



**HPAC / ACVL
STUDY GUIDE FOR
THE HAGAR EXAMINATION
VERSION 3.1**

20 Jun 2016

PREFACE

Background

Like it or not, uncontrolled airspace has but disappeared in most locations where we partake in our sports. HG/PG pilots flying in controlled airspace must have successfully written the Hang Glider Air Regulations examination i.e. HAGAR exam regardless of their HPAC rating.

HG/PG pilot who already have a pilot license (e.g. private, glider, ultralight, helicopter) are not required to write the HAGAR examination.

This study guide for the Hang Glider Air Regulations (HAGAR) examination covers the material that HG/PG pilots need to know in order to write the examination successfully. The material that is examinable is identified in TP 11408E Study and Reference Guide - Air Law and Procedures - Class 'E' Airspace which can be found at <http://www.tc.gc.ca/eng/civilaviation/publications/tp11408-menu-235.htm>.

Some candidates may question the relevance of some of the information contained in the exam. Indeed, some of the regulations, as they pertain to hang gliding and paragliding, do not seem to make a lot of sense. However, the material in the Guide is examinable so candidates should be familiar with it. I am continuing to try to improve the HAGAR examination but this effort has a very low priority with Transport Canada so it may be a while before I succeed.

It is important to recognize that this is a Study Guide for the HAGAR examination. This Guide does not touch on many topics that may be relevant to HG/PG pilots because those topics are not included in the examination. All pilots are encouraged to refer to other documentation in order to further their knowledge of the Canadian Aviation Regulations (CAR) and air operation in general. Nevertheless, I have added some non-examinable information that I deem important to safety in boxes like the one below.

The content of these boxes is intended to provide HG/PG pilots with information that is not examinable but is useful to know in order to share airspace safely with other types of aircraft.
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I have taken care to ensure that the information in this guide is accurate and complete. Nevertheless, it is possible that I have overlooked some material or that I have gotten some material wrong. If you do notice that some material is missing or erroneous, please pass on the information to the HPAC/ACVL Business Manager at admin@hpac.ca so that the next version of the guide can be amended accordingly. I particularly welcome feedback from pilots who have recently written the HAGAR Examination because the details are still fresh in their minds.

Writing the HAGAR Exam

In order to write the HAGAR exam, you must first make an appointment at a test centre. You must also have completed a Category 4 medical examination (see next section). You must bring at least two pieces of identification with you.

The HAGAR Exam lasts for 2 1/2 hours. The passing mark is 60%.

You should consider bringing a long ruler, a protractor and a calculator to the exam. That will be useful for map work.

Where you can write the HAGAR exam, and how much it costs, depends very much on where you are located. A few years back, TC created a system whereas “invigilators” would administer various TC exams in their behalf. Their intention was to have invigilators in all areas of the country. What has actually happened is that many potential invigilators did not come forth because of the burdensome pre-requisites to become invigilators. Some invigilators decided not to administer the HAGAR exam because the low volume did not make it worthwhile to them.

The end result is that there are invigilators that administer the HAGAR exams in some areas but not in others. In those areas where there are no invigilators, TC regional offices still administer the exam free of charge. Where there are invigilators, they are basically able to charge what they want so price will vary between invigilators. This is unfortunate but it is the system in place.

To find out whether there is an invigilator in your area, talk to your flying buddies or the local HG/PG school. You can also contact a TC regional office to find out although you are better verify with the contact that they give you to confirm that they are administering the HAGAR exam.

The TC regional office contacts can be found at <http://www.tc.gc.ca/eng/civilaviation/opssvs/regions-139.htm>

Medical Declaration

All HG/PG pilots flying in controlled airspace must complete a Category 4 Medical Declaration. The declaration form can be found on the Transport Canada site at http://www.tc.gc.ca/wwwdocs/Forms/26-0297_0712-06_BO.pdf. You must submit the form and get your Class 4 Medical Certificate from TC before writing the HAGAR examination. It may take up to 40 working days for TC to process your submission. Some examiners will ask to see your medical certificate before allowing you to write the exam so bring it with you to the examination.

Some people have reported that they were asked by TC receptionists at TC regional centres to have Part C of the form signed by a medical examiner. That is definitively not a requirement. Part C only applies to those seeking a private pilot or recreational pilot license and that is clearly stated on the form. If that happens to you, ask to see a supervisor - politely of course. Receptionist are not hired for their knowledge of aviation regulations and the majority of the people they see are seeking one of the two licenses that require Part C to be completed by a medical examiner so they assume that is true also for other pilots.

References

Canadian Aviation Regulations (CARs). The title says it all. Unfortunately, the CARs are often hard to read and interpret. Also, the CARs cover many topics and the ones that apply to hang gliders are not specifically identified. The CARs can be found at <http://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/index.html#docCont>.

There are a lot of older versions of the CARs on the Internet, some with obsolete material. The only current copy is the one on Justice Canada web site. TC no longer keeps a current copy on their web site. You have been warned.

Aeronautical Information Manual (AIM). The AIM is the most useful publication produced for pilots. It provides pilots with a single source for information concerning rules of the air and procedures for aircraft

operation in Canadian airspace. Think of the AIM as the useful CARs written in plain language. This document is available at <http://www.tc.gc.ca/eng/civilaviation/publications/tp14371-menu-3092.htm>.

VFR Navigation Charts (VNCs). These charts are the basic charts used by all pilots flying under Visual Flight Rules (VFR). Unfortunately, they are not published on the Internet so they must be purchased either through Nav Canada, your local flight school or through some vendors on the Internet (E.g. Calgary Pilot Supply). Getting your hand on a VNC chart is essential to properly prepare for the HAGAR examination. It does not matter if the chart is current or 15 years old to prepare for the exam.

There are seven VFR Terminal Area (VTA) charts that are half the scale of VNCs and cover the areas around Vancouver, Calgary, Edmonton, Winnipeg, Toronto, Ottawa and Montreal airports. VTAs are less busy than VNCs and cover much smaller areas so they are easier to read.

Canada Flight Supplement (CFS). This fat book is a directory of all the registered aerodromes and airport in Canada. It includes all of the relevant information about those facilities such as elevation, runways, communication frequencies and much more. It is published monthly by NavCan. Unfortunately, it is not yet available on the Internet. The best way to get a copy is to ask a local powered aircraft flight school to give you an older copy.

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Good luck
Andre Nadeau
HPAC TC representative

ORGANIZATION OF THIS GUIDE

This guide is broken down into six chapters in the order that I believe make the most sense. However, there is no perfect order and feel free to read them in any order that you want.

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1. AIR REGULATIONS

1.1. Introduction

This Chapter contains a hodgepodge of air regulations that are examinable. I present them in plain English as opposed to the more “formal” phrasing of the CARs. For those who prefer reviewing the actual CARs, I refer to the actual CAR.

Note that I use the word “you” extensively in my phrasing of the CARs. By “you”, I mean you the HG/PG pilot. The CARs use words like “person”, “pilot in command” and such and those terms will be in the exam. Also, some CARs mention passengers and those are certainly applicable to tandems where there is a pilot and a passenger.

1.2. Definitions

Here are some definitions that are important in understanding the CARs.

Aircraft. Any man-made object that flies is an aircraft. A glider is an aircraft. Hang gliders are gliders and paragliders are hang gliders. Other types of aircraft include balloons, airships, rotor-wings (helicopters and autogyros), airplanes, dirigibles, parachutes, drones (unmanned aircraft), etc.

Aerodrome. An aerodrome is any facility used for the take-off and landing of aircraft – it can be on land or water. An aerodrome can be registered and will appear in the CFS and on VNC charts. An airport is a certified aerodrome i.e. one that meets strict safety requirements. A heliport is an aerodrome for aircraft capable of vertical take-off and landing (basically helicopters). A controlled aerodrome is one where there is a tower providing ATC services. Aerodrome traffic means all traffic on and around the aerodrome.

Day. Day or daylight means the time between the beginning of morning civil twilight and the end of evening civil twilight.

Civil twilight is when the centre of the disk sun is 6 degrees below the horizon. This is nowhere to be found in the CARs or AIM.

Night. Night means the time between the end of evening civil twilight and the beginning of morning civil twilight.

VFR and IFR flights. A VFR flight is conducted by an aircraft following visual flight rules. An IFR flight is conducted by an aircraft following instrument flight rules.

Air Traffic Control (ATC). ATC units provide service to IFR aircraft (and to some VFR aircraft in Class B and C) in controlled airspace. An ATC unit can be a control tower which controls traffic within a Control Zone (CZ), a terminal control unit which controls traffic within a Terminal Control Area (TCA) or an area control centre which controls IFR traffic in controlled airspace outside of CZs and TCAs.

ATC provides advisories, clearances and instructions. An advisory is information that is useful to a pilot (e.g. weather, altimeter setting, number and type of aircraft around an airport). A clearance is an authorization that allows a pilot to do something (e.g. take off, land, climb to a specific altitude). An instruction is an action to be executed without delay.

FICs and FSSs. Flight Information Centres (FICs) and Flight Service Stations (FSSs) are NavCan points of contacts to obtain weather and NOTAM information and file flight plans and they can be reached by telephone on the ground and by radio in the air. FIC provide regional services and FSS provide local services. All of these services are also available on line at https://flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais&NoSession=NS_Inconnu&Page=forecast-observation&TypeDoc=html

"FL" or "flight level". This is the altitude expressed in hundreds of feet, indicated on an altimeter set to 29.92 inches of mercury or 1 013.2 millibars. For example, FL 240 is 24,000 ft.

Mandatory Frequency (MF) Area. An area in the vicinity of an uncontrolled aerodrome where the use of a specific radio frequency is prescribed. MFs are identified in the CFS and on VNCs.

NOTAM. A Notice to Airman concerning the establishment or condition of, or change in, any aeronautical facility, service or procedure, or any hazard affecting aviation safety, the knowledge of which is essential to personnel engaged in flight operations. NOTAMs are available on the NavCan site at <https://flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais&NoSession=&Page=Fore-obs/notam&TypeDoc=html>

1.3. Exemptions from the CARs.

In the CARs, hang gliders are gliders which are aircraft. However, TC recognizes that hang gliders are not your typical aircraft so the following exemptions from the CARs have been granted to hang gliders:

- a. hang glider pilots are exempt from the rules requiring pilot licenses or permits;
- b. hang gliders are exempt from registration;
- c. hang gliders are exempt from airworthiness certification requirements meaning that a Certificate of Airworthiness (C of A) or a flight permit is not required;
- d. hang gliders are exempt from displaying nationality and registration marks;
- e. hang gliders are exempt from the requirement to maintain and carry log books;
- f. hang gliders are exempt from carrying Day VFR instruments (except for a compass and altimeter in some situations);
- g. hang gliders are exempt from the safety belt and safety harness requirements; and
- h. hang gliders need not be equipped with an emergency locator transmitter (ELT).

Many aspects of hang gliding in Canada is mostly “self-regulated”. The HPAC/ACVL has put in place its own regulations as appropriate. An example is the pilot certification program.

It is important to understand that TC has not delegated its responsibilities to regulate hang gliding to the HPAC/ACVL. The HPAC/ACVL regulations apply only to its members and nobody else.

TC decision not to over-regulate hang gliding is based on the existence HPAC/ACVL and its assumption that the HPAC/ACVL makes effort to educate Canadian HG/PG pilots to share Canadian airspace safely with other aircraft. If the time comes that TC loses trust in the ability of the HPAC/ACVL to do so, it

could impose rules.

1.4. Operating and Flight Rules

The General Operating and Flight Rules of the CARs that pertain to hang gliders follow. In this section, regulations that apply to all aircraft will use the word aircraft, regulations that apply to all gliders will use the word gliders, and regulations that apply specifically to hang glider will use the term hang glider. These distinctions may be important in the exam.

Reckless or Negligent Operation of Aircraft (CAR 602.01). You cannot operate an aircraft in such a reckless or negligent manner as to endanger the life or property of any person.

Fitness of Flight Crew Members (CAR 602.02). You cannot pilot a hang glider if you have any reason to believe, that you are suffering or are likely to suffer from fatigue, or if you are otherwise unfit to perform properly as a pilot.

Alcohol and Drugs (CAR 602.03 and 602.04).

1. You cannot pilot an aircraft:
 - a. within twelve hours after consuming an alcoholic beverage;
 - b. while under the influence of alcohol; or
 - c. while using any drug that impairs your faculties to the extent that the safety of the aircraft or of passengers on board the aircraft is endangered in any way.
2. You cannot take up a passenger that is intoxicated.

Overflight of Built-up Areas or Open-Air Assemblies of Persons during Take-offs, Approaches and Landings (CAR 602.12)

1. Except at an airport, heliport or military aerodrome, you cannot conduct a take-off, approach or landing in an aircraft over a built-up area or over an open-air assembly of persons, in a manner that is likely to create a hazard to persons or property.
2. Except at an airport, heliport or military aerodrome, you cannot conduct a take-off, approach or landing in an aircraft over a built-up area or over an open-air assembly of persons unless that aircraft will be operated at an altitude from which, in the event of an engine failure or any other emergency necessitating an immediate landing, the aircraft can land without creating a hazard to persons or property.

The horizontal boundaries of a built-up area are defined in CAR 602-14 below.

Take-offs, Approaches and Landings within Built-up Areas of Cities and Towns (CAR 602.13)

1. Except if otherwise permitted under this section, section 603.66 or Part VII, you cannot conduct a take-off, approach or landing in an aircraft within a built-up area of a city or town, unless that take-off, approach or landing is conducted at an airport, heliport or a military aerodrome.
2. You may conduct a take-off or landing in an aircraft within a built-up area of a city or town at a place that is not located at an airport, heliport or a military aerodrome where

- a. the place is not set apart for the operation of aircraft;
- b. the flight is conducted without creating a hazard to persons or property on the surface; and
- c. the aircraft is operated for the purpose of a police operation that is conducted in the service of a police authority, or for the purpose of saving human life.

Minimum Altitude and Distances (CAR 602.14)

1. Except when conducting a take-off, approach or landing, you cannot operate an aircraft over a built-up area or over an open-air assembly of persons unless the aircraft is operated at an altitude from which, in the event of an emergency necessitating an immediate landing, it would be possible to land the aircraft without creating a hazard to persons or property on the surface, and, in any case, at an altitude that is not lower than
 - a. for aeroplanes, 1,000 feet above the highest obstacle located within a horizontal distance of 2,000 feet from the aeroplane,
 - b. for balloons, 500 feet above the highest obstacle located within a horizontal distance of 500 feet from the balloon, or
 - c. for an aircraft other than an aeroplane or a balloon, 1,000 feet above the highest obstacle located within a horizontal distance of 500 feet from the aircraft; and
2. Other than a built-up area or over an open-air assembly of persons, you cannot operate an aircraft at a distance less than 500 feet from any person, vessel, vehicle or structure.

Right-of-Way – General (CAR 602.19)

1. Even if you have the right of way, you must take action to avoid a collision if necessary.
2. If you are aware that another aircraft is in an emergency situation, you must give way to that other aircraft.
3. If you are converging with another aircraft at approximately the same altitude, and the other aircraft is on your right, you must give way except as follows:
 - a. a power-driven, heavier-than-air aircraft must give way to airships, gliders, parachutes and balloons;
 - b. an airship must give way to parachute and balloons;
 - c. a glider must give way to parachute and balloons; and
 - d. a power-driven aircraft must give way to aircraft that are seen to be towing gliders or other objects or carrying a slung load.
4. If you have to give the right of way to another aircraft, you cannot not pass over or under, or cross ahead of the other aircraft unless passing or crossing at a distance that will not create a risk of collision.

5. When you are approaching another aircraft head-on or approximately heads on, you must alter your heading to the right.
6. An aircraft that is being overtaken has the right of way. If you are overtaking another aircraft, you must pass that aircraft to the right.
7. If you are approaching an aerodrome for the purpose of landing, you must give the right of way to any aircraft at a lower altitude that is also approaching the aerodrome for the purpose of landing.
8. You cannot take-off or land in an aircraft until there is no apparent risk of collision with any aircraft, vessel, vehicle or structure in the take-off or landing path.

There are no right-of-way regulations with respect to ridge lift and thermal flights in the CARs. The appropriate regulations (really guidelines) are issued by the HPAC/ACVL and hang glider pilots should observe them. The sailplane community uses the same ones.

Avoidance of Collision (CAR 602.21). You cannot operate an aircraft in such proximity to another aircraft as to create a risk of collision.

Towing (CAR 602.22) No person can operate an aeroplane that is towing an object unless the aeroplane is equipped with a tow hook and release control mechanism.

This CAR applies directly to the aerotowing of hang glider as the tug must meet this regulation.

Dropping of Objects (CAR 602.23). You cannot drop an object from an aircraft in flight if it creates a hazard to people or property.

Formation Flight (CAR 602.24). You cannot fly in formation with other aircraft except by pre-arrangement between:

- a. the pilot of that other aircraft; or
- b. where the flight is conducted within a control zone, the pilot of the other aircraft and the appropriate air traffic control unit.

Aerobatic Manoeuvres - Prohibited Areas and Flight Conditions (CAR 602.27)

1. You cannot conduct any aerobatic flight:
 - a. if you are endangering or likely to be endangering air traffic;
 - b. over any urban or other populous areas;
 - c. in controlled airspace or within any air routes designated as such by the Minister except in accordance with the written authorization of the Minister.
2. You cannot conduct any aerobatic flying unless you are alone in the aircraft, or you are a flying instructor authorized by regulations to give dual aerobatic instruction.

Hang Glider and Ultra-light Aeroplane Operation (CAR 602.29)

1. You cannot fly a hang glider:

- a. at night. Night is considered the time commencing one-half hour after sunset and ending one-half hour before sunrise;
 - b. in IFR flight;
 - c. unless the hang glider is equipped with a suitable means of restraint that is attached to the primary structure of the aircraft;
 - d. unless the hang glider is equipped with a radio communication system adequate to permit two-way communication on the appropriate frequency when the hang glider is operated within Class D airspace or a Mandatory Frequency (MF) area.
 - e. while carrying another person on board unless the flight is conducted for the purpose of providing dual flight instruction;
 - f. unless each person on board is wearing a protective helmet.
2. You can operate a hang glider in controlled airspace:
- a. within five nautical miles from the centre of an airport or within a control zone of an uncontrolled airport if you obtained permission from the airport operator; or
 - b. within a control zone of a controlled airport if you have obtained an air traffic control clearance by two-way voice communication from the air traffic control unit of the airport.
3. You may operate a hang glider in Class E airspace if:
- a. the pilot:
 - (1) is at least 16 years of age;
 - (2) is in possession of a Category 1, 3 or 4 medical certificate, and
 - (3) has obtained a grade of not less than 60 percent on a Department of transport written examination pertaining to the Canadian Aviation Regulations, air traffic procedures, flight instruments, navigation, flight operations and human factors respecting hang glider operations in Class E airspace i.e. the HAGAR examination.
 - b. the hang glider is equipped with a magnetic compass and altimeter;
 - c. the flight is a cross-country flight; and
 - d. you informs the nearest flight service station (FSS) of the time of departure and estimated duration of the flight in Class E airspace.

Forest Fire Aircraft Operating Instruction (CAR 601.15). You cannot fly a hang glider:

- a. over a forest fire area, or over any area that is located within five nautical miles of a forest fire area, at an altitude of less than 3,000 feet AGL; or
- b. in any airspace that is described in a NOTAM issued in respect to operating restriction in an area where there is a forest fire.

Compliance with Air Traffic Control Instructions and Clearances (CAR 602.31)

1. You must comply with and acknowledge, to the appropriate air traffic control unit, all of the air traffic control instructions directed to and received by you
2. You must comply with all of the air traffic control clearances received and accepted by you
3. In the case of a VFR flight, read back to the appropriate air traffic control unit the text of any air traffic control clearance received, when so requested by the air traffic control unit.

Cruising Altitudes and Cruising Flight Levels (CAR 602.34). The appropriate cruising altitude or cruising flight level for an aircraft in level cruising flight is determined in accordance with the magnetic track in the Southern Domestic Airspace and the true track in the Northern Domestic Airspace.

- a. If VFR: Odd thousand plus 500' (e.g. 3,500', 5,500') when flying on track 000-179 and even thousand plus 500' (e.g. 4,500', 6,500') when on track 180 to 359.
- b. If IFR: Odd thousand when flying on track 000-179 and even thousand when on track 180 to 359.

Altimeter-setting and Operating Procedures in the Altimeter-setting Region (CAR 602.35)

1. When an aircraft is operated in the altimeter-setting region (always in the case of hang gliders), you must set the altimeter to the altimeter setting of the aerodrome or, if that altimeter setting is not obtainable, to the elevation of the aerodrome;
2. While in flight, you must set the altimeter to the altimeter setting of the nearest station along the route of flight or, where the nearest stations along the route of flight are separated by more than 150 nautical miles, to the altimeter setting of a station near the route of flight; and
3. Immediately before commencing a descent for the purpose of landing at an aerodrome, you must set the altimeter to the altimeter setting of the aerodrome, if that altimeter setting is obtainable.

Altimeter-setting and Operating Procedures in the Standard Pressure Region (CAR 602.36)

1. When an aircraft is operated in the standard pressure region, you must set the altimeter to the altimeter setting of the aerodrome or, if that altimeter setting is not obtainable, to the elevation of the aerodrome before takeoff;
2. Before reaching the flight level at which the flight is to be conducted, set the altimeter to 29.92 inches of mercury or 1,013.2 millibars; and
3. Immediately before commencing a descent for the purpose of landing at an aerodrome, set the altimeter to the altimeter setting of the aerodrome, if that altimeter setting is obtainable.

This does not apply to HG because the standard pressure region is above 18,000 ft where Class A begins (See Chapters 2 and 3). However. It is examinable.

1.5. Flight Preparation, Flight Plans and Flight Itineraries

Pre-flight Information (CAR 602.71). Before commencing a flight, you must be familiar with the available information that is appropriate to the intended flight.

Weather Information (CAR 602.72). Before commencing a flight, you must be familiar with the available weather information that is appropriate to the intended flight.

1.6. Operations at or in the Vicinity of an Aerodrome

General (CAR 602.96)

1. Before taking off from, landing at or otherwise operating at an aerodrome, you shall ensure that:
 - a. there is no likelihood of collision with another aircraft or a vehicle;
 - b. the aerodrome is suitable for the intended operation.
2. When operating at or in the vicinity of an aerodrome, you shall
 - a. observe aerodrome traffic for the purpose of avoiding a collision;
 - b. conform to or avoid the pattern of traffic formed by other aircraft in operation;
 - c. make all turns to the left when operating within the aerodrome traffic circuit, except where right turns are specified by the Minister in the CFS or authorized by the appropriate air traffic control unit;
 - d. where the aerodrome is an airport, comply with any airport operating restrictions specified by the Minister in the Canada Flight Supplement;
 - e. where practicable, land and take off into the wind unless otherwise authorized by the appropriate air traffic control unit;
 - f. maintain a continuous listening watch on the appropriate frequency for aerodrome control communications or, if this is not possible and an air traffic control unit is in operation at the aerodrome, keep a watch for such instructions as may be issued by visual means by the air traffic control unit; and
 - g. where the aerodrome is a controlled aerodrome, obtain from the appropriate air traffic control unit, either by radio communication or by visual signal, clearance to taxi, take off from or land at the aerodrome.
3. Unless otherwise authorized by the appropriate air traffic control unit, you cannot operate at an altitude of less than 2,000 feet over an aerodrome except for the purpose of landing or taking off.

There are a bunch of exception to this regulation (E.g. police, air ambulance, fisherie aircraft, crop sprayers, etc.) but none apply to us.
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VFR and IFR Aircraft Operations at Uncontrolled Aerodromes within a MF Area (Mandatory Frequency Area) (CAR 602.97)

1. You cannot normally fly within an MF area unless you have an aircraft radio. However, you can fly to/from an MF area without an aircraft radio under the following conditions:

- a. a ground station is in operation at the aerodrome;
 - b. you have provided prior notice of your intention to operate at the aerodrome to the ground station;
 - c. when taking off, you verify visually that there is no likelihood of collision with another aircraft or a vehicle during take-off; and
 - d. when approaching for a landing, you enter the aerodrome traffic circuit from a position that will require you to complete two sides of a rectangular circuit before turning onto the final approach path. In other word, you have to at least a downwind leg and a base leg before turning final.
2. When operating within an MF area, you shall maintain a listening watch on the mandatory frequency specified for use in the MF area.

General MF Reporting Requirements (CAR 602.98)

1. In a MF area, you must make any radio call on the mandatory frequency that has been specified for use in the applicable MF area.
2. Every report shall be:
 - a. directed to the ground station associated with the MF area, if a ground station exists and is in operation; or
 - b. broadcast to the aerodrome traffic (E.g. Gatineau traffic), if a ground station does not exist or is not in operation.

MF Reporting Procedures on Arrival (CAR 602.101). When arriving at an uncontrolled aerodrome that lies within an MF area, you shall report (if you have an aircraft radio):

- a. at least five minutes before entering the area, giving your position, altitude, estimated time of landing and your intention for the arrival procedures;
- b. when joining the aerodrome traffic circuit, giving the aircraft's position in the circuit;
- c. when on the downwind leg, if applicable;
- d. when on final approach; and
- e. when clear of the surface on which you have landed.

Reporting Procedures when Flying through an MF Area (CAR 602.103). When flying through an MF area, you shall report:

- a. at least five minutes before entering the area, giving the aircraft's position, altitude and your intentions; and

- b. when clear of the MF area.

1.7. Visual Flight Rules

Minimum Visual Meteorological Conditions for VFR Flight in Controlled Airspace (CAR 602.114)

1. You cannot fly in VFR conditions in controlled airspace unless:
 - a. you maintain visual reference to the surface;
 - b. flight visibility is not less than three miles;
 - c. the distance of the aircraft from cloud is not less than 500 feet vertically and one mile horizontally; and
2. In addition, if you are flying in a control zone, then,
 - a. ground visibility cannot be less than three miles, and
 - b. except when taking off or landing, you have to be at least 500 feet above the surface.

Minimum Visual Meteorological Conditions for VFR Flight in Uncontrolled Airspace (CAR 602.115). You cannot fly VFR in uncontrolled airspace unless

- a. you maintain visual reference to the surface;
- b. If you are at 1,000 feet AGL or above:
 - (1) during the day, flight visibility is not less than one mile,
 - (2) during the night, flight visibility is not less than three miles, and
 - (3) in either case, your distance from cloud is not less than 500 feet vertically and 2,000 feet horizontally;
- c. If you are at less than 1,000' AGL
 - (1) during the day, flight visibility is not less than two miles,
 - (2) during the night, flight visibility is not less than three miles, and
 - (3) in either case, you are clear of cloud.

1.8. Radio Communications

Language Used in Aeronautical Radiocommunications (CAR 602.133). English and French are the languages of aeronautical radiocommunication in Canada.

Continuous Listening Watch (CAR 602.136). If an aircraft carries an aircraft radio, then the pilot must be monitoring the appropriate frequency. If the pilot needs to communicate, then it must do so on the appropriate frequency.

1.9. Aircraft Equipment Requirements

Oxygen Equipment and Supply (CAR 605.31). All HG/PG must be equipped with sufficient oxygen for each occupant for:

- a. all flight exceeding 30 minutes between 10,000' and 13,000' ASL; and
- b. all flights above 13,000' ASL.

2. VNC CHARTS

2.1. Introduction

This Chapter provides an introduction to VNC charts that is used on the HAGAR examination.

The HAGAR examination uses an obsolete Toronto VNC on which there is a lot of uncontrolled airspace. Unfortunately, most of that uncontrolled airspace is now gone.

VFR Navigation Charts (VNCs) are used by VFR pilots. The chart displays aeronautical information and sufficient topographic detail to facilitate air navigation through the use of a unique colour scheme, layer tinting, and shaded relief. A VNC chart scale is 1:500,000 and there are 52 charts in the series that covers all of Canadian airspace. The charts in the series can be seen on the TC site at <http://www.navcanada.ca/EN/products-and-services/Pages/aeronautical-information-products-charts-VFR-navigational-charts.aspx>.

This chapter is not a course of basic geography. It assumes that the reader has a basic understanding of the Earth, latitude, longitude, geographical coordinates, great distance circles, geographical North and magnetic North, elevations and time zones. All of this information is taught in elementary and high school and can easily be found on the Internet so it is not repeated here.

NavCan does not provide VNC for free. They sell them in paper copies or digitally under license to third parties. I only know one source of free VNC charts. FltPlan.com <https://www.fltplan.com/> is a free navigation application for tablets. You can download the application and Canadian VNC charts (as well as the US equivalent called Sectional Aeronautical Charts or Sectionals in short) to your tablet. The US Sectionals are the default and they cover part of Canada. You must specifically download the VNCs if you want them. There are many differences between VNCs and sectionals even though they look basically the same at first sight. Note that there can be a delay between the time changes are made to charts and the time these changes appear on fltplan.

In the US, all aeronautical charts are free. That is why there are so many computer and tablet applications available. You would think that providing free up-to-date data to the pilot population at large would enhance safety and that NavCan would do so like the FAA does in the US. No such luck and I will let you draw your own conclusions.

The site http://www3.telus.net/cschwab/viewer/canadian_airspace.html shows Canadian airspace on top of Google Map. From my experience, it is quite accurate.

2.2. Overview of VNC Charts

2.2.1. VNC Chart Projection

All charts are created using a technique called projection and there are many different projections. The most commonly used is the Mercator projection where the parallels and meridians are perpendicular to each other, which makes it easy to locate a point from its geographical coordinates. Road maps and topographic maps are Mercator projection maps.

Mercator projection maps are not the best suited for aviation. Instead, VNC maps use the Lambert conformal conic projection which is a type of conic projection. To understand this projection, imagine a light source located right above the North pole that shines downwards on a transparent half globe (the

Northern hemisphere) and project whatever lines are on the globe on a flat sheet of paper placed at the equator. Tracing the projection on the piece of paper creates the map. This is illustrated in the picture below.

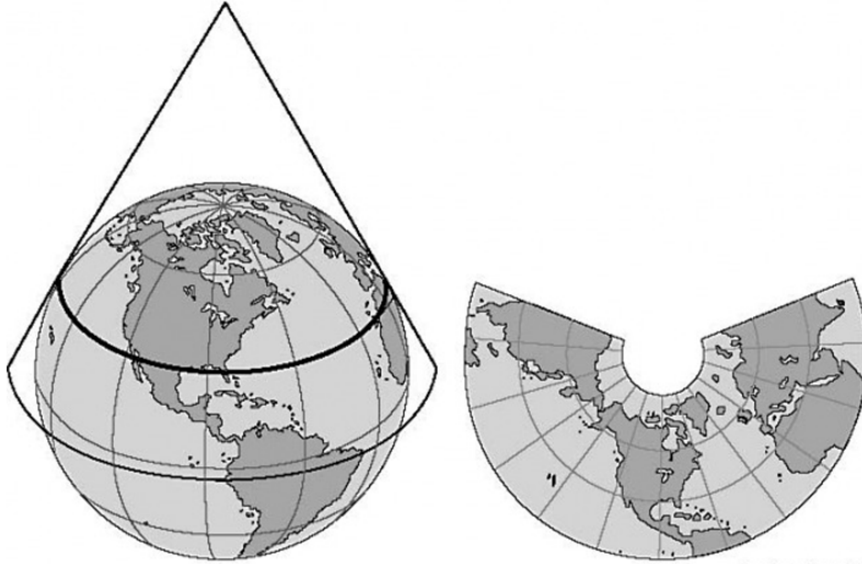


Figure 2.1 – Conic Projection

This type of projection has two major advantages for air navigation. First, a straight line on the chart corresponds roughly to a great circle which is the shortest distance between two points. Second, the scale on the chart is identical everywhere. That makes it easy to use a ruler and a protractor to plan a flight between two points.

This is not the case for Mercator projection where the closest distance between two points is a curve and where the scale of the chart changes with latitude. You can see why it would be a challenge to use a Mercator projection map to accurately plan an aircraft flight. Topographic maps cover much less areas than VNCs so these inaccuracies are acceptable. And inaccuracies do not matter on road maps because one just follows roads i.e. the distance between two points is irrelevant because the distance travelled is based on the road length.

The main disadvantage of a conic projection is that the parallels and meridians do not intersect at 90 degree angles. This makes it a bit more challenging to locate a point on a map, but one quickly get used to it.

2.2.2. VNC Chart Symbolology

I have been asked many times to explain what is on a VNC chart. They may look daunting until one realizes that most of what makes them that way is the various geographical features that are shown on them. The reason that information is there is because a pilot flying from Point A to Point B can track his/her progress by identifying those geographical features along the flight. If we removed those geographical features and only kept aviation-specific information, then there would be very little left on most VNC charts, especially on the ones covering Northern Canada.

Aviation specific information on VNC charts are various airspaces, aerodromes, radio navigation aids and air routes - that is it. We discuss airspaces in more details in Chapter 3 and Chapter 4 is a basic course in air navigation work.

The most important part of a VNC chart is the legend. Everything on the chart is described in the legend. There is no need to memorize anything, just look at the legend if you are not sure. Of course, you do not have to know about everything on the legend to write the HAGAR examination. You can find information about the terms that are not covered in this guide in the AIM.

2.3. Airspace Depictions on a VNC

2.3.1. Overview

The various types of airspaces up to 18,000' are depicted on a VNC. The significance of the various types of airspace to HG pilots is covered in Chapter 3 so I will not talk about this here. Instead, we will focus on identifying airspaces on the chart.

VNC charts only show Class C, D, E and F airspace. Class G airspace (which is uncontrolled airspace) is all of the airspace that is not Class C, D, E and F airspace so it is not identified specifically on the VNC chart.

All airspaces have floors. A floor is the lower altitude at which the airspace begins. It could be ground level or some other altitude. Another type of airspace can exist below the floor of another one. The floor of Class B airspace is most always 12,500' ASL. Typically, Class E airspace exists below Class C and D airspace and Class G airspace exists below Class E airspace. The floor of Class F airspace is always ground level. The floor of a CZ is always the ground.

2.3.2. Overview of Canadian Airspace

TC provides a very useful poster that pictures the “inverted cake” model of airspace in Canada because it looks like a wedding cake flipped over on its top. This poster can be found at <http://www.tc.gc.ca/Publications/BIL/TP6010/PDF/HR/TP6010B.PDF> . I find it needlessly complicated for the purpose of this study guide so I use simplified versions in this guide

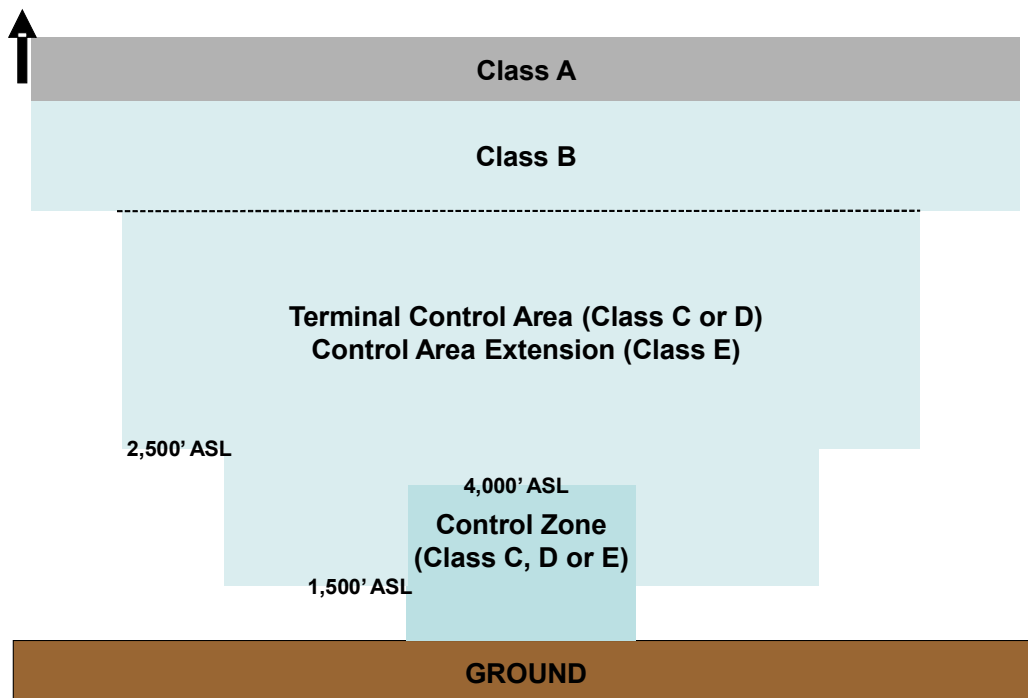


Figure 2.2 – Example of Inverted Cake

These “inverted cakes” exist around some airports, which are certified aerodrome. The Figure shows three layers of an “inverted cake” centered on an airport. Here is a description of each layer of the “inverted cake”.

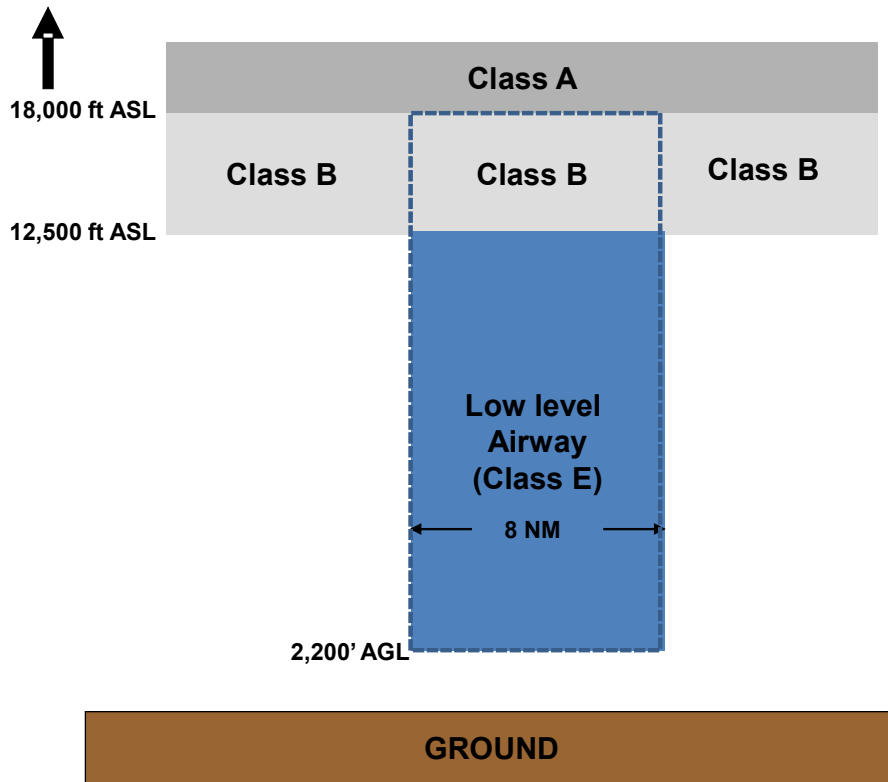
The “inverted cake” model is over-simplistic. In reality, many layers are not symmetrical because many layers have been nipped and tucked for a variety of reasons. For example, there could be two airports close to each other and their CZs cannot overlap so one or both of the CZs are truncated. The same apply to TCAs and other areas discussed below. It can get quite complicated and some careful examinations of VNC charts are sometimes required to make sense of it all.

- a. Control Zone (CZ). This is the bottom layer of the inverted cake and is centered around the airport. CZs always starts at ground level and extend to a specified altitude, always ASL. Not all airports have control zones. And not all control zones exist at all time – some only exists between specified hours. Those hours are not shown on the VNC chart but that information is available in the CFS.
- b. Terminal Control Area (TCA) and Control Area Extension (CAE). These are the second layer of the inverted cake and they surround CZs. Not all CZs have a TCA or a CAE around them. The difference between a TCA and a CAE is the type of airspace in it. TCAs are Class C or D airspace while CAEs contain Class E airspace. TCAs and CAEs can have multiple layers with the floor ceiling increasing in the outward layers from the airport. Figure 2.2 shows two such layers; the first one with a floor of 1,500’ ASL and the second one with a floor of 2,500’ ASL. Floors are typically at 700’, 1,500’, 2,500’ and 4,000’ but could also exist at other altitudes on special cases.

2.3.3. Airways

Aircraft use a network of radio navigation aids (NAVAIDs) to navigate. These are called VORs (the most common), DMEs, VORTACS, TACANs and NDBs. You can find their symbols on the VNC legend. Aircraft have receivers that can detect the signals from NAVAIDs and determine the direction, and in some case the distance, to or from a NAVAID. Those NAVAIDs are located close to where aircraft may want to go which usually means airports. Therefore aircraft fly from NAVAIDs to NAVAIDs in defined corridors called airways. The VNC chart shows low-level airways which exists below 12,500’ ASL.

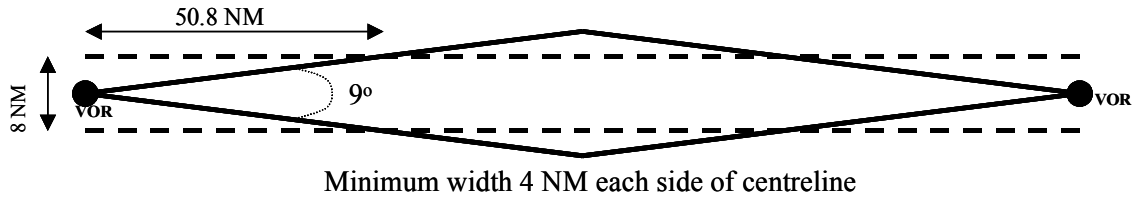
Here is a cross-section of a low-level airway between two VORs. Airways extend from 2,200’ AGL to 18,000’ ASL. The airspace in the airway is Class B above 12,500’ and Class E below that. Note that a low-level airway between a VOR and a NDB would be 8.68 NM.



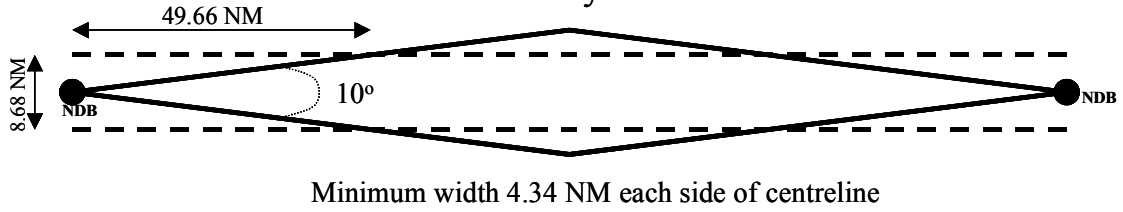
The significance of low-level airways is rapidly diminishing. Airways used to be where most traffic was located. Nowadays, most aircraft are equipped with GPS and they fly directly from their departure points to their destinations, not from navaid to navaid, as this is more efficient in many cases. So a lot of traffic can no longer be found in airways. NAVAIDs are now old and expensive to maintain and TC has begun to decommission quite a few of them. The airways that link them should also begin to disappear as this decommissioning continues.

The airway dimensions are shown in the diagrams below. Note that the airway dimensions include the area enclosed by the dashed lines from the VOR/NDB until it intersects the solid lines from the VOR/NDB. Then the area within the solid lines is part of the airways. The reason that the solid lines are the way they are is that aircraft radio navigation instrument provide pilots with a bearing to the beacons and anything within a specified range of bearing is considered inside the airway.

VHF/UHF Airway Dimensions

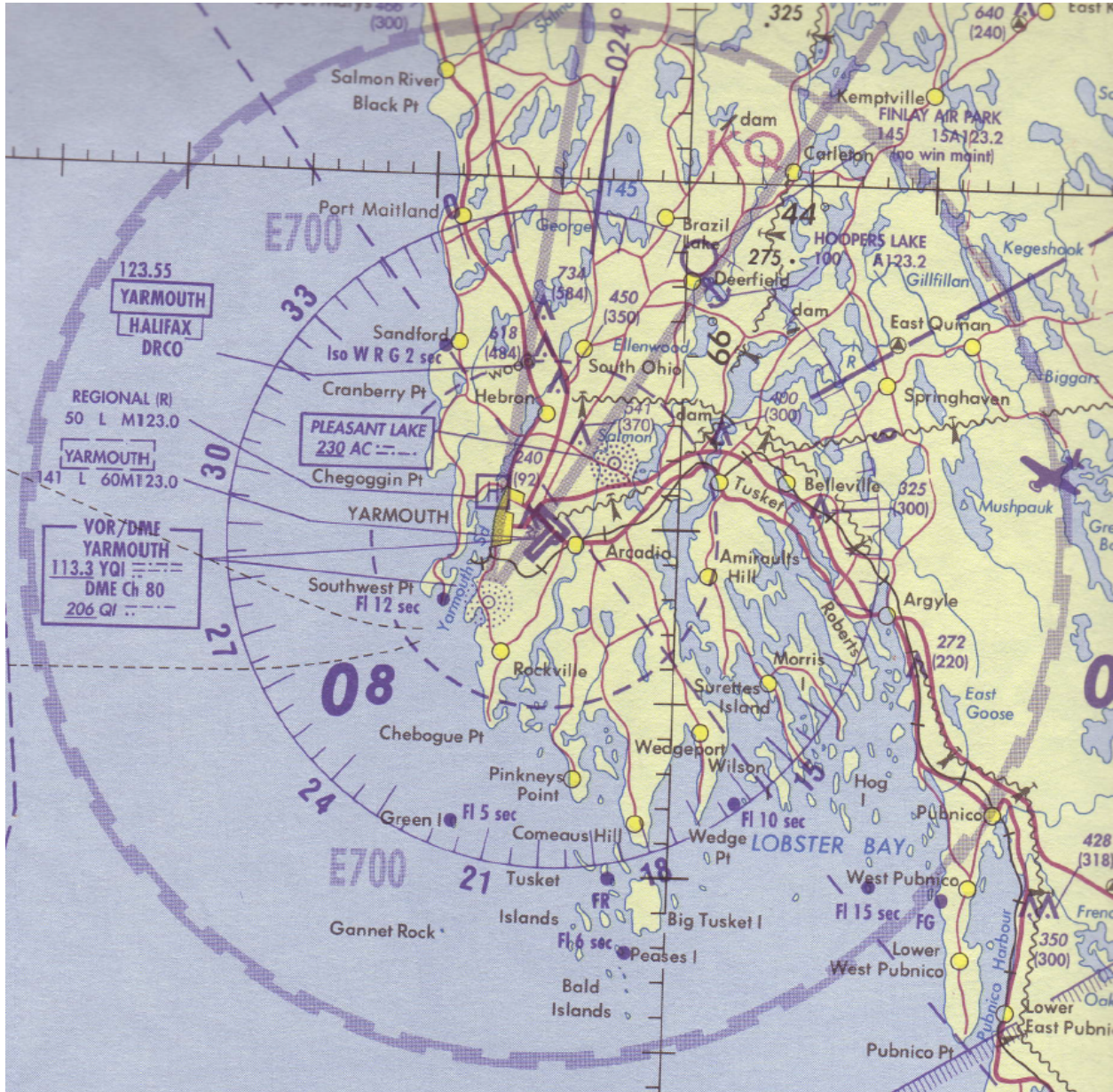


LF/MF Airway Dimensions



2.3.4. Example

The figure below is a small section of the Halifax VNC. Take a look and see if you can recognize some of the features.



Here are some important features of this chart. All this information can be gleaned from the chart legend:

- a. There is a Class E control zone around the Yarmouth airport;
- b. The Yarmouth airport frequency is mandatory and is 123.0 MHz. There is no control tower operating. The altitude of the airport is 141' ASL. Custom services are available at the airport.

- c. There is a Control Area Extension around the Yarmouth airport. It is Class E with a floor of 700' AGL. Transponders in the CAE and not mandatory.
- d. There is a heliport (Regional) just NW of the Yarmouth airport. The Regional frequency is also 123.0 MHz. That makes sense given its proximity to the Yarmouth airport. Having all pilots for both facilities on the same frequency increases safety.
- e. There is a training area at the East end of the chart. That would indicate that there is a flight school operating at the Yarmouth airport.
- f. The Yarmouth VOR is on the airport (There is no VOR symbol because it is co-located with the airport). The Yarmouth DME is just SW of the Yarmouth airport. There are two airways associated with this DME. There is another DME (Pleasance Lake) NE of the Yarmouth airport.
- g. There is an aerodrome (Findlay Airpark) NE of Yarmouth airport. The frequency of the aerodrome is 123.2 MHz. It has a grass runway. There is a water aerodrome (Hooper Lake) just SE of Findley Airpark. Its frequency is also 123.2 MHz.
- h. The airspace outside the CAE is also Class E. The floor is unknown because it does not show on this small section of the VNC but you should expect it to be higher than 700' AGL.
- i. The highest ground altitude within the quadrangle is 800' ASL. The highest obstruction is 640' ASL (240 AGL) in the top NE part of the chart.
- j. There is an isogonic line (line of equal magnetic variation) just East of the Yarmouth airport. The magnetic variation associated with this isogonic line is unknown as it is not shown on this small section of the VNC.

3. CANADIAN AIRSPACE AND AIRSPACE REGULATIONS

3.1. Introduction

This chapter discussed the various classes of Canadian airspace. What are they, where can they be found, and what are the restrictions associated with flying within them.

3.2. Canadian Domestic Airspace

Canadian domestic airspace is geographically divided into the Southern Domestic Airspace and the Northern Domestic Airspace as shown in the diagram below (copied from the AIM). The reason for the division is because magnetic compass indication can be erratic in the Northern Domestic Airspace. So magnetic indications are used in the Southern Domestic Airspace but not in the Northern Domestic Airspace.



The Canadian domestic airspace is further divided vertically into the Low Level Airspace, which consists of all airspace below 18,000 feet ASL, and the High Level Airspace, which consists of all airspace from 18,000 ASL and above.

In the Southern Domestic Airspace, all high-level airspace is controlled Class A airspace. In the Northern Domestic airspace, all high-level airspace above Flight Level 230 (i.e. 23,000 ft) is Class A and the airspace between 18,000 ft ASL and FL 230 is Class G airspace.

3.3. Controlled and Uncontrolled Airspaces

Canadian domestic airspace is either controlled or uncontrolled. All uncontrolled airspace is Class G airspace. Controlled airspace can be Class A, B, C, D or E airspaces.

Controlled airspace is the airspace within which air traffic control service is provided and within which some or all aircraft may be subject to air traffic control.

All aircraft flying under Instrument Flight Rules (IFR) are always under control of ATC in controlled airspaces. However, aircraft flying under Visual Flight Rules (VFR) are not controlled by ATC in all classes of controlled airspace.

Two other terms you will sometime hear or see are Visual Meteorological Condition (VMC) and Instrument Meteorological Conditions (IMC). All pilots flying in IMC must use IFR. However, pilots flying in VMC can use VFR, or IFR if they are qualified to do so. Most commercial flights use IFR regardless of the meteorological conditions because they rely on ATC to separate them from other traffic.

Some small pieces of airspace are designated as Special Use airspace (Class F airspace). Class F airspace can exist in uncontrolled airspace, controlled airspace or a combination of both. Class F airspace is discussed in more detail at Section 3.6.

3.4. Uncontrolled Airspace – Class G

Uncontrolled airspace is all airspace that is not controlled and where a HG/PG pilot can fly without a having written the HAGAR examination. Class G airspace is not specifically shown on VFR charts. Instead, if some airspace is not specifically identified as controlled airspace on a VFR chart, then it is Class G airspace. A lot of Class G airspace in Southern Canada exists below controlled airspace. For example, Class G airspace would exist from the ground up to a specific altitude where controlled airspace begins i.e. below Class E, C or D airspace.

Class G airspace exists up to 18,000 ft ASL if it is not capped by controlled airspace, except in the Northern Domestic airspace where it may also exist between 18,000' and FL 230.

Because there are no restrictions to flying hang gliders in Class G airspace does not mean that there are no rules in Class G airspace. All the CARs that are not airspace-specific are still applicable in Class G airspace.

3.5. Controlled Airspace

3.5.1. Controlled Airspace – Class A

Class A Airspace is restricted to IFR traffic so HGs/PGs are not allowed in Class A Airspace. Class A airspace does not specifically appear on VNC charts as it exists everywhere over 18,000 ft ASL in the Southern Domestic Airspace and either FL 230 or FL280 in the Northern Domestic Airspace.

3.5.2. Controlled Airspace – Class B

Class B Airspace exists above other controlled airspace between 12,500 ft ASL and 18,000 ft ASL everywhere in Canada.

Actually, Class B Airspace exists above controlled airspace above 12,500 ASL or above the Minimum Enroute Altitude (MEA) whichever is the highest. What is the MEA you ask? In a nutshell, aircraft flying cross country must have a direct line of sight to a ground-based radio navigation aid (VOR or other) and a ground-based ATC radio. When flying over mountains, an aircraft may have to fly higher to maintain these lines of sight. The lowest altitude clear of obstacles and where these lines of sight can be maintained is called the MEA.

The MEA is higher than 12,500 ft ASL in some areas in Canada. For example, the MEA is above 12,500 ft ASL around Golden in BC. That means that the Class E airspace around Golden extends above 12,500

ft ASL.

Your next question is probably how does one find out where the MEAs are. Unfortunately, they are not shown on VNC but on IFR charts where a MEA is specified for each airway.

Both IFR and VFR aircraft are allowed in Class B. There is nothing in the CARs that specifically exclude HG in Class B airspace. However, like other VFR traffic, a HG must obtain a clearance from ATC to enter Class B airspace as well as meet other conditions that are somewhat impractical, albeit not impossible, for a hang glider.

Some of these conditions above can be waived by NavCan in special circumstances such as competitions if such things are pre-arranged. That is true for other types of airspaces as well.

3.5.3. Controlled Airspace – Class C

Class C airspace exists in CZs and TCAs around some major airports. Both IFR and VFR aircraft are allowed in Class C airspace. There is nothing in the CARs that specifically exclude HG in Class C airspace. VFR aircraft must meet some specific conditions to enter Class C airspace. Those conditions are:

- Establish two-way radio contact with the appropriate air traffic control unit (tower for CZ and terminal for TCAs) before entering the airspace (if you do not have a radio, you can request and possibly obtain permission from ATC before your flight)
- Obtain clearance from the ATC unit before entering the airspace. ATC can refuse you entry.

In Class C airspace, ATC must provide conflict resolution between IFR and VFR traffic (but not between VFR and other VFR traffic).

3.5.4. Controlled Airspace - Class D

Class D airspace exists in CZs and TCAs around some airports. Both IFR and VFR aircraft are allowed in Class D airspace. There is nothing in the CARs that specifically exclude HG in Class D airspace. VFR aircraft must establish two-way communications with the appropriate ATC unit prior to entering the airspace (if you do not have a radio, you can request and possibly obtain permission from ATC before your flight).

In Class D airspace, ATC must provide conflict resolution between IFR and VFR traffic (but not between VFR and other VFR traffic).

The difference between flying in Class C and Class D airspace is subtle but important. In Class C, ATC can deny a pilot the clearance to fly in the airspace even if the pilot meets the conditions to do so. In Class D, ATC cannot deny a pilot the clearance to fly in the airspace if the pilot meets the conditions to do so. It is not impossible that ATC will allow a hang glider to operate within Class C airspace.

3.5.5. Controlled 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 Airspace. Operations may be conducted under VFR or IFR. ATC separation is provided only to aircraft operating under IFR. There are no special requirements for VFR aircraft. Low-level airways, control area extensions, transition areas, or CZs established without an operating control tower may be classified as Class E Airspace.

Hang gliders can operate in VFR flight in Class E Airspace if the pilot is at least 16 years of age, is in possession of a Category 1, 3 or 4 medical certificate and has passed, or is exempted from writing, the

HAGAR examination. In addition, the hang glider must be equipped with a magnetic compass and an altimeter, the flight must be a cross-country flight and the pilot must inform the nearest flight service station (FSS) of the time of departure and estimated duration of the flight in Class E airspace.

The HPAC submitted amendments to the CARs in 2000 to remove some of these requirements because they are unreasonable and burdensome. The amendments called for the elimination of the need for a magnetic compass and informing the nearest FSS. The need to carry a GPS was added instead. These changes were approved by the CARAC but have still not been made 15 years later because they are a lower priority and Justice Canada, which must review all of the changes for all of the Government of Canada before they can be implemented, just does not have the manpower to do so.

Note that the CARs specify what conditions the hang glider pilot must meet in order to fly in Class E airspace but does not specify any hang gliding – specific conditions for flights in Class C and D airspaces. So, in theory, hang glider pilots can fly in Class C and D without having written the HAGAR examination. This is one of many inconsistencies in the CARs.

3.6. Special Use Airspace – Class F

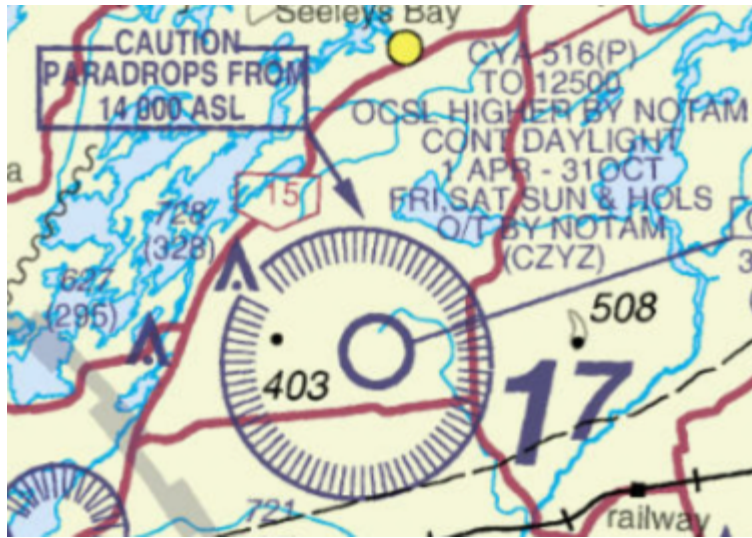
As its name indicates, special use airspace is airspace within which activities must be confined because of their nature and (or) within which limitations may be imposed upon aircraft operations that are not part of those activities.

Special use airspace may be classified as Class F Advisory (CYA) or Class F Restricted (CYR) and can be controlled airspace, uncontrolled airspace, or a combination of both. When areas of Class F Airspace are inactive, they assume the rules of the appropriate surrounding airspace. A hang glider cannot enter a CYR when it is active unless authorization has been obtained from the user agency. A hang glider can enter a CYA (if it could enter the underlying airspace if the CYA did not exist) but must exercise caution.

Each restricted and advisory area is uniquely identified. The letter in bracket in the identification (e.g. CYA 326(H)) identifies the activity within the airspace as follows:

- A – Aerobatics
- F – Aircraft test area
- H – Hang gliding
- M – Military operations
- P – Parachuting
- S – Soaring
- T - Training

Below is one example of a CYA, in this case CYA 516(P) in Southern Ontario. As you can see, the VNC has all of the condition associated with the CYA. In this case, the CYA is active for parachuting operations during daylight hours every Friday, Saturday, Sunday and Holidays between 1 Apr and 31 Oct from the ground up to 12,500 ASL. On occasion, the CYA will be active on other days and/or will extend to up to 14,000 ASL and that will be promulgated by NOTAM.



Note that there is an aerodrome in the middle of the CYA which is consistent with parachuting operations. The plane has to take off from somewhere and is efficient to have the parachutists land where the plane takes off from.

MAP WORK

3.7. Introduction

Navigate is what a pilot does when he goes cross-country. The act of navigation allows the pilot to know where he is at all times, thereby avoiding airspace in which he is not allowed to fly, and taking the correct actions in airspace where he is allowed to fly. “Pilotage” is navigation by reference only to landmarks and those landmarks are shown on the VNC. Being able to use a VNC to navigate is therefore tested on the HAGAR examination.

Pilots have to be capable of executing a number of tasks on a VNC chart for the HAGAR examination. A lot of these are trivial and are not worth discussing in detail in this guide. Some non-trivial topics have already been discussed in previous chapters. In this chapter, I will focus on what is left.

The following table shows the tasks and how they are handled in the guide.

TASK	HOW TO
Identifying the location of a feature on the chart knowing the latitude and longitude of the feature	See Section 4.2
Specifying the latitude and longitude of a feature on the chart	See Section 4.2
Recognizing the various symbols on the map	Trivial. Look at the legend.
Identifying the altitude for each point on the chart	Trivial. Look at the legend. Depending on what is asked, use the elevation associated with the shading or the actual elevation of the feature shown on the map.
Recognizing isogonic lines	See Section 4.3
Identifying the magnetic deviation for each isogonic lines on the chart	See Section 4.3
Knowing how to set a compass to read true north for a point on the chart	See Section 4.3
Identifying the airspace in which a particular point lies.	See Chapter 2
Identify airways, air routes, control areas, control area extensions, transition areas, TCA, aerodrome traffic zones and control zones and the airspace in which they are located	See Chapter 2
Recognizing the altitude floor and ceiling for various airspace areas	See Chapter 2
Determining obstacles along a given cross-country route between specified points	See Section 4.4
Calculating the distance between two points on the chart in nautical miles, statute miles or kilometers	Trivial. Use a ruler to measure the distance between the two points and use the appropriate scale at the bottom of the VNC to determine the actual distance in the proper unit.
Converting distances between nautical miles, statute miles and kilometers	Trivial. Use a ruler and the scale at the bottom of the map.
Identify the tower frequency for various aerodromes	Trivial. Look at the legend to see where the

information is shown and read it on the map.

3.8. Locating a Feature on a VNC

I assume pilots are at least familiar with the fact that the Earth is round and any point on the globe can be located by a series on intersecting circles called parallels of latitude and meridian of longitude. These are called geographical coordinates.

Longitude is measured from 0° to 180° east and west of the Prime Meridian which is the meridian that passes through Greenwich, England. The prime meridian is numbered 0°. The meridian on the opposite side of the earth to the Prime Meridian is called the International Date Line.

Latitude is measured from 0° to 180° north and south of the Equator and the Equator is at 0°.

On a VNC, longitude and latitude are measured in degrees, minutes and tenths of minutes. There are 60 minutes in a degree. So for example, N46°15.6' W77°30.9'. That means 46 degrees 15.6 minutes North of the Equator and 77 degrees 30.9 minutes West of the Prime Meridian. Those coordinates are somewhere in Eastern Quebec.

Other systems use degrees, minutes and seconds where there are 60 seconds in a minute. Do not get confused.

On a VNC, parallels and meridian are represented by solid lines separated by 30' (half of a degree). The smallest graduation on these lines is a minute. So a tenth of a minute is very small on a VNC chart.

In Figure 4.1 below, we can see that the coordinates for the village of Duhamel are N46°1.4' W75°4.8' and the coordinates for the village of St-Emile-de-Suffolk are N45°55.9' and W74°54.8'. In this example, I chose a section of a VNC that clearly shows the degrees associated with a parallel and a meridian. These are not always as obvious everywhere on a VNC chart so look carefully.

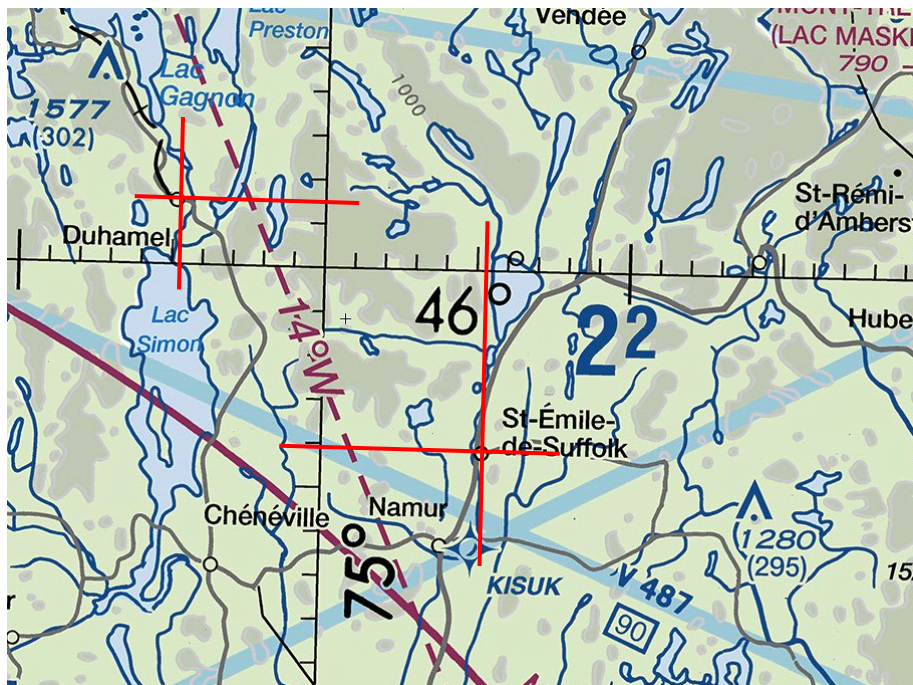


Figure 4.1 – Example of Geographical Coordinates

3.9. Magnetic Variation and Navigation

In the old days (i.e. before GPS), the magnetic compass was the main instrument to navigate using “pilotage”. Unlike a GPS, the magnetic compass does not point to geographical North (true North) but to magnetic North. So pilots had to be able to translate their headings from magnetic North to true North and vice versa. We also need to be able to do so also because it is examinable.

A compass is a very poor instrument for a hang glider pilot because a compass is only accurate in steady level flight. For example, when an aircraft turns, the compass will lag for a northerly turn and lead for a southerly turn. When an aircraft accelerate going east to west, the compass will indicate a northerly turn. When the aircraft decelerate going east to west, the compass will indicate a southerly turn. However, acceleration and deceleration have no effect on a north-south heading. In any case, a hang glider is not an aircraft that spends a lot of time in steady level flight. Viva the GPS because it shows true North.

The Earth is a magnet that has a north and a south magnetic pole. Lines of forces flow between these two poles creating a magnetic field that surrounds the Earth. A compass needle is influenced by the Earth’s magnetic field and will lie parallel to one of the magnetic lines of force.

The magnetic poles are not co-located with the geographical poles (true North). Therefore, the north direction indicated by a compass will give an erroneous reading of the geographical north as can be shown in Figure 4.2 where TN represents True North and MN represents Magnetic North.

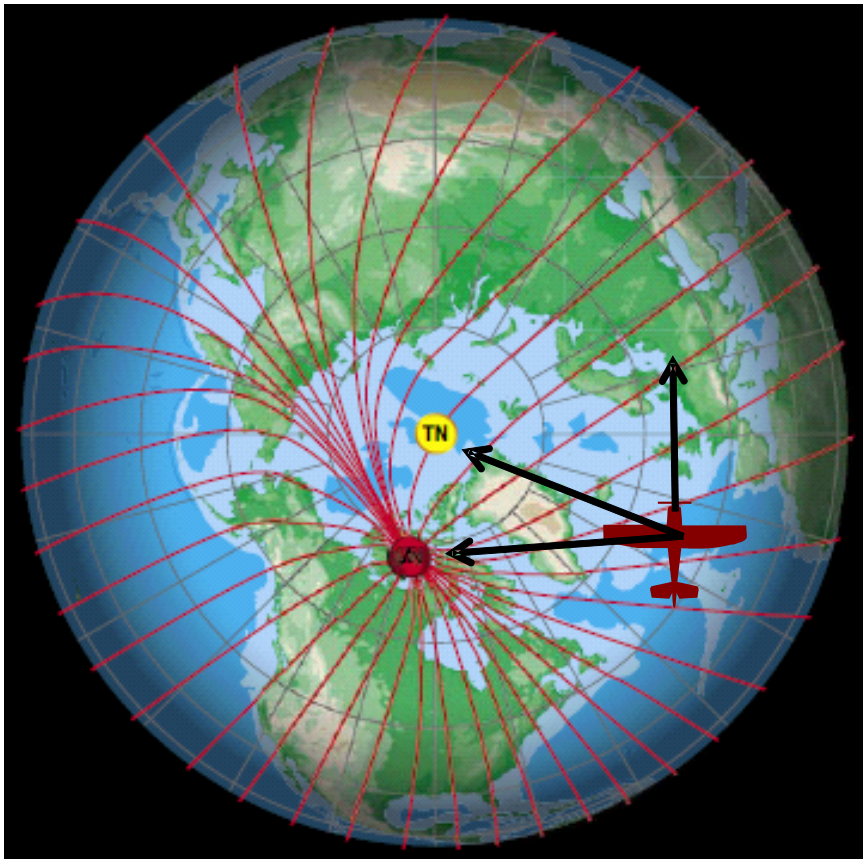
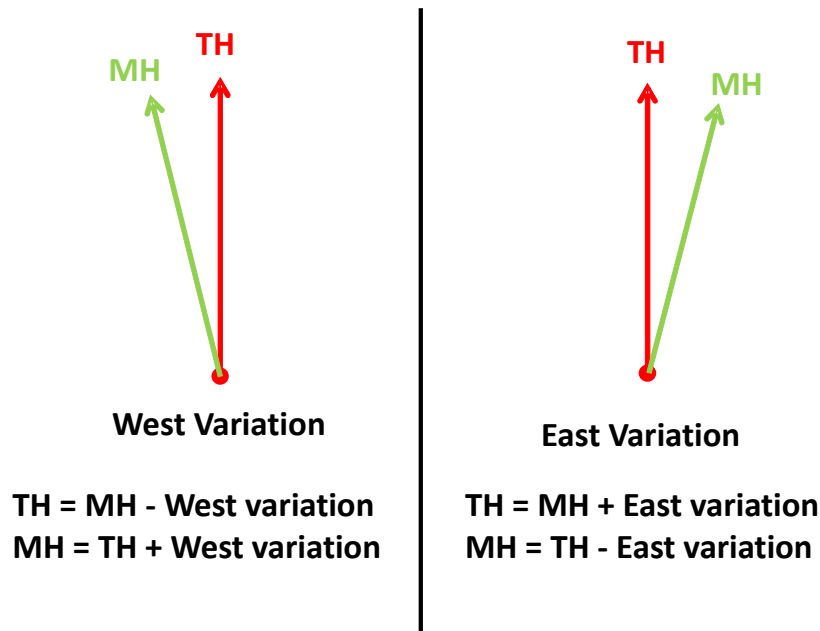


Figure 4.2 – Magnetic Deviation

The angle between the direction indicated by the compass and the true geographical direction is called the magnetic variation. This magnetic variation is indicated on VNCs so the users can apply the corrections. Isogonic lines are lines joining points that have the same magnetic variations. Check the VNC legend to see what isogonic lines look like (dashed curved magenta lines roughly North to South). The variation for a specific isogonic line is shown on the VNC along the line. For example, in Figure 4.1, you can see the 14°W isogonic line. The isogonic line with zero magnetic variation, i.e. the only line where true North is the same as magnetic North, is called the Agonic line.

If the magnetic pole lies west of the geographical pole from a given point (E.g. as in Figure 4.2), the compass needle will point west of True North. In that case, the variation is named west. Similarly, if the compass needle points east of True North, the variation is named east. To convert magnetic headings to true headings, subtract westerly variation and add easterly variation (E.g. magnetic heading of 135 close to the 13W isogonic line means a true heading of $135 - 13 = 122$ degree true heading). To convert true heading to magnetic heading, do the opposite. This is illustrated in the picture below.



There are issues with compasses. A compass is only accurate in steady level flight. There are compass errors when the aircraft turns or accelerates. Specifically:

- When the aircraft makes a turn from a heading of north (in the Northern hemisphere), the compass briefly indicates a turn in the opposite direction (lags). When the aircraft makes a turn from a heading of south, the compass indicates a turn in the correct direction but at a considerably faster rate than is actually occurring (leads). Thus, when an aircraft makes 360 turns, the compass will lead or lag depending on where the aircraft is in the turn.
- When an aircraft accelerate going east to west or west to east, the compass will indicate a northerly turn. When the aircraft decelerate going east to west or west to east, the compass will indicate a southerly turn. However, acceleration and deceleration have no effect on a north-south heading.

The magnetic poles are not stationary. The north magnetic pole rotates around the geographical North Pole in an east-to-west circle, completing the circle every 960 years. As a result, the magnetic variation changes continuously. If you look at the same VNC but separated by a few years, you would be surprised by how much the magnetic variation has changed.

4. FLIGHT OPERATIONS

4.1. General

This section includes all the odds and ends that are testable but do not fit in the other chapters.

4.2. NOTAM

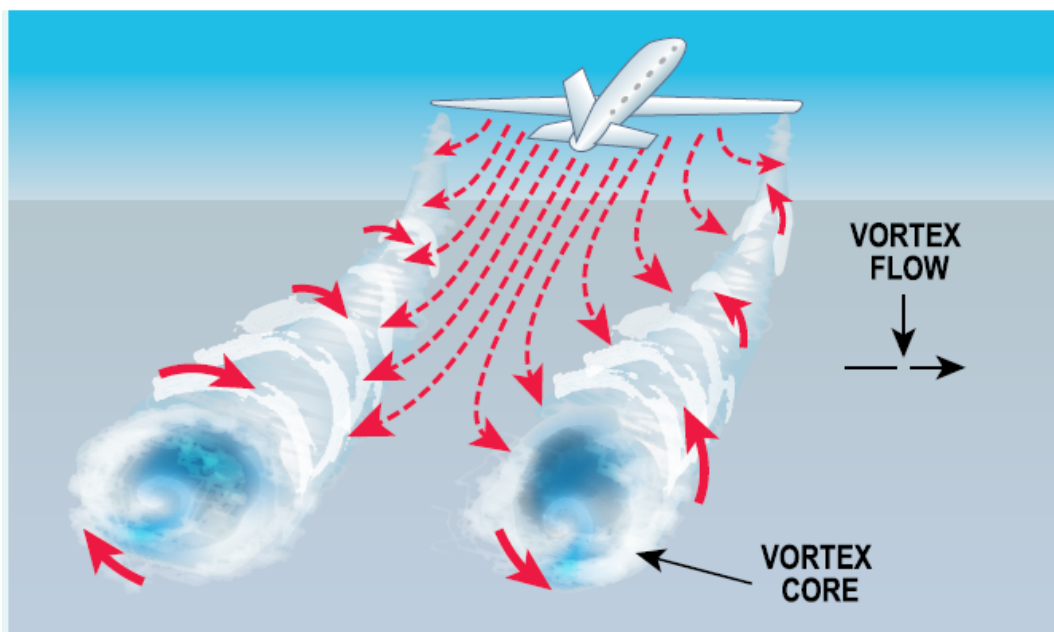
A NOTAM is a notice distributed by means of telecommunications containing information concerning the establishment, conditions or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to pilot. Pilots are supposed to check NOTAMs as part of their pre-flight preparations.

A NOTAM can apply to the entire country, a large area or to an element of a single airport. For example, a NOTAM could deal with a military exercise over a large area, an airshow at an airport, or the temporary closure of a runway at an airport. Some hang glider sites request that NOTAMs be issued to alert the flying community that there are hang gliding activities taking place.

NOTAMs can be found at <https://flightplanning.navcanada.ca/cgi-bin/CreePage.pl?Langue=anglais&NoSession=&Page=Fore-obs/notam&TypeDoc=html>.

4.3. Wake Turbulence, Causes, Effects and Avoidance.

Wake turbulence is caused by wing tip vortices and is a by-product of lift. As a lift producing airfoil (a wing) passes through the air, the airflow rotates up and back from each wing tip, producing two separate and distinct counter-rotating vortices. These vortices start when the nose wheel leaves the ground (rotation) on take-off and continue throughout the flight until the nose wheel touches down on landing. The heavier and slower the aircraft is, the greater the intensity of the vortex. It follows then that wake turbulence is usually most violent when large aircraft are climbing out from take-off and approaching to land.



Flight behind these aircraft may result in unresponsive controls, loss of control and structural damage. This danger increases as the size and weight of your aircraft decreases. Therefore, from the standpoint of HG/PG, all other aircraft produce hazardous wake turbulence. HG/PG should avoid flight behind and below all other aircraft. Because vortexes drift with the wind, they are not always found directly behind another aircraft.

4.4. Altimeter

An altimeter is a special form of aneroid barometer (a barometer without liquid) which measures the pressure of the atmosphere. Since the pressure of the air decreases with altitude, a barometer can be used to extrapolate the altitude. Under Standard Air Conditions of 15°C, the weight of a column of air one square inch in area is 14.7 lb at sea level. This pressure is recorded on a barometer as 29.92 inches of mercury¹. Of course, the air conditions in any particular area rarely exhibit the Standard Air Conditions. This means that an altimeter displaying the correct altitude under Standard Air Conditions will not do so under any other conditions unless the altimeter reading is corrected. This is what HG/PG pilots do when they are setting their altimeter to display actual take-off or LZ altitude before a flight.

Because the barometric pressure varies from place to place and with time, the altimeter of a pilot flying cross-country may display an erroneous reading after it travels some distance and/or during an extended local flight. Aircraft instruments are equipped with a barometric scale that allows the pilot to calibrate the altimeter for a certain area from data provided by a FIC/FSS or an ATC unit. I do not know of a HG/PG altimeter does not have this capability.

4.5. Aircraft Communications

General. There are specific frequencies used by aviation. In Canada, the Very High Frequency (VHF) used for civil aviation voice communications range from 118.10 MHz through 136.00 MHz on the AM band.

Two-way radio transmissions are regulated by Industry Canada. In order to use aviation frequencies, an individual must hold a Restricted Operator Certificate with Aeronautics Qualification issued by Industry Canada. Once obtained, the certificate is good for life.

Pilots can be tested at any Industry Canada district offices. A number of organizations, including commercial flight training school are authorized to test a pilot proficiency and issue an operator certificate. The proficiency test is much simpler than a radio amateur license.

Industry Canada publishes a study guide for the operator certificate. I strongly recommend that you read it as it is a useful supplement to this guide. It is available at <http://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01397.html>

Except for Quebec and the National Capital Region (NCR) i.e. the area around Ottawa, all communications must be in English. In Quebec and the NCR, communications can be carried out in French when the pilot indicated his desire to do so by making his initial contact in the French language.

This study guide deals with aviation frequencies. Most HG/PG pilots seem to use the radio-amateur band in Canada although I am not sure why.

¹ Altitudes based on 29.92 inches of Mercury are referred to as ICAO altitudes.

4.5.1. Frequencies of Special Interest

The following are frequencies that are of interest to hang gliding pilots.

121.50 Mhz. This is the international aircraft emergency frequency. Some aircraft do monitor this frequency just in case they can be of assistance.

122.75 MHz. This is the “chatting” frequency if you want to chat with your buddy while airborne.

It is sometimes very difficult to figure out what frequency a passing aircraft will be on because it is not all black and white. Normally, the aircraft should be on the aerodrome frequency whenever within five miles of the aerodrome but many aircraft switch to that frequency earlier because listening to the aerodrome frequency give them situation awareness of what is going on so they can plan their arrival accordingly. Outside but close to a TCA, some aircraft will choose to monitor the TCA frequency as opposed to 126.7 because traffic coming in and out of the TCA will communicate on that frequency so they get better situation awareness that way. Some aircraft have radio installations which allow the pilot to be live on one frequency and monitor another one at the same time. If you operate close to an aerodrome, I suggest that you use that aerodrome frequency so that local powered pilots are aware of your activities.

123.20 MHz. This frequency is used by all unregistered aerodromes and many registered ones for which a specific frequency has not been issued. If you cannot see an aerodrome frequency on a VNC, then the frequency is 123.20 MHz.

123.40 MHz. Gliders have been allocated 123.40 MHz. Many sailplane operations use this frequency. Other sailplane operations use the frequency for the aerodrome they operate from. Since HG/PG are gliders, we are allowed to use this frequency.

126.70 MHz. In Canada, this is the frequency which aircraft should, whenever practicable, be continuously monitored in uncontrolled airspace when not around an aerodrome. The idea behind the use of this frequency is for pilot to broadcast their location and intentions regularly so that other pilots in the vicinity can be made aware of any potential conflict. Pilots used to be able to contact FIC/FSS over this frequency but that is no longer the case in many areas where FIC/FSS-specific frequencies have been introduced. As a result, many aircraft do not use this frequency any longer.

4.5.2. Standard Radio Usage

Radio communications have been standardized to avoid misunderstanding and to shorten communications. This section provides only a basic overview of radio communication procedures consistent with what can be expected on the HAGAR examination.

All aircraft have a call sign. For registered aircraft, the call sign is the registration number. For a hang glider, the call sign is HANG GLIDER followed by the phonetic form of the pilot initials. For example, a hang glider pilot named Andre Nadeau would have a call sign of “HANG GLIDER ALPHA NOVEMBER”.

In radio communication, the International Civil Aviation Organization (ICAO) phonetic alphabet is used. The alphabet is as follows:

A	Alpha	J	Juliette	S	Sierra
B	Bravo	K	Kilo	T	Tango
C	Charlie	L	Lima	U	Uniform
D	Delta	M	Mike	V	Victor

E	Echo	N	November	W	Whiskey
F	Foxtrot	O	Oscar	X	X-ray
G	Golf	P	Papa	Y	Yankee
H	Hotel	Q	Quebec	Z	Zulu
I	India	R	Romeo		

4.5.3. Declaring an Emergency

An emergency condition is classified in accordance with the degree of danger or hazard being experienced, as follows:

- a. **Distress.** A condition of being threatened by serious and/or imminent danger and requiring immediate assistance. In case of a distress call, the pilot should use the distress signal MAYDAY three times at the beginning of his transmission. For example “MAYDAY MAYDAY MAYDAY, THIS IS HANG GLIDER ALPHA NOVEMBER, TWO MILES FROM SHORE OF MONT ST PIERRE, 1000 FT, HEADING TOWARDS SHORE, IMMINENT DITCHING FOR LACK OF ALTITUDE”
- b. **Urgency.** A condition concerning the safety of an aircraft or other vehicle, or of some person on board or within sight, which requires assistance as soon as possible. In case of an urgent call, the pilot should use the urgent signal “PAN PAN” three times at the beginning of his transmission. For example, “PAN PAN, PAN PAN, PAN PAN, THIS IS HANG GLIDER ALPHA NOVEMBER, (message)”

4.6. Canadian Time Zones and Date Time Groups

Coordinated Universal Time (UTC) is based on the 24-hour clock. Each day begins at 0000 hours and end at 2359 hours. An entry followed by UTC or a Z (for Zulu) reminds that UTC is being used. Zulu time is used extensively in aviation. For example, all aviation weather products are based on Zulu time. If you call ATC, you will be expected to use Zulu time.

In most areas, Standard Time is changed to Daylight Saving Time (DT) at 0200 local on the first Sunday in April and remains in effect until 0200 local on the last Sunday in October. To convert UTC to local Standard Time, subtract the following:

<u>Time Zone</u>	<u>To Obtain Local Time</u>
Newfoundland	UTC minus 3 ½ hours (2 ½ DT)
Atlantic	UTC minus 4 hours (3 DT)
Eastern	UTC minus 5 hours (4 DT)
Central	UTC minus 6 hours (5 DT)
Mountain	UTC minus 7 hours (6 DT)
Pacific	UTC minus 8 hours (7 DT)

Note that Saskatchewan does not switch to Daylight Saving Time. Therefore, for Saskatchewan, the Local Time is always UTC minus 6 hours.

4.7. Protection of Wildlife

General. All pilots should be aware of their provincial game laws. Information with regard to the preservation of wild life within the various provinces and territories may be obtained from the appropriate game officer as listed in the AIP Canada RAC.

Migratory Bird Protection. Migratory bird regulations prohibit the use of an aircraft in the killing of game birds. Furthermore, the breeding habits of most birds, and particularly migratory birds such as geese, are seriously disrupted by low flying aircraft. Pilots must avoid low-flying over nesting and feeding areas. Several species of migratory birds are now on the endangered list, and every efforts should be made to preserve them.

Reindeer, Caribou, Moose and Musk-oxen. The feeding and breeding of these animals is interrupted by low flying. As well, low-flying can lead to stampede which results in broken bones and exhaustion. Pilots should not fly at an altitude less than 2,000 ft AGL when in the vicinity of reindeer, caribou, moose and musk-oxen.

Flight Restrictions over National, Provincial and Municipal Parks. Flight restrictions have been imposed at a number of national, provincial and municipal parks. Details regarding the nature of these restrictions can be found in the AIP Canada RAC annexes and AICs, while the boundaries are shown on the applicable VFR aeronautical charts.

Fur Farms. Fur farmers suffer serious financial losses when their animals are frightened and exited by low flying aircraft. To warn pilots, fur farms may be marked by chrome yellow and black strips painted on pylons or roofs. In addition, a red flag may be flown during whelping season (February – May).

Pilots are warned to remain clear of any locations so marked. This is particularly important during the months of February to May when the young are raised.

Poultry and Livestock. Poultry and livestock are afraid of low-flying aircraft. Chicken and turkeys may flock, and cattle and horses stampede to escape the noise and shadows caused by aircraft. They are sometimes wounded or killed as a result.

5. HUMAN FACTORS

5.1. Aviation Physiology

There are few regulations that tell a pilot whether he/she is fit to fly. You have to make the decision on whether you are fit to fly based on common sense and experience. Not being fit for flight may result in reduced alertness, slower reaction time, poor decision making all the way to loss of consciousness.

Many medical conditions that may lead to a problem in flight can be diagnosed before the flight takes place. These conditions include fatigue, ingestion of alcohol or drugs, activities that may lead to decompression sickness, cold, and middle ears and sinus discomfort.

Individuals suffering from conditions that could result in sudden or subtle incapacitation, such as epilepsy, heart disease or uncontrolled diabetes should probably not fly at all.

Although the CARs only require HG pilots to have a Class 4 medical to fly in controlled airspace, in truth, all HG pilots should be able to meet the requirements for a Class 4 medical.

In some cases, healthy pilot may experience hypoxia, hyperventilation, disorientation and/or hypothermia during flight. It is important that you be able to recognize the symptoms for those conditions and know what to do if they occur to you.

5.2. Hypoxia.

Hypoxia is a result of a lack of sufficient oxygen for the body to operate normally. Even minor hypoxia impairs night vision and slows reaction time. More serious hypoxia interferes with reasoning, gives rise to unusual fatigue and finally produces unconsciousness.

To avoid hypoxia, pilots should not fly above 10,000 ft ASL without supplemental oxygen. The CAR specify that pilots should not fly between 10,000 and 13,000 ft ASL for more than 30 minutes without supplemental oxygen. Many out-of-shape pilots or pilots living close to sea level may encounter the effect of hypoxia faster. These pilots should stay below the 10,000 ft ASL for added safety.

The onset of hypoxia is difficult to detect as the body has no built-in alarm system to indicate it is not getting enough oxygen. In fact, an early symptom of hypoxia may be a feeling of well-being (euphoria) during which the pilot is unaware of any impairment. More serious hypoxia interferes with reasoning, gives rise to unusual fatigue and, finally, results in a loss of consciousness.

Relief from hypoxia can be achieved by breathing oxygen or descending to lower altitudes.

5.3. Hyperventilation

Hyperventilation most commonly occurs in association with anxiety, fear, or during intense concentration.

Hyperventilation is breathing at a faster and/or deeper rate than you have to for the existing work level. Normally the rate of breathing is controlled by the amount of carbon dioxide in the lungs and in the blood. When a pilot hyperventilates, carbon dioxide is blown off and the level of carbon dioxide in the blood drops below normal. This, in turn, causes the arteries to the brain to constrict and reduces the blood supply. Continuous hyperventilation can cause unconsciousness.

Symptoms may include dizziness, a feeling of coldness, a sensation like a tight band around the head and pins and needles in the hands and feet, and cramping and spasms of the hands and feet. Paradoxically, pilots will often feel as though they cannot get enough air.

It may be difficult for a pilot to differentiate between hypoxia. Rather than trying to make a diagnostic, pilots should follow this procedure:

To counteract hyperventilation, the pilot should consciously slow the rate of breathing to 10-12 breaths per minutes and not breathe deeply. The lowering of the respiratory rate should eliminate the symptoms and the pilot can then resume a normal breathing pattern.

5.4. Decompression Sickness

At ground level, the body tissues are saturated with nitrogen. When the atmospheric pressure diminishes, bubbles of nitrogen form in the tissues and these bubbles may track into joint spaces causing a dull, sickening pain called the bends. More critically, these bubbles can be released into the lungs or the brain, giving rise to chest pain or collapse. Atmospheric pressure diminishes with altitude and, at 18,000 ft ASL, is half the pressure at sea level. Although a pilot susceptibility to the bends varies with age, obesity, fitness, temperature and rate of climb, most pilots flying above 25,000 ft ASL in an unpressurized aircraft will be subject to the bends. Transport Canada specifies that flights above 20,000 ft ASL should not be attempted unless a pilot has completed specialized high-altitude indoctrination (HAI) training.

Although decompression sickness does not usually occur below 20,000 ft ASL, pilot who fly after scuba diving may develop the symptoms at much lower altitudes. The pressure under water increase by one atmosphere for every 33 ft and divers who breathe air underwater for more that a few minutes supersaturate their tissues with nitrogen. This greatly facilitates the formation of bubbles when the pilot flies later on. For these pilots, the bends can occur as low as 8,000 ft ASL.

After non-decompression dives, a pilot should not fly for 12 hours. When decompression stops have been required during the ascent to the water surface, the interval should be 24 hours. For flights above 8,000 ft, the interval should be 24 hours regardless of the type of dive.

The remedy for decompression sickness is to re-expose the pilot to a greater pressure. Although this may require special equipment for diving, when flying, this means descending to a safer altitude.

5.5. Middle ear and Sinus Discomfort or Pain

The middle ear is similar to a box: closed at one end by a flexible cover (the ear drum) and drained at the other end by a thin, straight tube (the Eustachian tube). When climbing, air in the body cavities expands as the barometric pressure decreases. Normally, air will escape from the middle ear and the sinuses and pilots will only notice their ears “popping”. The outlet of the Eustachian tubes, however, is narrow and, if the pilot has a head cold or a throat infection, local swelling may narrow it. On ascent, air may still be able to escape, but on descent—particularly at high rates—the outlet may close like a flap, preventing air from re-entering the middle-ear cavity. The increasing ambient air pressure will then force the eardrum inward. This can lead to severe pain and decreased hearing. Sometimes, the pressure in the middle ear on descent is so low relative to the external pressure that the eardrum can bleed and even rupture. This is known as barotrauma.

Pressure in the ears can be equalized by opening and closing the mouth, swallowing, yawning, chewing gum or by holding the nostrils shut while gently blowing the nose. If the pressure in the ears (or sinuses) cannot be relieved by these manoeuvres, it is best to climb if possible. The ears should then be cleared and a gradual descent made, clearing the ears frequently on the way down.

5.6. Substance Abuse

Alcohol is selectively concentrated by the body into certain areas and can remain in the fluid of the inner ear even after all traces of alcohol in the blood have disappeared. This accounts for the difficulty in balance that is experienced in a hangover.

Even small amounts of alcohol (0.05 percent) have been shown in simulators to reduce piloting skills. The effect of alcohol and hypoxia is additive, and at 6 000 ft ASL (1 830 m), the effect of one drink is equivalent to two drinks at sea level.

The body metabolizes alcohol at a fixed rate and no amount of coffee, medication or oxygen will alter this rate. It is best to allow at least 24 hours between the last drink and take-off time.

5.7. Medications (Prescribed, Over the Counter)

It can be hazardous to take medicine in any form immediately before or while flying. Over-the-counter and herbal remedies, such as antihistamines, cough medicines, sleeping pills, and appetite suppressants, (to name just a few) may cause drowsiness, decrease mental alertness, and seriously impair the judgement and co-ordination needed by the pilot.

5.8. Vision and Visual Scanning

VFR pilots fly in a “see-and-be-seen” world where the ability to spot other aircraft goes a long way towards safety. A good vision has always been an important part of the pilot tools. There are many factors that affect vision. Hypoxia, carbon monoxide poisoning, alcohol, drugs, fatigue and smoking are only a few of these. Wearing the right prescription eyewear correction is also critical.

This must be reinforced with good visual scan practices. Such practices are an acquired, not an inherent skill. In performing a visual scan, the eyes should be focused at a range that will ensure detection of traffic while there is still time to take avoiding action. This requires that pilots take an object on the horizon, focus on it, and then scan all sectors of the sky, refocusing as needed to avoid the empty-field myopia (space blindness) which can result from gazing at a featureless land or cloudscape. Conscientious scanning of all sections of the sky, interspersed with brief interludes of focusing on distant objects, will improve a pilot’s ability to detect distant aircraft.

<p>In gaggles, it is much more important to keep your eyes scanning constantly between the gliders close to you to maintain a constant situation awareness of your location within the immediate airspace around and repositioning yourself constantly to maintain safe separation with the other traffic. Any pilot uncomfortable with gaggle flying should leave the gaggle immediately to avoid endangering himself or his fellow pilots. When conditions are very turbulent, separation should be increased to allow for unexpected maneuvers (e.g. paraglider collapse).</p>

5.9. Disorientation

Disorientation is an incorrect sense of position, attitude or movement in relation to what is actually happening to the aircraft. On the ground, spatial orientation is sensed by a combination of vision, muscle sense (seat of the pants), and specialized organs in the inner ear which sense linear and angular accelerations. Vision is the strongest of the orientation senses, but, in a whiteout or flying in cloud, it is sometimes impossible for the pilot to orient himself by reference to the horizon.

Although the organs of balance in the inner ear give useful acceleration or turning information, they can also give rise to dangerous false information. Once a turn has been entered and is being maintained at a

steady rate, the sensation of turning will disappear. Upon recovering from the turn, a sensation of turning in the opposite direction may be encountered. This has been responsible for many accidents.

To avoid disorientation, do not lose sight of the ground.

ANNEX A
TO HPAC/ACVL HAGAR STUDY GUIDE

SAMPLE EXAMINATION QUESTIONS

These are practice questions that may prove useful in preparing for the HAGAR examination. It is possible that some of these questions deal with topics that will not appear on the examination. Also, it is possible that some topics on the HAGAR examination are not represented in these practice questions or in the material of the Study Guide. We must rely on our members who have recently taken the examination to advise us to any discrepancies between this Study Guide and the Examination.

1. When operating in accordance with VFR, hang gliders shall be flown:
 - a. outside designated airways
 - b. outside control zones
 - c. with visual reference to the ground or water
 - d. only in Class D Airspace

2. Except for the purpose of taking off or landing, a hang glider may not be flown at a height of less than _____ over an build-up area, except as otherwise directed by the ATC unit.
 - a. 1000 feet
 - b. 2000 feet
 - c. 3000 feet
 - d. 500 feet

3. When on final approach for landing, the right of way is normally given to:
 - a. faster aircrafts
 - b. slower aircrafts
 - c. aircraft at a higher altitude
 - d. aircraft at a lower altitude

4. Hazardous wake turbulence is produced by
 - a. all fixed and rotary wing aircraft
 - b. turbo-jet powered aircraft only
 - c. fast moving aeroplanes only, regardless of their weight
 - d. heavy aeroplanes only, regardless of their speed

5. Magnetic variation is defined as
 - a. an error in the compass caused by the magnetic field associated with metal in the airplane frame and engine
 - b. the difference between the magnetic track and the magnetic heading of the airplane
 - c. the angle between true north and magnetic north at any given point on the earth
 - d. the difference between true track and magnetic track

6. In the northern hemisphere, if your airplane is on a northerly heading and if a turn is made towards the east, the compass reading
- will lag or indicate a turn in the opposite direction
 - will lead or indicate a turn in the opposite direction
 - will not lead or lag
 - will be correct, providing the turn has been perfectly co-ordinated
7. Pilots should not low fly near farming activities because aircraft
- noise frighten livestock
 - shadows frighten livestock
 - may cause stampeding
 - may cause any of the above to occur.
8. Pilots should not overfly reindeer, caribou, moose or musk-oxen at an altitude of less than
- 1,000 feet AGL
 - 1,500 feet AGL
 - 2,000 feet AGL
 - 2,500 feet AGL
9. VFR Navigation Charts (VNC Series) are based on a Lambert Conformal Conic Projection. The following list contains three properties characteristic of this projection and three other properties characteristics of a Mercator projection.
- Meridians are straight, parallel lines, intersecting the parallel (which are also straight, parallel lines) at right angles
 - Meridians are converging lines, intersecting the parallels (which are concentric arcs of circles) at right angles
 - A straight line represents a great circle
 - A straight line represents a rhumb line
 - Scale errors are small, hence the scale may be considered constant over a single sheet
 - Scale varies with latitude and is only constant at the equator, hence distance must be measured on the latitude scale adjacent to the area.

Which of the following includes the three items which are characteristic of the Lambert Conformal Conic Projection?

- A-C-F
 - B-D-F
 - A-D-E
 - B-C-E
10. What does a map scale expressed in 1:1,000,000 mean:
- 1 inch = 8 miles
 - 1 inch on the map = one millionth of a mile
 - 1 mile equals 1,000,000 inches
 - 1 inch on the map = 1,000,000 inches on the ground

11. Complete familiarity with the compass rose is essential to navigation. Which of these statements is true?
 - a. the reciprocal of 267 degrees is 117 degrees
 - b. the direction NE is 090 degrees
 - c. to turn right 90 degrees from a heading of 145 degrees would be a turn to 235 degrees
 - d. the reciprocal of 115 degrees is 225 degrees

12. An airport is
 - a. a registered aerodrome
 - b. an aerodrome with a control tower
 - c. an aerodrome in respect of which a certificate is in force
 - d. an aerodrome with paved runways

13. The effect of alcohol decreases the brain's tolerance to hypoxia. This effect
 - a. decreases with an increase in altitude
 - b. increases with an increase in altitude
 - c. does not change with altitude
 - d. may be reduced by drinking coffee

14. The specified area associated with a mandatory frequency and within which a pilot is required to contact the ground station and report his intentions normally is
 - a. 5 n.m. in radius and extends up to 3000 ft. AGL
 - b. 10 n.m. in radius and extends up to 3000 ft. AGL
 - c. 5 n.m. in radius and extends up to 5000 ft. AGL
 - d. 10 n.m. in radius and extends up to 5000 ft. AGL

15. A pilot flying VFR and intending to land at an aerodrome where no mandatory frequency, aerodrome traffic frequency or ground station exists, should broadcast their intentions on
 - a. 123.2 MHz
 - b. 122.8 MHz
 - c. 126.7 MHz
 - d. 121.5 MHz

16. To transit VFR through any part of Class C Airspace, pilots must
 - a. have a special Class C endorsement to their HAGAR
 - b. monitor 126.7 MHz
 - c. advise ATC of their intentions and obtain a clearance
 - d. obtain prior permission in writing from ATC

17. Hazardous wake turbulence caused by aeroplanes in still air
 - a. dissipates immediately

- b. dissipates rapidly
 - c. may persist for five minutes or more
 - d. persists indefinitely
18. An airspace classified as Class F and indicated on an aeronautical chart by the code CYA(S) denotes
- a. a danger area with artillery activity
 - b. a restricted area with surveillance activity
 - c. an alert area with soaring activity
 - d. an airspace reservation
19. What should a pilot broadcast to indicate serious or imminent danger, and to request immediate assistance?
- a. MAYDAY, MAYDAY, MAYDAY
 - b. PAN PAN, PAN PAN, PAN PAN
 - c. SECUTITY, SECURITY, SECURITY
 - d. EMERGENCY, EMERGENCY, EMERGENCY
20. An Air Traffic Control "Instruction"
- a. is the same as an Air traffic Control "Clearance"
 - b. must be complied with when received by the pilot to whom it is directed unless he considers it unsafe to do so
 - c. must be "read back" in full to the controller and confirmed before coming effective
 - d. is in effect advice provided by ATC and does not require acceptance or formal acknowledgement by the pilot concerned
21. "Daylight" in Canada, at any place where the sun rises and sets daily, may be considered to be that period of time
- a. between sunrise and sunset
 - b. commencing one hour before sunrise and ending one hour after sunset
 - c. commencing one-half hour before sunrise and ending one-half hour after sunset
 - d. when the center of the sun's disc is not more than 12 degrees below the horizon when viewed from the surface.
22. The minimum flight visibility for airplanes under VFR outside controlled airspace, aerodrome traffic zones and special areas of British Columbia is _____; within control zones, the minimum visibility is _____. The missing figures are:
- a. 500 feet, 1 mile
 - b. 1 mile, 3 miles
 - c. 1 mile, 1 mile
 - d. 3 miles, 3 miles
23. The emergency VHF frequency is

- a. 122.1 MHz
 - b. 118.3 MHz
 - c. 121.5 MHz
 - d. 123.2 MHz
24. Daylight in Canada, at any place where the sun rises and sets daily, is defined as that period of time
- a. between sunrise and sunset
 - b. commencing one half hour before sunrise and ending one half hour after sunset
 - c. beginning at morning civil twilight and ending at evening civil twilight
 - d. when the centre of the sun's disk is not more than 12 degrees below the horizon when viewed from the surface
25. At high altitude, a pilot is subject to hypoxia. Hypoxia is:
- a. excess carbon monoxide in the hemoglobin
 - b. imbalance of oxygen and carbon dioxide in the body system
 - c. spatial disorientation
 - d. lack of sufficient oxygen in the body cells
26. To prevent hypoxia, a pilot should
- a. use oxygen above 5,000 feet ASL during daytime
 - b. breathe into a paper bag
 - c. use oxygen above 15,000 feet ASL during daytime
 - d. breathe deeply
27. No aircraft shall be flown in any aerobatic flight
- a. at an altitude below 2,000 feet AGL
 - b. in uncontrolled airspace
 - c. unless the flight has been authorized by the minister
 - d. over any urban or other populous area
28. One alcoholic drink taken at 5000 feet as compared to the same drink taken at sea level
- a. has a lesser effect
 - b. has a greater effect
 - c. has no appreciable difference in effect
 - d. increases the chance of coriolis effect
29. Which of the following statements pertaining to the use of alcohol is true?
- a. relatively small amount of alcohol significantly decrease a pilot's tolerance to hypoxia
 - b. Small amount of alcohol will not affect a pilot's judgment
 - c. The effects of alcohol are constant regardless of altitude
 - d. Coffee accelerates the body's ability to recover from the effects of alcohol
30. Select the statement that best describe the effects of fatigue.

- a. Financial or family problems do not influence fatigue
 - b. Fatigue slows reaction time and contributes to errors.
 - c. A fatigued person recuperates more quickly as altitude is gained
 - d. A fatigued person must have food immediately before and after a flight
31. After any underwater activity where compressed air is used for respiration, it is recommended that within 24 hours following such activity a pilot should
- a. not fly
 - b. restrict flights to altitude of less than 7000 feet
 - c. restricts rate of climbs and descent to less than 300 feet per minutes
 - d. restricts flight to passenger status only.
32. Many common drugs such as cold tablets, cough mixtures, antihistamines and other over-the-counter remedies may seriously impair the judgment and co-ordination needed while flying. The safest rule is to
- a. read the manufacturer's warning to ensure that you are aware of possible reactions to such drugs
 - b. allow at least 8 hours between taking any medicine or drugs and flying
 - c. allow at least 48 hours after commencing medication to check for possible side effects
 - d. take no medicine while flying except on the advice of your aviation medical examiner
33. A condition in which there is a lowering of the temperature of the body's core is called
- a. hyperventilation
 - b. hypoglycemia
 - c. coriolis effect
 - d. hypothermia
34. 1045 Mountain Daylight Time is
- a. 1745 Z
 - b. 1645 Z
 - c. 0245 Z
 - d. 0345 Z
35. Normally a NOTAM is
- a. issued at least 48 hours before becoming effective
 - b. distributed by telecommunication systems
 - c. distributed by first-class mail
 - d. issued only to high-level airspace users
36. A responsibility of flight service specialists is to
- a. control air traffic
 - b. provide flight planning services
 - c. provide air traffic services in uncontrolled airspace only
 - d. monitor pilot and aircraft licenses

37. Within what distance from the center of an uncontrolled airport are hang gliders flight prohibited, unless prior permission has been obtained?
- 5 nautical miles
 - 7 nautical miles
 - 10 nautical miles
 - 15 nautical miles
38. Ear pain, caused by a rapid decrease in altitude, may be relieved by
- swallowing or yawning
 - pulling on the ear lobes
 - reducing breathing rate
 - inducing extra “G” force
39. Controlled Airspace means all airspace of defined dimensions within which
- an air traffic control service is provided
 - security regulations are in force
 - special VFR flight only is permitted
 - control zone regulations are in force
40. The airspace around an airport under control tower control to a specific height is known as
- a terminal control area
 - a control area
 - a control zone
 - an aerodrome traffic zone
41. To determine the location and base of low level controlled airspace, you should consult
- the VFR Navigation Charts
 - the VFR Terminal Area Charts
 - the Designated Airspace Handbook
 - Any of the above
42. Low Level Airspace is defined as all airspace
- within the Canadian Domestic Airspace below 18,000 feet ASL
 - extending upwards from the surface of the earth within designated airways
 - extending upwards from 700 feet AGL within designated airspace
 - extending upwards from 2,200 feet AGL within designated airways
43. Which statement is correct with regard to “restricted areas”?
- Transient aircraft entering active restricted areas shall be equipped with two-way radio communication
 - Only military aircraft may enter restricted area depicted on aeronautical charts
 - Aircrafts may enter restricted areas provided pilots adhere to entry times specified in the flight plan

- d. No aircraft may enter active restricted areas except in accordance with permission issued by the controlling authority
- 44. The pilot of a hang glider shall make initial radio contact with a control tower in Class C airspace
 - a. immediately after entering the control zone
 - b. 10 NM outside the control zone
 - c. prior to entering the control zone
 - d. immediately prior to joining the circuit
- 45. Where a forest fire area has been designated, no aircraft shall be operated below
 - a. 1,000 feet AGL within 3 NM of this area
 - b. 2,000 feet AGL within 3 NM of this area
 - c. 2,000 feet AGL within 5 NM of this area
 - d. 3,000 feet AGL within 5 NM of this area
- 46. Hang gliders shall be flown
 - a. clear of designated airways
 - b. clear of terminal control areas
 - c. with visual reference to the ground or water
 - d. in compliance with all of the above
- 47. When in VFR flight within a control zone, a pilot shall remain clear of cloud by at least
 - a. 500 feet vertically and 1 mile horizontally
 - b. 500 feet vertically and 2,000 feet horizontally
 - c. 1,000 feet vertically and 1 mile horizontally
 - d. 1,000 feet vertically and 3 miles horizontally
- 48. The minimum flight visibility for aircraft in VFR flights outside controlled airspace, Aerodrome Traffic Zones and special areas of British Columbia is
 - a. 2,000 feet
 - b. 1 mile
 - c. 2 miles
 - d. 3 miles
- 49. An aircraft is in level VFR flight above 3,000 feet AGL in Class E airspace. As the track is 315 degrees, the aircraft shall be operated at an
 - a. even thousand foot altitude
 - b. even thousand plus 500 foot altitude
 - c. odd thousand foot altitude
 - d. odd thousand plus 500 foot altitude
- 50. Before setting out on any VFR flight, a pilot is required to
 - a. file a flight notification

- b. obtain an ATC clearance
 - c. read all weather reports received from stations within 100 miles of destination
 - d. familiarize himself with all available information appropriate to the flight
51. No person shall drop anything from an aircraft in flight
- a. unless it is attached to a parachute
 - b. unless approval has been granted by the minister of Transport
 - c. unless over an authorized jettison area
 - d. which will create a hazard to person or property
52. When two hang gliders are converging at approximately the same altitude
- a. both hang glider will alter heading to the left
 - b. the hang glider on the right will avoid the other by descending
 - c. the hang glider that has the other on its left shall give way
 - d. the hang glider that has the other on its right shall give way
53. An aircraft overtaking another aircraft shall keep out of the way by
- a. altering heading to the right
 - b. descending
 - c. climbing
 - d. altering heading to the left
54. When two aircraft are approaching head-on and there is a danger of collision, each shall
- a. wait for the opposite to climb or descend and do the opposite
 - b. alter heading to the left
 - c. alter heading to the right
 - d. reduce speed
55. When two aircraft are converging in flight
- a. helicopters shall give way to ultra-light aeroplanes
 - b. an aeroplane towing a banner shall give way to ultra-light aeroplanes
 - c. ultra-light aeroplanes shall give way to hang gliders
 - d. balloons shall give way to hang gliders
56. Except for the purpose of taking off or landing, an aircraft shall not be flown over an aerodrome at a height of less than
- a. 2,000 feet AGL
 - b. 2,000 feet ASL
 - c. 1,000 feet AGL
 - d. 1,000 feet ASL
57. A pilot may, over non-populous areas or over open water, fly an aircraft at a lower attitude than _____ above the highest obstacle provided the flight is conducted without creating a hazard to persons or property and the aircraft is not flown at a distance less

- than _____ from any person, vessel, vehicle or structure. The correct entries to complete the blank spaces are respectively:
- a. 500 feet, 200 feet
 - b. 500 feet, 500 feet
 - c. 1,000 feet, 2,000 feet
 - d. 1,000 feet, 1 mile
58. Except as provided by Air regulations, unless taking off, landing or attempting to land, no person shall fly an aircraft over the built-up area of any city, town or other settlement or over any open air assembly of persons except at an altitude that will permit, in the event of an emergency, the landing of the aircraft without creating a hazard to persons or property on the surface of the earth, and such altitude shall not in any case be less than _____ above the highest obstacle within a radius of _____ from the aircraft. The correct entries to complete the blank space are respectively:
- a. 500 feet, 500 feet
 - b. 1,000 feet, 2,000 feet
 - c. 2,000 feet, 1,000 feet
 - d. 3,000 feet, 1 mile
59. Formation flying is permitted only if such flights
- a. have been pre-arranged by the pilots in command
 - b. are conducted above 3,000 feet AGL
 - c. are conducted by commercial pilots
 - d. are led by a pilot who has previous experience with formation flying
60. No person shall fly a hang glider for more than _____ at an altitude between 10,000 and 13,000 feet ASL unless an oxygen mask and a supply of oxygen is readily available to the pilot. The correct entry to complete the blank space is:
- a. 15 minutes
 - b. 30 minutes
 - c. 1 hour
 - d. 2 hour
61. Unless oxygen and oxygen masks are used, no person shall fly an aircraft above
- a. 13,000 feet ASL
 - b. 12,500 feet ASL
 - c. 10,000 feet ASL
 - d. 9,500 feet ASL
62. At uncontrolled aerodromes where no ground stations exists, the Aerodrome Traffic frequency (ATF) is usually designated as
- a. 121.5 MHz
 - b. 122.2 MHz

- c. 123.2 MHz
 - d. 126.7 MHz
63. Which statement most completely describes the movement of wing tip vortices?
- a. Vortices normally settle below and behind the generating aircraft
 - b. With a light crosswind, one vortex can remain stationary over the ground for some time
 - c. Lateral movement of vortices may place a vortex core over a parallel runway
 - d. Statement (a), (b) and (c)
64. Chrome yellow and black strips painted on pylons or on the roof of a building identifies
- a. an area where explosives are in used
 - b. an open pit mine
 - c. an artillery range
 - d. a fur farm

The following 7 questions use the Vancouver VNC.

- A1. What can be found at N48°41.03 W123°55.33?
- a. The Duncan aerodrome
 - b. A hilltop
 - c. A VORTAC
 - d. CYA 145(H)
- A2. You are flying over Lake Cowichan (N48°49.44' W124°3.24') on a true heading (from your GPS) of 113°. What is your magnetic heading?
- a. 129°45'
 - b. 129°30'
 - c. 96°30'
 - d. 96°15'
- A3. What are the coordinates for Victoria International Airport?
- a. N48°40.67' W123°32.10'
 - b. N48°38.88' W123°38.38'
 - c. N48°57.68' W122°27.77'
 - d. N48°38.84' W123°25.89'
- A4. What activities can you expect in CYA 118 (A) (T) (H)?
- a. Soaring, training and helicopters
 - b. Training, hang gliding and aerobatics
 - c. Testing, aerobatics and helicopters
 - d. Helicopters, testing and surveying work

- A5. What is the airspace within the CZ of the Nanaimo airport (N49°03.3' W123°52.2')?
- a. Class E
 - b. Class D
 - c. Class C
 - d. Class G
- A6. What is the frequency used by the control tower at Nanaimo Airport?
- a. 123.2 MHz
 - b. 122.1 MHz
 - c. There is no control tower
 - d. 128.425 MHz
- A7. To what altitude does Class G airspace extends to just to the West (and outside of) the Nanaimo airport CZ?
- a. 2,200' AGL
 - b. 9,500' ASL
 - c. 700' AGL
 - d. 1,500' AGL

The following 7 questions use the Montreal VNC.

- B1. What is the class of airspace at 8,000 ft AGL at coordinates N45°54.70' W73°39.98'?
- a. Class C
 - b. Class D
 - c. Class E
 - d. None of the above
- B2. What is the class of airspace at 3,000 ft ASL at the same coordinates?
- a. Class C
 - b. Class D
 - c. Class E
 - d. None of the above
- B3. What is the class of airspace at 2,400 ft AGL at the same coordinates?
- a. Class C
 - b. Class D
 - c. Class E
 - d. None of the above
- B4. What is the highest obstacle within CYA 621 (H) at N45°27.26' W72°50.92'?
- a. Mountain top at 1,364' ABL
 - b. Mountain top at 1,364' ASL
 - c. Mountain top at 1,364' AGL
 - d. None of the above

- B5. What is the type of CZ for St-Hubert airport at N45°31.84' W73°24.98'?
- a. Class E
 - b. Class C
 - c. Class D
 - e. Class G
- B6. What altitude does the St-Hubert CZ extends to?
- a. 3,000 ft ASL
 - b. 3,000 ft AGL
 - c. 2,500 ft ASL
 - d. None of the above
- B7. What airspace exists above the St-Hubert CZ?
- a. Class C
 - b. Class D
 - c. Class E
 - d. None of the above

Answers:

Q	A	Q	A	Q	A	Q	A
1	c	25	d	49	b	B2	c
2	a	26	a	50	d	B3	c
3	d	27	d	51	d	B4	b
4	a	28	b	52	d	B5	c
5	c	29	a	53	a	B6	c
6	a	30	b	54	c	B7	a
7	d	31	a	55	c		
8	c	32	d	56	a		
9	d	33	d	57	b		
10	d	34	b	58	b		
11	c	35	b	59	a		
12	c	36	b	60	b		
13	b	37	a	61	a		
14	a	38	a	62	c		
15	a	39	a	63	d		
16	c	40	c	64	d		
17	c	41	d	A1	b		
18	c	42	a	A2	a		
19	a	43	d	A3	d		
20	b	44	c	A4	b		
21	c	45	d	A5	a		
22	b	46	d	A6	c		
23	c	47	a	A7	c		
24	c	48	b	B1	a		