ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL FOUR

INSTRUCTIONAL GUIDE

SECTION 4

EO C431.02 – DEMONSTRATE TURNS, CLIMBS AND DESCENTS IN A FLIGHT SIMULATOR

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the delivery of this lesson are listed in the lesson specification located in A-CR-CCP-804/PG-001, *Proficiency Level Four Qualification Standard and Plan*, 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 the handouts located at Attachments A and B for each cadet.

Create a scenario (eg, location, weather, aircraft) for the aircraft flight simulator IAW the manual provided with the software.

Set up the simulator with the scenario created.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

An interactive lecture was chosen for TPs 1 and 2 to give direction on procedures and present basic or background information about flight simulation.

A demonstration and performance was chosen for TP 3 as it allows the instructor to explain and demonstrate turns, climbs and descents in a flight simulator while providing an opportunity for the cadets to practice the skills under supervision.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have demonstrated turns, climbs and descents in a flight simulator.

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IMPORTANCE

It is important for cadets to demonstrate turns, climbs and descents in a flight simulator to develop a better understanding of the principles of flight and stimulate an interest in aviation. This will also serve as a solid foundation for any cadet who participates in a demonstration flight or flying training in the future.

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Teaching point 1 **Explain any safety considerations related to the location or design of the flight simulator.**

Time: 5 min Method: Interactive Lecture



Arrange the cadets so they can hear the safety briefing prior to using the flight simulator.



This briefing is being conducted to pass on safety considerations for use of the flight simulator. The actual content of the briefing will vary by region and squadron based on the squadron assets, the location of the assets, and other environmental factors. However, the following should be covered:

- DND regulations concerning the appropriate use of computers, including:
  - CATO 11-07, *Internet Acceptable Use–Cadet Program*,
  - DAOD 6001, *Internet*, and
  - Regional Orders;
- location of the nearest fire exit in case of fire,
- awareness of any moving parts of the simulator, and
- proper entry and exit techniques to avoid damage to assets.

CONFIRMATION OF TEACHING POINT 1

Confirmation questions for this TP will depend on the content covered.

Teaching point 2 **Explain how to manipulate the necessary control inputs and the location of necessary instruments.**

Time: 10 min Method: Interactive Lecture

NECESSARY CONTROL INPUTS

Control Column or Yoke



Using a control yoke in a flight simulator is preferable. Accordingly, the following will need to be adjusted if a control column is used instead.

The control yoke is located directly in front of the pilot in the centre of the pilot's side of the instrument panel. The control yoke is very much like the steering wheel of a car, both in look and function. The yoke is designed to move on two planes of motion.

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The first plane of motion is left and right. The control yoke will usually move to approximately 45 degrees left or right of centre when moved like a steering wheel. This motion is what controls the ailerons of the simulated airplane. To roll left, turn the yoke left. To roll right, turn the yoke right. Remember, this must be used as well as the rudder in order to properly turn the aircraft.

The control yoke also moves back and forth. The steering column of the yoke moves in and out of the main assembly. This controls the elevator of the simulated aircraft. To pitch up, pull back (towards the pilot). To pitch down, push forward (away from the pilot).



Pitch will change the altitude, but more importantly the airspeed.

Rudder Pedals

On the floor of the simulator there are two pedals. If the left pedal is pushed forward, the right one moves back and vice versa. These pedals control the rudder of the simulated aircraft. To yaw left, push on the left pedal. To yaw right, push on the right pedal.



Rudder pedals move in different directions so pressure must be taken off the opposite pedal in order for the movement to take place.

LOCATION OF NECESSARY INSTRUMENTS



Distribute the handout located at Attachment A to each cadet.

The instruments of the simulated aircraft will be displayed in front of the pilot, laid out above the control yoke on what is called an instrument panel. The four instruments that are of significance are the airspeed indicator (ASI), vertical speed indicator (VSI), altimeter, and turn coordinator.

ASI. Shows an aircraft's speed through the air.

VSI. Shows the rate at which an aircraft is ascending or descending.

Altimeter. Shows the altitude of an aircraft.

Turn Coordinator. Shows rate of roll as well as the rate of turn of the aircraft.



Function of the ASI, VSI, altimeter and turn coordinator was discussed in M431.02 (Describe Flight Instruments).

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CONFIRMATION OF TEACHING POINT 2

QUESTIONS:

Q1. Where is the control yoke located?

Q2. Where are the instruments located?

Q3. How is pitch controlled?

ANTICIPATED ANSWERS:

A1. Directly in front of the pilot in the centre of the pilot's side of the instrument panel.

A2. In front of the pilot, laid out above the control yoke on what is called an instrument panel.

A3. By moving the yoke towards or away from the pilot.

Teaching point 3 **Explain, demonstrate and have the cadets practice turns, climbs and descents using a flight simulator.**

Time: 70 min Method: Demonstration and Performance

ACTIVITY

OBJECTIVE

The objective of this activity is to allow the cadets to practice turns, climbs and descents and witness their effect on the pitot static instruments and the turn coordinator.

RESOURCES

- flight simulator (Microsoft flight simulator, computer, control yoke, and rudder pedals; or Link),
- scenario using a local airport, no weather, and positioned 1 000 feet above ground level (AGL), and
- Climbs, Turns and Descents Handout located at Attachment B.

ACTIVITY LAYOUT

Training should be conducted for a light training single engine aircraft such as:

- a Cessna 172, or
- a Piper J-3C-65 Cub.

This will depend on the location of the flight simulator.

ACTIVITY INSTRUCTIONS

1. Start the simulator with the scenario created prior to the lesson.

2. Using the flight simulator, explain and demonstrate turns, climbs and descents by climbing to 5 000 feet AGL, making turns and descending to 1 000 feet AGL.

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Specific details on how to conduct turns, climbs and descents can be found in:

- the Transport Canada *Flight Training Manual*,
- the *Computerized Aircraft Simulation Center*,
- the Pilots Operating Handbook (POH), and / or
- the operating instructions for the flight simulator program.

3. Distribute the handout located at Attachment B to each cadet. The handout reflects the sequence in which the instructor will explain and demonstrate turns, climbs and descents.

4. Have the cadets take turns in the flight simulator, practicing turns, climbs and descents as demonstrated.

5. Give each cadet verbal and physical assistance as necessary as they practice turns, climbs and descents.

6. Provide each cadet an equal amount of time. This means that the 70 minutes should be divided as evenly as possible based on the number of cadets in the class and the number of flight simulators available.

7. Debrief each cadet as they finish their individual flight. The debrief should include the following:

   a. the overall performance of the cadet,

   b. the sequences where the cadet performed strongly,

   c. the sequences where the cadet performed weakly, and

   d. how to improve their performance.

SAFETY

Nil.

CONFIRMATION OF TEACHING POINT 3

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

END OF LESSON CONFIRMATION

The cadets' participation in practicing turns, climbs and descents in the flight simulator will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

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CLOSING STATEMENT

It has been stated by many flight instructors that a significant difference can be seen in the quality of students who used a flight simulator compared to those who did not. The military is a large user of computer-based flight simulators, as are Air Canada and WestJet. Continued training on flight simulators will enhance preparation for future flight training.

INSTRUCTOR NOTES / REMARKS

All staff should be familiarized with the operation of the flight simulator prior to the cadets arriving. This will allow them to troubleshoot, and give them a better perspective for instructing.

Additional instructors are required for this lesson. There should be one instructor per two flight simulators.

Cadets who are qualified Advanced Aviation may assist with this instruction.

REFERENCES

C3-139 ISBN 0-7715511-5-0 Transport Canada. (1999). *Flight training manual 4th edition revised*. Ottawa, ON: Transport Canada.

C3-156 *Computerized Aircraft Simulation Center*. (2007). Retrieved October 2, 2007, from http://www.regions.cadets.forces.gc.ca/pac/aircad/flight/casc_lessons_e.asp

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Note. From "Design a Virtual Cockpit Instrument Panel", Ngee Ann Polytechnic, 2007. Retrieved October 31, 2007, from http://www.learnerstogether.net/avionics-project-design-problem-based-learning/56

Figure A-1 Cessna Flight Instrument Panel

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CLIMBS, TURNS AND DESCENTS HANDOUT

The handout is presented to reflect the sequence in which the instructor will explain and demonstrate climbs, turns and descents.

CLIMBS

Climbs are executed by doing the following:

1. Adjust the pitch angle to obtain climb airspeed.

2. Increase the power to maintain airspeed.

3. Climb to the desired altitude.

4. Upon reaching the desired altitude, resume a level attitude and adjust power to maintain altitude and airspeed.

5. For any climb, follow the sequence: attitude, power, trim (APT).

TURNS

Turns are executed by doing the following:

1. Look out from the outside to the inside of the turn. A good look out is the most important part of airmanship as is essential for safe flying.

2. Roll the airplane in the desired direction, using the rudder to stay coordinated. Stay coordinated by "stepping on the ball" of the turn coordinator. That is, if the ball of the turn coordinator is to the right, apply more right rudder and vice versa.

3. Once the desired angle of bank has been reached, reduce the yoke input as required to maintain that angle of bank.

Gentle turn. A turn with up to 15 degrees angle of bank.

Medium turn. A turn with approximately 30 degrees angle of bank.

Steep turn. A turn with at least 45 degrees angle of bank. When executing a steep turn, as the angle of bank passes 30 degrees, back-stick pressure must be applied to maintain attitude and altitude. The power setting must be increased to maintain altitude.

DESCENTS

Descents are executed by doing the following:

1. Decrease power, adjust the attitude to reach and maintain the descent speed, and adjust the trim.

2. For any descent, follow the sequence: power, attitude, trim (PAT).

3. Upon reaching the desired altitude, resume a level attitude and adjust power to maintain altitude and airspeed.

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