



**HPAC / ACVL STUDY GUIDE FOR
THE HAGAR EXAMINATION
VERSION 2.01**

1 January 2003

PREFACE

This study guide for the Hang Glider Air Regulations (HAGAR) examination covers the material that hang glider and paraglider pilots need to know in order to write the examination successfully. In the preparation of this study guide, care has been taken to ensure that the information it contains is accurate and complete. However, it is possible that some material was overlooked or is incorrect in this version of the guide. 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. Feedback from candidates that have recently written the HAGAR Examination is particularly welcome.

The material in this guide has been compiled from Transport Canada publications and other sources.

Some candidates may question the relevance of some of the information contained in this guide.

However, the material in the Guide is examinable so candidates should be familiar with it. Some comments have been added in *italic* to clarify some of the information. The content of these comments is not examinable.

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I wish to thank the members who have taken the time to suggest improvement to this version of the Guide.

Andre Nadeau, Transport Canada Liaison

WHAT'S NEW IN VERSION 2.01

The main change in Version 1.5 that was published in early December 2002 was the addition of sample questions in Annex C. The main change in Version 2.0 is the addition of many more questions. Some of the material has been beefed up as well. Version 2.01: minor typos corrected (19-May-2003).

INTRODUCTION

About the HAGAR Examination

Transport Canada mandates that pilots wishing to conduct hang gliding and paragliding operations in controlled airspace must demonstrate their knowledge by writing the HAGAR examination.

The HAGAR Examination lasts for 2 1/2 hours. The passing mark is 60%. There is no longer a fee to write the examination¹.

Successful completion of the HAGAR examination is a pre-requisite for obtaining an HPAC/ACVL Intermediate and higher pilot ratings for hang gliding and paragliding.

Candidates should consider bringing a long ruler and a calculator to the examination.

How to Register for the HAGAR Examination

Transport Canada, or a duly delegated authority, administers the HAGAR Examination to candidate. To obtain a list of location and time to write the examination, contact your Transport Canada regional office. Each regional office has made its own arrangement for the administration of the examination and these vary per region.

The contacts are:

Pacific Region	(604) 666-5851
Prairies and Northern Region	(204) 983-4335 in MB and (780) 495-2524 in AB
Ontario	(416) 952-0164
Quebec	(514) 633-3030
Atlantic Region	(506) 851-7220

Better still, ask a local pilot who has already written the examination about the procedure to book a time to write the examination yourself.

Comment on Scope

It is important to recognize that this is a Study Guide for a specific examination. This Guide does not touch on many topics that may be relevant to 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 CAR and air operation in general.

Comments on Units

Aviation uses specific units. For example, distance are usually expressed in nautical miles (NM), speed are expressed in knots and visibility in statute miles (SM). Unless specified otherwise, these units are assumed.

CATEGORY 4 MEDICAL DECLARATION

All pilots flying in controlled airspace must complete a Category 4 Medical Declaration at a minimum.

This form can be found on the Transport Canada site at http://www.tc.gc.ca/wwwdocs/Forms/26-0297_0712-06_BO.pdf

¹ The fee of \$35 was abolished in early 2002.

FUTURE CHANGES TO THE CARs

Some amendments to the CARs have been approved by Transport Canada and will likely be implemented in 2003. They are briefly described here for your information. These changes are NOT part of the examination.

The amendments can be broken down in two categories: structure and content.

Structural Amendments

Structural amendments relate to the way the regulations are organized in the CARs, not changes to individual regulations. Currently, the regulations for hang gliders are combined with regulations for ultralight aircraft in CAR 602.29. Transport Canada has recognized that this is less than ideal and is reorganizing the structure of the CARs so that hang gliding regulations are consolidated into their own sections. In fact, there will be two sections that deal specifically with hang gliders. The first one is CAR 603.77 that specifies the general hang gliding operation rules. The second one is CAR 605.114 that specifies equipment requirements for hang gliders. Note that this does not mean that the only regulations that apply to hang gliders are in those two sections. There are other CARs that apply to all aircraft and those are still relevant to hang glider pilots.

Content Amendments

There is nothing earth shattering in the amendment to individual CARs themselves. The amended regulations, for the most part, close existing loopholes, clear up some confusing issues and eliminate some regulations that are not necessary. This list is not exhaustive but these are the changes that will interest most pilots.

Flights in Class B, C, D and E. The current regulations only address hang glider flights in Class E airspace. There is no mention of other controlled airspaces. The amended CARs specify the conditions that hang gliders must meet to fly in Class B, C, D and E controlled airspaces. This eliminates a potential source of confusion.

Cross-Country Flights. The current regulation specifies that hang gliders are only allowed in Class E airspace if they conduct XC flights.

The CARAC has approved the deletion of the above regulation and non-cross-country flights are now allowed in Class E. Furthermore, there has never been any regulation specifying that flights in Class B, C and D had to be cross-country flights so non cross-country flights are also allowed in these airspaces as well as long as the pilot obeys the other regulations that apply to those airspaces. These changes ease regulations imposed on hang gliders.

Requirement to Contact FSS. The current regulation specifies that hang gliders must inform the nearest flight service station of the time of departure and estimated duration of the (XC) flight in Class E airspace.

The CARAC has approved an amendment that removes this requirement entirely. This change eases regulations imposed on hang gliders. Note that since a pilot must be in radio contact with an ATC unit when they fly in Class B, C and D, there is no requirement to inform an FSS of a flight in those airspaces either.

Requirement to carry a compass. The current CARs specify that a hang glider flying in Class E must carry a compass.

The CARAC has approved two amendments to this regulation. First, a GPS can now be used in lieu of a compass. Second, the new regulation specifies that a compass or GPS must be carried in Class E for XC flights and at all times in Class B, C and D. This means that a compass is no longer required in Class E for non cross-country flights.

Requirement to carry an altimeter. The current CARs specify that a hang glider flying in Class E must carry an altimeter.

The CARAC has approved an amendment to this regulation. A hang glider must now carry an altimeter in all controlled airspace. This change just acknowledges that hang gliders can fly in Class B, C and D airspaces and removes a potential loophole.

Aerotowing. The current regulation specifies that a person operating a Flight Training Unit (FTU) can use ultralight aircraft to tow hang gliders for the purpose of providing hang gliding flight instruction.

The CARAC has approved an amendment that specifies that a FTU can use ultralight aircraft to tow hang gliders for recreational flights as well.

The significance of this change is obvious. After a pilot completes its training, he can continue to be aerotowed for recreational flying, something that is not currently permitted by the CARs but is happening on a regular basis at Canadian flight parks. Note however, that recreational aerotowing is still permitted only at FTUs. Note also that there are some conditions that must be met before aerotowing operations can begin. I will address these in a future article.

Flight Training. Presently, a "person" cannot conduct flight training for a glider (including hang glider and paraglider) unless they are a club, school or other organization.

The CARAC has approved an amendment that specifies that a person can now conduct flight training as well. That is self-explanatory.

SECTION 1 – CANADIAN AVIATION REGULATIONS (CARs)

What Are CARs?

In 1996, Transport Canada (TC) concluded a total revision of the aviation safety regulations. The revision incorporates recommendations made by the Moshansky Commission, the 1992/93 Federal Regulatory Review, the TCA Rules Harmonization Project, and the Transportation Safety Board. The new regulations are entitled the Canadian Aviation Regulations (CARs) and are more complete and easier to understand than the old regulations, while maintaining or enhancing safety. Developed in consultation with the aviation community as part of the Canadian Aviation Regulation Advisory Council (or CARAC) process, the new regulations exemplify the benefits of the partnership approach. The CARs are available on the Internet at: <http://www.tc.gc.ca/civilaviation/regserv/affairs/cars/menu.htm>

Many of the CARs are vague on purpose because they refer to topics that are covered in other TC publications. Where appropriate, information from those other publications has been incorporated in the Study Guide.

The A.I.P Canada is the most useful publication produced for pilots by TC. It provides flight crews with a single source for information concerning rules of the air and procedures for aircraft operation in Canadian airspace. It includes those sections of the Canadian Aviation Regulations (CARs) of interest to pilots. A free copy of the A.I.P is given to every newly licensed pilot (excluding HPAC/ACVL certification) along with amendments for the first year. The A.I.P are not currently on the Internet but TC has a project to make them available at a later date. HPAC/ACVL members may purchase a copy from the Canadian Government Publishing at <http://www.tc.gc.ca/civilaviation/publications/tp14371/menu.htm>

The HPAC/ACVL Transport Canada Liaison participates in the CARAC process on behalf of the HPAC/ACVL. The current HPAC/ACVL Transport Canada Liaison is Andre Nadeau. He can be contacted by e-mail at annadeau@intranet.ca or by phone at 613-837-5482.

Definitions

The definitions in CARs that apply to hang gliding and paragliding are attached as Annex A to this guide. Candidates should be familiar with these definitions. Note that paragliders are not defined in CARs. However, TC assumes that paragliders are hang gliders. In the remainder of this Study Guide the terms hang glider and hang gliding will apply to both hang gliders and paragliders. By definition, hang gliders are aircraft. They are also gliders. Therefore, they are subject to CARs which cover the movement of gliders in Canada.

The HPAC/ACVL has proposed to TC that paragliders be defined as hang gliders with no rigid structure.

Hang gliding is partly self-regulated and is exempt from some of the CARs. The HPAC/ACVL has put in place its own regulations as appropriate. An example is the pilot certification program.

Exemptions from CARs.

The following exemptions from 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;
- h. hang gliders need not be equipped with an emergency locator transmitter (ELT).

General Operating and Flight Rules

Overview. The General Operating and Flight Rules of the CARs that pertains to hang gliders follow. In this section, regulations that apply to all aircraft will use the word aircraft. Regulations that apply specifically to hang glider will use the term hang glider.

Reckless or Negligent Operation of Aircraft. No person shall operate an aircraft in such a reckless or negligent manner as to endanger the life or property of any person.

Alcohol and Drugs. No pilot shall act as a pilot of an aircraft:

- a. within eight hours after consuming an alcoholic beverage;
- b. while under the influence of alcohol; or
- c. while using any drug that impairs the person's faculties to the extent that the safety of the aircraft or of passengers on board the hang glider is endangered in any way.

Right of Way.

1. Notwithstanding any other provisions of this section,
 - a. the pilot-in-command of an aircraft that has the right of way shall, if there is any risk of collision, take such action as is necessary to avoid collision; and
 - b. where the pilot-in-command of an aircraft is aware that another aircraft is in an emergency situation, the pilot-in-command shall give way to that other aircraft.
2. When two aircraft are converging at approximately the same altitude, the pilot-in-command of the aircraft that has the other on its right shall give way, except as follows:
 - a. a power-driven, heavier-than-air aircraft shall give way to airships, gliders, parachutes and balloons;
 - b. an airship shall give way to parachute and balloons;
 - c. a glider shall give way to parachute and balloons; and
 - d. a power-driven aircraft shall give way to aircraft that are seen to be towing gliders or other objects or carrying a slung load.

The HAGAR examination may not yet refer to parachutes in questions dealing with right of way. The CARs were amended in Fall 99 to add parachutes to the articles with right of way. It may take a while before the HAGAR examination is amended accordingly.

3. Where an aircraft is required to give way to another aircraft, the pilot-in-command of the first-mentioned aircraft shall not pass over or under, or cross ahead of, the other aircraft unless passing or crossing at such a distance as will not create a risk of collision.
4. Where two aircraft are approaching head-on or approximately so and there is a risk of collision, the pilot-in-command of each aircraft shall alter its heading to the right.

5. An aircraft that is being overtaken has the right of way and the pilot-in-command of the overtaking aircraft, whether climbing, descending or in level flight, shall give way to the other aircraft by altering the heading of the overtaking aircraft to the right, and no subsequent change in the relative positions of the two aircraft shall absolve the pilot-in-command of the overtaking aircraft from this obligation until that aircraft has entirely passed and is clear of the other aircraft.
6. When an aircraft is in flight or manoeuvring on the surface, the pilot-in-command of the aircraft shall give way to an aircraft that is landing or about to land.
7. The pilot-in-command of an aircraft that is approaching an aerodrome (LZ) for the purpose of landing shall give way to any aircraft at a lower altitude that is also approaching the aerodrome (LZ) for the purpose of landing.
8. The pilot-in-command of an aircraft at a lower altitude, as described in subsection (8), shall not overtake or cut in front of an aircraft at a higher altitude that is in the final stages of an approach to land.
9. No person shall conduct or attempt to conduct a take-off or landing 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.

Notice that 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.

Avoidance of Collision. No person shall operate an aircraft in such proximity to another aircraft as to create a risk of collision.

Dropping of Objects. No person shall create a hazard to persons or property on the surface by dropping an object from an aircraft in flight.

Formation Flight. No person shall operate an aircraft in formation with other aircraft except by pre-arrangement between:

- a. the pilots-in-command of the aircraft; or
- b. where the flight is conducted within a control zone, the pilots-in-command and the appropriate air traffic control unit.

Aerobatic Flight.

1. No aircraft shall be flown in any aerobatic flight:
 - a. so as to endanger or be likely to endanger air traffic in the vicinity of the aircraft;
 - 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. No person shall carry out any aerobatic flying unless he is alone in the aircraft, or is a flying instructor authorized by regulations to give dual aerobatic instruction.

Hang Glider and Paraglider Operations

1. No person shall operate 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. subject to section 2 and 3 (below), in controlled airspace;

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- d. unless the hang glider is equipped with
 - (1) a suitable means of restraint that is attached to the primary structure of the aircraft;
 - (2) a radio communication system adequate to permit two-way communication on the appropriate frequency when the aircraft is operated within:
 - (a) Class D airspace;
 - (b) the Air Defence Interception Zone (ADIZ);
 - (c) a Mandatory Frequency (MF) area.
 - e. subject to sections 4 and 5 (below), while carrying another person on board; or
 - f. unless each person on board:
 - (1) is secured by a means of restraint referred to in subparagraph d(1), and
 - (2) is wearing a protective helmet.
2. A person may 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 where the person has obtained permission from the airport operator; or
 - b. within a control zone of a controlled airport where the person has obtained an air traffic control clearance by two-way voice communication from the air traffic control unit of the airport.
 3. A person may operate a hang glider in Class E airspace where:
 - 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. the pilot informs the nearest flight service station (FSS) of the time of departure and estimated duration of the flight in Class E airspace.
 4. A person may operate a hang glider with another person on board where the flight is conducted for the purpose of providing dual flight instruction.

Minimum Visual Meteorological Conditions for VFR Flight in Controlled Airspace. No

person shall operate an aircraft in VFR flight within controlled airspace unless:

- a. the aircraft is operated with 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
- d. where the aircraft is operated within a control zone,
 - (1) when reported, ground visibility is not less than three miles, and
 - (2) except when taking off or landing, the distance of the hang glider from the surface is not less than 500 feet.

Minimum Visual Meteorological Conditions for VFR Flight in Uncontrolled Airspace. No

person shall operate an aircraft in VFR flight within uncontrolled airspace unless

- a. the aircraft is operated with visual reference to the surface;
- b. where the aircraft is operated at or above 1,000 feet AGL
 - (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, the distance of the hang glider from cloud is not less than 500 feet vertically and 2,000 feet horizontally;

- c. where the aircraft is not a helicopter and is operated at less than 1,000 feet AGL
 - (1) during the day, flight visibility is not less than two miles, except if otherwise authorized in an air operator certificate or a private operator certificate,
 - (2) during the night, flight visibility is not less than three miles, and
 - (3) in either case, the aircraft is operated clear of cloud.

VFR Over-the-Top. VFR over-the-top (VFR OTT) refers to VFR flights above the clouds. An aircraft may be operated in VFR OTT flight during the cruise portion of the flight during the day if:

- a. the aircraft is operated at a vertical distance from cloud of at least 1,000 feet;
- b. where the aircraft is operated between two cloud layers, the vertical distance between the layers is at least 5,000 feet;
- c. flight visibility at the cruising altitude of the aircraft is at least five miles; and
- d. the weather at the aerodrome of destination is forecast to have a sky condition of scattered cloud or clear and a ground visibility of five miles or greater with no forecast of precipitation, fog, thunderstorms or blowing snow, and those conditions are forecast to exist
 - (1) where the forecast is an aerodrome forecast, for the period from one hour before to two hours after the estimated time of arrival; and
 - (2) where an aerodrome forecast (TAF) is not available and the forecast is an area forecast (FA), for the period from one hour before to three hours after the estimated time of arrival.

Although it may appear that VFR OTT does not apply to hang glider, this is not true. Hang gliders have been flying over clouds in the past. For example, it is quite possible for a hang glider to take off from a site that is above the cloud. It is also possible for a hang glider to be aerotowed above the cloud so this section is quite relevant.

Cruising Altitudes in VFR Flight. In level VFR flights above 3,000 ft AGL, aircraft shall be operated at an altitude depending on their magnetic track in the Southern Domestic Airspace and their true track in the Northern Domestic Airspace as follows:

- a. Track 000° to 179°: Odd thousands plus 500 feet; and
- b. Track 180° to 359°: Even thousands plus 500 feet

So, an aircraft heading east must fly at 3500', 5500' etc. while an aircraft flying west must fly at 4500', 6500' etc.

Cruising Altitudes in IFR Flight. In level IFR flights above 3,000 ft AGL, aircraft shall be operated at an altitude depending on their magnetic track in the Southern Domestic Airspace and their true track in the Northern Domestic Airspace as follows:

- a. Track 000° to 179°: Odd thousands feet; and
- b. Track 180° to 359°: Even thousands

So, an aircraft heading east must fly at 3000', 5000' etc. while an aircraft flying west must fly at 4000', 6000' etc. This material is examinable because pilots should know the altitude at which they can expect to meet IFR traffic. Note that most commercial aviation operate under IFR condition at all times.

Low-Flying – Minimum Altitude

1. No person shall fly an aircraft at a height of less than 2,000 ft AGL over an aerodrome except for the purpose of landing and taking off except as otherwise directed by an air traffic control unit.

2. No person shall fly an aircraft:
 - a. over the build-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 1,000 feet above the highest obstacle within a radius of 2,000 feet from the aircraft;
 - b. elsewhere than over the built-up area of any city, town or settlement or over any open air assembly of persons at an altitude less than 500 feet above the highest obstacle within a radius of 500 feet from the aircraft.

3. For the purpose of section 2 above, an aircraft shall be deemed to be over the built-up area of any city, town or other settlement or over any open air assembly of persons where that built-up area or open air assembly of persons is within a radius of 2,000 feet from the aircraft.

4. A person may fly an aircraft at an altitude lower than those specified in section 2 above where the flight is conducted without creating a hazard to persons or property on the surface of the earth and
 - a. the aircraft is operated in the service of a police authority within the geographic jurisdiction of the government that established that police authority;
 - b. the flight is necessary for the purpose of saving human life; or
 - c. the aircraft is flown for fire fighting or air ambulance operations.

5. A person may fly an aircraft at a lower altitude than the one specified in section 2b above where:
 - a. the flight is conducted without creating a hazard to person or property; and
 - b. the aircraft is flown in a special purpose operation of a nature that necessitates the flight of the aircraft at such lower altitude.

6. A person may, over non-populous areas or over water, fly an aircraft at a lower altitude than the one specified in section 2b above where:
 - a. the flight is conducted without creating a hazard to person or property; and
 - b. except for an aircraft operated in accordance to sections 4 or 5 above, the aircraft is not flown at a distance less than 500 feet from any person, vessel, vehicle or structure.

7. Except in accordance with an authorization issued by the Minister, no person shall cause any aircraft to take off from, land on or attempt to land on, any surface within the built-up area of any city or town unless:
 - a. the surface is an airport or a military aerodrome;
 - b. the aircraft is operated in the service of a police authority within the geographic jurisdiction of the government that established that police authority; or
 - c. the take off or landing is necessary for the purpose of saving human life.

Flights over Water. Approved life jackets suitable for each person on board are required to be carried:

- a. on all aircraft taking off from or landing on water;
- b. on all aircraft being flown beyond gliding distance from shore.

Use of Oxygen. No person shall fly an aircraft;

- a. for more than thirty minutes at an altitude between 10,000 and 13,000 feet ASL; or
- b. at an altitude above 13,000 feet ASL unless there is readily available to each flight crew member an oxygen mask and a supply of oxygen.

Forest Fire Aircraft Operating Instruction. No person shall operate an aircraft:

- 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.

Penalties for Breaking Regulations

As with any regulations, there are penalties for breaking the CAR. The penalties can be monetary or can involve the loss of licenses. There have been cases where hang glider pilots have been penalized for breaking the CARs.

SECTION 2 – CANADIAN AIRSPACE

Airspace Structure

Canadian Domestic Airspace. Canadian domestic airspace is geographically divided into the Southern Domestic Airspace, the Northern Domestic Airspace and the Arctic Domestic Airspace. In the Southern Domestic Airspace, magnetic track is used to determine cruising altitude for direction of flight.

The Magnetic North Pole is located near the centre of the Northern Domestic Airspace, therefore magnetic compass indication may be erratic². Thus, the Northern Domestic Airspace and Arctic Domestic Airspace, runway headings is given in true heading and true track is used to determine cruising altitude for direction of flight in lieu of magnetic track.

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. In the Northern Domestic airspace, all high-level airspace above Flight Level 230 (i.e. 23,000 ft) is controlled and the airspace between 18,000 ft ASL and FL 230 is uncontrolled. In the Arctic Domestic Airspace, all high-level airspace above FL 280 is controlled and the airspace between 18,000 ft ASL and FL 280 is uncontrolled.

Controlled and Uncontrolled Airspace. All airspace over Canada is either:

- a. **Controlled Airspace.** Controlled Airspace is that airspace within which Air Traffic Control (ATC) service is provided and some or all aircraft may be subject to air traffic control. Controlled airspace can consists of the following types of airspace:
 - (1) control area extensions;
 - (2) control zones;
 - (3) high-level airways;
 - (4) low-level airways;
 - (5) Arctic, Northern and Southern Control Areas;
 - (6) terminal control areas;
 - (7) transitions areas;
 - (8) restricted airspace;
 - (9) advisory airspace; (10) military operations areas; and
 - (11) danger areas

Some people get confused about controlled airspace. The key is that some aircraft are controlled in controlled airspace, not all of them. For example, IFR aircraft are always controlled in controlled airspace but VFR aircraft, including HG and PG, are only controlled in some specific classes of controlled airspace. For example, VFR aircraft are not controlled in Class E controlled airspace.

- b. **Uncontrolled Airspace.** Uncontrolled airspace is that airspace in which ATC units have neither the authority nor the responsibility to exercise control over air traffic. However, ATC and Flight Service Stations (FSS) units provide flight information and alerting services for search and rescue. Uncontrolled airspace can consists of the following types of airspace:
 - (1) high-level air routes;
 - (2) low-level air routes;
 - (3) restricted airspace;
 - (4) advisory airspace;
 - (5) military operations areas; and
 - (6) danger areas.

²See Section 4 for an explanation of magnetic and true track.

Control Zones. Control zones have been designated around certain aerodromes to facilitate the control of VFR and IFR traffic. They have various radii, normally between 3 and 10 NM, centered on the aerodrome and extend upwards from the surface to 3,000 ft AGL unless specified otherwise. All IFR traffic within Control zones is controlled. VFR traffic is controlled only when a tower is in operation. Hang gliders must obtain authorization from the airport operator or from the airport control tower (when in operation) before entering a control zone.

Aerodrome Traffic Zones. Aerodrome traffic zones surround certain uncontrolled aerodromes. They are normally centered on the aerodrome, have a radius of 5 NM and extend vertically to 3,000 ft AGL. As uncontrolled airspace, they are open to hang glider unless they overlie by controlled airspace such as an airway.

Control Areas. Control areas in the low-level airspace consists of controlled airspace that is designated as either airways, control area extensions, transition areas, or terminal control areas. Hang gliders are not allowed in control areas.

- a. **Low-level airways.** Low-level airways are established between two radio-communication aid facilities. They include all airspace extending upwards from 2,200 ft AGL to the ceiling of the low-level airspace and within the airway boundary as shown on the diagrams at Annex B. Note that the dimensions of VHF/UHF and LF/MF airways are not the same.
- b. **Control Area Extensions.** Control area extensions are designated low-level controlled airspace used either to provide additional airspace for IFR traffic at busiest airports, or to connect two control areas. Normally, control area extensions are based at 2,200 ft AGL and extend up to the ceiling of low-level airspace. The outer portions of some control area extensions are based at even greater heights.
- c. **Transition Areas.** Transition areas are controlled airspace of defined dimensions extending upwards from 700 ft AGL, unless otherwise specified, to the base of overlying controlled airspace. Transition areas provide additional controlled airspace for instrument approach and departure procedures.
- d. **Terminal Control Areas (TCA).** TCA are designated controlled airspace controlled by a Terminal Control Unit (TCU) to provide an air traffic service to IFR flights. The limits of a TCA are similar to a control area extension except that they may extend into high-level airspace. A military TCA is similar to a TCA except that a military TCU provides the air traffic service and special provisions for military aircraft may exist.

Low-level Air Routes. Low-level air routes are similar to low-level airways with two exceptions:

- a. they extend from the ground up; and
- b. they are uncontrolled.

Airspace Classification

All Canadian Airspace is classified as one of the following airspace listed below. Hang gliders can only fly within some of these airspace:

- a. **Class A Airspace.** Class A Airspace is designated where an operational need exists to exclude VFR aircraft. All operations must be conducted under IFR and are subject to ATC clearances and instructions. ATC separation is provided to all aircraft. Class A airspace is designated from the base of all high-level controlled airspace up to, and including FL600. Hang gliders are not allowed in Class A Airspace.
- b. **Class B Airspace.** Class B Airspace is designated where an operational need exists to provide air traffic control service to IFR and to control VFR aircraft. Operations may be conducted under IFR or VFR. All aircraft are subject to ATC clearances and instructions. ATC separation is provided to all aircraft. All low-level controlled airspace above 12,500

feet ASL, at or above the minimum en-route IFR altitude (whichever is higher), up but not including 18,000 ft ASL will be Class B Airspace. Control Zones and associated terminal control areas may also be classified as Class B. Hang gliders are not allowed in Class B airspace.

- c. **Class C Airspace.** Class C Airspace is a controlled airspace within which both IFR and VFR flights are permitted, but VFR flights require a clearance from ATC to enter. ATC separation is provided between VFR and IFR aircraft. Aircraft will be provided with traffic information. Airspace classified as Class C becomes Class E when the appropriate ATC unit is not in operation. TCA and associated control zones may be classified as Class C Airspace.

Hang gliders operating in VFR flight in Class C Airspace must establish two-way radio contact with the appropriate air traffic control unit before entering the airspace and must obtain clearance from the ATC unit before entering the airspace. A pilot that wishes to operate an aircraft that is not equipped with a functioning communication equipment for VFR flight in Class C Airspace may, during daylight hours and in Visual Meteorological Conditions (VMC), enter Class C airspace provided that permission to enter and to operate within the airspace is obtained from ATC prior to the operation being conducted.

- d. **Class D Airspace.** Class D Airspace is a controlled airspace within which both IFR and VFR flights are permitted, but VFR flights must establish two-way communications with the appropriate TCA unit prior to entering the airspace. ATC separation is provided only for aircraft operating under IFR. Aircraft will be provided traffic information. Conflict resolution may be provided by ATC, equipment and workload permitted. Airspace classified as Class D airspace becomes Class E Airspace when the appropriate ATC unit is not in operation. TCA and associated control zones may be classified as Class D Airspace.

Hang gliders operating in VFR flight in Class D Airspace must establish two-way radio contact with the appropriate air traffic control unit before entering the airspace. A pilot wishing to operate an aircraft that is not equipped with a functioning communication equipment for VFR flight in Class D Airspace may, during daylight hours and in VMC, enter Class D airspace provided that permission to enter and to operate within the airspace is obtained from ATC prior to the operation being conducted.

The main reason HG must contact air traffic control in Class C airspace is because air traffic control is mandated to provide separation between IFR and VFR traffic in Class C. There is no need to contact air traffic control in Class D because air traffic control is only mandated to provide separation between IFR traffic in Class D. Air traffic does not need to know where VFR traffic is in that case.

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. In Class D, ATC cannot deny a pilot the clearance to fly in the airspace. It is unlikely, but not impossible, that ATC will allow a hang glider to operate within Class C airspace simply because we represent an unknown and it is difficult to keep track of us. One of the reason is that a hang glider radar return is minimal and we do not carry transponder to generate a signal. Second, because we are unpowered, it is difficult to impossible to follow ATC instructions precisely.

- e. **Class E Airspace.** 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. Low-level airways, control area extensions, transition areas, or control zones 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 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.

Flights in Class C, D and E airspace may be confusing since the CAR are not consistent. For example, the CAR specify what conditions the hang glider pilot must meet in order to fly in Class E airspace but does not specify that these conditions must also be met in Class C and D airspace. There are no regulations specific to hang gliders as far as flying in Class C and D airspace. The existing regulations address aircraft conducting VFR flights in these airspaces. Since hang gliders are aircraft, it follows that these regulations apply to hang gliders so hang gliders are not prohibited from flying in Class C and D airspace. Note that TC has confirmed this interpretation.

- f. **Class F Airspace.** Class F Airspace is airspace of defined dimensions 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 or Class F Restricted and can be controlled airspace, uncontrolled airspace, or a combination of both. When areas of Class F Airspace are inactive, they will assume the rules of the appropriate surrounding airspace. Each restricted and advisory area within Canada has been assigned an identification code group that consists of the following below. Hang gliders can operate in Class F Advisory Airspace.

- (1) Part A – Nationality letters “CY”;
- (2) Part B – the letter “R” for Restricted areas (the letter “D” for danger areas in a restricted area is established over international waters) or the letter “A” for Advisory areas;
- (3) Part C – a three-digit number which identifies the area. The number indicates the Canadian region within which the area lies according to the following:

101 to 199 British Columbia
201 to 299 Alberta
301 to 399 Saskatchewan
401 to 499 Manitoba
501 to 599 Ontario
601 to 699 Quebec
701 to 799 New Brunswick, Nova Scotia, PEI and Newfoundland
801 to 899 Yukon territory
901 to 999 Northwest territories and Nunavut (including the arctic islands)

- (4) Part D – in the case of Advisory areas, one of the following letters (in bracket after the three digit number) indicates the type of activity within the area:
 - A – Aerobatics
 - F – Aircraft test area
 - H – hang gliding
 - M – Military operations
 - P – Parachutin
 - S – Soaring
 - T - Training

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- g. **Class G Airspace.** Class G Airspace is airspace that is not designated Class A, B, C, D, E or F Airspace and within which ATC has neither the authority or responsibility for exercising control over air traffic. In effect, Class G airspace is all uncontrolled airspace. Hang gliders can operate without restriction in Class G Airspace.

Information on Canadian Airspace is available from Transport Canada:

<http://www.tc.gc.ca/CivilAviation/publications/tp14371/RAC/2-1.htm>

Aerodromes and Airports

Definition of Aerodrome . Transport Canada defines an aerodrome is any area of land (including the frozen surface thereof) or other supporting surface used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival and departure, movement or servicing of aircraft and includes any building, installations and equipment in connection therewith.

Aerodrome Certification. Aerodromes can be publicly or privately licensed, uncertified, or a military aerodrome. When an aerodrome is certified by Transport Canada, it is referred to as an airport. All airports and military aerodromes are prohibited to hang gliders unless prior permission is obtained from the operating authority.

In the event of an in-flight emergency, any Canadian aerodrome may be used at the pilot's discretion.

Wind Direction Indicators. At aerodromes that do not have prepared runways, the wind direction indicators is usually mounted on or near some conspicuous building associated with the aerodrome or the general aircraft parking area. More specifically:

- a. At aerodromes with runways greater than 4,000 ft in length, wind indicator will be located at each end of the runway, 500 ft in from the end and 200 ft outwards, usually on the left side.
- b. At aerodromes with runways 4,000 ft and shorter, the wind direction indicator will be located centrally so as to be visible from approaches and the aircraft parking area, and where only one runway exists, at the mid-point of the runway 200 ft from the edge.

Runway Nomenclature. A runway is a defined rectangular area on an aerodrome prepared for the landing and take-off of aircraft along its length. Runways are identified by a number. In the southern domestic airspace, runways are numbered by two digits indicating the magnetic heading. For example, the west end of a runway oriented east to west would be identified as Runway 09 representing 090 degrees. The east end of the runway would be identified as Runway 27 representing 270 degrees.

In the northern domestic airspace, the runway numbers will be related to true headings rather than magnetic headings.

Heliports. Heliports are identified by a white capital letter H centered within the take-off and landing area. The letter H may be enclosed within a dashed triangle to make it stand out. The letter H and dashed triangle, when used, are oriented with North. Hospital heliports are identified by a red capital letter H centered within a white cross. The H is oriented with North.

Heliports are licensed publicly or privately. As such, there are airports and prior permission for their use shall be obtained by hang gliders.

SECTION 3 – NAVIGATION

What is Navigation?

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 time, thereby avoiding airspace in which he is not allowed to fly, and taking the correct actions in airspace where he is allowed to fly eg. contacting the nearest airport tower when flying in Class D airspace.

There are many methods of navigation used by pilots in general. However, hang glider usually the method of navigation known as “pilotage” which is navigation by reference only to landmarks. Radio navigation using GPS is becoming increasingly popular as the price of handheld GPS receiver decreases.

A Brief Lesson in Geography

Longitude and Latitude. This guide does not intend to provide a detailed lesson of geography since most 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. The Equator is numbered 0°.

Both longitude and latitude are measured in degrees, minutes and seconds. There are 60 minutes in a degree and 60 seconds in a minute.

Time and Longitude. Air traffic control and meteorological facilities in both Canada and the US operates on Coordinate Universal Time (UTC) or Z time. UTC replaced Greenwich Mean Time (GMT) which was the universally accepted standard for the measurement of time until December 1985 and is still widely used informally. Both UTC and GMT represent the Local Meant Time for the Prime Meridian.

Earth Magnetism. 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 will be influenced by the Earth’s magnetic field and will lie parallel to one of the magnetic lines of force³.

The magnetic poles are not co-located with the geographical poles (True Poles). Therefore, the north direction indicated by a compass will give an erroneous reading of the geographical north. 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 navigation maps so the users can apply the corrections.

If the magnetic pole lies west of the geographical pole from a given point, 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 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. Acceleration and deceleration have no effect on a north-south heading.

³ A compass is only accurate in steady level flight. When an aircraft turns, the compass will lag for a westerly variation and add

easterly variation. To convert true heading to magnetic heading, do the opposite.

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. The Canadian Department of energy, Mines and Resources update its chart every ten years to reflect the changes.

In addition of meridians of longitudes, most navigational maps also show isogonic lines. Isogonic lines are lines joining points that have the same magnetic variations.

Aeronautical Charts

There are many aeronautical charts available to pilots. All but the VFR Navigation Chart are listed below for information purpose. The HAGAR examination contains a number of questions that involve map work on a VFR Navigation Chart. This map work is described in the next section.

- a. **Canadian Pilotage Charts (CPC Series).** Canadian Pilotage Charts are designed primarily for visual navigation and are most useful during flights at lower altitude and at slower speeds. Canadian Pilotage Charts have been replaced by VFR Navigation Charts for the southern and some northern regions of Canada and for the Arctic Islands. They are still used in some northern areas of continental Canada but most hang glider pilots will probably never see one. They have a scale of 1:500,000.
- b. **VFR Navigation Charts (VNC Series).** VFR Navigation Charts also have a scale of 1:500,000 but cover four times the areas of a Canadian Pilotage Chart. These charts are printed on both sides. VNF Charts accurately represent distances between any two points on the chart but a correction must be applied for heading⁴.
- c. **World Aeronautical Charts (WAC Series).** The WAC are also designed for visual navigation but are intended for fast airplane flying at higher altitudes. These charts have a scale of 1:1,000,000 which is bit small for most hang glider use. It takes 19 of these charts to cover the whole country. VNF Charts accurately represent distances between any two points on the chart but a correction must be applied for heading.
- d. **VFR Terminal Area Charts (VTA Series).** VFR Terminal Area Charts have a scale of 1:250,000 and are published for those airports around which a Terminal Class C airspace has been designated. VTA Chart accurately represents headings between any two point on the chart but a correction must be applied for distance⁵.
- e. **Radio Navigation Charts.** Radio Navigation Charts provide information for radio navigation over designated airways systems. Enroute Low Altitude Charts (LE) are intended for use up to, but not including 18,000 feet. Enroute High Altitude Charts are intended for use at 18,000 feet and above.
- f. **Canada Flight Supplement.** The Canada Flight Supplement lists all the aerodromes shown on Canada Pilotage Charts, VFR Navigation Charts and World Aeronautical Charts. They contain information about the airport facilities, communication frequencies, approach patterns and the like.
- g. **Water Aerodrome Supplement.** This provides the same information for water aerodromes as the Canada Flight Supplement does for aerodromes located on land.

⁴ The VNC and WAC charts are based on the Lambert Conformal Conic Projection.

⁵ The VTA chart is based on the Transverse Mercator Projection.

It is highly recommended that pilots either own, or have access to, the VFR Sectional Chart covering their flying areas to understand where they may or may not fly. There have been a number of recent incidents where pilots have flown in unauthorized airspace. Each of these incidents negatively raises the HPAC/ACVL profile with Transport Canada. If pilots continue to misbehave, it is possible that the HPAC/ACVL may lose its self-regulatory status. This would

most probably result in much higher license and user fees for all hang glider and paraglider pilots.

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. The valid method for writing a date and time is the year, month, day and time.

UTC is important because most aviation services such as weather reports use it. 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:

Time Zone	To Obtain Local Time
Newfoundland	UTC minus 3 hours (2 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.

Map Work

Candidates should be familiar with VFR Navigation Chart and should be capable of executing the following tasks during the HAGAR examination:

- Identifying the location of a feature on the chart knowing the latitude and longitude of the feature;
- Specifying the latitude and longitude of a feature on the chart;
- Recognizing the various symbols on the map. Hint: look at the legend;
- Identifying the altitude for each point on the chart;
- Recognizing isogonic lines;
- Identifying the magnetic deviation for each isogonic lines on the chart;
- Knowing how to set a compass to read true north for a point on the chart;
- Identifying the airspace in which a particular point lies;
- Identifying the various types of airspaces along a defined track from point A to point B;
- 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;
- Recognizing the altitude floor and ceiling for various airspace areas;
- Being capable of determining obstacles along a given cross-country route between specified points;
- Calculating the distance between two points on the chart in nautical miles, statute miles or kilometers;
- Converting distances between nautical miles, statute miles and kilometers;
- Identify the tower frequency for various aerodromes;
- Other tasks this guide may not have thought of.

SECTION 4 – FLIGHT OPERATIONS

General

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

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, 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 hang gliders, all other aircraft produce hazardous wake turbulence. Hang gliders should avoid flight behind and below all other aircraft.

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 mercury⁶. 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 under any other conditions unless the altimeter reading is corrected. This is what pilots do when they are zeroing their altimeter before a flight.

Because the barometric pressure varies from place to place, the altimeter of a pilot flying cross-country may display an erroneous reading. 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 FSS or an Air traffic Control Unit. A hang glider altimeter does not have this capability.

Aircraft Communications

General. Two-way radio transmissions are regulated by Industry Canada. The pilot operating the radio must hold a certificate of Competency issued by Industry Canada. Once obtained, the operator's certificate does not have to be renewed and can be used when flying any type of aircraft.

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.

The Very High Frequency (VHF) range from 118.00 MHz through 135.95 MHz is allocated for civil aviation voice communications. Hang gliders have been allocated 123.400 Mhz within the Aircraft (AM) Band for communications. TC has also allocated 173.640 MHz (on the FM band) for "Hang Gliding Club use" for tracking operations on a non-interference basis with a maximum power of 1 Watt. Clubs can purchase bulk licenses for this frequency. In Canada, the frequency 126.7 MHz Aircraft band should, whenever practicable, be continuously monitored in uncontrolled airspace. The international Aircraft band emergency frequency is 121.5 Mhz.

⁶Altitudes based on 29.92 inches of Mercury are referred to as ICAO altitudes.

Except for Quebec and the National Capital Region (NCR), all communications must be in English. In Quebec or 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.

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. Pilots who wish to obtain an operator certificate should contact their local flying club for more details.

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". While flying a paraglider, the same pilot call sign would be "PARAGLIDER 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		

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

- 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, HEADING TOWARDS SHORE, IMMINENT DITCHING FOR LACK OF ALTITUDE"
- 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 three times at the beginning of his transmission.

There are a lot of misconceptions that surround the use of radio by hang glider pilots in Canada. The only official frequency assigned to hang gliders by Industry Canada are 123.400 Mhz aircraft band and 173.640 Mhz FM in the commercial private band, allocated for "Hang Gliding Club" use. Clubs can bulk purchase licenses for their membership. Note: No license fee or registration is required for aircraft radios carried aboard an aircraft. However aircraft base stations (in vehicles) and all FM radios require a license.

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.

SECTION 5 – HUMAN FACTORS

Aviation Physiology

A healthy pilot is as essential to safe flight as a mechanically sound aircraft. There are few precise regulations that tell a pilot whether he/she is fit to fly. Each individual must make the decision whether he/she is medically fit prior to each flight based on common sense and experience.

Most medical conditions that may lead to a problem in flight can be diagnosed before the flight takes place. A pilot diagnosed (or more likely diagnosing himself) with one of these conditions should not fly as he may endanger his life as well as the life of fellow pilots because of a loss of alertness, reaction time or decision making ability. These conditions include ingestion of alcohol or drug, fatigue, activities that may lead to decompression sickness, cold and middle ears and sinus discomfort. Of course, individuals suffering from conditions that could result in sudden or subtle incapacitation, such as epilepsy, heart disease or uncontrolled diabetes, should not fly at all.

In some cases, a seemingly healthy pilot may encounter unexpected problems during flight. It is important that pilots be able to recognize the symptom of the problem in these instances and take corrective actions. This is especially important for hang gliding and paragliding pilot because our aircraft have a crew of one i.e. there is nobody else up there to help us. Problems that will most likely occur during a flight are hypoxia, hyperventilation, disorientation and hypothermia.

Hypoxia/Hyperventilation.

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. However, 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 known as euphoria.

Hyperventilation. 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 this leads to changes in the acidity of the blood. This, in turn, causes the arteries to the brain to constrict thus reducing the blood supply. Continuous hyperventilation can cause unconsciousness. Hyperventilation most commonly occurs in association with anxiety, fear or during intense concentration on a difficult task. The symptoms of hyperventilation are very similar to those for hypoxia and include:

- Euphoria (hypoxia only)
- Dizziness
- A feeling of coldness,
- A sensation like a tight band around the head,
- Pins and needles in the hand and feet
- Shortness of breath.

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

- Breathe oxygen if available. After three or four breaths of oxygen, the symptoms should improve markedly if hypoxia is the cause.
- If the symptoms persist, then hyperventilation is most likely the culprit for the symptoms. 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.

Decompression Sickness. At ground level, the body tissues are saturated with nitrogen, the inert gas that makes up 80% of our atmosphere. 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. 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. Atmospheric 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 diving to a safer altitude.

Middle ear and Sinus Discomfort or Pain. The middle ear and nasal cavisinuses are essentially closed cavities with a narrow drainage, pressure-equalizing tube. As an aircraft climbs, air in these cavities expand. Normally, air will escape from the middle ear and the sinuses. However, the outlet of the pressure-equalizing tubes are narrow and, if the pilot has a head cold or throat infection, local swelling can reduce them. On ascent, air may still be able to escape but on descent, particularly at high rates, the outlet may close like a flap and pressure will build up in the cavity. This can lead to severe pain and to injury known as barotrauma.

Pressure in the ears can be equalized by swallowing, yawning or by a Valsalva maneuver. The latter consists of holding the nose and mouth shut and gently, but firmly, attempting to exhale. The maneuver should be done with caution as the use of excessive force can damage the eardrums and may slow the heart rate in susceptible individuals.

Illness and Medication. Medication, either prescribed by doctors or available over-the-counter, are often designed to relieve the symptoms of an illness, not cure the illness. An illness affects a pilot ability to fly by reducing his concentration, reflexes and ability to think, etc. While medications can make a pilot feel better, they can have side-effects that are also detrimental. Common among these medications are tranquilizers and sedatives designed to relieve stress,

amphetamines to work against the effects of sleepiness, and drugs for allergies, colds and other ailments.

The following table, adapted from Dr. Richard Reinhart’s book *Fit to Fly*, lists the side-effect of many common ingredients in medical drugs and the time it takes for the effect of the drugs to clear. As a general guideline, a pilot should worry about chemical ending with “in” or “ine” eg. Aspirine or ephredine

Chemical	Effects and side-effects	Time to clear
Caffeine	Stimulant, diuretic (urine loss), induces anxiety	Varies from person to person
Aspirin	Pain killer, reduces fever, anti-inflammatory, causes ringing ears and gastritis. May mask real problem.	About two hours
Acetaminophen	Pain killer, reduces fever. May mask real problem.	About 15 hours
Ephedrine and Phenylephrine	Decongestant, stimulant.	About 15 hours
Chlorpheniramine	Antihistamine, sedative, drying agent, induces vertigo, causes blurred vision, increases heart rate, decreases coordination.	About 30 hours
Phenylpropanolamine	Decongestant, strong stimulant, diet suppressant, increases blood sugar, increases blood pressure.	About 30 hours

Substance Abuse. Like medication, such substance such as alcohol or illegal drug can affect a pilot ability to fly.

Alcohol. Alcohol is a substance that is legal and widely available. Even though the effect of alcohol are well publicized, about 10% of fatal accidents in Canada over the last decade involved some level of inebriety. Alcohol affects almost all mental and physical abilities needed for safe flight. It affects, vision, balance, co-ordination, reaction time, memory, thinking, decision-making and judgment. To make matter worse, it often increases the self-confidence of the individual.

The effect of alcohol increases with altitude. One drink at 6,000 feet is equivalent to two at sea level. This is unaffected by such “cures” as drinking string coffee.

Flying is prohibited for 8 hours after consuming alcohol although wise pilots will refrain from flying until the effects of alcohol consumption have also disappeared. For example, performance can be severely impaired by a hangover.

Illegal Drugs. Obviously, a pilot should not fly when under the influence of illegal drugs particularly “mind altering” drugs such as LSD, marijuana, and cocaine. Some of these drugs can have intermittent effects on a pilot long after they have been taken. For example, there was a study on the effects of marijuana on US fighter pilot abilities in a flight simulator. Performance immediately after taking the drug was obviously degraded. Of more significance, there was still a measurable performance degradation two or three days later.

The Operating Environment

Vision and Visual Scanning. Pilot 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. 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.

The above guidelines will work well on a cross-country flight where traffic is widely dispersed and it is important to detect another aircraft early because of the closing speeds generated by powered aircraft or fast gliders. However, hang glider and paraglider pilots often fly in close gaggle that are unknown to the general aviation pilot. In these gaggles, it is much more important to keep your eyes scanning constantly between 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. This is akin to the technique used in formation flying where pilot maintain a constant sight on the other aircraft in the formation while only the formation leader looks for traffic. If you think about it, gaggle flying is really chaotic formation flying without a leader. Therefore, every pilot in the gaggle should also play the role of leader and conduct a periodic full scan to detect any new traffic in your vicinity. Any pilot uncomfortable with gaggle flying should leave the gaggle immediately to avoid endangering himself or his fellow pilots.

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.

Because our sports are self-regulated, hang glider and paraglider pilots do not have to pass a medical examination like other pilots to obtain a license from Transport Canada (except when flying in controlled airspace). A pre-requisite for all other licenses requires that the pilot pass a physical examination that includes a thorough eye examination. This ensures that all pilots have the ability to see well enough to sight other traffic. Although an eye examination is not a pre-requisite for a hang glider or paraglider certification, it is highly recommended that all pilots get one.

Hazardous Attitudes and their Antidote. 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.

ANNEX A TO HPAC/ACVL HAGAR STUDY GUIDE

DEFINITIONS

The following are definitions in CARs that are relevant to hang gliding and paragliding:

"Act" means the Aeronautics Act;

"aerobatic manoeuvre" - means a manoeuvre where a change in the attitude of an aircraft results in a bank angle greater than 60 degrees, an abnormal attitude or an abnormal acceleration not incidental to normal flying;

"aerodrome traffic" - means all traffic on the movement area of an aerodrome and all aircraft operating at or in the vicinity of the aerodrome;

"aeroplane" - means a power-driven heavier-than-air aircraft that derives its lift in flight from aerodynamic reactions on surfaces that remain fixed during flight;

"AGL" - means above ground level;

"air route" - means the airspace within the boundaries or along the tracks specified in the Designated Airspace Handbook;

"air show" - means an aerial display or demonstration before an invited assembly of persons by one or more aircraft;

"air time" - means, with respect to keeping technical records, the time from the moment an aircraft leaves the surface until it comes into contact with the surface at the next point of landing;

"air traffic advisory services" - means the provision by an air traffic control unit or flight service station of aeronautical safety information, including aviation weather information and serviceability reports in respect of aerodromes and radio navigation aids, but does not include the provision of IFR air traffic control messages;

"air traffic control clearance" - means an authorization issued by an air traffic control unit that authorizes an aircraft to proceed within controlled airspace in accordance with the conditions specified by that unit;

"air traffic control instruction" - means a directive issued by an air traffic control unit for air traffic control purposes;

"airport" - means an aerodrome in respect of which an airport certificate issued under Subpart 2 of Part III is in force;

"airship" - means a power-driven, lighter-than-air aircraft;

"airway" - means the airspace within the boundaries or along the tracks specified in the Designated Airspace Handbook and within which air traffic control service is provided;

"airworthy" - in respect of an aeronautical product, means in a fit and safe state for flight and in conformity with its type design;

"altimeter setting region" - means the low level airspace so specified, and delineated, in the Designated Airspace Handbook; "appropriate frequency" – means:

- (a) the radio frequency specified by an air traffic control unit or flight service station for use by the pilot-in-command of an aircraft,
- (b) the mandatory frequency for use at or in the vicinity of an aerodrome for which a mandatory frequency has been specified, or
- (c) in any case not described in paragraph (a) or (b), the frequency specified for an aerodrome or an airspace in the Canada Air Pilot or the Canada Flight Supplement;

"apron" - means a part of an aerodrome, other than the manoeuvring area, that is intended to be used for the loading and unloading of passengers and cargo, the refuelling, servicing, maintenance and parking of aircraft and the movement of aircraft, vehicles and persons engaged in services necessary for those purposes;

"Arctic Control Area" - means the controlled airspace within the Northern Domestic Airspace, so specified, and delineated in the Designated Airspace Handbook;

"ASL" - means above sea level;

"ATC unit" or "air traffic control unit" – means:

- (a) an area control centre established to provide air traffic control service to IFR aircraft,
- (b) a terminal control unit established to provide air traffic control service to IFR aircraft while they are being operated within a terminal control area, or
- (c) an air traffic control tower established to provide air traffic control service at an aerodrome;

"ATS" or "air traffic services" - includes air traffic control services and advisory services;

"balloon" - means a non-power-driven lighter-than-air aircraft;

"Canadian Domestic Airspace" means the airspace specified, and delineated as such, in the Designated Airspace Handbook;

"control area" - means the controlled airspace that is specified as the Northern Control Area or the Southern Control Area in the Designated Airspace Handbook and that extends upwards vertically from a specified altitude or a specified pressure-altitude;

"control zone" - means the controlled airspace that is so specified in the Designated Airspace Handbook and that extends upwards vertically from the surface of the earth up to and including 3,000 feet AGL, unless otherwise specified in that Handbook;

"controlled aerodrome" - means an aerodrome at which an air traffic control unit is in operation;

"controlled airspace" - means an airspace of fixed dimensions that is so specified in the Designated Airspace Handbook and within which air traffic control service is provided;

"danger area" - means an airspace of fixed dimensions that is so specified in the Designated Airspace Handbook, within which activities dangerous to the flight of aircraft could take place at the times specified in the Handbook;

"day" - means the period beginning one half-hour before sunrise and ending one half-hour after sunset and, in respect of any place where the sun does not rise or set daily, the period during which the centre of the sun's disc is less than six degrees below the horizon;

"Designated Airspace Handbook" - means the manual that contains information in respect of the designation of airspace and that is published under the authority of the Minister;

"FL" or "flight level" - means the altitude expressed in hundreds of feet, indicated on an altimeter set to 29.92 inches of mercury or 1 013.2 millibars;

"flight service station" - means a ground station established to provide air traffic advisory services, flight information services and emergency assistance services for the safe movement of aircraft;

"flight time" - means the time from the moment an aircraft first moves under its own power for the purpose of taking off until the moment it comes to rest at the end of the flight;

"flight visibility" - means the visibility forward from the cockpit of an aircraft in flight;

"glider" - means a non-power-driven heavier-than-air aircraft that derives its lift in flight from aerodynamic reactions on surfaces that remain fixed during flight;

"ground station" - means a location on the ground equipped with radio transmitting and receiving equipment capable of two-way voice communications with an aircraft;

"gyroplane" - means a heavier-than-air aircraft that derives its lift in flight from aerodynamic reactions on one or more non-power-driven rotors on substantially vertical axes;

"hang glider" - means a glider that is designed to carry not more than two persons and has a launch weight of 45 kg (99.2 pounds) or less;

"heading" - means the direction in which the longitudinal axis of an aircraft is pointed, usually expressed in true, magnetic or grid degrees from North;

"heavier-than-air aircraft" - means an aircraft supported in the atmosphere by lift derived from aerodynamic forces;

"helicopter" - means a power-driven heavier-than-air aircraft that derives its lift in flight from aerodynamic reactions on one or more power-driven rotors on substantially vertical axes;

"heliport" - means an aerodrome used or intended to be used for the arrival, landing, take-off or departure of aircraft capable of vertical take-off and landing;

"high level airspace" - means airspace at or above 18,000 feet ASL that is within Canadian Domestic Airspace;

"IFR" - means instrument flight rules; **"landing"** – means:

- (a) in respect of an aircraft other than an airship, the act of coming into contact with a supporting surface, and includes the acts immediately preceding and following the coming into contact with that surface, and
- (b) in respect of an airship, the act of bringing the airship under restraint, and includes the acts preceding and following the bringing of the airship under restraint;

"light turbulence" - means turbulence that momentarily causes slight, erratic changes in altitude or attitude or turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude;

"lighter-than-air aircraft" - means an aircraft supported in the atmosphere by its buoyancy;

"low level airspace" - means airspace below 18,000 feet ASL that is within Canadian Domestic Airspace;

"mandatory frequency" - means a VHF frequency specified in the Canada Air Pilot or the Canada Flight Supplement for the use of radio-equipped aircraft operating within an MF area;

"manoeuvring area" - means that part of an aerodrome, other than an apron, that is intended to be used for the take-off and landing of aircraft and for the movement of aircraft associated with take-off and landing;

"MF area" - means an area of specific dimensions that consists of the surface area and airspace in the vicinity of an uncontrolled aerodrome and:

- (a) to which a mandatory frequency has been assigned,
- (b) in respect of which the reporting procedures specified in Division V of Subpart 2 of Part VI are applicable, and
- (c) that is identified as an MF area in the Canada Air Pilot or the Canada Flight Supplement;

"night" - means the period beginning one half-hour after sunset and ending one half-hour before sunrise and, in respect of any place where the sun does not rise or set daily, the period during which the centre of the sun's disc is more than six degrees below the horizon;

"Northern Domestic Airspace" - means the airspace so specified, and delineated, in the Designated Airspace Handbook;

"NOTAM" - means a notice to airmen 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;

"paraglider" - No definition yet. The HPAC/ACVL has proposed the following definition "A hang glider with no rigid structure".

"personal flotation device" - means a personal flotation device that meets the standards set out in the Canadian General Standards Board Standard 65-GP-11, entitled Standard for Personal Flotation Devices, published in October 1972;

"powered glider" - means an aeroplane that, with engines inoperative, has the flight characteristics of a glider;

"restricted airspace" - means airspace of fixed dimensions that is so specified in the Designated Airspace Handbook and within which the flight of aircraft is restricted in accordance with certain conditions specified in that Handbook;

"SCATANA plan" or **"Security Control of Air Traffic and Navigation Aids Plan"** - means the measures to be implemented by Her Majesty in right of Canada in accordance with the North American Aerospace Defence Command (NORAD) Agreement in the case of an air defence emergency;

"Southern Domestic Airspace" - means that airspace so specified, and delineated, in the Designated Airspace Handbook;

"standard pressure region" - means all of the Canadian Domestic Airspace not within the altimeter setting region;

"surface" - means any ground or water, including the frozen surface thereof; "take-off" – means:

- (a) in respect of an aircraft other than an airship, the act of leaving a supporting surface, and includes the take-off run and the acts immediately preceding and following the leaving of that surface, and
- (b) in respect of an airship, the act of freeing the airship from restraint, and includes the acts immediately preceding and following the freeing of that airship from restraint;

"terminal control area" - means an airspace of fixed dimensions that is so specified in the Designated Airspace Handbook and within which an air traffic control service for IFR flights is provided;

"UHF" - means ultra-high frequency; "ultra-light aeroplane" – means:

- (a) a single-seat aeroplane that has a launch weight of 165 kg (363.8 pounds) or less, and a wing area, expressed in square metres, of not less than the launch weight minus 15, divided by 10, and in no case less than 10 m²,
- (b) a two-seat instructional aeroplane that has a launch weight of 195 kg (429.9 pounds) or less, and a wing area, expressed in square metres, of not less than 10 m² and a wing loading of not more than 25 kg / m² (5.12 pounds/ft.²), the wing loading being calculated using the launch weight plus the occupant weight of 80 kg (176.4 pounds) per person, or
- (c) an advanced ultra-light aeroplane;

"UTC" - means Coordinated Universal Time; "VFR" - means visual flight rules;

"VFR aircraft" - means an aircraft operating in VFR flight;

"VFR flight" - means a flight conducted in accordance with the visual flight rules;

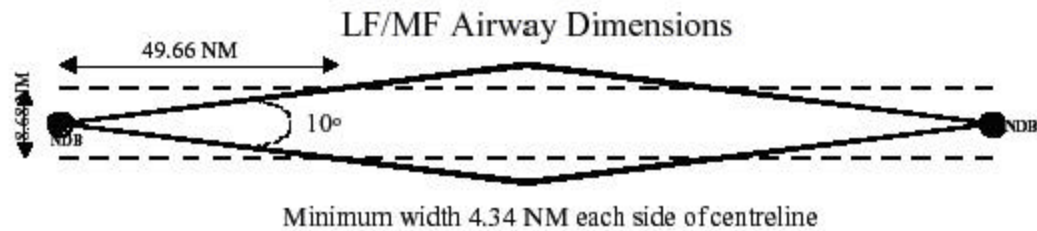
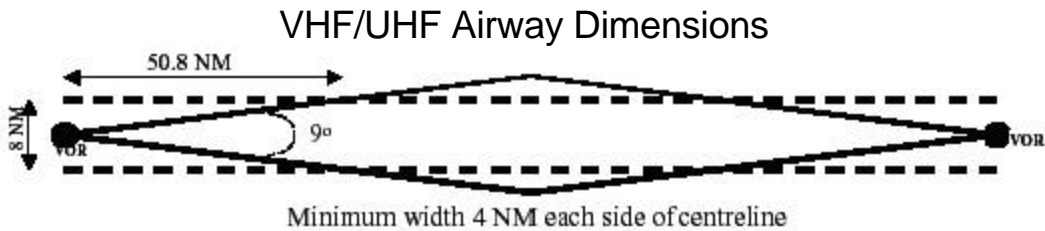
"VFR OTT" - means VFR over-the-top;

"VHF" - means very high frequency; and "VMC" – means visual meteorological conditions.

ANNEX B TO HPAC/ACVL HAGAR STUDY GUIDE

AIRWAYS

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. So, some airways can be quite large if the beacons are far apart.



ANNEX C 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 aerodrome, 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. A curved line on the surface of the earth that cuts all meridians at the same angle is called a
 - a. rhumb line
 - b. great circle
 - c. azimuth line
 - d. grivation

5. Magnetic variation is defined as
 - a. 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 or the west, the compass reading
- will lag or indicate a turn in the opposite direction
 - will lead or indicate a turn in the opposite direction
 - is inversely proportional to the magnetic variation for the particular area
 - will be correct, providing the turn has been perfectly co-ordinated
7. The following are terms which you, as a pilot, should be familiar with. Associate the terms with the appropriate definitions:
- | | |
|-------------------|----------------|
| A. Isogonic Lines | B. Agonic Line |
| C. Isobar | D. Isotherm |
- W. A line connecting points of equal pressure on a constant altitude chart
 X. A line on a chart joining points of zero variation
 Y. A line on a chart joining points of equal variations
 Z. A line on a chart joining places or points having equal temperature
- A-W, B-X, C-Z, D-Y
 - A-X, B-W, C-X, D-Z
 - A-Y, B-W, C-X, D-Z
 - A-Y, B-Z, C-W, D-X
8. In the vicinity of the magnetic pole, there is an area where
- in which all aircraft must be under positive control
 - in which the compass is unreliable
 - true north is the same as magnetic north
 - in which the northerly turning error of the compass is more pronounced than usual
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
 - B. 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?
- the reciprocal of 267 degrees is 117 degrees
 - the direction NE is 090 degrees
 - to turn right 90 degrees from a heading of 145 degrees would be a turn to 235 degrees
 - the reciprocal of 115 degrees is 225 degrees
12. An airport is
- a registered aerodrome
 - an aerodrome with a control tower
 - an aerodrome in respect of which a certificate is in force
 - an aerodrome with paved runways
13. The west end of a runway oriented east and west is numbered
- 09
 - 90
 - 27
 - 270
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
- 5 n.m. in radius and extends up to 3000 ft. AGL
 - 10 n.m. in radius and extends up to 3000 ft. AGL
 - 5 n.m. in radius and extends up to 5000 ft. AGL
 - 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
- 123.2 MHz
 - 122.8 MHz
 - 126.7 MHz
 - 121.5 MHz
16. To transit VFR through any part of Class C Airspace, pilots must
- have a special Class C endorsement to their HAGAR
 - monitor 126.7 MHz
 - advise ATC of their intentions and obtain a clearance
 - obtain prior permission in writing from ATC
17. The primary function of Class C Airspace to VFR flights is to
- provide headings to the pilot that will "home" the aircraft to the airport
 - provide assistance to a pilot flying above an overcast cloud condition
 - more efficiently integrate the flow of VFR and IFR flights in the vicinity of major airports

- d. permit "special VFR" flights to be conducted within the control zone
18. An airspace classified as Class F and indicated on an aeronautical chart by the code CYA(S) denotes
- a danger area with artillery activity
 - a restricted area with surveillance activity
 - an alert area with soaring activity
 - an airspace reservation
19. Which of the following extends upwards from the surface of the earth?
- a control zone
 - a restricted area
 - a flight information area
 - a control area
20. An Air Traffic Control "Instruction"
- is the same as an Air traffic Control "Clearance"
 - must be complied with when received by the pilot to whom it is directed unless he considers it unsafe to do so
 - must be "read back" in full to the controller and confirmed before coming effective
 - is in effect advice provided by ATC and does not require acceptance or formal acknowledgement by the pilot concerned
21. You are flying outside of a control area on a cross country flight at an altitude of more than 3000 feet but below 18,000 feet. Your magnetic track is 155 degrees. Flight visibility is 2 1/2 miles. Your altitude should be
- odd thousand plus 500 feet
 - even thousands plus 500 feet
 - odd thousands
 - assigned to you by ATC
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:
- 500 feet, 1 mile
 - 1 mile, 3 miles
 - 1 mile, 1 mile
 - 3 miles, 3 miles
23. The emergency VHF frequency is
- 122.1 MHz
 - 118.3 MHz
 - 121.5 MHz
 - 123.2 MHz
24. Daylight in Canada, at any place where the sun rises and sets daily, is defined as that period of time
- between sunrise and sunset
 - commencing one half hour before sunrise and ending one hour after sunset
 - commencing one half hour before sunrise and ending one half hour after sunset

-
- 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:
- excess carbon monoxide in the hemoglobin
 - imbalance of oxygen and carbon dioxide in the body system
 - spatial disorientation
 - lack of sufficient oxygen in the body cells
26. To prevent hypoxia, a pilot should
- use oxygen above 5000 feet ASL during daytime
 - breathe into a paper bag
 - use oxygen above 5000 feet ASL at night
 - breathe deeply
27. After receiving a local or general dental or other anesthetic, a pilot should allow _____ hours to elapse before flying
- 48
 - 24
 - 72
 - 12
28. One alcoholic drink taken at 5000 feet as compared to the same drink taken at sea level
- has a lesser effect
 - has a greater effect
 - has no appreciable difference in effect
 - increases the chance of coriolis effect
29. Which of the following statements pertaining to the use of alcohol is true?
- relatively small amount of alcohol significantly decrease a pilot's tolerance to hypoxia
 - Small amount of alcohol will not affect a pilot's judgment
 - The effects of alcohol are constant regardless of altitude
 - Coffee accelerates the body's ability to recover from the effects of alcohol
30. Select the statement that best describe the effects of fatigue.
- Financial or family problems do not influence fatigue
 - Fatigue slows reaction time and contributes to errors.
 - A fatigues person recuperates more quickly as altitude is gained
 - A fatigue 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
- not fly
 - restrict flights to altitude of less than 7000 feet
 - restricts rate of climbs and descent to less than 300 feet per minutes
 - 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
- 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?
- a. 5 nautical miles
 - b. 7 nautical miles
 - c. 10 nautical miles
 - d. 15 nautical miles
38. When unable to complete a medical declaration, a hang glider pilot shall pass a medical examination given by
- a. a family physician
 - b. the Transport Canada Medical Review Board
 - c. a Civil Aviation Medical Examiner
 - d. any of the above
39. Controlled Airspace means all airspace of defined dimensions within which
- a. an air traffic control service is provided
 - b. security regulations are in force
 - c. special VFR flight only is permitted
 - d. control zone regulations are in force
40. The airspace around an airport under control tower control to a specific height is known as
- a. a terminal control area
 - b. a control area

- c. a control zone
 - d. an aerodrome traffic zone
41. To determine the location and base of low level controlled airspace, you should consult
- a. the VFR Navigation Charts
 - b. the VFR Terminal Area Charts
 - c. the Designated Airspace Handbook
 - d. Any of the above
42. Low Level Airspace is defined as all airspace
- a. within the Canadian Domestic Airspace below 18,000 feet ASL
 - b. extending upwards from the surface of the earth within designated airways
 - c. extending upwards from 700 feet AGL within designated airspace
 - d. extending upwards from 2,200 feet AGL within designated airways
43. When operating a hang glider, it shall be flown
- a. clear of designated airways
 - b. clear of control area extensions
 - c. clear of transition areas
 - d. in compliance with all of the above
44. Which airspace may a hang glider be operated in without special authorization?
- a. Transition area
 - b. Terminal control area
 - c. Low level air route
 - d. Low level airway.
45. Which statement is correct with regard to “restricted areas”?
- a. Transient aircraft entering active restricted areas shall be equipped with two-way radio communication
 - b. Only military aircraft may enter restricted area depicted on aeronautical charts
 - c. 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
46. Which statement is correct with regard to “danger areas”?
- a. Transient aircraft entering active danger areas shall be equipped with serviceable transponders.
 - b. Only military aircraft may enter danger areas depicted on aeronautical charts.
 - c. Aircraft may enter active danger areas if equipped with a two-way radio.
 - d. Danger areas should be avoided during active periods specified on aeronautical charts and NOTAM.
47. Which statement is correct with regard to “Alert Areas”?
- a. Collision avoidance rests with the pilots of transient and participating aircraft.
 - b. Prior permission from the controlling agency is required before entering an alert area.
 - c. Pilots of non-participating flights must not enter active alert areas.
 - d. Flight activity in alert areas may be conducted only under IFR control.
48. 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.
49. A series of projectiles discharged at intervals of ten seconds, each showing on bursting red and green lights or stars, means
- a. you are in the vicinity of a prohibited, danger or restricted area – alter course
 - b. continue circling, do not land for the time being
 - c. return to the airport for a landing
 - d. airport unsafe, do not land
50. 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
51. An airport is
- a. an uncertified aerodrome
 - b. an aerodrome equipped with a control tower
 - c. an aerodrome with paved runways
 - d. a certified aerodrome
52. No person shall operate any vehicle on any part of an uncontrolled airport used for the movement of aircraft, except in accordance with permission from
- a. the operator of the airport
 - b. the airport security officer
 - c. a federal peace officer
 - d. a qualified flying instructor
53. The east end of a runway in Canada oriented east and west is numbered
- a. 09
 - b. 9
 - c. 27
 - d. 90
54. A white capital letter H inside a dashed triangle indicates
- a. a hospital heliport
 - b. a hoverport
 - c. an uncertified heliport
 - d. a civil heliport
55. 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
56. 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
57. When in VFR flight within an Aerodrome Traffic Zone, a pilot shall remain clear of cloud by at least
- 1,000 feet vertically and 3 miles horizontally
 - 1,000 feet vertically and 1 mile horizontally
 - 500 feet vertically and 2,000 feet horizontally
 - 500 feet vertically and 1 mile horizontally
58. An aircraft flying in accordance with a Special VFR clearance would be flying within
- a Control Zone
 - an aerodrome traffic Zone
 - a terminal Control Area
 - an airway
59. What distance from cloud must a hang glider maintain when flying 700 feet AGL or above and outside of controlled airspace and Aerodrome Traffic Zones
- At least 1 mile horizontally and 500 feet vertically
 - At least 2,000 feet horizontally and 500 feet vertically
 - At least 2 mile horizontally and 500 feet vertically
 - Clear of clouds horizontally and vertically
60. The minimum flight visibility for aircraft in VFR flights outside controlled airspace, Aerodrome Traffic Zones and special areas of British Columbia is
- 2,000 feet
 - 1 mile
 - 2 miles
 - 3 miles
61. 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
- even thousand foot altitude
 - even thousand plus 500 foot altitude
 - even thousand foot altitude
 - odd thousand plus 500 foot altitude
62. An aircraft is in level VFR flight above 3,000 feet AGL in Class E airspace. As the track is 135 degrees, the aircraft shall be operated at an
- even thousand foot altitude
 - even thousand plus 500 foot altitude
 - even thousand foot altitude
 - odd thousand plus 500 foot altitude
63. Before setting out on any VFR flight, a pilot is required to
- file a flight notification
 - obtain an ATC clearance
 - read all weather reports received from stations within 100 miles of destination
 - familiarize himself with all available information appropriate to the flight
64. No person shall drop anything from an aircraft in flight
- unless it is attached to a parachute
 - unless approval has been granted by the minister of Transport
 - unless over an authorized jettison area

- d. which will create a hazard to person or property
65. When two hang gliders are converging at approximately the same altitude
- both hang glider will alter heading to the left
 - the hang glider on the right will avoid the other by descending
 - the hang glider that has the other on its left shall give way
 - the hang glider that has the other on its right shall give way
66. An aircraft overtaking another aircraft shall keep out of the way by
- altering heading to the right
 - descending
 - climbing
 - altering heading to the left
67. When two aircraft are approaching head-on and there is a danger of collision, each shall
- wait for the opposite to climb or descend and do the opposite
 - alter heading to the left
 - alter heading to the right
 - reduce speed
68. When two aircraft are converging in flight
- helicopters shall give way to ultra-light aeroplanes
 - an aeroplane towing a banner shall give way to ultra-light aeroplanes
 - ultra-light aeroplanes shall give way to hang gliders
 - balloons shall give way to hang gliders
69. Except for the purpose of taking off or landing, an aircraft shall not be flown over an aerodrome at a height of less than
- 2,000 feet AGL
 - 2,000 feet ASL
 - 1,000 feet AGL
 - 1,000 feet ASL
70. 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:
- 500 feet, 200 feet
 - 500 feet, 500 feet
 - 1,000 feet, 2,000 feet
 - 1,000 feet, 1 mile
71. 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:
- 500 feet, 500 feet

-
- b. 1,000 feet, 2,000 feet
 - c. 2,000 feet, 1,000 feet
 - d. 3,000 feet, 1 mile
72. 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
73. 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
74. 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
75. 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
76. "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.
77. "Night" in Canada, at any place where the sun rises and sets daily, may be considered to be that period of time between
- a. sunset and sunrise
 - b. one-half hour after sunset and one-half hour before sunrise
 - c. one hour after sunset and one hour after sunrise
 - d. one-half hour before sunset and one-half hour after sunrise
78. Which statement is correct with regard to a fly-in to which the public is invited?
- a. the sponsor shall apply for transport Canada approval at least 60 days prior to the proposed date
 - b. When the public fly-in is held outside of controlled airspace, transport Canada approval is not required
 - c. Public fly-ins are restricted to controlled aerodromes and a NOTAM shall be issued

- d. A public fly-in is not considered to be a “special aviation event”
79. An Air traffic Control instruction
- a. is the same as an Air traffic Control Clearance
 - b. shall be complied with when received providing the safety of the aircraft is not jeopardized
 - c. shall be read back in full to the controller before becoming effective
 - d. is advice provided by ATC and does not require compliance
80. A pilot flying a heading of 270 degrees receives the following message from ATC, “Traffic 2 o’clock, 5 miles, eastbound”. This information indicates the traffic is
- a. 60 degrees to the right at the same altitude
 - b. 60 degrees to the right, altitude unknown
 - c. 90 degrees to the right and on a collision course
 - d. on a heading of approximately 180 degrees
81. 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
82. All mandatory and aerodrome traffic frequencies in use at selected aerodromes are given in the
- a. Notice to Airman (NOTAM)
 - b. Canada Flight Supplement
 - c. Automatic Terminal Information Service (ATIS)
 - d. AGA section of the AIP Canada
83. 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
84. 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
85. 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)

86. In two-way radio communications, the pilot shall transmit the
- type of aircraft and the last four letters of the registration in phonetics, on initial contact
 - last three letters of the registration in phonetics, on initial contact on each frequency
 - whole registration in phonetics on initial contact
 - whole registration at all times
87. What should a pilot broadcast to indicate serious or imminent danger, and to request immediate assistance?
- MAYDAY, MAYDAY, MAYDAY
 - PAN PAN, PAN PAN, PAN PAN
 - SECURITY, SECURITY, SECURITY
 - EMERGENCY, EMERGENCY, EMERGENCY
88. The effect of alcohol decreases the brain/s tolerance to hypoxia. This effect
- decreases with an increase in altitude
 - increases with an increase in altitude
 - does not change with altitude
 - may be reduced by drinking coffee
89. 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
90. Pilots should not over fly 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
91. Chrome yellow and black strips painted on pylons or on the roof of a building identifies
- an area where explosives are in used
 - an open pit mine
 - an artillery range
 - a fur farm
92. 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.
93. The Transportation Safety Board of Canada considers a missing aircraft to be
- a reportable aviation incident
 - an occurrence which need not be reported
 - an aviation incident which need not be reported
 - a reportable aviation accident

Answers:

Q	A	Q	A	Q	A	Q	A
1	c	25	d	49	a	73	d
2	b	26	c	50	d	74	b
3	d	27	a	51	d	75	a
4	a	28	b	52	a	76	c
5	c	29	a	53	c	77	b
6	a	30	b	54	d	78	a
7	c	31	a	55	d	79	b
8	b	32	d	56	a	80	a
9	d	33	d	57	d	81	c
10	d	34	b	58	a	82	b
11	c	35	b	59	b	83	a
12	c	36	b	60	c	84	c
13	a	37	a	61	b	85	d
14	a	38	c	62	d	86	a
15	a	39	a	63	d	87	a
16	c	40	a	64	d	88	b
17	c	41	d	65	d	89	a
18	c	42	a	66	a	90	c
19	b	43	d	67	c	91	d
20	b	44	c	68	c	92	d
21	a	45	d	69	a	93	d
22	b	46	d	70	b		
23	c	47	a	71	b		
24	c	48	c	72	a		