# Edmonton Centre

## 1. Introduction

Welcome to Edmonton Centre, the largest Flight Information Region in Canada. Edmonton Centre is home to the busy terminal airspace which surrounds Calgary and Edmonton, as well as the most complex and busiest procedural airspace in the world. Besides traffic to/from Calgary and Edmonton, there is lots of overflight traffic from nearby airports (Vancouver, Anchorage, Seattle, and Winnipeg) as well as from the US West coast to Europe and from the US East coast to Asia and Alaska. This results in lots of traffic flowing in a number of directions.

The job of Edmonton Centre is to coordinate and separate this enroute traffic, to sequence and space traffic arriving at airports within the FIR and in adjacent FIRs/ARTCCs, and handle arrivals and departures from uncontrolled airports within the FIR. Additionally, Edmonton Centre can (traffic permitting) assume the role of any unmanned positions within the FIR.

The end result of all these jobs is a position that requires all the knowledge accumulated to this point and then some, as well as the ability to multi-task and keep track of multiple situations simultaneously. Centre is a very demanding yet rewarding position.

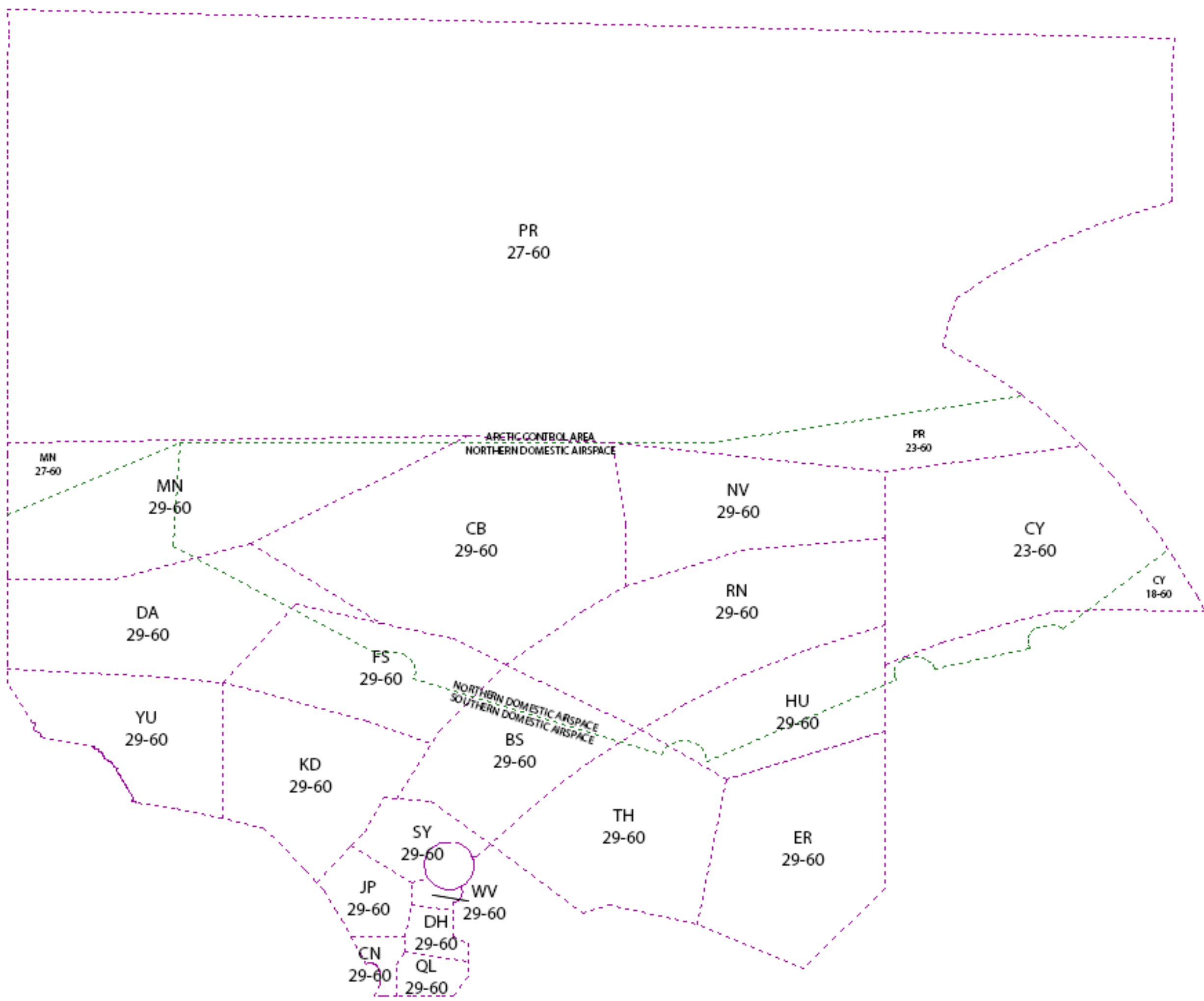
## 2. Enroute Airspace Structure

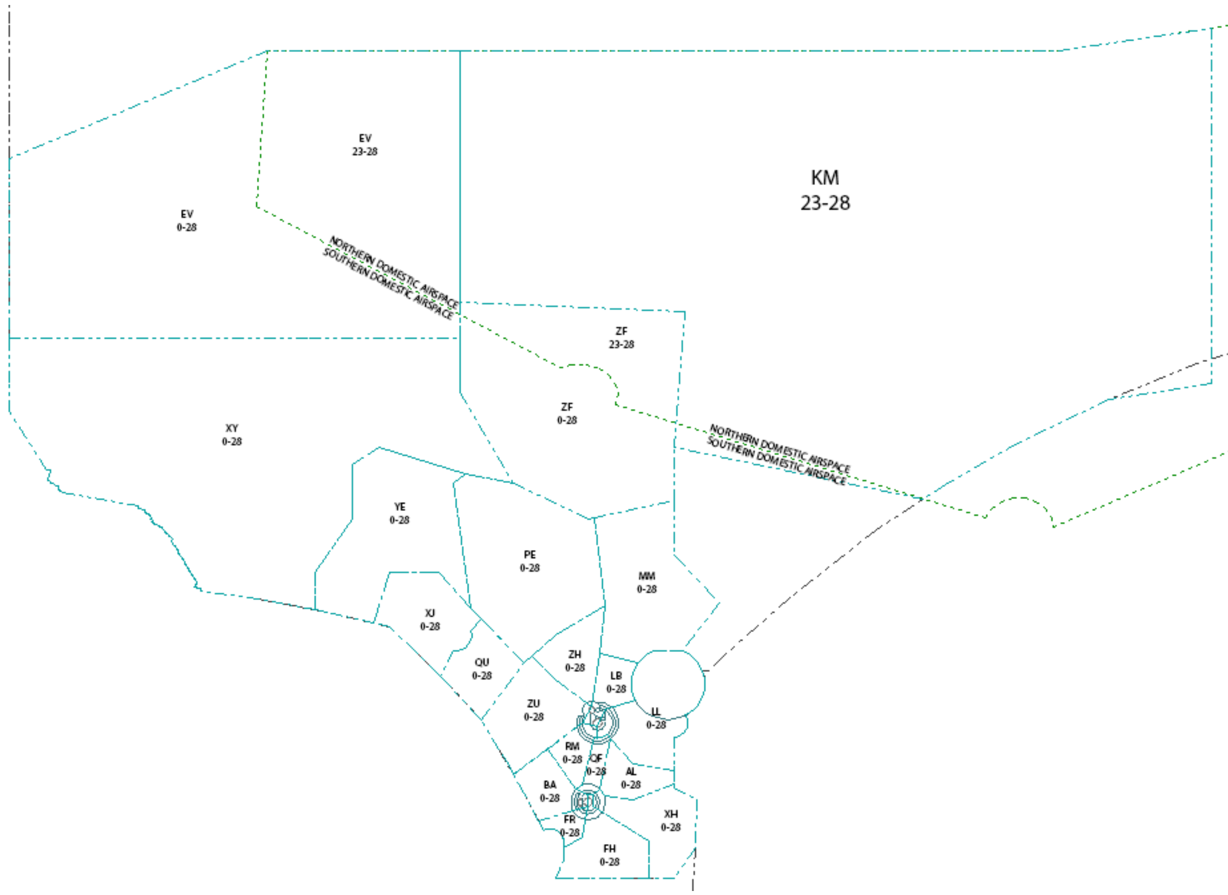
The Centre position is usually worked by a single controller, CZEG_CTR on 132.850.
The capability does exist for multiple controllers to log on as EDMONTON Centre. There are 40 available sectors in Edmonton Centre, which allows great flexibility for providing service where it is needed during high traffic events.

### 2.1 High/Low Airspace Splits

Throughout Edmonton Centre, the airspace is divided into High Level and Low Level sectors. Low Level sectors control from the surface to FL280, while High Level sectors control from FL290 to FL600 (the upper limit of controlled airspace).

The high and low sectors have very different shapes, based on predominant traffic flows at their altitudes. All of the sector boundaries can be activated in CanScope, either for individual sectors or all the high or low level sectors.






## 2.2 Sector Hierarchy

CanScope allows a hierarchy of sectors to be specified. Each sector is controlled by the lowest sector in its hierarchy that is online. The change in sector ownership is automatic within CanScope as other controllers log on or off, but is visible to a controller in two ways: First, their active sectors are shown in black (or whatever customized colour is selected). Second, their aircraft lists will add aircraft that will enter an expanded sector, and remove aircraft that will no longer enter their sector when it shrinks.

The following is a list of all the Edmonton Centre sectors, their frequency, and their ownership. Ownership hierarchy reads left to right, with the first (leftmost) sector that is online being the one that controls the given sector.

| | Callsign | Sector | Frequency | Ownership |
|---|---|---|---|---|
| Alberta High | ZEG_QL_CTR | Lethbridge | 135.75 | QL:JP:QF |
| | ZEG_CN_CTR | Crowsnest | 133.75 | CN:QL:JP:QF |
| | ZEG_JP_CTR | Jasper | 132.05 | JP:QF |
| | ZEG_DH_CTR | Drumheller | 135.12 | DH:JP:QF |
| | ZEG_WV_CTR | Wainwright | 134.90 | WV:SY:JP:QF |
| | ZEG_SY_CTR | Syncrude | 132.70 | SY:JP:QF |

| | Callsign | Sector | Frequency | Ownership |
|---|---|---|---|---|
| Arctic High | ZEG_KD_CTR | Klondike | 134.85 | KD:PR:QF |
| | ZEG_YU_CTR | Yukon | 132.67 | YU:PR:QF |
| | ZEG_DA_CTR | Dawson | 132.80 | DA:PR:QF |
| | ZEG_MN_CTR | Mackenzie | 134.47 | MN:PR:QF |
| | ZEG_FS_CTR | Simpson | 132.25 | FS:PR:QF |
| | ZEG_CB_CTR | Cambridge | 132.22 | CB:PR:QF |
| | ZEG_BS_CTR | Bison | 132.15 | BS:PR:QF |
| | ZEG_RN_CTR | Rankin | 133.40 | RN:PR:QF |
| | ZEG_NV_CTR | Nunavut | 134.40 | NV:PR:QF |
| | ZEG_CY_CTR | Clyde | 118.47 | CY:PR:QF |
| | ZEG_TH_CTR | Thompson | 134.50 | TH:ER |
| | ZEG_HU_CTR | Hudson | 132.07 | HU:ER |
| | ZEG_ER_CTR | Severn | 135.00 | ER |
| | ZEG_PR_CTR | Polar | 135.02 | PR:QF |

| | Callsign | Sector | Frequency | Ownership |
|---|---|---|---|---|
| Calgary Enroute | ZEG_XH_CTR | Medicine Hat | 132.65 | XH:QF |
| | ZEG_FH_CTR | Foothills | 132.75 | FH:QF |
| | ZEG_FR_CTR | Fortress | 128.70 | FR:FH:QF |
| | ZEG_BA_CTR | Banff | 133.30 | BA:QF |
| | ZEG_RM_CTR | Rocky Mountain | 134.30 | RM:BA:QF |
| | ZEG_QF_CTR | Red Deer | 132.85 | QF |
| | ZEG_AL_CTR | Alsask | 124.45 | AL:XH:QF |
| Edmonton Enroute | ZEG_LL_CTR | Lloydminster | 133.45 | LL:ZU:QF |
| | ZEG_LB_CTR | Lac La Biche | 134.70 | LB:LL:ZU:QF |
| | ZEG_ZH_CTR | Slave Lake | 127.82 | ZH:ZU:QF |
| | ZEG_ZU_CTR | Whitecourt | 132.05 | ZU:QF |
| | ZEG_QU_CTR | Grande Prarie | 134.50 | QU:ZU:QF |
| | ZEG_XJ_CTR | Fort St. John | 132.60 | XJ:QU:ZU:QF |
| North Low | ZEG_MM_CTR | McMurray | 135.70 | MM:QF |
| | ZEG_PE_CTR | Peace River | 135.27 | PE:MM:QF |
| | ZEG_YE_CTR | Fort Nelson | 132.87 | YE:MM:QF |
| | ZEG_XY_CTR | Whitehorse | 134.15 | XY:EV:ZF:MM:QF |
| | ZEG_EV_CTR | Inuvik | 132.40 | EV:ZF:MM:QF |
| | ZEG_ZF_CTR | Yellowknife | 135.80 | ZF:MM:QF |
| | ZEG_KM_CTR | Coppermine | 134.67 | KM:ZF:MM:QF |

Within all of these sectors, there are a few primary sectors that are usually used unless an event requires some special plan. The following are the 3 primary sectors and should generally be brought online in this order:

- ZEG_QF_CTR, which is the same as CZEG_CTR as far as CanScope is concerned. This is the default Edmonton sector and all other sectors will fall under its control if no other CTR is online.
- ZEG_PR_CTR, which controls all the sectors in Arctic High.
- ZEG_JP_CTR, which controls all the sectors in Alberta High.

The following are 2 secondary sectors which help relieve workload in the primary sectors during busy periods.

- ZEG_QL_CTR, which takes control of some of the south sectors (the ones furthest south (CN +QL)).
- ZEG_SY_CTR, which takes half of the northern Alberta High sectors, reducing workload in the high density Fort McMurray-Edmonton-Calgary corridor.

Finally, to enable high-low splits, the following low sectors can be brought online:

- ZEG_MM_CTR, which is the primary low-level sector. It will take control of all North Low sectors.
- ZEG_ZU_CTR, which controls Edmonton Enroute
- ZEG_QF_CTR, which is left with Calgary Enroute.

Additionally, Edmonton Centre can take control over Winnipeg's High Level airspace over the Hudson Bay:

- ZEG_ER_CTR, which controls the three high level sectors over the Hudson Bay.

Almost all other sectors will only take control of their sector when logging on. If in doubt, consult the ownership table above to see who has control, or check the Sector Ownership dialog in the Other Settings menu in CanScope. It always lists who currently has control of a sector, and even allows overriding of the default hierarchy if needed.

## 2.3 Types of Airspace

It is important for controllers to be aware of the classes of airspace in Canada and how they affect operations. There are 7 classes of airspace in Canada, A through G. Each type is described briefly below. For quicker comparisons, a table comparing the various classes is included at the end of this section.

### 2.3.1 Class A

Exists where there is a need to control all aircraft.
VFR traffic is prohibited. IFR traffic only. ATC provides separation to all aircraft.
All airspace from 18,000' to FL600 is Class A in the SDA (Southern Domestic Airspace).
All airspace from FL230 to FL600 is Class A in the NDA (Northern Domestic Airspace).
All airspace from FL270 to FL600 is Class A in the ACA (Arctic Control Area).

### 2.3.2 Class B

Exists where VFR is allowable but needs CVFR.
VFR traffic is permitted, but only with an air traffic control clearance (also known as Controlled VFR or CVFR). VFR is treated exactly like IFR, except they must remain VMC at all times. ATC provides separation to all aircraft.
All airspace from 12,500 to but not including 18,000'. Terminal airspace and control zones can be designated Class B but no such zones exist in the Edmonton FIR.

### 2.3.3 Class C

Exists where VFR and IFR must be separated.
VFR traffic is permitted, but must obtain permission to enter. Separation is provided for IFR/IFR and IFR/VFR traffic. VFR/VFR separation is provided as workload permits.
Terminal airspace and control zones can be designated Class C. Edmonton and Calgary Terminal Control Area along with control zones at CYYC, CYEG, CYBW, and CYMM are designated Class C while towers are in operation.

### 2.3.4 Class D

Exists where there is a need to provide control service to both VFR and IFR traffic. VFR traffic is permitted but must establish 2-way radio communication to enter.
Terminal airspace and control zones can be designated Class D. In Edmonton FIR, all remaining controlled (towered) airports that are not Class C are designated Class D. These include CZVL, CYXY, CYZF and CYOD. All Class D reverts to Class E when the control tower is closed.

**2.3.5 C**
**lass E**
Exists where there is a need to provide control of IFR traffic.
No control of VFR traffic is provided. Only separation of IFR traffic. (Services can be provided to VFR on request.) Only areas around airports with control zones, and along Victor airways or T RNAV airways are designated Class E. Outside of these areas is Class G airspace. See the current LO1, LO2, LO5, AND LO9 charts for exact dimensions of controlled/uncontrolled airspace.

**2.3.6 Class F**
Exists where there is a need to restrict aircraft activity.
Class F can be either Advisory or Restricted.
Advisory airspace means aircraft are not prohibited but it is recommended to remain clear due to activities such as Parachuting, Gliding, Training, Aerobatics, etc.
Restricted airspace means aircraft cannot enter without permission from the controlling agency. Airspace can be restricted for military training, weapons testing, rocket launches, etc. Temporary restricted areas can be designated for VIPs and special events.
In no case will ATC clear an aircraft to enter any Class F airspace. Class F airspace can be found on applicable LO and HI charts.
Note that Class F airspace is not simulated on VatSim. The information here is provided mainly for reference.

**2.3.7 Class G**
Uncontrolled airspace. No control service is needed or provided by ATC. Both VFR and IFR aircraft proceed at their own discretion.
Most airspace below 2200' AGL is uncontrolled, except where control zones or terminals explicitly extend lower (eg to the surface). Large areas of northern Ontario outside of airports and airways are also Class G below 12,500' ASL. These areas are shaded green on the LO1, LO2, LO5, and LO9 charts.
See Section 3.2 for more information on procedures in uncontrolled (Class G) airspace.

**2.3.8 Summary**
The following summarizes some of the important differences between the various classes of airspace, as far as ATC is concerned.

| Class | VFR Allowed? | Separation |
|---|---|---|
| A | No | All |
| B | CVFR Only | All |
| C | Permission to enter required | IFR/IFR, IFR/VFR, VFR/VFR workload permitting |
| D | 2-way communication required | IFR/IFR, IFR/VFR, VFR/VFR workload permitting |
| E | Uncontrolled | IFR/IFR |
| F | Restricted/Advisory | None |
| G | Uncontrolled | None |

## 3. Enroute Rules and Procedures

### 3.1 Separation

Apply lateral, longitudinal or vertical separation between aircraft operating in accordance with an IFR or CVFR clearance, through consistent reference to and use of, the following three elements that are fundamental to safe, orderly and expeditious control:

A. Planning — determine the appropriate separation minimum required.
B. Executing — implement the selected standard.
C.Monitoring — ensure that the planned and executed separation is maintained.

### 3.1.1 Vertical Separation

Apply vertical separation by assigning different altitudes. Separate aircraft vertically by using one of the following minima:

A. Below FL290 - 1,000 feet.
B. FL290 - FL410:
1. 1,000 feet between RVSM aircraft;
2. 2,000 feet between a Non-RVSM aircraft and any other aircraft.
C.Above FL410 - 2,000 feet.

### 3.1.2 Lateral Separation

Apply lateral separation by requiring operation on different routes or in different areas or geographic locations as determined by the use of radar, NAVAIDs, RNAV, or visual reference to the ground. Separate aircraft laterally by ensuring that the following protected airspaces do not overlap.

A. Holding areas.
B.
1. low-level airways; and
2. the airspace to be protected, including additional protected airspace for change of direction, for:

a. high-level airways; and
b. off-airway tracks.
c. Initial, intermediate, final, missed approach and departure areas.

**For radar identified aircraft:**

- Separate aircraft 5nm laterally outside of all terminal environments.

**For non radar identified aircraft:**

- Separate aircraft on tracks outside of NAVAID signal coverage by 45nm lateral or 15 minutes in trail.
- Separate aircraft on the same track at cruise by 10 minutes provided NAVAID coverage exists. In addition, separate aircraft on crossing tracks by 10 minutes provided NAVAID coverage exists
- Separate aircraft using DME Lateral Separation by maintaining a specified arc of the same DME facility by 20 miles or 10 miles provided both aircraft are 35 miles or less from the DME facility.
- Apply OMNI-track separation of 30 degrees or greater between same direction, departing, outbound aircraft that are 15 miles or less from the facility.
- Apply OMNI-track separation of 15 degrees between same direction, outbound aircraft provided at least one aircraft is more than 15 miles from the facility.
- Apply OMNI-track separation of 15 degrees between same direction, inbound aircraft provided the second aircraft is more than 15 miles and 10 minutes or more, from the facility.
- Apply OMNI-track separation of 15 degrees between opposite direction aircraft provided, they will pass at a point more than 15 miles from the facility; or the outbound aircraft is more than 15 miles from the facility.

For example, as most commonly seen at the Whitehorse airport…

The standard clearance to aircraft departing CYXY is as follows:
For RWY14R departures…
**"JZA288, is cleared to the Vancouver International Airport, via Whitehorse, the Whitehorse VOR, NCA34, flight planned route, make climb from 11,000 to FL270 established on the 076 radial, cross 17 DME at 11,000 or below, squawk 1716."**

For RWY 32L departures…
**"JZA288, is cleared to the Vancouver International Airport, via Whitehorse, the Whitehorse VOR, NCA34, flight planned route, make climb from 11,000 to FL270 established on the 343 radial, cross 17 DME at 11,000 below, squawk 1716."**

For the 14R example, the  arriving aircraft are at least 10 minutes from the field when the departure becomes airborne, and are arriving on an OMNI-track radial separated by 30 degrees or more. The arrival aircraft will have a clearance to the Whitehorse Airport as follows…
**"KBA301, cleared to Whitehorse Airport NDB/DME RWY 14R approach, make decent from FL280 to 12,000 established on the 046 radial, cross 30DME at 12,000 or above, once established on 30DME ARC, descent your discretion, contact Tower 118.3 now"**

### 3.2 Holds
Since aircraft are unable to stop in the air, holds are used to 'park' an airplane when it is necessary for an aircraft to stop proceeding forward, due to excessive congestion, weather that has gone below minimums, closed runways, or other reasons.

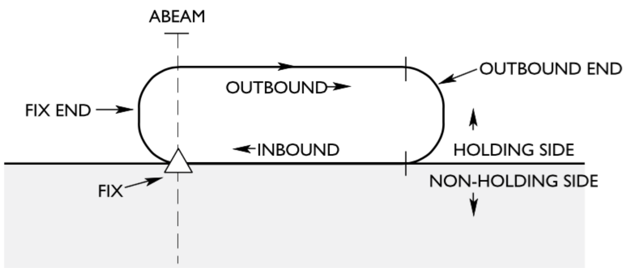



**Figure 3-1: Standard Hold**

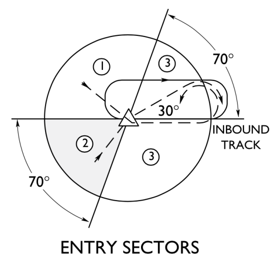



**Figure 3-2: Standard Hold Entry Procedures**

Holds are flown as a racetrack pattern anchored around a single fix and a specific track into that fix. Upon passing the fix, a 180° right turn is initiated, the aircraft flies away from the fix for 1 minute, and then turns back to the right 180° again and re-intercepts that track back to the fix. When a hold is necessary, a clearance is issued in the following order:
- Holding Fix
- Direction of hold relative to fix
- Inbound track
- Direction of turns (if non-standard; standard hold is right turns)
- Altitude
- Expected Further Clearance (EFC) or Expected Approach Time (EAT)

Example: **"WJA553, cleared to YYC, hold east, inbound on 090 radial. Maintain 8,000. Expect further clearance at 0030z**."

Any point can be used as the fix. While VORs/NDBs used to be popular, with today's RNAV systems, any intersection or other fix can be used (assuming the aircraft's systems are able to navigate to it).

The direction should indicate where most of the holding will take place. In the example (shown as in Figure 3-1: Standard Hold Figure 3-2: Standard Hold Entry Procedures), hold east means the inbound and outbound tracks of the hold will be east of the VOR. Only the 180° turn extends west of the hold fix.

Like the fix, thanks to RNAV and FMS, the inbound track can be almost anything. Any arbitrary track can be assigned, though tracks along airways, or localizers are preferred.

The length of the inbound leg is usually measured in time (1 minute at or below 14,000', or 1 1/2 minutes above 14,000'). To keep things easier, pilots often request the legs be changed to a specific distance rather than time, 10 mile legs being the most common. This should be approved unless a specific reason exists to refuse the request.

Aircraft will always need a time specified to exit the hold, known as an EFC time (or an EAT if the hold is over an approach fix waiting to initiate an approach). If no time is specified the pilot will ask for one. This time is only used if the aircraft experiences a comm failure. In case of comm failure, the aircraft will leave the hold at that time. As long as communication is maintained, ATC can continue to extend this time if required, and terminate the hold at anytime. However, if no EFC is specified and a comm failure occurs, the aircraft does not have and will never be able to receive a clearance to leave the hold.

To make things easier for pilots and controllers, STARs (and other procedures) will usually have a number of specific holds published on the chart. This simplifies phraseology, as the controller issue a much simpler clearance without as many specifics: **"WJA196, cleared to IGVEP, hold as published. Maintain 16,000. Expect further clearance at 2345z."** Some examples of published holds can be seen in Figure 3-3: Published Holds on the IGVEP3 STAR, where published holds can be seen at IGVEP and PIBSO on the IGVEP3 STAR.

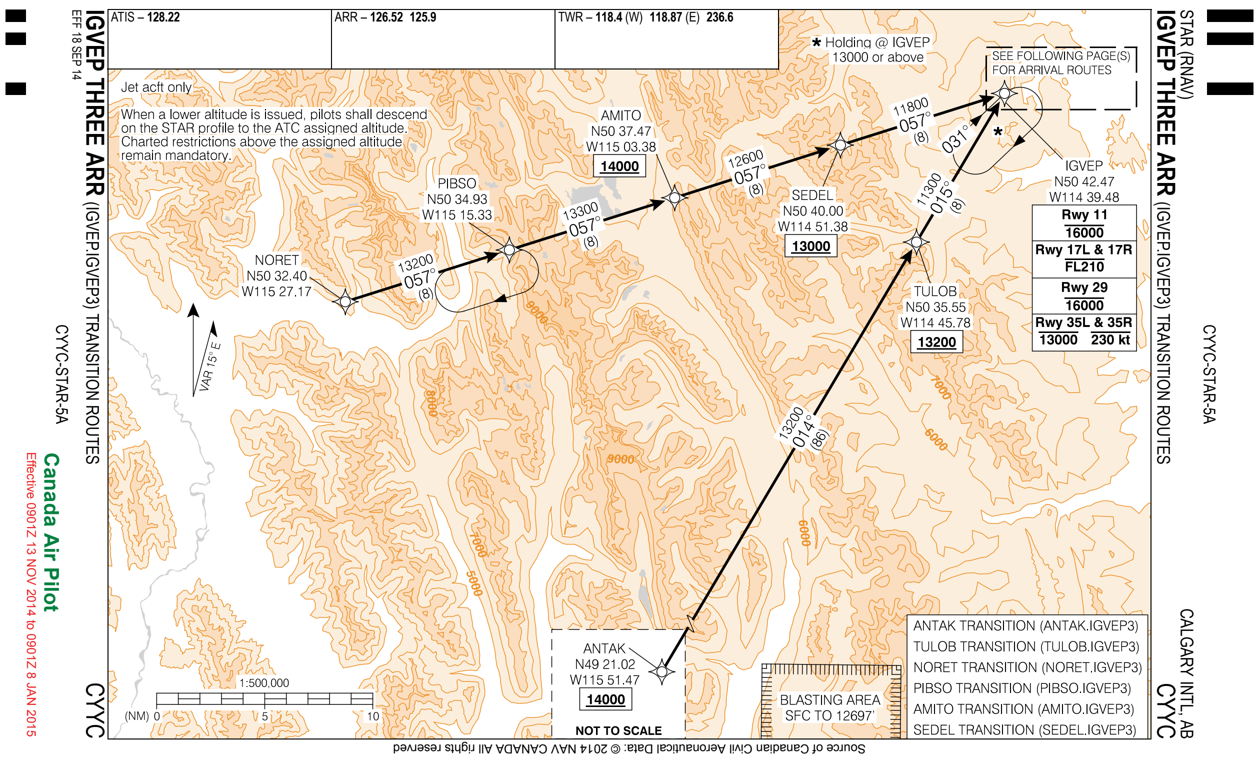



**Figure 3-3: IGVEP3 STAR with published holding patterns.**

When aircraft first arrive at a holding fix, they may not always be travelling along the specified inbound track, depending upon where they are coming from. They may require one time around the hold to get established in the proper hold pattern. This is known as the Hold Entry.

Pilots are required to report once they are "**Established in the hold.**" This report occurs on the second time the pilot passes over the hold fix, once the Hold Entry procedure is complete. ATC can also request that a pilot "**Report entering the hold.**" In this case, the pilot will call the first time they pass over the holding fix, as they initiate the hold entry procedure.

## 3.3 Uncontrolled Airspace Procedures

One of the large differences between the area controlled by Centre and other lower positions within the Edmonton FIR is the amount of uncontrolled airspace that falls under Centre jurisdiction and how to deal with it.

There are two classes of airspace that can be described as uncontrolled: Class E and Class G. Recall from section 2.3 that Class E is uncontrolled airspace for VFR but controlled for IFR, while Class G is uncontrolled for everyone. All low level (below 12,500) airspace that falls under Centre jurisdiction (not including other positions that Centre is performing duties for) is Class E or G airspace.

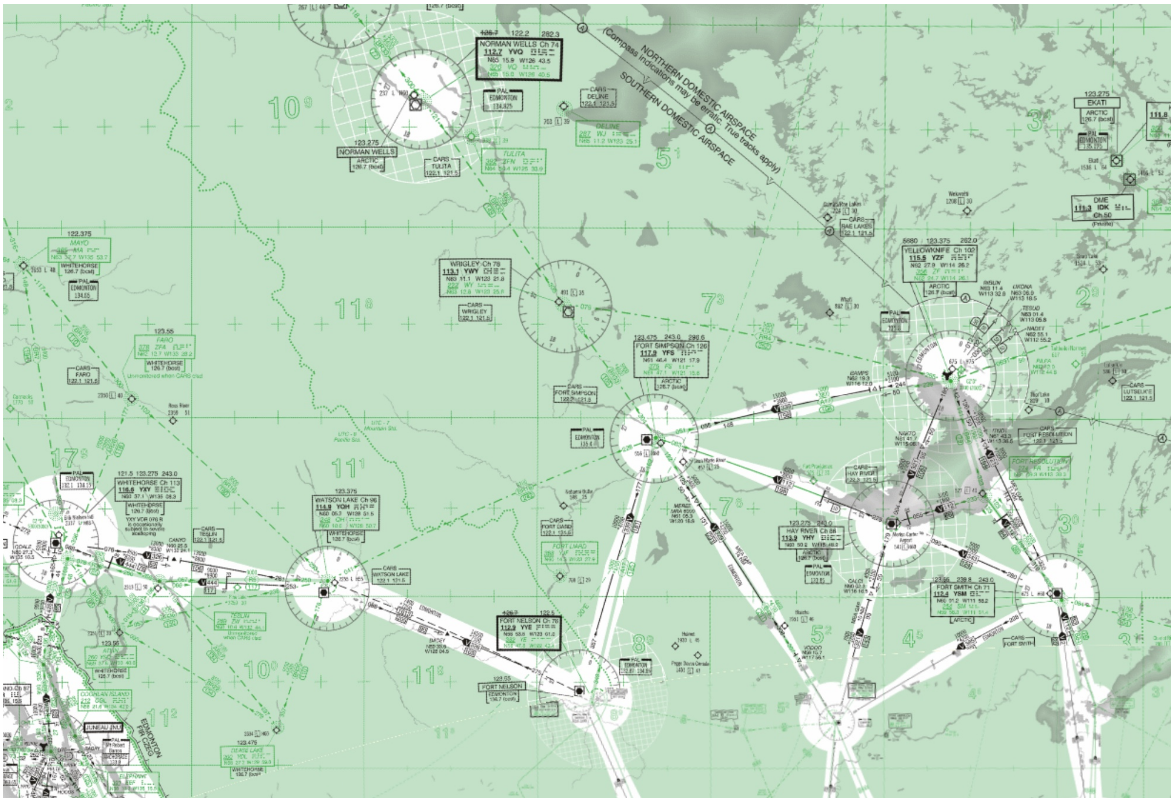


**Figure 3-4: Class G airspace in the Edmonton FIR. Green airspace is Class G SFC-18,000' ASL. Note: Inuvik not included on the map also has controlled Class E airspace.**

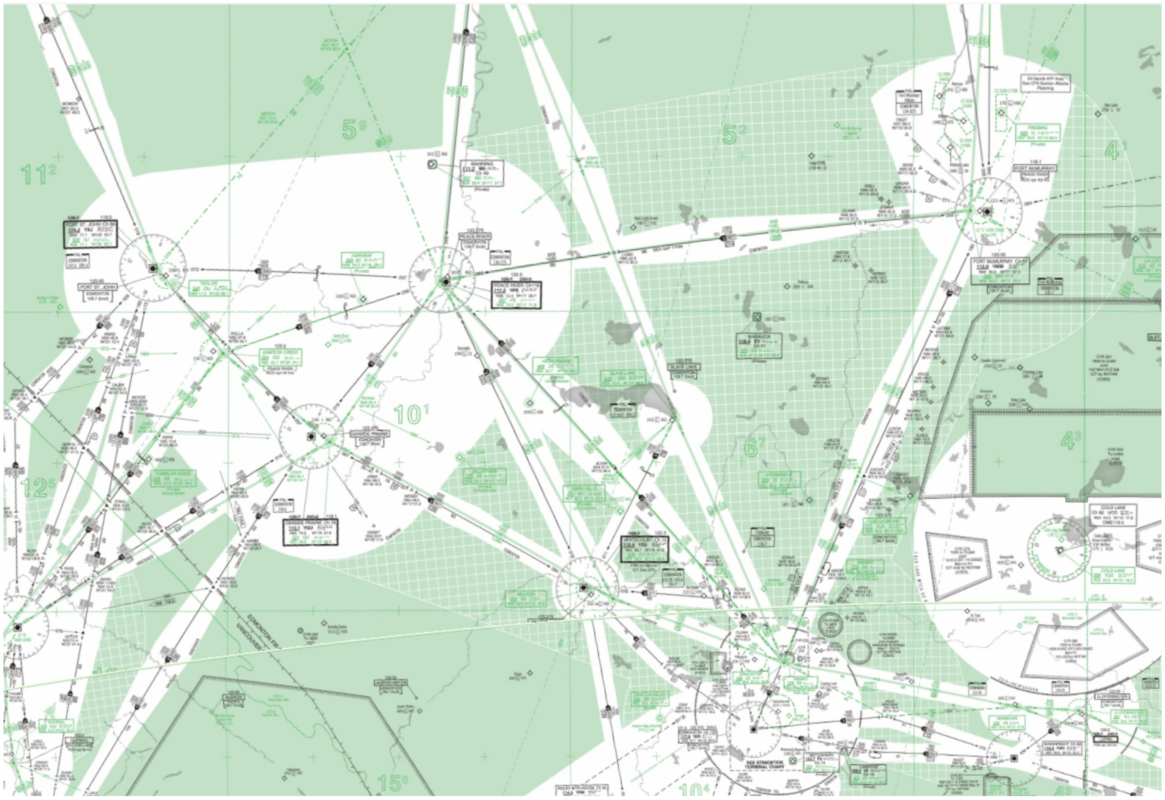


**Figure 3-5: Class G airspace in the Edmonton FIR. Green airspace is Class G SFC-18,000' ASL.**

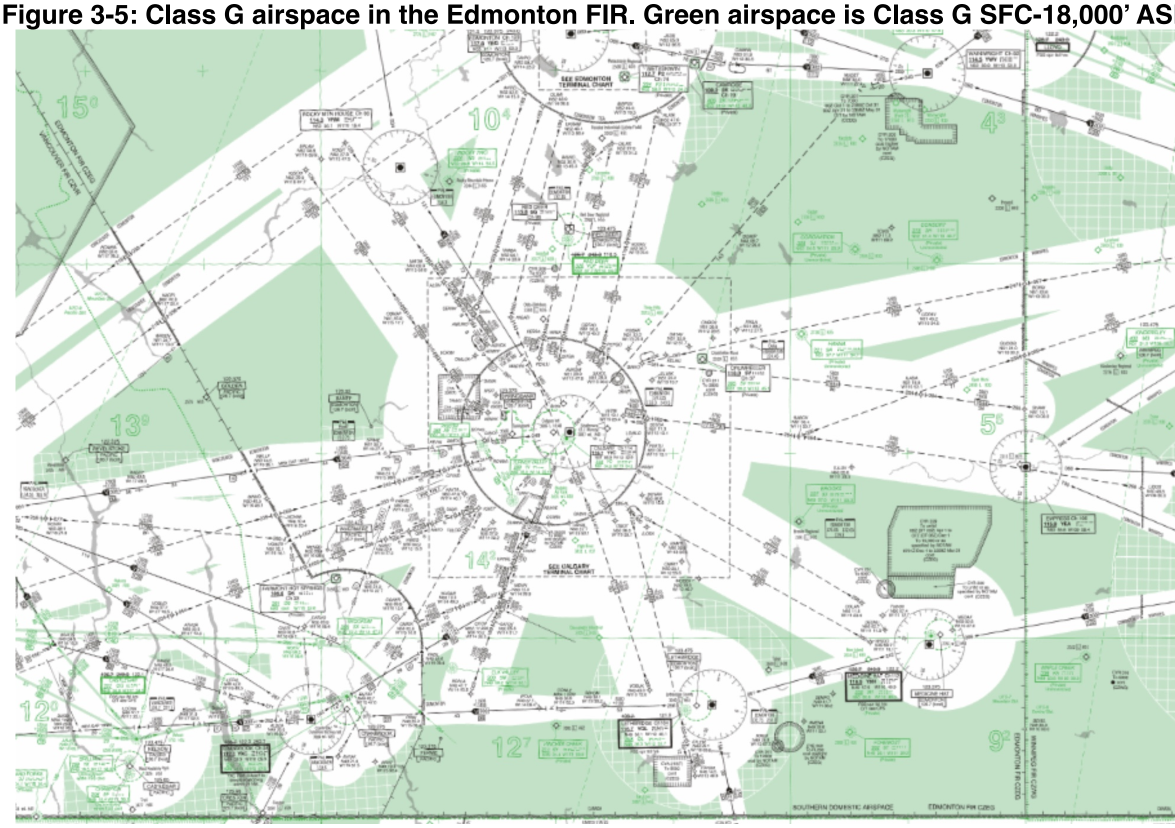


**Figure 3-6: Class G airspace in the Edmonton FIR. Green airspace is Class G SFC-18,000' ASL.**

Figure 3-4, 3-5, and 3-6 shows the extent of Class E and G airspace within the Edmonton FIR. The shaded green areas are Class G airspace below 18,000. As the diagram shows, in the quieter northern areas, most airspace is designated Class G, and only airways and transition areas around busier airports are designated Class E. Note that solid lines represent Victor airways, while the dashed lines represent uncontrolled Air Routes (AR), which are recognized low-level routes along which control is not provided. Note also that airways are generally a fixed width of 8 nm. This distance increases to 8.68 nm when one or both of the navaids at either end is an NDB. The width also increases on very long segments, where the normal tolerance of 4.5° (5° for NDBs) exceeds the specified width. For example, halfway between YPE and YMM, the airway gets wider to match the 4.5° tolerance from the two VORs.

### 3.3.1 Class E Airspace Procedures

Refer to Figure 3-4: Class G airspace within the Edmonton FIR. Green airspace is Class G up to 18,000' ASL. for where Class E procedures apply. Control is provided to IFR aircraft, and separation is provided between IFR aircraft. VFR aircraft are uncontrolled within this airspace. Controllers do not need to provide separation to VFR aircraft, and VFR aircraft in Class E are under no obligation to communicate with ATC. If VFR traffic is observed, information can be passed to IFR aircraft, but without validation of altitude readouts, this information is advisory only, and the IFR aircraft are still obligated to watch for and provide their own separation from the VFR traffic.

VFR traffic can be provided with traffic information and conflict resolution if it is requested and controller workload permits. See section 3.3 for more information on providing service to VFR in uncontrolled airspace.

### 3.3.2 Class G Airspace Procedures

When IFR aircraft are in Class G airspace, controllers provide no control service and should not attempt to provide separation. Aircraft should generally remain on unicom frequency, though they can monitor CTR frequencies and should be establishing contact with ATC before entering controlled airspace (eg. Class E).

IFR/IFR separation should be coordinated directly between the pilots on Unicom frequency.

Specific phraseology should be used when aircraft are entering/exiting controlled airspace in the enroute phase of flight.

Examples:

**"DA501, cleared out of/into controlled airspace in the vicinity of Fort Liard."**

When aircraft are entering/exiting controlled airspace, altitudes should be assigned using the phraseology: "While in controlled airspace"

**“FAB521, maintain 16,000 while in controlled airspace.”** Note that this does not guarantee the aircraft will enter controlled airspace at that altitude, as they may still be climbing or descending towards that altitude.

You can specify an altitude or position to leave/enter controlled airspace if it is required for purposes of separation.

**"FAB521, cleared out of controlled airspace 50 miles north of Yellowknife at 16,000."**

## 3.3.3 Uncontrolled Airport Procedures

Uncontrolled airports will fall into two categories: Class E and Class G, with similar procedures applied to both. In both cases, ATC exerts no control over the airport itself or the surrounding airspace. Pilots must be vigilant, as VFR traffic may be operating in the vicinity that is unknown to the controller (below radar coverage). A key difference is that if an airport lies in Class E airspace (ie. a Class E Control Zone), the controller must still separate IFR aircraft from IFR aircraft. Since there is no controller present at the field, and radar coverage seldom extends to the ground, this can only be accomplished by clearing one aircraft to or from the airport at one time. Subsequent departures/arrivals must wait until the location of the other aircraft is positively determined, either through position reports (including a report on the ground), or radar identification.

### 3.3.4 Clearing Aircraft out of High Level controlled airspace

In Northern Canada, aircraft frequently get cleared out of high level controlled airspace, as all airspace below FL230 in the Northern Domestic Airspace, and below FL270 in the Arctic Control Area is Glass G and uncontrolled airspace. For example, in the Northern Domestic Airspace, Canforce 478 is cruising at FL260 from Hall Beach to Kugluktuk and is approaching top of descent, but estimating it west of the Cambridge Bay VOR. Another aircraft, Buffalo 1228, is on an IFR flight plan at FL250 from Yellowknife to Resolute Bay via the Cambridge Bay VOR.

Example:
**"ATC clears Canforce 478 out of the Northern Control Area. Cross Cambridge Bay VOR FL240 or below, report leaving FL230."**

## 3.3.4.1 Uncontrolled Airport Arrivals

If an airport is in Class E airspace (eg. Norman Wells, Lethbridge), then ATC exerts control over IFR aircraft within that airspace. Approach clearances will be just like those for a controlled airport, as the aircraft remains under Centre's control until touchdown. One exception is that the approach doesn't need be specific if traffic permits. However, aircraft should advise the approach they will be performing if it wasn't specified by Centre.

Examples:
**"WEN3291, cleared to the Grande Prairie airport RNAV Z Runway 12 Approach."**
**"MPE444, cleared to the Inuvik airport for an approach."**
**"Edmonton Centre, MPE444 cleared to Inuvik for an approach. We will conduct the ILS/DME Runway 06 Approach."**

If an airport is in Class G airspace (ie. it has no control zone), then one of two scenarios may apply:

If the airport is located under Class G airspace up to a relatively high altitude, then the procedures listed above (section 3.2.2) for uncontrolled airspace will apply. No control is exerted over the aircraft, so they simply need to be cleared out of controlled airspace. Then the flight plan can be closed later. Examples include Cambridge Bay (CYCB) and Rankin Inlet (CYRT).

If the airport is located under Class E airspace, then the controller needs to protect controlled airspace around the airport while the aircraft conducts the approach and in case the aircraft needs to do a missed approach. In this case, the aircraft will have to be cleared out of controlled airspace via the approach. Examples include Drumheller (CEG4) and Dawson Creek (CYDQ).

Example: **"CNK200, cleared to descend out of controlled airspace via the Dawson Creek RNAV Runway 06 approach."**

Once an aircraft has been cleared for the approach and no conflicts with other IFR aircraft exist, the aircraft should be switched over to unicom so that the pilot can communicate and coordinate with other traffic at the airport, especially VFR traffic. Before switching to local frequencies, a method for closing the flight plan will need to be specified. In reality, there are three ways: Close in the air, close on the ground via radio, or close in on the ground via a phone call. On VatSim, we simulate the first two methods. If a pilot is able to continue to the airport under VFR, the IFR can be cancelled, and the flight plan reverts to a VFR flight plan. This provides an advantage that another IFR flight can then be cleared to depart or arrive at the airport once the first aircraft is no longer flying under IFR. However, do not pressure aircraft to cancel prematurely. Pilots are aware of this courtesy they can provide to others, and will gladly do so if they feel it's safe. If a pilot requests to cancel IFR, then it must be clarified if the search and rescue portion of the flight plan will be closed as well, or just the IFR portion.

Examples:
**"CNK432, no traffic observed or reported around Dawson Creek. Switch to unicom now. Report down and clear on this frequency."**
**"Centre, CNK432 over to unicom, will report down and clear with you."**

Once the airport is in sight, the aircraft may cancel in the air. Or they may skip this step:
**"Centre, CNK432 has the field in sight. Request cancel IFR."**
**"CNK432, Center, are you cancelling alerting services as well?**
**"Centre, CNK432, negative. Cancel IFR only. We'll keep the alerting service."**
**"CNK432, Centre, IFR is cancelled. Back to unicom. Advise down and clear on this frequency."**

Once the aircraft has landed and cleared the runway:
**"Centre, CNK432 is down and clear at Dawson Creek."**
**"CNK432, Centre. Arrival report received at 1815z. Flight plan and alerting services closed. Good day!"**

### 3.3.4.2 Uncontrolled Airport Departures
When aircraft are departing from an uncontrolled airport, the aircraft has two choices: Depart VFR or IFR.

If an aircraft opts to depart IFR, the procedure is similar to a controlled airport with a few exceptions. First, aircraft will not (or should not) call for clearance before being ready to taxi, as ATC can only have one IFR aircraft cleared to use an airport at a time (arrive or depart). Secondly, because there is no control and for the reason stated above, during initial callup, the controller should request a planned runway and time till departure.

**"KBA204, what runway for departure and how long before you're ready?"**

This information is necessary for ATC's planning purposes. When the clearance is issued, an expiry time must be given so that the clearance is not valid forever, preventing other IFR aircraft from using the airport. Also, instructions must be given for who to contact after departure.

**"KBA204, cleared to Yellowknife off runway 06, climb on course. Maintain FL250. Squawk 5217. Report this frequency airborne. Clearance is valid now, cancelled if not airborne by 2245z."**
**"KBA204, readback is correct. Time now is 2238z. You can go back to unicom."**

### 3.4 Airports Without IFR Approaches

There are hundreds of minor aerodromes throughout the FIR that are not served by any IFR approach whatsoever. These range from small municipal or private airports to farm fields to water aerodromes or lakes used by float planes. In order for an IFR aircraft to land at any of these VFR- only aerodromes, they must cease operating under IFR. Some aircraft may simply file an IFR flight plan to a specific VOR or fix near their destination, intending to cancel before that point on days when the weather is good. If the weather is poor, the aircraft may need to fly an IFR approach to a nearby airport and cancel IFR once the aircraft is VMC and able to complete their flight under VFR.

### 3.5 VFR Flight Following

While VFR aircraft in class E airspace are not required to contact ATC, many (especially those on VATSIM) would still prefer to make use of ATC services when they are available.
Workload permitting, you can provide traffic advisories to VFR aircraft. This service is referred to as "Radar Surveillance" or more commonly "Flight Following".

**Example: "Edmonton Centre, C-GSCT request flight following."**

In order to provide this service to a VFR aircraft, you must radar identify the aircraft, using the same methods as an IFR aircraft. (eg. Issue a discrete transponder code. See the Departure module for more information.) Once the aircraft is radar identified, issue information about proximate traffic. VFR aircraft still retain final responsibility for traffic and terrain avoidance. ATC's job in this case is to provide information to help them avoid traffic. To emphasize that the pilot is still responsible, the phrase "**Maintain VFR at all times**" should be used one the aircraft has been radar identified.

If VFR aircraft request assistance with navigation, keep in mind that you do not exert control over these aircraft. The best phraseology is to "**suggest**" headings. Any such instruction should be followed by the phrase "**VFR**", to emphasize that the pilot is still responsible for remaining legally VFR and clear of cloud.

**Example: "C-GSCT Centre. Suggest you fly a heading of 270 VFR."**

### 3.6 Altitude Terminology

#### 3.6.1 Flight Levels vs. Altitude

In Canada (and the U.S.), aircraft flying at 18,000' ASL and above in Southern Domestic Airspace are in what is known as the Standard Pressure Region. In this region of airspace, all aircraft use the same altimeter setting: 29.92"Hg, which is standard (average) sea level pressure. The major premise behind this is that aircraft in long distance cruise will not have to continually adjust their altimeters throughout cruise. Although indicated altitudes may not be very close to the true altitude above sea level, all aircraft in an area are experiencing the same error at the same time, and thus are all still flying 1,000' apart. Altitudes that are flown using standard pressure are known as Flight Levels. For example, an aircraft flying at 25,000' using the standard altimeter setting is at Flight Level Two-Five-Zero (FL250). If that aircraft climbs to 29,000', it is now at FL290.

The Standard Pressure Region in the Northern Domestic Airspace and Arctic Control Area includes all altitudes, therefore aircraft descending into Cambridge Bay (in the NDA), do not set the local altimeter setting.

Any aircraft that is operating below 18,000' ASL is in the Altimeter Setting Region. The aircraft altimeter should always be set to the nearest reported altimeter setting. Any altitude issued in the Altimeter Setting Region is an altitude, and should be expressed as an altitude in feet, such as Five-Thousand-Five-Hundred (5,500), or One-Two-Thousand (12,000).

### 3.6.2 Transition

Transition is the point where an aircraft enters the Standard Pressure Region or enters the Altimeter Setting Region. Before an aircraft descends through the transition altitude (18,000' ASL), they should be issued a local altimeter setting, and will request one of you forget.

### 3.6.3 Lowest Usable Flight Level

The Lowest Usable Flight Level is a consequence of the transition mentioned in Section 3.5.2. Because the Standard Pressure Region starts at 18,000' ASL, the highest altitude that can ever be issued is 17,000 (otherwise 1,000' vertical spacing could not be maintained). If atmospheric pressure is higher than standard (29.92" Hg at Sea Level), there is no problem. An aircraft that cruises at FL180 (altimeter set to standard and 18,000 indicated on the altimeter) will actually be higher than 18,000', and thus the minimum separation from aircraft at 17,000 is maintained. However, if pressure is less than standard, the aircraft that is flying at FL180 with standard pressure set on the altimeter will actually be at less than 18,000, and consequently will not be maintaining the minimum 1,000' vertical separation from any aircraft at 17,000 with a local altimeter setting. For this reason, there is a Lowest Usable Flight Level based on the altimeter setting.

| Altimeter Setting | Lowest Usable Flight Level |
|---|---|
| 29.92 Hg or greater | FL180 |
| 28.92-29.91” Hg | FL190 |
| 28.91” Hg or less | FL200 |

If an aircraft ever requests a flight level that is unusable, you must inform them "Unable FL180 due to altimeter setting." Offer alternative altitudes instead. ("Would you prefer 16,000 or FL200?”)

Shouldn't the table above continue down to lower and lower pressures? In theory yes, but the likelihood of seeing a pressure below 28.00" Hg outside of a hurricane (where no one should be flying) is realistically nil.

### 3.6.4 RVSM (Reduced vertical Separation Minima)

RVSM stands for Reduced Vertical Separation Minima. Historically, because altimeters were very inaccurate at higher altitudes, 2,000' vertical separation was applied from FL290 to FL410. Modern altimeter designs and air data computers allowed more accurate altitude-keeping in the high flight levels, and consequently, separation in this airspace was reduced to 1,000' worldwide between 1997 and 2005.

Before using this RVSM airspace, aircraft (operators) must demonstrate that their equipment is accurate enough, through certification processes. For all intents and purposes, we shall consider all aircraft on VatSim to be RVSM certified unless the pilot declares otherwise.

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## 4. Enroute Techniques

### 4.1 Initial Contact and Runway Assignment

For aircraft that will be landing within the Edmonton FIR, on initial contact they should be issued the current ATIS or weather if no ATIS is online, as well as an arrival runway. If no weather is available at the destination, the nearest available weather should be issued.

Arrival runways at controlled airports are determine by the controller with jurisdiction (eg TWR or DEP/APP/CTR if TWR is offline). In case of multiple active runways, runways are assigned based on the arrival bedpost. Requests by aircraft to utilize non-conforming runways must be passed along to Arrival for approval.

At an uncontrolled airport, the controller should ask the pilot what runway and approach they plan to use, once the pilot has been provided with the weather.
At all airports, use of visual approaches should be encouraged when conditions permit, as these allow maximum flexibility. However, pilots may exercise their prerogative at any time to execute or refuse and approach as they see fit.

Once a runway has been assigned, this should be annotated in the scratchpad, as a reminder to the current controller and information for subsequent controllers. For Calgary and surrounding airports, a series of codes have been established to keep the scratchpad simpler. Most of these codes depend on the active runway:
R - Right (35R,17R)
L - Left (35L,17L)
B - Runway 29
C - Runway 26
W - Springbank (CYBW)
V - Visual
K - Kontact

Sample phraseology: **"KLM677, radar identified. Information Hotel, Plan runway 35R."** Mark R in KLM677 scratchpad.

For those seeking the ultimate in realism, in reality the ATIS and runway are usually issued by the last Centre sector that will talk to an arrival before handoff to Arrival. This makes sense, as arrivals to Calgary from the north may enter Edmonton FIR airspace an hour or more before landing, and the ATIS and runway could easily change in that time period. For realism, ensure all the sector boundaries within Edmonton FIR are displayed and issue the ATIS and runway once they enter the last sector before Arrival instead of on initial contact an hour earlier.

### 4.2 Estimating and Issuing Descents

Actual descent rates can vary based on aircraft, ground speed (which is affected by winds), as well as personal preference. However, there is a simple way to estimate when an aircraft will want to begin descent: Take the required altitude loss in thousands, and multiply by 3. The result is the number of miles the descent should require (roughly).

For example, WEN3115 is at 20,000, and needs to cross IGVEP at 16,000 or below. This requires a descent of 4,000. 4 x 3 is 12. So JZA729 will probably want to begin descending about 12 miles back.

Descents can be issued in two ways: as immediate instructions or clearances at pilot's discretion.

Immediate descents are issued the same way that they have been done in previous units. **"CJA642, descend 15,000. Altimeter 29.92"** This indicates that the aircraft should begin descent immediately to the cleared altitude. Altimeters should be given anytime the aircraft first descends out of the Standard Pressure Region (18,000 and above) into the Altimeter-Setting Region, as well as anytime the local altimeter changes, or if you are unsure the pilot has the local altimeter.

Pilot discretion descents are more commonly used by Centre. The benefit of a descent at pilot's discretion is that the descent can be initiated at the most optimal time by the pilot, without have to request a descent instruction at the correct moment. This allows for the more efficient Continuous Descent Approaches mentioned in the Arrival module, and also relieves your workload by allowing you to issue descents well in advance of the actual descent point. These should be used whenever practical.
Example: **“KLM677, when ready descend 12,000. Calgary altimeter 3017." “Edmonton, KLM677, pilot's discretion to 12,000."**
The phrase **"when ready"** indicates that the pilot can begin descent at their discretion, and is often read back as **"pilot's discretion."**

### 4.3 Speed Control
While speed control is a useful tool to maintain established spacing, keep in mind that different pilots may be using different weather (ie. wind) data sources, such as SquawkBox, Jeppesen (MS Flight Sim), or a third party add-on such as Active Sky. For this reason, expect some variation in ground speeds, and leave yourself some "wiggle" room. Expect the unexpected on VatSim.

#### 4.3.1 Mach Number
Mach Number is the speed of an aircraft with respect to the speed of sound, and is given as a number to two decimal places. For example, Mach 0.78 (usually stated as "Mach Seven-Eight")

is 78% of the local speed of sound. The speed of sound varies throughout the atmosphere, mainly with temperature. Since many aircraft performance limitations are associated with the way the air moves over the aircraft, it is most useful to measure high speed flight using Mach numbers, as the performance generally remains consistent for a given Mach number. Mach number is usually abbreviated as just an M (eg. M 0.78).

### 4.3.2 Indicated Airspeed
Indicated airspeed is the speed shown to the pilot on any airspeed indicator. It is derived basically by the difference in pressure of air being pushed against the nose of the aircraft (dynamic pressure) to the ambient atmospheric pressure around the aircraft (static pressure). For this reason, it is only accurate at sea level. Above sea level, as the air density decreases with altitude, dynamic pressure at a given speed also falls, and thus the difference between static and dynamic pressure is not as great. Like altitude though, all aircraft suffer from the same problem. So two aircraft at the same altitude and both indicating 200 knots will both be travelling at the same speed, even if it isn't 200 knots. Note that Knots Indicated Airspeed is usually abbreviated KIAS.

### 4.3.3 True Airspeed
True airspeed is the actual speed that an aircraft is travelling through the air. Modern aircraft can usually determine this through air data computers that detect air temperature and pressure and correct the indicated airspeed. However, speed control is always done with indicated airspeed. Note that Knots Indicated Airspeed is usually abbreviated KTAS.
For aircraft cruising at the same altitude, the difference in magnitude between True airspeed and Indicated airspeed can be significant. For example a CRJ1 at FL350 and M0.74 will show 250 kts IAS and a TAS of 425 kts while a B744 at FL350 and M0.86 will show 295 kts IAS and a TAS of 495 kts. In this instance the 45 kt difference in IAS results in 70 kt difference in true airspeed. The 75 kt difference in TAS then is carried over to the ground speeds shown on radar for these aircraft.

### 4.3.4 Transition or Crossover
At lower altitudes, aircraft all fly at lower airspeeds and use indicated airspeed to report and measure speed.

At higher altitudes (generally above FL270), jets will measure and report speeds using Mach numbers, as the performance data at these altitudes is measured in Mach number.

At some point between the two, aircraft will transition or crossover from flying based on KIAS to Mach number or vice-versa.

An example of a Mach/Indicated speed crossover is an A320 descending from its cruise level of FL370/M0.78 planning to descend at 300kts in transition. As the A320 descends maintaining M0.78, it’s indicated airspeed will continue to rise from 253 IAS. Once the indicated airspeed has increased to 300 kts, (which happens at FL290 (the crossover altitude), the A320 will continue descending at 300 kts IAS. This same A320 planning to descend at M.078/270 IAS will crossover earlier, at a higher altitude of roughly FL340. What this all means to the controller is that the type of speed (IAS or Mach) issued to an aircraft will only make sense if the aircraft is in fact using that same measure of speed at their altitude. In the examples above, once the A320 has descended below their transition altitude, reference to Mach no longer applies.

## 4.4 Sequencing Arrivals

The biggest challenge for Edmonton Centre controllers lies in trying to sequence arrivals into Calgary (as well as other airports). Subsequent arrivals over a bedpost fix must be 10 miles in trail or increasing. Decreasing or inadequate spacing is unacceptable. If Centre is unable provide sufficient spacing between arrivals, some arrivals may have to be issued holds until congestion into the terminal area subsides.

Centre must also ensure that all arrivals into Calgary also conform to the (current) published STARs. Any aircraft that is not able to fly the STAR must either be given a similar vector to the STAR tracks or else coordinated with the arrival controller to ensure the basic traffic flows can be conformed to.

While the basic task of sequencing arrivals sounds easy, the multiple converging routes towards each bedpost combined with high cruise speeds and varying performance levels between aircraft makes this more challenging than it sounds.

The key to successfully sequencing traffic is to ensure that conflicts are anticipated early and resolved with small changes early on. For example, if two aircraft are going to arrive at the bedpost fix from different directions at the same time, and you adjust the speed of one aircraft by 30 kts, it will take 20 minutes to create 10 miles of spacing. If the aircraft are moving at typical jet cruise speeds of 450 kts (true airspeed), in this 20 minutes, they will have traversed 150 miles. For reference, this is the entire distance from the Winnipeg FIR border to Calgary's bedpost fixes of BIRKO or EBGAL. So to create 10 miles of space, the speed adjustment had to be made 20 minutes early and 150 miles away to have enough of an impact on the spacing. So plan ahead and make adjustments early.

As with Departure and Arrival, the two primary methods for in-trail separation remain vectors and speed, with vectors being more effective for generating space, while speed restrictions can be used to maintain or make small adjustments to existing spacing.

### 4.4.1 Vectoring

As with speed control, making smaller adjustments sooner is preferable to large adjustments later. A small turn of 10-15° off course sooner is preferable to a 30° turn off course later. Even more ideal is to offer shortcuts to the lead aircraft to make their route shorter, rather than making the trailing aircraft's route longer. (One of the overall goals of ATC is to provide the most efficient service possible.) Regardless of the method chosen, aircraft must be back on the STAR once they enter the TCU and are handed off to Arrival. Aircraft can be cleared direct any fix up to the TCU border. Otherwise arrivals not on the STAR must be coordinated with Arrival before handoff.

### 4.4.1 Speed Control

Jets are expected to enter the TCU at no less than 250 KIAS for non-straight-in arrivals, and no less than 210 KIAS for straight-in arrivals. As jets typically descend at 300-320 KIAS, this leaves only a range of about 50-70 KIAS for speed adjustments for most aircraft entering the TCU. At this rate, at least 10 minutes is needed to create 10 mile-in-trail spacings, assuming a 60 kt speed adjustment. Such large adjustments are undesirable, demonstrating again that speed control takes too long to create large spacing and should only be used for fine tuning. Keep in mind also, that having one particular aircraft in the sequence slow down substantially may mean a loss of in-trail spacing to any other subsequent aircraft and can end up creating a logjam back down the STAR.

### 4.4.1 Altitude

Until such time as spacing between subsequent arrivals is assured (adequate existing spacing and compatible speeds), vertical separation must be maintained. This is especially important on VATSIM, as pilots have varying skill levels (ie. varying abilities to maintain a specific speed), and it is very possible for two pilots flying the same route to have very different winds loaded, and thus have very different ground speeds.

### 4.5 Enroute Conflict Resolution

Normally on VatSim, traffic levels are light and conflicts seldom occur between enroute traffic. However, when conflicts do need to be resolved, there are two ways to achieve the required separation: lateral and vertical changes.

Lateral changes are preferred. These are accomplished using a change in route, either through a temporary vector or perhaps clearance to a different waypoint further down the route (a "shortcut"). As is always the case, early recognition and a slight change (eg. **"MPE551, turn right 10° for traffic."** ) is preferable to a sudden abrupt change, like a 70° turn.

Vertical changes should be generally avoided. The power and speed changes required to climb up 1000' only to descent back down again waste a lot of fuel, and heavier aircraft on overseas flight may not even be capable of climbing quickly enough. The only time vertical changes should be used are cases where an altitude change would eventually happen anyways, such as starting a descent 5 minutes earlier. (eg. **"WJA182, descend now FL240 for traffic.**”)

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## 5. Appendix: Letters of Agreement & Arrangement

Agreements have been made with some adjacent FIRs and ARTCCs. The agreements define specific procedures to follow when handing off aircraft, especially those departing from or arriving at airports near the boundary between the FIRs. The following sections provide an overview of most of these procedures. Always consult the most recent LOA (available on our website) for the most up-to-date procedures.