ROYAL CANADIAN AIR CADETS

PROFICIENCY LEVEL THREE

INSTRUCTIONAL GUIDE

SECTION 3

EO C360.03 – CONSTRUCT A MODEL OF THE AIRSPACE AT AN AERODROME

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-803/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 the handouts located at Annexes B to D for each cadet.

PRE-LESSON ASSIGNMENT

N/A.

APPROACH

An interactive lecture was chosen for TPs 1–3 to introduce the parts of the Canadian Domestic Airspace (CDA).

An in-class activity was chosen for TP 4 as an interactive way to reinforce concepts of the CDA.

INTRODUCTION

REVIEW

N/A.

OBJECTIVES

By the end of this lesson the cadet shall have constructed a model of the airspace at an aerodrome.

IMPORTANCE

It is important for the cadets to know about the CDA system as each airspace classification has a set of requirements and operating rules that make it unique. By understanding and adhering to these rules, pilots, ground crew, and aerodrome operations staff can operate safely.

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Teaching point 1 **Explain Parts of the Canadian Domestic Airspace (CDA) System**

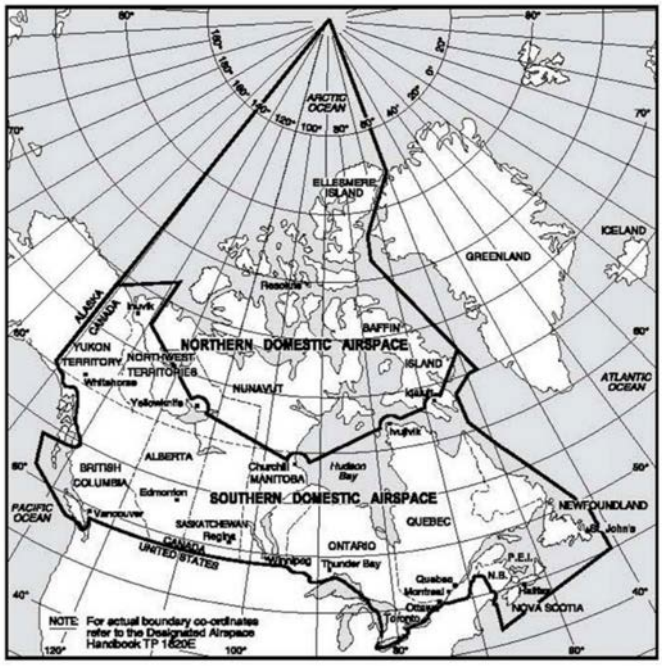
Time: 10 min Method: Interactive Lecture

Distribute photocopies of Annex B to the cadets.

CDA

CDA includes all airspace over Canadian land mass, the Canadian Arctic, Canadian Archipelago (group of islands) and those areas of the high seas within the airspace boundaries.

CDA is geographically divided into the Northern Domestic Airspace (NDA) and the Southern Domestic Airspace (SDA) (as illustrated in Figure 16-3-1). CDA is also divided vertically into high and low level airspace (as illustrated in Figure 16-3-2).



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 182)

Figure 1 Boundaries of CDA, NDA, and SDA

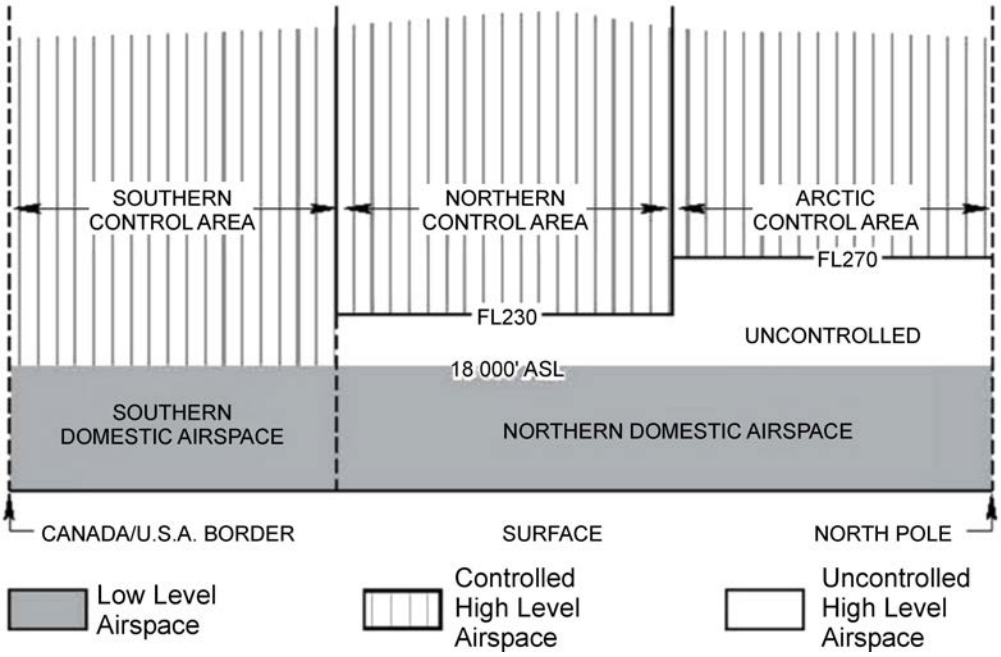
NDA

The magnetic north pole is located near the centre of the NDA. Near the pole, the lines of magnetic force dip downwards, almost becoming vertical. This causes the horizontal compass needle to produce unreliable readings. In this region, runway headings are given in degrees true, and true track (the direction the aircraft is travelling) is used to determine cruising altitudes.

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SDA

In the SDA, further away from the magnetic north pole, compass readings are reliable as the lines of magnetic force become horizontal. In this region, runway headings are given in degrees magnetic, and magnetic track is used to determine cruising altitudes.



Aeronautical Information Manual, Ottawa, ON: Her Majesty the Queen in Right of Canada (p. 184)

Figure 2 Vertical Divisions of Airspace

High Level Airspace

High level airspace consists of all airspace above 18 000 feet above sea level (ASL). Aircraft operating in this airspace must be operating in accordance with instrument flight rules (IFR); these are rules that govern the procedures for conducting flight under instrument meteorological conditions (IMC). Traffic operating in accordance with visual flight rules (VFR), which govern the procedures for conducting flight under visual conditions, is excluded from high level airspace.

This is the airspace in which the en route portions of most flights by the following aircraft occur:

- commercial passenger and cargo jets (eg, Boeing 767, Airbus 340), and
- business jets (eg, Citation, LearJet).

Low Level Airspace

Low level airspace consists of all airspace below 18 000 feet ASL. This is the airspace used by general aviation and most commercial turbo-prop aircraft. This is the general classification of airspace used for takeoffs and landings.

CONFIRMATION OF TEACHING POINT 1

QUESTIONS

Q1. How is CDA geographically divided?

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Q2. How is CDA vertically divided?

Q3. Low level airspace is the airspace below what altitude?

ANTICIPATED ANSWERS

A1. Northern and Southern Domestic Airspace.

A2. High and low level airspace.

A3. Below 18 000 feet ASL.

Teaching point 2 **Explain Types of Airspace**

Time: 10 min Method: Interactive Lecture

CONTROLLED AIRSPACE

Controlled airspace is the airspace in which air traffic control service is provided. Depending on the specific classification of the airspace, some or all aircraft may be subject to air traffic control. Types of low level controlled airspace include:

- low level airways,
- control zones,
- terminal control areas,
- transition areas,
- control area extensions, and
- military terminal control areas.

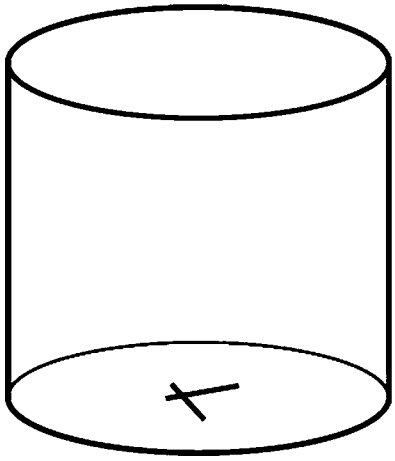
Control Zones (CZs)

CZs are designated around certain aerodromes to keep IFR aircraft within controlled airspace during approaches and to facilitate the control of VFR and IFR traffic. CZs vary in size, with the most common radii being three, five, or seven nautical miles. They are usually capped at 3 000 feet above aerodrome elevation (AAE). CZs will be classified as B, C, D or E depending on the classification of the surrounding airspace.

Military CZs usually have a 10 nautical mile radius and are capped at 6 000 feet AAE.

One can visualize a CZ as a vertical cylinder, with the base of the cylinder centred on the aerodrome (as illustrated in Figure 16-3-3).

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Figure 3 A Control Zone

Terminal Control Areas (TCAs)

TCAs are established at high volume traffic aerodromes to provide an IFR control service to arriving, departing and en route aircraft. The TCA operating rules are established by the classification of the airspace. These rules are based on the level of ATC service that is appropriate for the number and type of aircraft using the airspace as well as the nature of the operations being conducted.

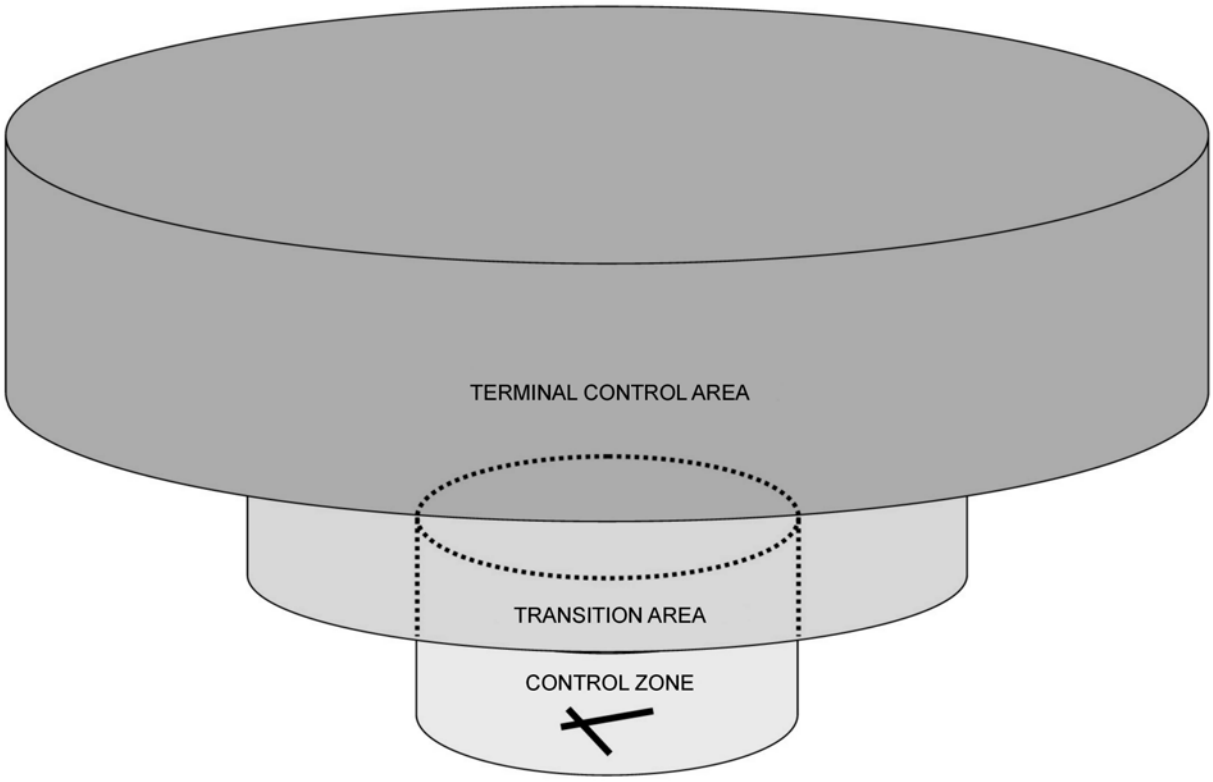
A TCA expands the controlled airspace surrounding a major aerodrome.

Transition Areas

Transition areas are established when it is necessary to provide additional controlled airspace for the IFR operations, specifically to control all of the airspace used by aircraft during takeoff and landing. Transition areas are of defined dimensions, generally based at 700 feet above ground level (AGL), and extend upwards to the base of overlying controlled airspace. The area provided around an aerodrome will normally be a 15 nautical mile radius of the aerodrome centre.

The airspace surrounding an aerodrome is best visualized as an “upside down wedding cake” (as illustrated in Figure 16-3-4).

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Director Cadets 3, 2007, Ottawa, ON: Department of National Defence

Figure 4 Control Zone, Terminal Control Area, and Transition Area

CONFIRMATION OF TEACHING POINT 2

QUESTIONS

Q1. What is the typical radius of a CZ?

Q2. Where are TCAs established?

Q3. At what height does a transition area usually begin?

ANTICIPATED ANSWERS

A1. Three, five, or seven nautical miles (10 nautical miles for a military control zone).

A2. At high volume traffic aerodromes.

A3. At 700 feet AGL.

Teaching point 3 **Explain Classes of Airspace**

Time: 10 min Method: Interactive Lecture

AIRSPACE CLASSIFICATIONS

CDA is divided into seven classes, each identified by a single letter: A, B, C, D, E, F, or G. Flight within each class is governed by specific rules applicable to that class.

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Class A

Class A airspace is designated where an operational need exists to exclude VFR aircraft. All operations must be conducted under IFR and are subject to Air Traffic Control (ATC) clearances and instructions. An ATC clearance gives authorization to proceed within controlled airspace and an ATC instruction is a directive issued by an ATC unit for air traffic control purposes.

All high level controlled airspace is designated as Class A.

Class B

Class B airspace is designated where an operational need exists to provide air traffic control service to IFR and to control VFR aircraft.

All low level controlled airspace above 12 500 feet ASL or at and above the minimum en route altitude (MEA), whichever is higher, up to but not including 18 000 feet ASL will be Class B airspace. Control zones and associated terminal control areas may also be classified as Class B airspace.

Class C

Class C airspace is controlled airspace in which both IFR and VFR flights are permitted.

Airspace classified as Class C becomes Class E airspace when the appropriate ATC unit is not in operation. Terminal control areas and associated control zones may be classified as Class C airspace.

Class D

Class D airspace is controlled airspace in which both IFR and VFR flights are permitted, but VFR flights must establish two-way communication with the appropriate ATC agency prior to entering the airspace.

Airspace classified as Class D becomes Class E airspace when the appropriate ATC unit is not in operation. A terminal control area and associated control zone could be classified as Class D airspace.

Class E

Class E airspace is designated where an operational need exists for controlled airspace but does not meet the requirements for Class A, B, C, or D.

Low level airways, control area extensions, transition areas, or control zones established without an operating control tower may be classified as Class E airspace.

Class F

Class F airspace is an area in which activities must be restricted, or limitations imposed upon aircraft operations that are not a part of those activities. Typical uses for Class F airspace include:

- military practice areas,
- fire-bombing,
- parachute jumping,
- flight training,
- soaring,
- hang gliders, and
- air shows.

Class F airspace is sometimes known as special use airspace. It may be classified as Class F advisory, or as Class F restricted, and can be controlled airspace, uncontrolled airspace, or a combination of both.

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Class G

Class G airspace is airspace that has not been designated Class A, B, C, D, E or F and in which ATC has neither the authority or responsibility for exercising control over air traffic.



To help the cadets remember:

- Classes A to E are controlled airspace,
- Class F may be controlled or uncontrolled, and
- Class G airspace is uncontrolled.

The difference between Class C and Class D is that an ATC clearance is needed to enter Class C, but two-way communication is all you need to enter Class D.



Distribute photocopies of Annex C to the cadets.

CONFIRMATION OF TEACHING POINT 3

QUESTIONS

Q1. What happens to Class C airspace when the ATC unit is not in operation?

Q2. What is another name for Class F airspace?

Q3. Which airspace is uncontrolled?

ANTICIPATED ANSWERS

A1. It becomes Class E airspace.

A2. Special use airspace.

A3. Class G airspace.

Teaching point 4 — **Have the Cadet, as a Member of a Group of No More Than Four, Construct a Model of the Airspace at an Aerodrome**

Time: 55 min — Method: In-Class Activity

ACTIVITY

OBJECTIVE

The objective of this activity is for the cadet to construct a model of the airspace at an aerodrome.

RESOURCES

- Checklist located at Annex D.

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- Coloured construction paper,
- Transparent tape,
- Scissors,
- Coloured markers, and
- Glue.



Other materials may be used in addition to this list if available. The amount of materials that are needed will depend on class size and the number of groups.

ACTIVITY LAYOUT

Group the tables/desks together to form a large work surface to support the base of the model.

ACTIVITY INSTRUCTIONS

1. Distribute the checklist located at Annex D to each cadet.
2. Divide the cadets into groups of four.
3. Inform the cadets of the materials available for them to use.
4. Inform the cadets they are all to start with a base of two large pieces of construction paper taped together.
5. Have each group create their own model aerodrome airspace using the checklist located at Annex D, ensuring all the required components are included.



While it is not important for the model to be built exactly to scale, care should be taken to construct items that are the correct size, relative to the other components of the aerodrome.



While cadets are encouraged to be creative with the materials provided, recommend the following:

- Brown or green paper should be used for the base.
- Black or grey paper should be used for pavement.
- Airspace can be created by cutting a strip of construction paper and taping the ends together to create a cylinder.
- Airspace areas can be stacked vertically by cutting and taping a circle of construction paper to the cylinders.
- Different colours of paper should be used for each classification of airspace.
- Coloured markers can be used for adding specific details to components.
- Groups that finish early can improve their model by adding a second aerodrome to the model with airspace that overlaps the first aerodrome's airspace, creating an irregular shape for the airspace areas.

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SAFETY

N/A.

CONFIRMATION OF TEACHING POINT 4

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

END OF LESSON CONFIRMATION

The cadets' participation in the construction of a model of the airspace at an aerodrome will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK/READING/PRACTICE

N/A.

METHOD OF EVALUATION

N/A.

CLOSING STATEMENT

Each airspace classification has a set of requirements and operating rules that make it unique. These rules allow pilots, ground crew, and aerodrome operations staff to operate safely.

INSTRUCTOR NOTES/REMARKS

N/A.

REFERENCES

C2-044 Transport Canada. (2007). *Aeronautical Information Manual*. Retrieved October 2, 2007, from http://www.tc.gc.ca/publications/EN/TP14371/PDF/HR/TP14371E.PDF.

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