

Student Study Notes – Canadian PPL

Aviation Ground School: Air Law & Miscellaneous

This version of my “Air Law & Miscellaneous” study notes is from January 1st, 2017. I’ll update this document any time I find the need to make any changes, and as I continue to progress through additional training.

I am sharing these study notes for anyone else who is taking their PPL in Canada. These aren’t intended as a replacement for proper training. I’m only sharing these notes as a supplement covering many of the key points that I decided that I really needed to memorize while going through my own PPL studies. The info in these notes comes from a large number of different sources: The Transport Canada Flight Training Manual, Transport Canada’s Aeronautical Information Manual (AIM), various flight schools and instructors (in multiple provinces), and numerous other books and online sources. These notes are not always in any particular order, although I tried to keep similar topics together in many cases.

Please note that while I have made every effort to ensure that all of the information in these notes is accurate, based on the sources from which I learned, you should verify everything here against what you’ve learned in your own study programs. I (Jonathan Clark) shall not assume any liability for errors or omissions in these notes, and your official pilot training should always supersede any information presented herein. As the Canadian PPL curriculum is updated occasionally, I recommend that if you want to be 100% certain that everything in this set of study notes is correct, you should print a copy and ask your instructor to review these notes with you.

If the aircraft type is not specified in the notes below, you should always assume that they refer specifically to characteristics of a Cessna 172M, which is a common training aircraft, and the type that I have used most frequently. Know the characteristics of your own specific training/examination aircraft by memory!

To download PDF or audio MP3 versions of these notes, visit: <http://djbolivia.ca/aviation.html>

Let’s Get Started – Ground School: Air Law & Miscellaneous

CARS – Canadian Aviation Regulations

Transport Canada is the government authority. Transport Canada and its representatives are often collectively referred to as “**The Minister**.”

You must produce documents upon request by peace officers, immigration officers, or The Minister.

Accountable Executives:

1. Flight Training Operator certificate.
2. Approved maintenance organization.
3. Air Operator certificate.

Every organization with an accountable executive must have a **Safety Management System (SMS)**. Your SMS must have a safety policy, and must have processes for:

- Goal setting.
- Identifying hazards.
- Ensuring training.

- Internal reporting and analysis.
- Conducting periodic reviews.
- Identifying processes and ensuring awareness.

Pilots Must:

- Keep medicals current.
- Keep license and recencies current.
- Keep a log book.

Medical Requirements:

- Recreational: Category 4/3/1 medical, or medical declaration form. Good for five years to age 40, two years after 40.
- Private: Category 3/1 medical, CAME examination. Good for five years to age 40, two years after 40.
- Commercial: Category 1 medical, CAME examination. Good for twelve months under age 40, six months once over 40. EKG every two years between thirty and forty, every year after 40. Audiogram on first medical and on 55th birthday.

Recency Requirements:

- Every 24 months you must do one from this list.
- Flight review with an instructor.
- Attend a Transport Canada safety seminar.
- Participate in a Transport Canada training program.
- Complete a self-paced study program.
- Complete a training program or PPC.
- Get a new or renewal license permit or rating.
- Complete the written exam for a license, permit, or rating.

You must also fly as PIC or copilot at least once every five years.

You must complete **five takeoffs and landings** every six months in order to continue being allowed to carry passengers.

Forest Fire Flight Restrictions – When within 5 NM of a forest fire, you must fly at a minimum of 3000' AGL.

Miscellaneous Equipment Requirements, Power-Driven Aircraft:

- Checklist.
- Charts.
- Fire Extinguisher.
- Timepiece.
- First Aid Kit.
- One flashlight per crew for night ops.

Survival Equipment Requirements:

- Be able to start a fire.
- Provide shelter.
- Provide or have a means of purifying water.
- Visual signaling device.

Float planes should have life preservers. If you're out of gliding range from shore, this becomes mandatory.

Single engine aircraft must carry a life raft if you are more than 100 NM or more than 30 minutes cruising speed from the nearest emergency landing area. That life raft must be able to accommodate all persons. The same applies to a multi-engine that can't maintain flight with a failed engine. For a multi-engine that can

sustain flight with an engine out, those distances are doubled. For a single engine helicopter, the distance is 25 NM and the time is 15 minutes. For a multi-engine helicopter, double those minimums.

If a helicopter is mandated to carry life rafts, then each passenger and crew also needs an immersion suit. The Pilot In Command (PIC) needs to be wearing the immersion suit.

A **flight plan** or **flight itinerary** is required when a flight goes beyond 25 NM from the airport of departure. One of these is also required for a flight to the US or to a military aerodrome.

An IFR flight usually needs a flight plan, but can be a flight itinerary if partly conducted outside of controlled airspace, or if facilities are inadequate to permit the communication of a flight plan.

Flight Rule Abbreviations:

- I – IFR only.
- V – VFR only.
- Y – IFR then VFR.
- Z – VFR then IFR.

Type of Flight, 1st Character:

- C – Controlled VFR.
- D – Defense VFR.
- E – Defense Flight Itinerary.
- F – Flight Itinerary.

Type of Flight, 2nd Character:

- S – Scheduled Air Service.
- N – Non-scheduled Air Transport Ops.
- G – General Aviation.
- M – Military.
- X – Anything else.

SSR – Secondary Surveillance Radar

The Airspeed on a flight plan is True (TAS), not Indicated (IAS). If in knots, the format is N0123 for 123 knots. If in Mach, the format is M082 for 0.82 Mach.

Cruising Level designations:

- Flight Level: FL085.
- Altitude: A075 (hundreds of feet).
- Uncontrolled VFR can just write VFR.

On an IFR flight plan, the total estimated elapsed time ends at the initial approach fix.

On an IFR flight, having at least one alternate airport is mandatory.

Fuel endurance time on a flight plan is given in hours and minutes, including all reserves.

If arriving at an airport controlled by a tower, the tower will close your flight plan automatically. However, it's still a good idea to call and make sure they closed it. In all other cases, you must close the flight plan yourself.

Alcohol:

- You aren't allowed to crew for eight hours after consuming your last drink, ie. "Eight hours from bottle to throttle."
- Never fly while under the influence of drugs or alcohol.
- Waiting for 24 hours is smarter, or for 48 hours after heavy drinking.
- You are more likely to feel the effects of alcohol at higher altitudes.

Minimum Altitudes and Distances:

- Built Up area, fixed wing: 1000' above the highest obstacle within a horizontal radius of 2000'.
- Built Up area, rotary wing: 1000' above the highest obstacle within a radius of 500'.
- Non Built Up area: 500' from any person, vehicle, or structure.
- National Parks: At least 2000' AGL.

UAV – Unmanned Aerial Vehicle (drone)

Drones are supposed to stay below 300' AGL (in Canada), so it's good if you're always flying above 500' AGL in a GA aircraft. Drones also have to stay at least 8km from airports in Canada. But be aware that drone regulations are evolving rapidly, so it's best to check for up-to-date info on the Transport Canada website.

Landing Right-of-Way:

- Where an aircraft is in flight or manoeuvring on the surface, the one that is landing or about to land has the right of way.
- When two aircraft are both landing, the one at the lower altitude has the right of way.

If operating a **float plane** on water, you must obey both the rules for aircraft and for watercraft. But think in terms of watercraft until you take off.

Parachute Descents:

- Cannot drop into or operate in an air route or controlled airspace (unless you have permission from an ATC unit).
- Cannot drop over or into a built up area.
- Cannot drop over an open-air assembly.

ATC instructions and clearances are based on traffic known to ATC. The pilot is still the one who is ultimately responsible for traffic avoidance.

Speed Limits:

- Max 200 knots IAS below 3000' and within 10 NM of a controlled airport, unless you have a clearance.
- Below 10,000', the limit is 250 knots IAS.
- No matter what the altitude is, you are not allowed to exceed Mach 1 (767 mph or 667 KTS).

Cruising Altitudes:

- Use magnetic track in SDA.
- Use true track in NDA.
- Cruising altitudes kick in at 3000' AGL, not 3000' ASL! But they are measured in ASL in terms of numbers.
- East cross-country (000 to 179) is odd 1000's plus 500'.
- West cross-country (180 to 359) is even 1000's plus 500'.

CVFR – Controlled VFR

Reduced Vertical Separation Minima (**RVSM**) – Special rules that can come into play starting above FL 290 that change vertical separation from 2000' to 1000'. Designed to save fuel, allow aircraft to safely fly more

optimum profiles, and to increase airspace capacity. Normally the separation is 4000' between levels flying in the same direction, and 2000' between opposing layers, but RVSM cuts these in half.

Flight Radar 24 is a great site: www.flightradar24.com

Standard Pressure Region (SPR):

- Altimeter always gets set to 29.92" Hg.
- When passing from Altitude Pressure Region to SPR, always set the altimeter *after* entering and *before* leaving the SPR.

Altimeter Setting Region (ASR):

- In SDA, this is up to 17,999' ASL.
- Set the altimeter to the current altimeter setting or to airport elevation before takeoff.
- In cruise, set the altimeter to the nearest reporting station. This may happen multiple times en route.
- Set to the destination airport before you land.

Air Time is the time with wheels off the ground, and is used for maintenance schedules and for determining when inspections are due.

Flight Time starts when the aircraft first moves under its own power, and ends when the engine stops. This is what pilots log for our logbook hours, and what determines your level of experience. Flight time always exceeds air time.

You should review all of your **PSTAR material** while studying for your PPL.

The Transport Canada PSTAR app by Kermod Industries is a good study and memorization guide for PSTAR material.

An airport is a certified aerodrome.

Manoeuvring Area – Includes runways and taxiways.

Apron – Used for loading cargo and passengers, parking, refueling, etc.

Airports have orange and white runway markers, but aerodromes have solid orange.

Night runways need two parallel rows of white lights or retro-reflective markers with lights at the ends, visible for at least 2 NM.

Overflying an Aerodrome:

- Must be at least 2000' AGL or 1000' above the circuit for an en route overflight.
- Being 500' above the circuit is OK for crossing to examine the circuit or the airport.

RSC – Runway Surface Condition

RSC Reports are required when:

- Frost/snow/slush/ice are on the runway.
- Snow banks/drifts/windrows are on or adjacent to the runway.
- Sand/aggregate or anti-icing or de-icing materials have been applied.
- The cleared width is less than the published width.
- Runway lights are partially or fully obscured.
- There is a significant change in conditions, including for the better.

- At a minimum inspection frequency.

CRFI's are reported when there is "anything other than rain" on the runway.

If you see a number painted on a heliport, it indicates a weight limit in thousands of pounds.

CYR – Restricted Area.

CYA – Advisory Area.

Memorize and understand the information about the seven classes of airspace. There is lots to memorize, and it is very important! A visual chart might be helpful for this topic, as it can be pretty confusing. I have a Canadian Airspace Poster in my public Dropbox folder.

Area Activity Codes:

- A – Aerobatic.
- H – Hang Gliders.
- S – Soaring.
- T – Flight Training.
- F – Flight Test.
- P – Parachute.
- M – Military.

Controlled Airspace:

- Airspace with defined dimensions within which air traffic control (ATC) service is available, which some or all aircraft *may* be subject to.
- IFR aircraft require a clearance to enter or operate in controlled airspace.

Types of Controlled Airspace:

- High Level Airspace: 18,000' and above.
- Low Level Airspace: Class B, C, D, or E.
- Low Level Airways: Class E.

Low Level Airways (Victor Airways):

- Controlled low level airspace from 2200' AGL to 17,999' ASL.
- Normally based on VHF, ie. a VORTAC.
- The basic width is 4 NM on each side of the centerline out to 50.8 NM.
- Past 50.8 NM and onward to the midpoint of the airway, the width increases bounded by 4.5° angles on each side of the centerline.
- If it is a Victor Airway based on LF/MF, the boundaries change to 4.34 NM width up to 49.66 NM out, and 5° thereafter to the midpoint. The same applies if the airway is mixed, ie. based upon a VORTAC and an NDB.

Control Area Extension (CAE):

- Provides additional controlled airspace to handle IFR traffic.
- Surrounds and overlies the core control zone.
- IFR traffic is controlled by the ACC.
- Usually circular with a defined radius.
- Extends upwards from 2200' AGL to 17,999' ASL, same as an airway.

Control Zone – Usually extends upwards vertically from ground level up to and including 3000' AGL, unless otherwise noted.

Class A Airspace:

- Extends from FL180 to FL600, and is entirely transponder airspace.
- IFR flights require clearance to operate, and are provided full traffic control service.
- VFR flights are not permitted to operate within Class A airspace.
- Also known as High Level Airspace.
- Divided into three control areas in Canada.
- Southern Control Area (in SDA) is from FL180 to FL600.
- Northern Control Area (in NDA) is from FL230 to FL600.
- Arctic Control Area (in NDA) is from FL270 to FL600.
- Pilot must be IFR rated, and Aircraft must be IFR certified.
- A functioning Mode C transponder and a pressure sensitive altimeter are also required.

Class B Airspace:

- Roughly speaking, extends from 12,500' to 17,999' ASL, entirely transponder airspace.
- IFR flights require clearance to operate within Class B, and are provided full traffic control service.
- VFR flights require clearance to penetrate and operate, and once inside are provided with full traffic control (just like IFR). They are designated CVFR for Controlled VFR.
- CVFR must request clearance for all altitude or heading changes, and must comply with ATC instructions. CVFR flights may be vectored, and given speed/altitude instructions provided that they stay clear of cloud. The pilot must inform ATC if they cannot comply with an instruction. CVFR is similar to Flight Following.
- Technically, Class B includes all Low Level Airspace from 12,500' upwards, or at and above the minimum en route altitude (MEA) for IFR aircraft, whichever is higher.
- Indicated by hatched pattern on LO (instrument) charts. Dark blue line on VFR charts.

Class C Airspace:

- Found in some larger areas. Designated as Terminal Control Areas (TCA's) and associated control zones.
- It will extend in the upside-down wedding cake shape up to 12,500' ASL, entirely transponder airspace.
- Surrounds approximately 38 airports across Canada.
- IFR flights require clearance, and are provided full control service.
- VFR flights require clearance to penetrate and operate, and once inside can be assigned general altitude restrictions and heading restrictions, but are still not controlled in the IFR sense of the word, therefore cannot be ordered around like IFR aircraft.
- Conflict resolution (avoidance instructions) are provided upon request, and flights should always be advised of nearby traffic, just like flight following.
- If the workload is too high, VFR flights can be denied access to Class C airspace.
- The PIC has [as always] the responsibility to avoid other aircraft, maintain terrain and obstruction clearance, and to remain in VFR weather. A pilot must communicate to ATC any concerns related to pilot responsibilities.
- Aircraft must be equipped for two-way radio communication, and must maintain a continuous listening watch.
- Mode C transponders required.
- Class C reverts to Class E (temporarily) when ATC services are not operating.
- Brackets surround Class C airspace on a VFR navigation chart.
- Examples include Calgary, Edmonton, Vancouver.

Class D Airspace:

- Found in some larger TCA's.
- It will extend in the upside down wedding cake shape up to 12,500' ASL.
- Can be designated transponder airspace, although in some airports, having a transponder will not be mandatory.
- IFR flights require clearance, and are provided full control service.

- VFR flights must make contact with the appropriate ATS unit before entering, but do not require a clearance to penetrate and operate within Class D.
- Aircraft must be equipped for two-way radio communication, and must maintain a continuous listening watch.
- Pilots flying in Class D will proceed on their own navigation, but ATC can assign altitude restrictions and heading restrictions if required for IFR traffic separation.
- When workload permits, conflict resolution (avoidance instructions) are provided upon request, and flights should always be advised of nearby traffic, just like flight following.
- If the workload is too high, VFR flights can be denied access to Class D.
- If a Control Zone is Class D, then it will be a towered airport.
- Your aircraft may or may not need a transponder. Your charts and the CFS will answer this question.
- Brackets surround Class D airspace on a VFR navigation chart.
- Examples include Thunder Bay, Regina.

Class E Airspace:

- All low-level controlled airspace that has not been designated as class B/C/D is Class E. This includes all Victor Airways, and some smaller Terminal Control Areas. Victor airways extend from 2200' AGL to 12,500' ASL (watch this!).
- Some Class E TCA's can be designated transponder airspace.
- All airspace above FL600 is Class E.
- IFR flights require clearance to operate in Class E, and are provided full control service. However, in VMC, the pilot is expected to keep a lookout for VFR traffic that may not be talking to ATC.
- VFR flights do not require any authorization, and ATC has no authority. However, VFR traffic may request flight following where they will rely on ATC to advise them of nearby traffic. ATC can refuse this service if workload is high.
- Although ATC does not have authority over VFR, ATC can give suggestions, or request that the VFR pilot restrict their climb to let an IFR flight go by. If the VFR pilot is not willing to comply, the IFR flight must make the detour.
- Essentially, there are no special requirements for VFR in Class E.
- Control Area Extensions may also be Class E.
- If an aerodrome/airport has a Class E Control Zone, VFR aircraft must follow MF procedures and must also get a traffic advisory from the appropriate controlling FSS at least five minutes prior to entering.
- When a Tower (Class C or D) closes temporarily, the aerodrome/airport becomes a Class E Control Zone with MF, and pilots need to follow MF procedures.
- Examples include Kenora, Brandon.
- Some Class E airspace in direct proximity to a large aerodrome will be classified as transponder airspace.

Class F Airspace:

- Uncontrolled, special use airspace. Either CYR or CYA.
- CYR is restricted, and no unauthorized aircraft may penetrate this zone.
- CYA is advisory, and this area is hazardous to the operation of civil aircraft, so penetrating this zone is not recommended. An aircraft may fly through, but it is not ATC's problem to provide separation.
- If a certain area is temporarily designated as CYR or CYA, it will be done by NOTAM.
- Usually designated as Class F due to either military operations or hazards (forest fire, experimental testing, training, soaring, etc.). Can be active 24/7, during only certain periods of the day, or maybe only by NOTAM.
- IFR are not permitted in or cleared through by ATC unless the pilot has obtained prior permission from a user agency, has an Altitude Reservation, or is conducting a Contact or Visual approach.
- Unless otherwise specified, the radio frequency of 126.7 MHz should be monitored at all times.

Class G Airspace;

- ATC does not have the authority or obligation to provide service for anyone.

- IFR flights do not require clearance to operate, however, they are required to proceed in accordance with all IFR procedures.
- VFR flights require no clearance, but they must remain VMC at all times.
- The only information service available is provided by the appropriate FIC on 126.7 MHz.
- Class G accounts for 99% of Canadian airspace.
- Some remote parts of Canada are Class G below FL180. These areas are tinted green on the Lo charts. Airspace that is Class G to 12,500' but with Class B above that, is tinted green with white lines.
- Low Level Air Routes (similar to Low Level Airways, but uncontrolled) start at the surface (rather than at 2200' AGL), and are designated by two letters and a number, ie. AR34.

While Low Level Air Routes are uncontrolled, it is important to remember that part of an LLAR may pass through controlled airspace, even though an LLAR does not "create" controlled airspace.

Minimum En Route Altitude (MEA) - the lowest published altitude between radio navigation fixes that assures acceptable navigational signal coverage and meets obstacle clearance requirements between those fixes.

Transponder Airspace:

- A transponder is required in Class A/B/C. It may or may not be required in Class D and/or E.
- If a transponder or Mode C fails, proceed to the next aerodrome of intended landing.

There are four categories of VFR Weather Minima:

1. In control zone.
2. In other controlled airspace.
3. In uncontrolled airspace greater than or equal to 1000' AGL.
4. In uncontrolled airspace below 1000' AGL.

Knowing all VFR rules is absolutely critical for your flight exam. You must memorize them perfectly!

VFR Weather Minima, Control Zones:

- 3 miles visibility.
- 1 mile horizontally from clouds.
- 500 feet below clouds.
- 500 feet above ground.
- If you have to go to SVFR, you must remain clear of cloud above, and your visibility can drop to 1 mile.
- In addition, for SVFR, you must ask for a clearance or permission to enter a control zone.

VFR Weather Minima, Other Controlled Airspace:

- Same as above, except disregard the requirement to be 500' AGL. This is a given, because controlled airspace that is not a control zone is up high.

VFR Minima at or above 1000' AGL, Uncontrolled Airspace:

- 1 SM visibility by day, 3 SM visibility by night.
- 500' below clouds vertically.
- 2000' horizontally from clouds.

VFR Minima below 1000' AGL, Uncontrolled Airspace:

- 2 SM visibility by day, 3 SM visibility by night.
- Clear of clouds.
- The visibility requirement is greater when we are below 1000' AGL because you are likely closer to an airport and because there is likely more traffic.

Special VFR Requirements:

- The pilot must request it, ATC must also then authorize.
- ATC will never instruct SVFR, although they may often hint at it.
- Must retain visual contact with the ground.
- Minimum visibility is 1 SM (except for helicopters which are ½ SM).
- Airplanes can arrive/depart daytime.
- At night, airplanes can only arrive, not depart.
- Helicopters can arrive/depart either day or night.
- Must operate clear of cloud at all times.

VFR Over-The-Top (OTT) Requirements:

- Special endorsement.
- Must be at least 1000' above clouds vertically.
- Permitted in daytime only, and only during the cruise portion of the flight.
- Horizontal distance of at least 5 SM from cloud layers at your altitude.
- When operating between two cloud layers, the vertical separation of layers must be 5000'.
- The destination forecast must be scattered/few/clear, ground visibility of at least 5 SM, and no precipitation/fog/thunderstorms or blowing snow. This forecast must be 1hr prior and 2hr afterwards when using a TAF, or 1hr prior and 3hr afterwards when using a GFA.

IFR aircraft have priority under IFR conditions! So if you request SVFR when there is an IFR aircraft incoming, you may be denied or deferred. Wait for the IFR aircraft to clear, then ask again.

Airworthiness Defect (AD) – Special maintenance outlines or items that are issued by an aircraft manufacturer and/or aircraft component manufacturer. Must be rectified, certified, and signed as airworthy by an AME.

Annual Airworthiness Information Report (AAIR) – Does not affect the Certificate of Airworthiness, but must be submitted to Transport Canada annually or you might get a fine.

You must have a radio and be listening on the appropriate frequency if you're going into an MF area. MF boundaries are usually 5 NM radius and 3000' AAE.

Remote Aerodrome Advisory Service (RAAS) – Controlled remotely by a FSS. Class E.

Dashed lines in a circle around an airport (on a chart) mean that it is controlled, and Class E. Therefore, it is MF, whether on-site FSS or RAAS.

The letter A in front of the frequency on a chart means that it is an uncontrolled ATF frequency, non-mandatory. These typically have a radius of 5 NM and extend to 3000' AGL. NORDO operations are permitted. For an ATF with no published frequency, use 123.2 MHz.

The letter M in front of a frequency means that it is MF. A thick boundary box tells you that the FSS and controller are on site.

The only way that you're permitted to enter an MF area with no radio (NORDO) is if there is a ground station operating, you've given them prior notice, they agree, and you arrive at a pre-specified time.

"PRO" in the CFS stands for standard procedures.

If you're in a Class E Control Zone, you'd better be talking to someone. But if you're transiting Class E Airspace, you may not necessarily be talking to anyone.

Try carrying a spare handheld and/or a cell phone for comm failures.

In an emergency, one good option may be to divert to an uncontrolled airport that may not have mandatory frequencies. But never land at an unsuitable airport or fly beyond safe fuel range. If absolutely necessary, enter controlled airspace with caution and follow the comm failure procedures.

Squawk 7600 for communications failures.

Communication failure **Light Signals, while in the air:**

- Green steady – cleared to land.
- Green flashing – return for landing.
- Red steady – Continue circling.
- Red flashing – unsafe, don't land.
- Red pyrotechnical – military, don't land.

Communication failure **Light Signals, on the ground:**

- Green steady – cleared for takeoff.
- Green flashing – cleared to taxi.
- Red steady – stop.
- Red flashing – Taxi clear of landing area in use.
- White flashing – return to starting point.
- Blinking runway lights – vacate immediately (usually a signal to vehicles and pedestrians).

The international emergency frequency is 121.5 MHz.

Practice interceptions are not carried out on civil aircraft. If you're being intercepted, it's real and it's serious. The CFS lists interception procedures in the emergency section.

Air Defense Identification Zones (ADIZ):

- You need a flight plan or itinerary to enter or depart.
- Penetration of ADIZ must be within 20 NM and 5 minutes of flight plan.

60,000 ASL is the International Standard for the beginning of outer space. But others say that "space" starts about 80km up, at the base of the thermosphere.

Note that Canada's ADIZ's touch or overlap many of the coastal boundary edges of Nova Scotia, Newfoundland, Vancouver Island, Haida Gwaii, and coastal BC/north.

Emergency Security Control of Air Traffic Plan (**ESCAT**):

- Was used once historically, during 9/11.
- Provides for security/control of all civil and military air traffic by the NORAD commander.
- If you hear an ESCAT test, you must report every thirty minutes, even if flying in uncontrolled airspace.
- You must comply with all ATC/FSS instructions.
- Sometimes, this system is tested without prior knowledge.

Minimum Equipment List (MEL) – A list of items that are required, and also that are allowed to be inoperative. It is only required on aircraft that are over 12,500 pounds and turbine powered. MMEL is the Master MEL.

When an AD is in conflict with an item listed in the MEL, the AD prevails.

Equipment Requirements, Daytime, Power-Driven:

- Radio (if in MF only).
- Magnetic compass.
- Airspeed indicator.
- Altimeter.
- Timepiece.
- Engine instruments (Tach/MP, fuel gauge, oil pressure/temperature).
- Remember MAATE.

Equipment Requirements, Day VFR OTT, Power-Driven:

- All normal day power equipment requirements, plus all other items on this list.
- Pitot heat, alternate static.
- Heading indicator.
- Attitude indicator.
- Turn coordinator.
- Radio communications equipment.
- Radio navigation equipment adequate to permit the aircraft to be navigated safely (probably VOR, possibly ADF).

Equipment Requirements, Night VFR, No Passengers, Power-Driven:

- All daytime power-driven equipment requirements.
- Turn coordinator.
- Heading indicator.
- Adequate source of electrical power.
- Spare fuses to 50%.
- Position and anti-collision lights.

Equipment Requirements, Night VFR, With Passengers, Power-Driven:

- All normal day and night (non-PAX) VFR power-driven equipment requirements.
- Attitude indicator.
- Vertical speed indicator.
- Outside Air Temperature (OAT) gauge.
- Landing light.
- Pitot heat.

Navigation lights are red on the left (port), green on the right (starboard), and white on the tail.

The **anti-collision light** is flashing, colored red or white or both.

If a person is carried on a stretcher or in an incubator, or planning to parachute out of the aircraft, restraints may be used in place of seat belts.

All persons in an aircraft must wear seat belts when landing, taking off, moving on the surface, or at the direction of the PIC. The pilot must wear a seat belt at all times, even in cruise.

You aren't allowed to fly into current/forecast reports of icing conditions unless your aircraft has anti-icing equipment.

The pilot at the flight controls of an aircraft shall use an **oxygen mask** if:

1. The aircraft is not equipped with quick-donning oxygen masks and is operated at or above flight level 250; or
2. The aircraft is equipped with quick-donning oxygen masks and is operated above flight level 410.

An ATC unit may authorize an aircraft to operate without a transponder but within airspace where a transponder is required if ATC receives and approves the request prior to the aircraft entering their airspace, and if it is not likely to affect aviation safety.

You cannot take off in an aircraft that has an open snag.

In addition to a comprehensive journey log for all maintenance items, each aircraft will have separate technical logs for the airframe, each engine, and each variable pitch propeller. The journey log and the technical logs are never allowed to be stored or transported together, to help ensure that they cannot be accidentally lost or destroyed.

When starting a new volume of a journey log, you must carry over enough entries to ensure an unbroken chronological number.

You are not permitted to make a single entry into a journey log for a series of flights unless the aircraft is operated by the same PIC throughout the series of flights, and an approved daily flight record is used. This variation on SOP's is suitable for use at a Flight School, but probably not for a PPL.

Elementary Work – A form of simple maintenance that is not subject to a maintenance release, ie. replacing tires, bulbs, fuses, spark plugs, checking compression, etc. The owner can do this work on a privately registered aircraft, but for a commercially registered aircraft, you must be supervised by an AME for the first time that you perform the work.

An aircraft that has been subjected to an **abnormal occurrence** cannot be flown until the aircraft has been inspected for damage. An inspection can be performed by the PIC only if disassembly is not required.

Aviation Occurrence – Any accident or incident associated with the operation of an aircraft.

Accident:

- A person sustains serious injury or is killed.
- Aircraft sustains substantial damage.
- Aircraft is missing or inaccessible.

Reportable Aviation Incident:

- Aircraft fails to remain on the landing or takeoff area, lands with the gear retracted or drags a wing tip, an engine pod, or any other part of the aircraft.
- Crew member incapacitation that poses a threat to safety.
- Depressurization occurs that necessitates an emergency descent.
- A fuel shortage results in a diversion or requires approach and landing priority.
- The aircraft is refueled with the incorrect type of fuel or contaminated fuel.
- A collision, a risk of collision, or a loss of separation occurs.
- A crew member declares an emergency or requires priority handling.
- A slung load is released unintentionally or as a precaution.
- Any dangerous goods are released in or from the aircraft.
- An engine fails or is shut down.
- A transmission gearbox malfunctions.
- Smoke or fire occurs.
- Difficulties are encountered in controlling the aircraft.

Commercial aircraft need to have an ERP (Emergency Response Plan).

If you need to report an aviation accident, call 911 first if necessary, then contact the nearest FSS/FCC, or call toll-free 1-866-WXBRIEF.

Civil Aviation Daily Occurrence Reporting System (**CADORS**):

- This system allows aviators and investigators to report preliminary data on any unusual occurrences.
- CADOR items: student getting lost, flight plan not closed, accidents and incidents, taking off without a clearance, etc.
- Can be found on the Transport Canada website, and are visible to the public. It is worth studying some of them.

Nav Canada is a private, not-for-profit company. It is responsible for ATS, ATC, FSS/FIC, weather briefings, and electronic navigation aids.

ATC is provided through:

- Control Centers (ACC's).
- Terminal Control Units (TCU's).
- Control Towers.

Terminal airspace typically starts at 2200' AGL, and often extends out for 35 NM. It often extends to the bottom of Class B airspace, which starts at 12,500' ASL. A TCU controller may work out of an ACC, and an en route controller may also. En route controllers will be in charge of Class E airways.

A Class E airport with MF will not have a tower, however, it will have a controller working out of a FSS. This is the only case where a FSS will have an actual controller, although you can find lots of other staff in a FSS.

The en route portion of your flight can include flight time in both Terminal Airspace and Class E airways.

Terminal Control Service is provided within specified control areas by ACC's or TCU's.

The eight **Flight Information Centers** (FIC's) service the eight **Flight Information Regions** (FIR's), for weather briefings and flight planning services.

A **FSS** is a branch/offshoot of a FIC. Sometimes, FSS staff are physically split between a FSS in a smaller city and a FIC in the main regional center. FSS staff also coordinate Vehicle Control Services for airport vehicles.

Flight Information Services En route (FISE) – A frequency used by FSS or FIC for weather briefing and flight planning info, which is easy for pilots en route to access via their VHF radio.

Dialup RCO (Radio Communications Outlet) is known as a DRCO. To operate, key your mic 4 times on the published frequency to activate it. It then calls a distant ATS unit (via telephone landline).

Community Aerodrome Radio Station (CARS):

- Established at certain isolated airports, operated by territorial or provincial governments, or by ATS.
- Interconnected with a FSS.
- They can provide local data, and they also accept and pass on PIREPS and flight plan itineraries.

UNICOM:

- Operated by a private agency that provides private advisory station service at uncontrolled aerodromes.
- Not official, and info provided may or may not be used (at the discretion of the pilot).
- Used at airports with low traffic volumes and typically with no control tower.
- Some UNICOM stations are not staffed.

Automatic Terminal Information Service (**ATIS**):

- Broadcast on a specific separate frequency.

- Contains non-control info.
- Broadcast repeatedly, in a continuous audio loop.
- Usually updated hourly, but sometimes more frequently.
- Each successive ATIS message throughout a day gets a new phonetic identifier.

NavCan publishes a book that reviews **basic VFR phraseology**. It's fairly handy. Here's a link: <https://www.navcanada.ca/EN/media/Publications/VFR%20Phraseology.pdf>

When a controller gives a radar position, it is based on the track (path over the ground), not on the heading of the aircraft. The controller just sees which way the aircraft is travelling and can't account for the fact that an aircraft may be pointed on a different heading to account for wind drift.

A controller may tell you to join a circuit on "left base" or "left downwind" when using a right-hand circuit, or on "right base" or "right downwind" when using a left-hand circuit. These instructions would imply that you are using a circuit that is a mirror of the normal one in effect at the airfield. You can't do this on your own at an uncontrolled field, because at uncontrolled fields, there are only two legal ways to join the circuit: downwind, and crossing midfield. However, at a controlled field, the controller can give you a wider variety of options (including unconventional options), depending on circumstances at the time.

When a Class C or Class D towered airport closes (such as during nighttime), it becomes a Class E mandatory frequency.

The usual radius for both ATF and MF is 5 NM out from the airport up to 3000' (double-check this, as I believe one is AAE and one is AGL).

ATF usually uses one of the UNICOM frequencies (there are approximately eleven of them). Where there is no ground station, the ATF would be 123.2 MHz.

Statute Mile = 5280 feet.

Nautical Mile = 6076.1 feet or approximately 1.15 statute miles.

Always join the circuit at circuit height!

Some other frequencies are starting to replace 126.7 MHz as the FISE frequency, as 126.7 is sometimes becoming a broadcast-only frequency. These other frequencies are often in the 123's.

Land And Hold Short Operation (**LAHSO**) minimums:

- 1000' ceiling and 3 SM visibility.
- Reported braking action not less than good.
- Runway must be bare.
- Tailwind of less than 5 knots is acceptable.
- Maximum crosswind component of 15 knots.
- ATC must include specific instructions.
- Pilots must read back clearance.
- Pilots must remain 200 feet short of the closest edge of the runway being intersected.

Progressive Taxi – If uncertain about taxi instructions, because they are too complex or because you are unfamiliar with the airport, ask for progressive taxi. The controllers will give you step-by-step instructions in a series, rather than all at once.

Hypoxia:

- Low oxygen.
- May make you feel euphoric.

- Impairs night vision, slows reaction time.
- Can cause unconsciousness.
- Smokers are more susceptible.

You must use supplemental oxygen above 13,000 feet, and also if you're above 10,000 feet for more than thirty minutes. Recommended at night if you're flying above 5,000 feet.

The atmosphere is thicker around the equator.

Types of Hypoxia:

1. Hypoxic: Lack of oxygen from changes in altitude.
2. Anemic: Due to a person's blood's inability to absorb oxygen.
3. Stagnant: Due to blood pooling in areas.
4. Histotoxic: Due to our body's cells' inability to absorb oxygen.

Dysbarism – Caused by gases trapped in the body that expand or contract in body cavities. Can cause toothaches, ear/sinus pain, or abdominal pain. Most evident during descents.

Barotrauma – Physical damage caused by any type of dysbarism.

If a passenger reports ear pain, level off for a bit, and suggest yawning, swallowing, or chewing gum.

Atmospheric pressure is only 50% at 18,000 feet.

Flying above 25,000 feet in an unpressurized aircraft can lead to the “bends” or decompression sickness.

If you've been diving, don't fly anything up to 8,000 feet for at least twelve hours. If you needed decompression stops, OR if the flight is going to go above 8,000 feet, wait twenty-four hours after your dive.

When scanning for other aircraft, segment the windshield, use peripheral vision rather than center-of-view, don't stay staring at any one area for too long.

Noise levels in the cockpit are usually high. Earplugs or noise cancelling headphones should be worn to protect your hearing.

Spatial Disorientation – Sense of confusion about your position or movement.

Vertigo – Sense or hallucination of spinning or rotating even after motion has stopped.

Vestibular Illusions – When an aircraft becomes established in a turn, the fluid in your inner ear can incorrectly indicate that the turn has stopped, or if the turn stops, fluid can indicate a turn in the opposite direction. This is especially strong at night.

Visual illusions can be caused by at least a dozen things. Scan and trust all instruments regularly, no matter what your senses tell you.

Do not take medicines for airsickness while piloting, as they usually cause drowsiness and impair judgment.

Don't fly within 24 hours of local anesthetics or until a doctor gives approval for a general anesthetic. Wait 48 hours after donating blood.

Hyperventilation – Breathing at a faster and/or deeper rate than the body requires for good oxygenation at the existing work level. You need to slow down and get more carbon dioxide into your system.

Smoking can severely limit your career as a pilot.

Time of Useful Consciousness (TUC) – The amount of time that an individual is able to perform flying duties efficiently in a period of low oxygen availability.

Tensing calf and thigh muscles increases our tolerance to high “G” manoeuvres.

Common responses to stress can include omission error, queuing, approximation, and fixation.

Dehydration occurs more quickly at altitude. Bring water/juice on a flight, but try to avoid caffeine or carbonated drinks.

Decision Making Process: (GRADES)

Gather

Review

Analyze

Decide and Do

Evaluate

(Start over, if necessary)

Types of Stress – Acute is temporary, chronic is long term.

Correct use and following of checklists is a critical skill for anyone trying to get a license, and throughout a pilot’s career.

Snag – A note to maintenance personnel.

CRM – Crew Resource Management

Emergency Procedures:

1. Aviate.
2. Navigate.
3. Communicate.

Humans are designed to maintain spatial orientation on the ground. The flight environment is hostile and unfamiliar.

VFR requires that you are able to see a horizon. Even birds are unable to maintain spatial orientation and fly safely when deprived of vision (clouds, fog, etc.).

Foveal Vision – Central vision, involved with the identification of objects and the perception of colours.

With peripheral/ambient vision, motion of the surrounding environment produces a perception of self-motion even if we are standing or sitting still.

When the natural horizon is obscured, the attitude (for pitch) can sometimes be maintained by visual reference to the surface below.

Up-sloping Runway – May produce the visual illusion of a high altitude final approach.

Down-sloping Runway – May produce the visual illusion of a low altitude final approach.

Wide Runway – May produce the visual illusion of a low altitude final approach.

Black Hole Approach – A final approach at night (with no stars or moonlight) over water or unlighted terrain to a lighted runway beyond which no horizon is visible. You may have the illusion of being upright, and may perceive the runway to be tilted left and up-sloping.

Especially dangerous is a black hole approach with no lights before the runway and city lights or rising terrain beyond. This may produce the visual illusion of a high altitude final approach.

Autokinetic Illusion – The impression that a stationary object is moving in front of the airplane's path. It is caused by staring at a single fixed point of light in a totally dark and featureless background.

False Visual Horizon references:

- Flying over a banked cloud.
- Mountainous terrain can be misleading.
- Night flying over featureless terrain.
- Good ground lights but dark, starless sky.

Spatial Disorientation – A mismatch between visual, vestibular, and proprioceptive sensory inputs. Approximately 5-10% of GA accidents can be attributed to spatial disorientation. Ninety percent of those accidents are fatal.

Vestibular System:

- Inside the ears.
- Organs of equilibrium.
- Semicircular canals detect changes in angular acceleration.
- Otolith organs (utricle and saccule) detect changes in linear acceleration and gravity.

Your semicircular canals are three half circular, interconnected tubes. They are the equivalent of three gyroscopes located in three planes which are each perpendicular to the others.

Vestibular Illusions:

- Occur primarily under conditions of unavailable or unreliable external visual references.
- Leans: Caused by a sudden return to level flight following a gradual and prolonged turn that went unnoticed by the pilot.
- Graveyard Spin: Occurs when you enter a spin. You will initially have a sensation of spinning in the same direction as your spin. However, as it continues, you have the sensation that the spin is progressively decreasing. If you apply rudder to stop the spin, your body may trick you, then you overcompensate.
- Graveyard Spiral: Associated with a return to level flight following an intentional or unintentional prolonged bank turn. After perhaps twenty seconds in a banking turn, your body tricks you into thinking that you are no longer banking. Very dangerous.
- Coriolis Illusion: Involves the simultaneous stimulation of two semicircular canals with a sudden tilt of the pilot's head (sideways/forward/back) when the aircraft is turning. Can produce the almost unbearable sensation that the aircraft is rolling, pitching, and yawing, all at the same time.

Human exposure to rotational acceleration of two degrees per second or lower is below the detection threshold of the semicircular canals. Remember that a standard rate turn is only three degrees per second, or barely detectable.

Levelling the wings after a turn may cause the illusion that a plane is banking in the opposite direction.

In a spin, the ball (in the inclinometer) tells you nothing. Remember this: "Step on the sky, or the wing that is high."

Otolith Organs:

1. Saccule: Detects gravity changes in the vertical plane.
2. Utricle: Detects changes in linear acceleration in the horizontal plane.

Somatogravic Illusions involve the utricle and saccule. These happen most frequently when there are not any exterior sensory inputs. Types include:

1. **Inversion:** Steep ascent (forward linear acceleration), followed by a sudden return to level flight, can make you think that the aircraft is inverted.
2. **Head Up:** Sudden forward linear acceleration makes you think that the aircraft is pitching up significantly. This occurs most commonly during an overshoot, and is especially dangerous at night.
3. **Head Down:** Sudden linear deceleration during level flight that makes the pilot perceive a sudden steep pitching forward. Common on short final. A risk is that the pilot reacts by pitching up, and stalls.

Proprioceptive Receptors – Located in the skin, muscles, tendons, and joints. Play a small role in maintaining spatial orientation.

Preventing Spatial Disorientation:

1. Stay in three-mile visibility VFR conditions.
2. Don't push the weather.

Airsickness is different than spatial disorientation. Symptoms of airsickness include vertigo, loss of appetite, salivation and swallowing, burping, stomach awareness, nausea, retching, vomiting, urge for a bowel movement, cold sweats, skin pallor, sensation of fullness in head, mental confusion, apathy, drowsiness, difficulty focusing, visual flashbacks, eye strain, and blurred vision.

Airsickness is uncommon among experienced pilots. You build a tolerance. Avoid fatigue, alcohol, drugs/medications, and stress.

If your attention is focused on flying the aircraft, you are less likely to become airsick. Never take drugs for motion sickness!

If you become airsick it can help to:

- Open windows/vents.
- Put your head against the seat headrest.
- Keep your eyes on a point outside the aircraft.

Night – Officially lasts from the end of evening civil twilight to the start of morning civil twilight. Or when the center of the sun's disc is 6° below the horizon (which is approximately 25 minutes after sunset, or 25 minutes before sunrise).

Night Flying:

- Bring at least one flashlight, plus spare batteries.
- Red filtered lights are the best.
- Headlamps are convenient.
- You need a flashlight to inspect the outside of the aircraft.

Always check NOTAM's, every time you fly. Including at night.

Using a Landing Light is technically not a legal requirement if you are a PPL with no passengers, but it is smart to always use it for all takeoffs and landings.

Recency Requirements:

- Five takeoffs and landings at night in the last six months.
- Landing light must be serviceable.
- For commercial (CPL), recency is three takeoffs and landings in ninety days.

CARS for Night Flying:

- Three mile visibility for VFR, unless using SVFR.
- SVFR is not authorized for night departures.
- You need 45 minutes of reserve fuel, not 30 minutes.

Nighttime Equipment Requirements:

- All daytime equipment, plus all other items on this list.
- Turn Coordinator or Turn & Bank indicator.
- Source of electricity for all equipment.
- Spare fuses, 50% minimum for each type.
- Heading indicator, unless flying within eyesight of airport.
- Illumination for instruments, plus backup.
- Landing light.
- Position lights, anti-collision lights.
- GPS if within NDA.
- For commercial, you also need attitude indicator, VSI, OAT, and a way to prevent icing of the airspeed indicator system.

Requirements for Night Rating:

- Must have PPL.
- Ten hours of night flying, five of which are dual (including two cross-country) and five of which are solo (with a minimum of ten takeoffs and landings).
- Ten hours of dual instrument time total.
- Night instrument hours can only be applied to one of night or instrument time requirements, not to both.
- Total time of twenty hours.

Night Rating Hazards:

- Deer and other wildlife.
- Fog (light winds, small spread between temperature and dew point).
- Radiation fog occurs most frequently during this time.
- Strong winds up top (circuit attitude).
- Electrical failure would be very serious at night. Keep an eye on the ammeter/load meter.
- Might not be able to see where to land on a forced approach.
- Airport closures, or lack of lighting.

Lighting Annotations:

- F – Fixed
- Fl – Flashing
- Occ – Occulting
- R – Red
- G – Green
- Bl – Blue

Lights are white unless otherwise notated.

ARCAL Lighting:

1. Type J: Key the mic five times in five seconds, timer resets for approximately fifteen minutes.
2. Type K: Key the mic seven times initially, puts it on high lighting, but if you follow up by five or three times you'll lower the intensity to medium (5) or low (3).

VASI Lights – Designed for a three degree glide path. For a three bar VASI system, a small craft would ignore the top light, and a large aircraft would ignore the bottom lights.

PAPI – Precision Approach Path Indicator. Has four lights side-by-side.

Averted Vision – Looking a few degrees off center when trying to see an object at night.

You have a central blind spot because you have no rods in the fovea.

Night Illusions:

- Autokinesis: Objects appear to shift.
- False Reference: Stars or lights near the horizon.
- Venus & Sirius: False aircraft.
- Night Myopia: Dilation, inability to focus.
- Somatographic: Acceleration with pitch.

Make sure that you taxi more slowly at night. Speed is deceptive and depth perception is reduced. And make sure that your brakes are on firmly.

International Virtual Aviation Association (**IVAO**) – A free service to enthusiasts participating in the worldwide flight simulation community.

Moving between two aprons is acceptable and does not require permission from ground control (although in a busy airport, it would often be a wise courtesy).

Crossing a runway is only permitted if your taxi instructions took you past that point, and if you were not told to hold short of the runway that must be crossed.

Always hold short of your takeoff runway, unless you have been told that you may line up. Being told to line up is not a clearance to take off! After lining up, you must still wait for a takeoff clearance.

If you are told to line up on a runway and you are approaching that runway in a straight line (from before the threshold), stopping at the hold short line for the runway does not mean that you are lined up! You must still cross the hold short line (as long as you haven't been told to hold short), and only then, once you are onto the actual runway and stopped, are you considered to be lined up.

There is a difference between ATS, which stands for Air Traffic Services, and ATC, which stands for Air Traffic Controller. "Services" encompasses a broad range of services, while "Control" is a specific type of service. All controllers provide ATS. However, not all entities which provide ATS are classified as controllers. I have occasionally used these two acronyms in a slightly synonymous manner within these study notes, however, you must learn to understand the distinction.

Conclusion

The topics included in a study of air law and miscellaneous topics for aviation have a greater scope than I've covered here. It would also be wise to spend quite a bit of time studying the various publications that I've linked to on this page: <http://www.djbolivia.ca/aviation.html>

I have links there to several additional aviation-related publications.

Thanks for reading, I hope this was helpful to pilots in training. If you find any errors in the above information, feel free to contact me at jonathan.scooter.clark@gmail.com

- Jonathan Clark