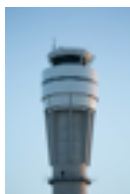


# Calgary Tower



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## Introduction

Tower controllers ensure separation of aircraft in the vicinity of runways and in the air by means of both visual observations and radar. Although Canscope does have the capability to enable the Tower controller to observe traffic visually with a multiplayer option, radar procedures will be emphasized in this module. The use of radar procedures at Calgary lends itself to accurate simulation on VATSIM because almost all of the VATSIM Calgary traffic is IFR. Aspects of VFR airport control including the circuit and the blending of IFR and VFR aircraft will be discussed in depth in module ten.

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## Calgary Control Zone

The Calgary Control Zone is the airspace within a 7 mile radius centred on N051.06'50.00" W114.01'13.00" from the surface up to and including 6,600 ASL. The airspace is designated as Class C. The primary Tower frequency is 118.4 MHz.

### **Split Operations**

Similar to how Calgary Ground may be split, Calgary Tower may be split into two control positions. With typical traffic levels on VATSIM a split Tower configuration would most likely occur only during a fly-in.

**West Tower** works runways 17R-35L or 11-29 and 08-26 on 118.4 MHz.

**East Tower** works runways 17L-35R, on 118.87 MHz.

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## Calgary and the Surrounding Communities

Due to urban sprawl, Calgary airport finds itself situated adjacent to several residential communities. The area most sensitive to aircraft noise is the NE quadrant of Calgary because a portion of it lies directly to the east and south of the airport. Residential housing is found just to the east of the field and is affected by noise when the north-south runways (17L/R) are used. Because noise from departures is much greater than that from arrivals, this community is affected the most when Calgary departs on the 17's. For this reason, departure operations on the 17's are less common and usually only occur if wind deems necessary.

About 4 miles due north of the field lies a portion of the City of Airdrie. Airdrie is far enough away from Calgary that with the help of the SIDs, noise levels from 35L/R departures or 17L/R arrivals are at a reasonable level.

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## Noise Abatement

Noise from aircraft operations plays a major role in influencing how Calgary operates. Because VATSIM is merely a simulation of reality the real noise abatement procedures do not need to be enforced, however controllers and pilots should make an effort to abide by some of the more important aspects of noise abatement in order to enhance realism.

At Calgary two distinct time periods exist:

Day Operations - from 0700 local until 2300 local

Night Operations – from 2300 local until 0700 local

The major change that occurs at 11 pm local time is that Calgary may operate using “suicide-ops” where aircraft may land 17R, and depart 35L. A second change that occurs at 11 pm is that due to noise abatement, all aircraft are treated as though they are jet aircraft. This differs from the day period, when props are not subject to the same noise restrictions imposed upon jet aircraft. For example during the day, non-jet aircraft are routinely assigned an amended SID heading, to expedite departures on a same or crossing runway as seen in **M335.1**, a turn by the Tower is commenced at 500 feet AGL. However during night operations, props cannot be authorized to commence turns off of the SID until they reach 6,500 ASL.

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## Preferential Runways (All Aircraft)

ATC will designate runways to divert as many take-offs as possible, consistent with safety of operations, from flight over residential areas adjacent to the airport. Use of other than designated runways should only be requested to meet operational necessity.

Taking into consideration the following conditions and except as authorized by ATC, all aircraft will use the following preferential runways:

All Aircraft				
Operation		Local Time		Preferential Runway
ARRIVALS				
	Monday-Friday	06:00-07:00	35R	
	Monday-Friday Saturday-Sunday	07:00-23:00 09:00-23:00	35L, 35R	
	Monday-Friday Saturday-Sunday	23:00-06:00 23:00-09:00	17R, 17L, 29, 26	
DEPARTURES				
	All hours		35L, 35R	

1. Physical condition of surface.
2. Effective crosswind component not to exceed 15 knots for arrivals, 20 knots for departures.
3. Effective tailwind component not to exceed 5 knots.

4. Other safety considerations declared by the Captain of the aircraft.
5. For landing on RWY 26 at night, aircraft are to fly the RWY 29 ILS until interception of the extended centreline of RWY 26 for a visual straight-in approach.

If those issues listed above were not a factor, the active runway or runways would simply be chosen based on M302.1. M302.5 outlines how runways should be selected with a PRP (Preferential Runway Program) in place with consideration to factors such as runway surface conditions, visibility and crosswinds. With traffic levels at Calgary being what they are, it is necessary that every effort is made to maintain operations on the parallel north-south runways especially during peak periods.

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## Runway Selection and Configurations

### Dual Operations

Calgary is able to move the most amount of traffic per hour when in a dual north-south configuration. When dual, 35L/35R or 17L/17R are active simultaneously for both arrivals and departures. On VATSIM, a dual configuration is usually not required, since the volume of traffic can normally be accommodated with a single arrival runway. In a dual configuration Calgary's capacity is: 44 movements/hr in VFR weather and 36 movements/hr in IFR weather.

### Dedicated Parallel Operations

Dedicated parallel runway operations are also referred to as "land one, depart one". Common land one, depart one configurations at Calgary are:

Land 35R, Depart 35L  
Land 17L, Depart 17R  
Land 17R, Depart 17L

In an north-south land one, depart one configuration Calgary can handle: 36 movements/hr in VFR weather and 34 movements/hr in IFR weather.

It may be advantageous to select a secondary arrival runway during north-south operations so that the arrival controller has the option to offload the occasional aircraft if traffic picks up. When weather dictates it, Tower may be forced out of a parallel north-south configuration and into a land 29/26 depart 29 operation.

### Non Parallel Runway Configurations

When winds and traffic permit, often a non-parallel runway configuration is used. In this type of configuration one or more runways may be used for both arrivals and departures. A non-parallel configuration permits the optimal configuration for both noise abatement and reduction of taxi times. In an intersecting runway configuration, Calgary can move upwards of **78 aircraft/hr in VFR weather and 73 movements/hr in IFR weather**. Common non-parallel configurations are:

Land 17R or 11, Depart 17R  
Land 35L or 29, Depart 29  
Land 35L or 29, Depart 35L  
Land 29 or 26, Depart 29

## **Single Runway Operation**

It would be very rare for Calgary to have only one suitable active runway available for both arrival and departure. Reasons such as weather, wind, construction, hazardous runway conditions or closures could result with only a single usable runway. As previously mentioned on VATSIM a single runway operation normally suffices. When a single runway is utilized for both departures and arrivals, the movement numbers are as follows:

Runway 29: 36/hr in VFR, 28/hr in IFR

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## **Crosswind Limitations**

As mentioned Calgary attempts to remain on north-south runways as much as possible, and normally right up to the crosswind limits permissible by MANOPs. These limits are:

Dry Runway: maximum of 25kt crosswind component including gusts

Wet Runway: maximum of 15kt crosswind component including gusts

Even though Flight Simulator does not replicate runway surface conditions (wet/dry), it may be unreasonable to expect VATSIM pilots to accept a landing or departure on a runway with a 15 knot crosswind component. Controllers should accommodate pilot requests for a non-active runway whenever possible especially when winds dictate it.

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## **Wake Turbulence**

Although in Flight Simulation the effects of wake turbulence may or may not exist, wake turbulence procedures are simulated on VATSIM to enhance realism. A wake turbulence cautionary is required to be issued to any aircraft operating directly behind a heavy, or a light aircraft operating behind a medium aircraft M182.5. There are other references which deal with more complex traffic situations such as M182.6 and M182.9.

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## **Departures**

### **Tower Release Authority**

At Calgary, there is an agreement in place between the Tower and the ACC that puts the responsibility for providing the initial separation of IFR traffic with the Tower. At towers without such an agreement, the tower controller must request and obtain release from the IFR controller before permitting any IFR aircraft to depart. At Calgary, the Tower controller obtains what is known as "SYD" from the Departure controller. SYD (pronounced as 'swyde') is an acronym for "Subject to Your Discretion". Once SYD has been granted to Tower by Departure for the departure runway or runways, Tower may then depart IFR traffic without requesting release. SYD is only valid on the active departure runway or runways and Tower must request release for an IFR departure off any inactive runway.

### **Radar Wake Turbulence Separation**

The required radar wake turbulence separation minima must be ensured by the Tower controller between successive departures. When aircraft are operating directly behind one another and with less than 1,000 of vertical spacing between them, at least three miles of separation must be in place in a terminal area. However because of the potentially hazardous effects of wake

turbulence to aircraft operating behind certain weight classes of aircraft, extra spacing is sometimes required to be in place to enhance safety. For example when a light category aircraft such as a C172 operates behind a heavy category aircraft such as an A340, three extra miles of spacing is required to mitigate the effects of wake turbulence to the C172. Therefore on departure (or arrival) the minimum spacing the C172 can be behind the A340 is six miles. For some aircraft weight combinations it has been determined that no extra spacing above the minimum three miles is required such as when a medium aircraft operates directly behind another medium aircraft or when a light aircraft operates behind another light aircraft. Because of its importance to Tower operations **M182.6** is quoted here:

You may use the following radar minima in lieu of 2 minutes wake turbulence separation between VFR or IFR departures on the same or crossing runways provided you are certified to apply radar separation between departures:

Behind an A380	-	not permitted (3 minute delay for Light or Medium) (2 minutes delay for Heavy or A380)
Heavy behind a heavy	-	4 miles
Medium behind a heavy	-	5 miles
Light behind a heavy	-	6 miles

**M181.4 Note 2** adds that for the purpose of wake turbulence application, the Boeing 757 is to be considered as heavy when it is the preceding aircraft. When a controller applies the above minima between successive departures, it should be noted that it is not required for the proper wake turbulence separation to have been achieved before clearing the second aircraft for take off. The point at which the second aircraft rotates is deemed to be the moment when the minimum separation must be in place. What this means is that the following aircraft may be cleared for takeoff at a time such that the proper wake turbulence separation will be achieved at its point of rotation. This is known as anticipated radar separation.

### Departure Spacing

Calgary Tower has the authority to release a successive departing IFR aircraft from the same runway with visual separation in accordance with **M335.1**. Besides providing the radar wake turbulence separation between departures, the Tower controller must ensure that the initial separation between aircraft does not decrease. Factors such as aircraft performance and pilot technique vary even in the real world so VATSIM controllers should be wary when attempting to run consecutive departures with minimum spacing. For example, separation may become compromised in a situation with an A320 becoming airborne at the moment a leading B738 is 3 miles ahead. Although, these aircraft's performances are expected to be similar, the controller has no way to ensure that the radar separation will remain constant or increase on VATSIM.

### Anticipated Radar Separation

A way for the Tower controller to run successive departures as efficiently as possible from one runway to use anticipated radar separation. As mentioned above the controller will issue a takeoff clearance to an aircraft at a time when the required wake turbulence separation has not yet been achieved from the previous departure. The way this is done is as follows: Because the parallel runways at Calgary are roughly 13,000 feet long, or longer, this equates to approximately 2 nm. When a lead aircraft is airborne and over the threshold of the opposite end of the runway with the next departure ready to depart, the aircraft can be considered to be separated by 2 nm. When the second aircraft is cleared for takeoff, typically by the time it has

accelerated and become airborne the lead aircraft will have increased their separation by one more mile. Therefore, when the controller wishes to create 3 miles of separation in the air, the second departure can be cleared for takeoff once the lead aircraft is overhead the opposite end of the runway. To create 4 miles of separation airborne the controller may clear the second aircraft for takeoff once the lead aircraft has flown one mile past the end of the departure runway. This is not a hard and fast method but works as a rule of thumb in most situations where departing aircraft are of similar performances.

### **Simultaneous Parallel Departures**

At Calgary, simultaneous departures from parallel runways can occur only on the north-south runways. **M564.1** deals with simultaneous departures off parallel runways and there are two points of interest with reference to Calgary. The first is that the centrelines between runways must be at least 2,500 feet in order for simultaneous departures to be authorized. At Calgary the distance between the north-south runways is well over 7,000 feet so this condition is met. The other requirement is that the tracks of departing aircraft must diverge by at least 15 degrees immediately after takeoff. At Calgary the RODEO SID and BANFF SID provides a track divergence of 15 degrees. On VATSIM, IFR pilots that do not have SIDs are instructed to fly runway heading on departure by Clearance Delivery. Tower controllers should be aware that technically a loss of separation is in place if an aircraft without a SID departs (other than 35L/17R) simultaneously with an aircraft on an adjacent parallel. For simplicity it has been decided that on VATSIM we will accept this, however a tower controller that is aware of an aircraft departing without a SID may elect to amend their departure heading to correct this. For example, if an aircraft will be departing runway 35R without a SID simultaneously with an aircraft off 35L that does have a SID, Tower may issue an initial heading of 360 to the runway 35R departure in conjunction with the takeoff clearance to provide the required 15 degrees of track divergence.

### **Prop Departures**

It has been determined that the noise level from departing prop aircraft is low enough that they can be exempt from some of the noise abatement procedures. During day operations, though not mandatory, props are normally issued a turn off their SID by the Tower controller. This exemption allows subsequent departures to be expedited especially in cases where a jet is to depart behind a prop. **M564.1 C.** describes how if a prop is turned by at least 30 degrees from runway heading, a second aircraft may be departed once the leading prop is one mile away and has commenced its turn. Being able to turn a prop on departure also helps provide an extra margin of safety in a situation when a prop departs with a faster aircraft on final behind to the same runway. Turning the prop on departure clears the jet's straight-out overshoot path in the event of a missed approach.

### **Control and Communications Transfer of Departures**

Control of a departing aircraft is automatically transferred to the Departure controller once an aircraft becomes airborne unless otherwise coordinated. Therefore the instruction for the aircraft to contact the Departure controller when airborne is normally to be included in the take-off clearance. **M362.2** and **M363.4.** A departing aircraft that appears to be in squawk standby mode should be reminded to come out of standby mode before a takeoff clearance is issued to them, but keep in mind that standard pilot procedure is for the pilot to turn their transponder on only upon entering the runway.

## Non-Conforming Departures

The system in place at Calgary where during a dual operation, aircraft are assigned their departure runway based upon their initial airway is so that departures will never have to cross the departure path of the other parallel runway. When this occurs all aircraft are said to be 'conforming'. The Clearance Delivery and/or Ground controller must be given permission from Tower before assigning a non-standard runway for departure to an aircraft. When approved, the Tower controller must inform the Departure controller in advance of which aircraft will not be conforming and of which runway they will depart from. Slightly complex situations occur with a non-conforming departure in a parallel runway configuration, since at some point in time the aircraft will need to be turned to cross the departure path of the other runway to become established on course. The Tower must ensure that this aircraft will be separated from any subsequent departures, and this may cause a slight delay for the next departures.

More complexity occurs with a non-conforming departure from a crossing runway. For example, to accommodate a 29 departure while in a dual 35L/35R configuration, a sufficient arrival hole on runway 35L must exist so that the departure lifting off 29 will not be in conflict with an arrival on short final to runway 23. Because of the impact that a crossing non-conforming departure has on the terminal traffic, the Tower must request the Departure controller for release for this aircraft. A crossing runway departure impacts other traffic because it will enter airspace in the climb where previous departures from an active runway may be climbing into. The Tower should give the Terminal controllers advance notice as soon as they become aware that a crossing non conforming departure is taxiing for departure. Prior to departing a crossing runway departure the Tower controller must obtain control of the departure runway from the Ground controller, and obtain release off that runway from the Departure controller. IFR release is requested by stating the aircraft identification, aircraft type, initial airway and the departure runway. For example: "request release of WJA123 a Q961 jet off runway 17R". The Departure controller will respond when able with "ACA123 valid runway 17R" or simply "I'll advise" if they cannot grant release at that moment. Once release has been obtained and ownership of the departure runway has been given to Tower, the aircraft can then be cleared for takeoff. Once the departure has left, the Tower should transfer control of the runway back to the Ground controller.

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## Arrivals

### Control Transfer of Arrivals

Responsibility for separation between arriving aircraft is automatically transferred to Calgary Tower once an aircraft has entered the Control Zone. With the use of radar, Calgary Tower assumes control of arrivals at the Control Zone boundary provided the weather conditions exist in **M362.5**. **M362.5** outlines the criteria necessary in order for a tower to assume responsibility for an IFR arrival, and most towers do not have the ability to assume control of all arriving IFR aircraft the way that Calgary does. The topic of control transfer between a Tower and an IFR unit will be discussed again in subsequent modules.

### Arrival Spacing

Though it is the responsibility of the Arrival controller to provide the appropriate separation between successive arrivals on final approach, if the Tower has control of an arriving aircraft and separation will be lost with another aircraft, they must take action to avoid a loss of separation. Options are to instruct an aircraft to reduce their speed, maintain their present speed as long as possible or if no alternative exists to commence a missed approach. On VATSIM due to problems with visual observation, Calgary Tower is to be operated as a radar unit and therefore appropriate radar separation between arrivals is to be maintained by the

Tower and Arrival controllers until aircraft have landed. If visual observation was always possible, it may be permissible for arriving aircraft to have less than the prescribed spacing between them if the Tower was able to have the aircraft in sight. Another instance of when aircraft may legally have less than the prescribed radar wake turbulence separation on final approach is when an aircraft has been authorized to conduct a visual approach in accordance with **M566** and **M567**. In this case the aircraft is responsible for providing its own separation and wake turbulence avoidance from a preceding aircraft. In order to preserve spacing between aircraft on final, and to provide Tower with aircraft flying consistent speeds on final approach, the Arrival controller may instruct arrivals to cross the FAF at a speed of 160 kts when in IMC, and 170 kts when in VMC.

### **After Landing**

Once an aircraft has landed, unless otherwise instructed, the aircraft may exit the runway at the first available taxiway to them without permission. An aircraft may not, however vacate onto another runway whether it is active or not, or commence a back track without permission. If required, Tower may specify the taxiway an aircraft is to vacate into, and to contact Ground when off the runway. Because of lack of visual observation, it may be advantageous to request a pilot to report when they are off the active runway in order to expedite issuing a clearance for a subsequent runway operation.

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## Arrivals and Departures

### **Separation**

**M562.2** deals with the conditions for being able to simultaneously land and depart aircraft using different parallel runways. Issues such as distance between runway centrelines and the distance the runway thresholds are staggered come into play. The set of parallel runways at Calgary have sufficient distance between them that an aircraft may be departed from one parallel runway regardless of the distance back on final an aircraft is on the other parallel. For instance, Tower may clear aircraft to depart runway 35R at any time regardless of the position of an aircraft on final for runway 35L. The only item to keep in mind is that in the event of an overshoot of 35L, Tower must ensure separation between the aircraft on the overshoot and any 35R departure. For 35L, the aircraft conducting the missed approach may require a prompt turn away from runway heading in order to maintain separation from a 35R departure.

### **Mixed Runway Operations**

Anytime that a runway is used in mixed mode, which means it is being used simultaneously for both arrivals and departures, the Arrival Controller must provide the Tower with at least 5 miles or the required radar wake turbulence separation between successive arrivals. Providing five miles between arrivals should allow Tower to taxi a departure to position, exit a lander and then depart traffic while having appropriate departure-arrival separation as per **M562.1** or **M562.2** with the next arrival.

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## Missed Approaches

A missed approach is obviously an approach that does not end with the aircraft landing. A missed approach may be either controller or pilot initiated and is also called an overshoot, go-around, or fly-through. Once a missed approach has been initiated, the aircraft is considered to be a departure as it enters into the departure phase of flight when it immediately begins to accelerate and climb. All aircraft at Calgary are issued alternate missed approach instructions



which supersede the published missed approach procedure in the CAP for the runway the aircraft is on approach to. Tower is authorized to issue a climb to 7,000 on a heading that will ensure separation with other aircraft. Typically a turn of at least 30 degrees off runway heading and away from the airport is assigned. Once any potential separation issue has been resolved with other aircraft, the overshooting aircraft is handed off to the Departure controller. The Tower is responsible for providing a vector to the overshooting aircraft (if required) that will not compromise separation with any other aircraft. In a situation where the possibility of a missed approach exists, Tower should issue alternate missed approach instructions to the pilot as soon as possible. For example, in a case where an aircraft that has been cleared for takeoff has not moved, Tower will issue instructions to the aircraft on final that are to be followed in the event that a missed approach does become necessary.

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## LAHSO at Calgary

Land and Hold Short Operations are authorized at Calgary. In accordance with the agreement between Calgary Tower and the ACC, LAHSO may be issued to an aircraft provided all of the conditions in **M352.7** are met.

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## VFR flight at Calgary

Although there is usually a vast amount of IFR traffic operating continuously in and around Calgary, VFR traffic exists and is permitted around the airport. Most of the VFR aircraft that fly around and within the Calgary Control Zone are light planes and helicopters owned by TV or radio stations for reporting on traffic. In addition air ambulance helicopters and police aircraft work within and transit the Control Zone. On VATSIM it is at the Tower's discretion whether or not to permit VFR flight within the Calgary Control Zone, however Tower should never restrict VFR flights wishing to depart and fly outside of the Control Zone. Similarly VFR arrivals should not be denied access to Calgary. As a general rule, Jet aircraft should not be permitted to conduct practice instrument approaches as a VFR aircraft. This is partly due to the problems which arise because of the noise abatement rules at Calgary requiring a jet to climb to at least 6,500 on departure before turning, and to turn final at or above 4,800 feet or at or above the PAPI glide path slope depending on the runway. Because of the problems involved with a VFR jet aircraft having to continually transit both the Departure and Arrival controllers' airspace, practice instrument approaches should be only permitted by an aircraft that has filed IFR. On the other hand, a light, or medium prop aircraft should be permitted to fly VFR circuits at Calgary. A VFR prop should be able to fly circuits remaining entirely within the Control Zone at 6,500 or below. This permits the aircraft to remain under the control of Calgary Tower at all times.