1 as it is an interactive way to provoke thought and stimulate interest among cadets.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to describe the production of lift by an aircraft wing.

IMPORTANCE

It is important for cadets to learn about the production of lift by an aircraft wing so that they can develop an understanding of subsequent and related principles of flight.

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Teaching Point 1 **Explain That Air Acts Like a Fluid**

Time: 10 min Method: In-Class Activity

AIR ACTS LIKE A FLUID

Air behaves like a fluid since it has pressure and speed. As airspeed increases, its pressure drops. A wing uses principle to deflect air, which causes an equal and opposite reaction.

The pressure of moving air can be examined by blowing gently over a small piece of curved paper. The air does not push the paper down as might be intuitively assumed. Instead, the paper behind the curve rises toward the moving air. This happens because the air pressure drops over the paper due to the air's increased speed—this would seem to match the description of speed/pressure relationship. The curvature in the paper enhances the effect of the lowered air pressure.



Distribute handout of Figure 11D-2 – Creating Lift located at the end of this document.

ACTIVITY

Time: 5 min

OBJECTIVE

The objective of this activity is to have the cadets reduce the air pressure over a sheet of paper and observe the results.

RESOURCES

- Paper 8 1/2 x 11, and
- Pencil.

ACTIVITY LAYOUT

N/A.

ACTIVITY INSTRUCTIONS

1. Tear a sheet of paper 8 1/2 x 11 vertically, into two pieces.
2. Curve one end of the sheet gently over a pencil as shown in Figure 11D-2.
3. Blow gently over the paper as shown in Figure 11D-2.
4. Observe that the paper rises into the moving air.

SAFETY

N/A.

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CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why does air behave like a fluid?

Q2. Why does the paper airfoil rise when a cadet blows over it?

Q3. Why was the paper deliberately curved before blowing over it?

ANTICIPATED ANSWERS

A1. It has speed and pressure.

A2. Air pressure over the paper drops as the air moves, so the still air below the paper pushes it up.

A3. The curvature in the paper enhances the effect of the lowered air pressure.

END OF LESSON CONFIRMATION

The cadet's participation in the in-class activity will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

There are other methods of producing lift, such as rocketry, but airfoils are by far the most common, not just because of their elegance, but because they are best suited to prolonged horizontal flight.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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

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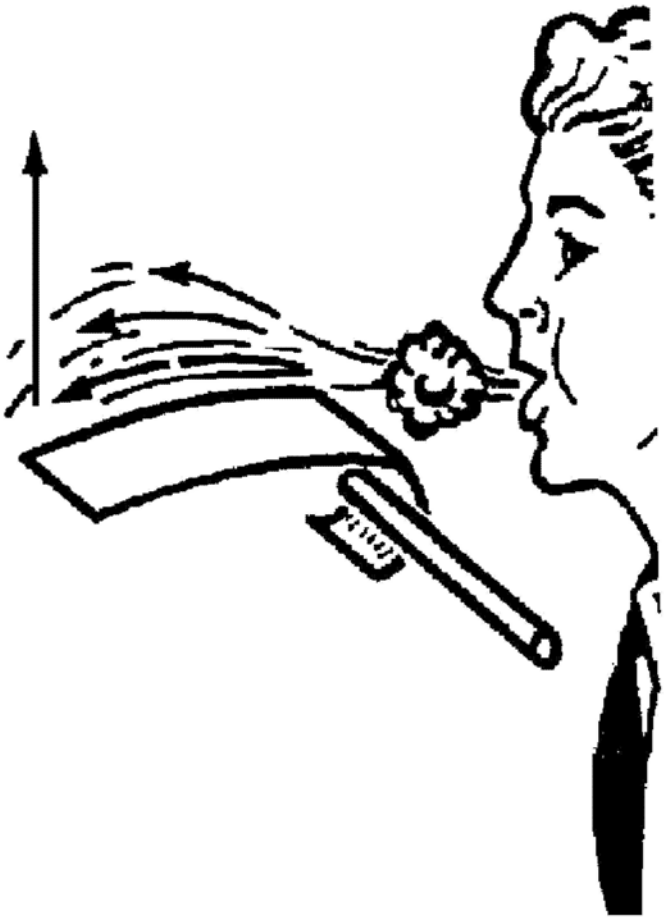
CREATING LIFT



Cadets Canada: RCSU Pacific, 2007, Air Cadet Master Lesson Plans. Retrieved 7 March 2007, from http://www.regions.cadets.ca/pac/aircad/resources/mlp_air_e.asp

Figure 11D-2 Creating Lift

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