MODIFIED LESSON INSTRUCTIONS AND INSTRUCTIONAL GUIDES – TPS 1 AND 2 OF EO M231.04

A-CR-CCP-802/PG-001

EO M231.04 – DESCRIBE THE AXIAL MOVEMENTS OF AN AIRCRAFT

1. **Performance.** Describe the Axial Movements of an Aircraft.

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 describe the axial movements of an aircraft, to include:

   a. the three axes of an aircraft; and

   b. the three corresponding axial movements.

4. **Teaching Points**

TP	Description	Method	Time	Ref
TP1	Explain that aircraft operate in a three-dimensional space. Identify the three axes of aircraft movement, to include: a. the longitudinal axis; b. the lateral axis; and c. the vertical axis.	Interactive Lecture	5 min	C3-116 (p. 30)
TP2	Using a model aircraft, describe the three movements that aircraft make around their three axes, to include: a. roll about the longitudinal axis; b. pitch about the lateral axis; and c. yaw about the vertical axis.	Interactive Lecture	10 min	C3-116 (p. 30) C3-017 (p. 22)

5. **Time**

   a. Introduction/Conclusion: 5 min

   b. Interactive Lecture: 10 min

   c. Total: 15 min

6. **Substantiation.** An interactive lecture was chosen for this lesson to introduce the subject of axial movement of an aircraft and give an overview of it.

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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; and

   b. Model of a light fixed-wing aircraft with wing struts, fixed gear and control surface detail.

9. **Learning Aids.** N/A.

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

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

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ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL TWO

INSTRUCTIONAL GUIDE

SECTION 4

EO M231.04 – DESCRIBE THE AXIAL MOVEMENTS OF AN AIRCRAFT

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 handouts of Figure 11K-1 Axes of an Aircraft for each cadet, located at the end of this document.

Obtain a model of a light fixed-wing aircraft with wing struts, fixed gear and control surface detail.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for this lesson to introduce the subject of axial movement and give an overview of it.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall be expected to identify the three axes of an aircraft and describe an aircraft's movement about them.

IMPORTANCE

It is important for cadets to learn about aircraft axes and axial movement so that they can understand subsequent and related principles of flight.

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Teaching Point 1 **Identify the Three Axes of Aircraft Movement**

Time: 5 min Method: Interactive Lecture

Aircraft operate in a three-dimensional space so there are three corresponding ways they can turn. Each of the three possibilities has an associated axis of motion:

- the longitudinal axis,
- the lateral axis, and
- the vertical axis.



Distribute handouts of aircraft axes in Figure 11K-1 Axes of an Aircraft, located at the end of this document.

When an aircraft is airborne, it can move in almost any direction. All movement of the aircraft takes place around the centre of gravity. This is the aircraft's balance point, or point through which all weight acts downwards.



The centre of gravity is the point where the three axes intersect.

To clarify the ways that aircraft can move in flight, the aircraft is said to move around an axis. This is an imaginary line running through the centre of gravity of the aircraft and around which the aircraft rotates.

There are three such axes and the aircraft may rotate around one, two or all three axes at the same time. They are the longitudinal axis, the lateral axis, and the vertical axis:

- The longitudinal axis runs lengthwise through the fuselage from the nose to the tail and passes through the centre of gravity.
- The lateral axis runs from wingtip to wingtip through the centre of gravity.
- The vertical axis runs vertically through the centre of gravity. It is situated at right angles to the other axes.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. Why does an aircraft have exactly three axes of motion?

Q2. Where is an aircraft's centre of gravity located?

Q3. What are the three axes of an aircraft called?

ANTICIPATED ANSWERS

A1. An aircraft operates in a three-dimensional space and needs an axis for each dimension.

A2. At the intersection of the three axes of motion.

A3. The three axes of an aircraft are the longitudinal axis, the lateral axis and the vertical axis.

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Teaching Point 2 **Describe the Three Axial Movements That Aircraft Make**

Time: 5 min Method: Interactive Lecture



Using a model aircraft, describe the three movements that aircraft make around their three axes, to include:

- roll about the longitudinal axis;
- pitch about the lateral axis; and
- yaw about the vertical axis.

Have cadets simulate the three movements of an aircraft using their hand. Spin the wrist right to left to simulate roll, bend the wrist up and down to simulate pitch, and twist the wrist left to right simulate yaw.

Rolling. Movement of an aircraft about the longitudinal axis is called roll.

Pitching. Movement of an aircraft about the lateral axis is called pitch.

Yawing. Movement of an aircraft about the vertical axis is called yaw.

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is roll?

Q2. What is pitch?

Q3. What is yaw?

ANTICIPATED ANSWERS

A1. Roll is the movement of an aircraft about its longitudinal axis.

A2. Pitch is the movement of an aircraft about its lateral axis.

A3. Yaw is the movement of an aircraft about its vertical axis.

END OF LESSON CONFIRMATION

Have the cadets simulate the movements of an aircraft using their hand as confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

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CLOSING STATEMENT

Movement through a three-dimensional space requires three axes of movement. The names of the axes and the names of the movements are borrowed from the sea, where ships have pitched, yawed and rolled for thousands of years.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

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

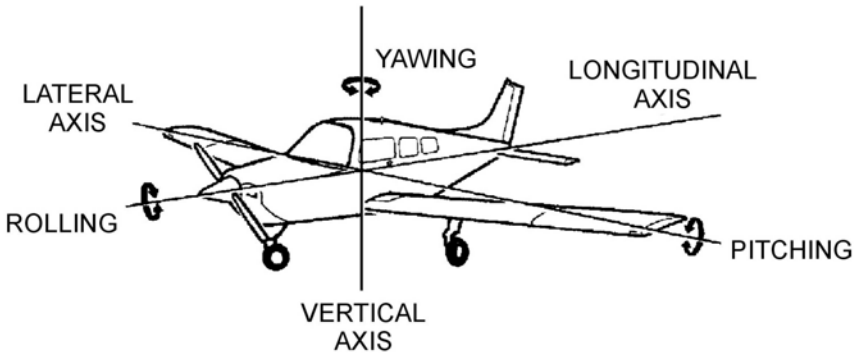
C3-116 A-CR-CCP-263/PT-001/(ISBN 0-9680390-5-7) MacDonald, A. F. and Peppler, I. L. (2000). *From the Ground Up: Millennium Edition.* Ottawa, ON: Aviation Publishers Co. Limited.

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A-CR-CCP-802/PF-001
Chapter 11, Annex K

AXES OF AN AIRCRAFT

AXIAL MOVEMENTS



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 11K-1 Axes of an Aircraft

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