SAFETY ISSUES TO CONSIDER

IN THE PROPOSAL TO

EXPAND THE ISLAND AIRPORT FOR JETS

Produced by:
The Greater Waterfront Coalition

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SAFETY ISSUES TO CONSIDER WITH RESPECT TO THE PROPOSAL TO EXPAND THE ISLAND AIRPORT FOR JETS.

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EXECUTIVE SUMMARY

The Greater Waterfront Coalition (GWC) represents community groups concerned about the future of the Toronto Waterfront.

The expansion proposal for Billy Bishop Toronto City Airport (BBTCA) introduced by Porter Airlines and PortsToronto would result in major changes at the airport and environs. The impact of these changes will require detailed study. One of the most important areas is safety.

Safety issues are critical because the Bombardier CS100 jets that Porter proposes to fly are twice as heavy, carry three times as much fuel, take off and land at higher speeds and have larger engines than the current turboprops.

It is the GWC's position that the safety implications of the proposal must be considered by experts at arm's length from those already retained by PortsToronto in its assessment of its own proposal. Ports Toronto is widely seen as supporting expansion; its chairman has spoken publicly in support of it.

The GWC's concerns relate to the safety implications of the expansion proposal in the following areas:

1) Implementation and size of Marine Exclusion Zones: The MEZs are intended to keep boats and airplanes far enough apart to avoid accidents. Although Transport Action Ontario, an independent non-government organization, has indicated that the MEZs should expand, based on Transport Canada regulations, the proponents have indicated the MEZs will not change materially. If the MEZs do not expand, jets starting their take-off run will be extremely close (as little as 132 meters) to ferries, tour boats, sailboats and other watercraft. Will there be gale-velocity jet blast that could capsize boats? Is it reasonable that the MEZs will not expand?

2) Effects of noise and exhaust emissions of jets at MEZ boundary: It is noted that airport personnel typically wear ear protection, even when jets are only taxiing or idling. What precautions are needed for nearby boaters during jet take-off? Similarly, what is the cumulative effect of exhaust emissions on nearby boaters?

3) Effectiveness and feasibility of proposed jet blast deflector: PortsToronto has proposed a wall-like jet blast deflector at the end of the runway, similar to that at Pearson Airport near Airport Road. Will this be effective for sailboats only 132 m away with sails higher than the deflector? A jet blast deflector was destroyed at Mumbai Airport because it was too close to jets (400 feet). The distance at BBTCA will have to be much closer than that due to lack of ground space. Will the BBTCA deflector even be feasible?

4) Uncertainty in regulatory responsibility for BBTCA safety: The flight regulator, Transport Canada, Civil Aviation, does not consider the safety of boats, but only airplanes. It cannot decide where the MEZ will be, if the runway is expanded. What regulator, if any, has jurisdiction to consider the safety of boaters, ferry passengers, and other water users, or the effectiveness of a jet blast deflector, in this situation?

5) Effects of aircraft wake turbulence: Large jetliners create wake turbulence including wingtip vortices, swirling patterns of disturbed air which spin off the ends of the wings. At the small distances between boats and planes during landing and takeoff, will wake turbulence endanger boats, particularly vulnerable sailboats, canoes and kayaks?

6) Clearances between aircraft and marine operations: At present, the approved runway approach calls for the airplane to descend at an angle of 4.8 degrees if coming from the east, or 3.5 degrees in coming from the west. These angles are calculated to ensure the aircraft passes above the masts of boats passing just outside the MEZs. Under visual flight rules, pilots need not follow and do not in practice follow these approved angles. The existing Q400 turboprops typically approach at an angle of under 3 degrees. Presumably jets will do the same. Is there a danger that a low approach will be unsafe for jets, which are less maneuverable and approach the runway faster than the existing turboprops?

7) Bird strike hazards: The jet engines have 6 foot diameter intakes. Transport Canada recommends there be no waterfowl refuge within 3.2 km of an airport. Toronto Harbour and Islands are home to many Canada geese and other waterfowl. Will jets create an unacceptable risk of danger arising from bird strikes?

8) Scenarios in which an aircraft cannot complete a landing ("Missed Approach"): One of the required "safety surfaces" around an airport allows room for a "missed approach" (aborted landing). The size of the missed approach safety area will vary depending on what approach procedure the airport is approved for. BBTCA recently became a non-precision instrument runway approach, after being approved only for visual runway approach for many years. Even using the present much smaller and lighter turboprops, there has been confusion as to how much air space is needed for the new non-precision "missed approach" surface. In 2012, Transport Canada approved use of a non-precision instrument approach known as RNAV(GNSS). However, due to errors in the calculations, Transport Canada revoked this approach in 2013. This was because the calculations had overlooked tall recently-built condo towers. In view of the numerous tall condo and office towers near BBTCA, with more to come, is there a safe non-precision "missed approach" surface for jets, which are heavier, faster and less maneuverable than turboprops?

9) Scenarios in which a jet aircraft takes off with one engine inoperative: Upcoming regulations at Transport Canada will require a safety surface called an "One Engine Inoperative Surface" which may seriously restrict building heights in the Portlands in future years. What is the effect of this regulation change, coupled with jet expansion, on future development or on the MEZs?

10) Transparency in reporting safety incidents and concerns: The public only became aware of the above incident (revoking of RNAV(GNSS)) as a result of numerous Access to Information requests. How can we develop a more transparent and accountable safety regime?

11) Runway approach lighting: Present Transport Canada regulations recommend runway approach lights as a safety measure for the class of runway proposed in the expansion proposal. These would be 450 to 750 metre long structures in the Harbour and Humber Bay. If the runways are expanded, all similar-sized runways in Canada have such approach lights. What are the consequences of ignoring this recommendation, as PortsToronto proposes?

In conclusion, the numerous safety implications of the BBTCA expansion proposal, as represented by the topics listed above, must be considered by experts at arm's length from those already retained by PortsToronto in its assessment of its own proposal.

INTRODUCTION

Porter Airlines and PortsToronto propose that the runway at Billy Bishop Toronto City Airport (the Island Airport) be extended 200 metres to the east and 200 metres to the west in order to accommodate jets. PortsToronto is now conducting an extensive study of its own proposal. (Porter and PortsToronto are referred to together in this document as the Proponents.)

The Greater Waterfront Coalition ("GWC") is a group of community organizations representing the public interest. As set out in the December 8, 2014 GWC request for funding available at www.waterfrontcoalition.com (*https://drive.google.com/file/d/0B86yxyGd4xMWT01FNk9VUExCcG8/preview?pli*) many safety issues arise from the proposal. The safety issues must be reviewed by independent experts representing the public interest, at arm's length from PortsToronto, which is widely seen by the public as having an institutional bias towards airport expansion. The chairman of PortsToronto has spoken publicly in support of jets.

Safety issues are critical because the Bombardier CS100 jets that Porter Airlines proposes to fly at the Island Airport are about twice the weight of the current turboprops. They carry three times as much fuel. They will take off and land at higher speeds. Their twin engines will have intakes approximately six feet in diameter, making them susceptible to bird strikes.

If the runway is extended as proposed, Toronto Island ferries, sailboats and kayaks will be much closer to the jets than they are now to the existing turboprops.

The airport is beside a sensitive harbour, and close to Toronto's revitalized waterfront, and Canada's largest downtown core. Many tall buildings stand nearby, potentially leading to heightened collision risk in the event of a bird strike.

The safety issues on the following pages need to be addressed. They are to some extent interrelated.

WHAT ARE THE MARINE EXCLUSION ZONES?

The Marine Exclusion Zones are shown on page 9. They are water areas that are off-limits to boat traffic, at both ends of the runway. The MEZs are marked by white buoys, as shown at right. The purpose of the MEZs is to keep boats and airplanes far enough apart to avoid accidents.

The MEZs are significant because marine navigation (boating) is the dominant use of Toronto Harbour. Toronto Island ferries bound for Hanlan's Point pass with metres of the southeast corner of the MEZ at the east end of the runway. Thousands of sailboats use the Harbour from the many nearby yacht clubs and marinas. There are sailing races almost every night in summer.

The Harbour is widely used by kayakers and canoeists. The route from the Harbourfront Canoe and Kayak Centre, just north of the east end of the runway, to Toronto Island, past the white buoys of the MEZ, is the most paddled route in Canada, according to Paddle Canada. Paddlers often pass so close to the white buoys they can easily reach out and touch them. The Island Yacht Club (IYC) tender, or shuttle boat, goes around the east end of the MEZ beside the white buoys, every few minutes.

Many boaters are children; there are paddling and sailing summer day-camps at the Rees Street Slip approximately 400 yards north of the east end of the runway and Marine Exclusion Zones.

A typical summer evening on the Harbour with a group of paddlers going by the MEZ.

Planes landing at the Island Airport pass the white buoys at low altitude, not far above boaters

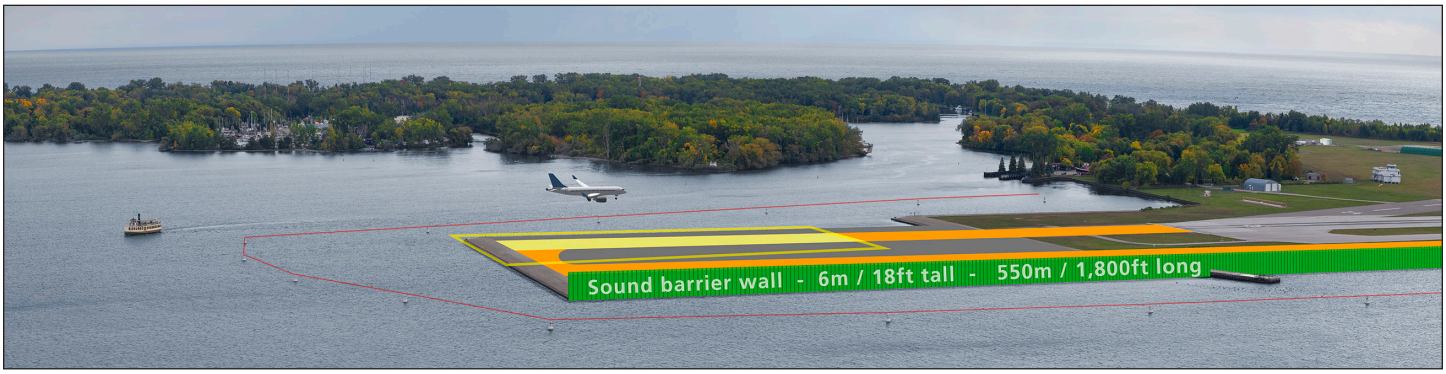
Much of this boat traffic must detour around the east end of the MEZ; the water beside the buoys is crowded on summer days. As well, sailboats and other watercraft using the Western Gap pass within metres of the white buoys at the west end of the MEZ.

If extending the runway for jets means the Marine Exclusion Zones must get larger, the harbour area available for boats will obviously get smaller. The detour around the MEZs will become more crowded.

Toronto City Council has accordingly said that any expansion of the runway must make "*no changes to the airport's Marine Exclusion Zones as currently configured, that would materially encroach on the Western Shipping Channel*".

On the other hand, if keeping MEZ where it is makes the Harbour unsafe because boats and planes are too close to each other, that is also unacceptable. Jets should not be allowed if they endanger the nearby people on the water.

It should be noted that the buoys can be changed at any time at the discretion of Transport Canada. To add to the uncertainty, there is some confusion as to which departments of Transport Canada have authority (as discussed below); it is possible that the airplane regulators might decide the buoys need not move but later change their minds, or that different Transport Canada officials such as the marine navigation regulators might later order the buoys be moved.



The image shows the expanded runway on the Harbour side (based on December 9, 2013 WSP/PortsToronto concept) and the proposed CS100 jet to scale, coming in for a landing). Please refer to page 9 for a comparison of the existing runway and the proposed runway design. Refer to page 12 for a current view from this vantage point.

HOW BIG MUST THE MARINE EXCLUSION ZONES BE, IF JETS ARE ALLOWED?

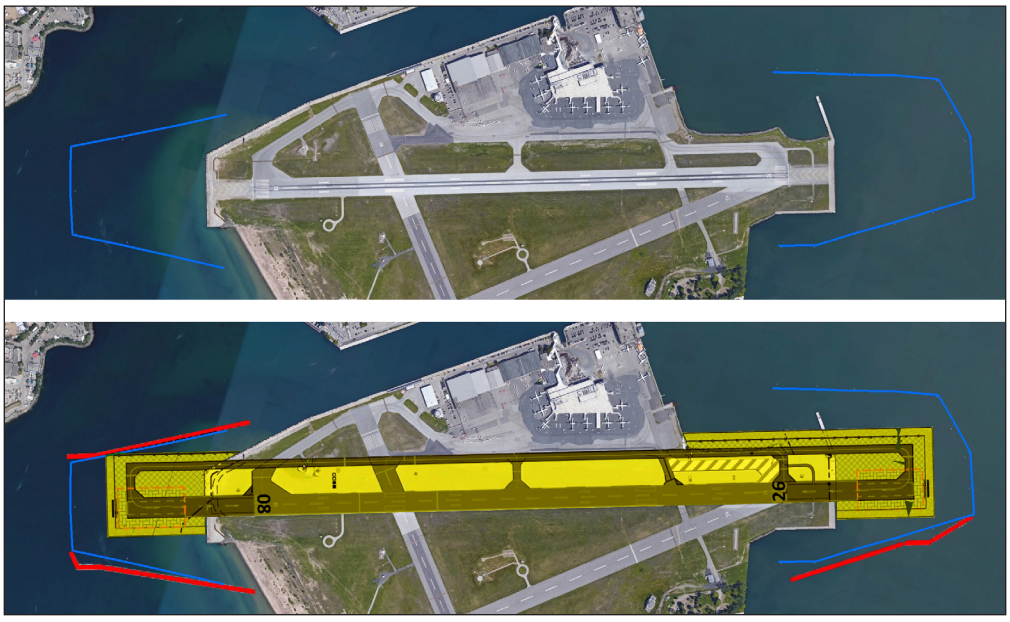
Transport Action Ontario, a group involved in commenting on transportation issues, released a study in 2014 saying that, if the runway is extended for jets, the MEZ too will have to expand.[1]

TAO reviewed Transport Canada's airspace safety regulations[2] and other industry guidelines to reach this conclusion. It reported that the expanded MEZs would have significant effects for boating. For example, TAO said the Western Gap would in effect be closed to boat traffic.

Neither PortsToronto nor Porter Airlines has responded to the TAO Report, although it appeared over a year ago. The Proponents simply denied that MEZs would move (they later admitted that it would move, but said it would not move as much as TAO said). This refusal to respond to or address the concerns in the TAO report did nothing to reassure the public.

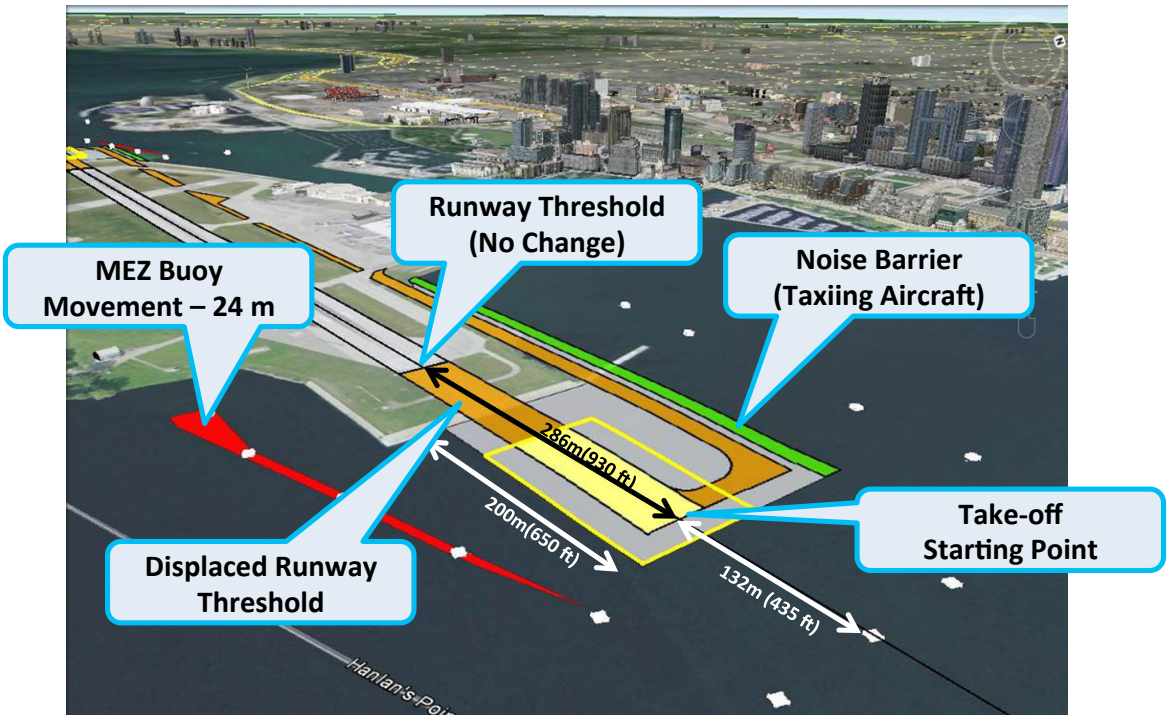
There should be a proper expert analysis of the issues raised by TAO done by experts who are independent of the Proponents.

The question how big the MEZs should be if the runway is expanded may be decided by Transport Canada. It has yet to say what it thinks. There is also some confusion as to who the proper regulator is. The proposal raises safety concerns affecting both airplanes and boats, which are subject to different statutes and regulatory regimes. This problem is discussed more fully later in this document under the heading "Who regulates boat safety in this situation?"



Top image shows the airport as it currently is with MEZs shown in blue.
Bottom image shows the proposed expanded runway in yellow, with the expanded MEZs shown in red.

WILL JETS BE TOO CLOSE TO BOATS TO BE SAFE?



Graphic: Part of PortsToronto presentation at December 9, 2014 EA meeting.

A visualization of the east end of the proposed expanded runway is shown above.

The white buoys marking the Marine Exclusion Zones are shown by white diamonds. It can be seen that only 132 metres separate the "Take-off Starting Point", labeled in the diagram, and the white buoys marking the MEZ. Boats pass around the outside of the MEZ, past the white buoys.

At the Take-off Starting Point, the pilot of a jet will apply full throttle, or close to it, to the twin engines, sufficient to accelerate the plane from a stationary position down the runway to the west, into the air. The runway, even if extended, will be a comparatively short one for the purposes of a jet taking off.

The jet blast behind the Take-Off Starting Point, towards boats by the MEZ 132 metres away, will be powerful. Jet blast can send a truck flying through the air, like a tornado or hurricane.[3]

A preliminary report from aeronautical consultant AIRBIZ found that the velocity of the jet blast could be 60 - 90 km an hour[4] by the MEZs, where boats are. This is enough to overturn a small boat. The consultants said more study of the effect of jet blast on boating is needed.

A full but independent investigation must be done of the effects of the expected jet blast on a kayak, sailboat, tour boat, or other craft passing only 132 metres away, immediately behind the jet engine, when full take-off thrust is applied.

As seen in this still frame, the force of the jet blast is powerful enough to roll this van may times over a great distance. The entire video can be seen here: *https://www.youtube.com/watch?v=Q6AKVMtj5Kc*

This inquiry must involve not only the question of the velocity of the blast, but related concerns such as the noise and emissions. For example, tour boats pass immediately by the MEZ every few minutes in summer. Most of the tourists are seated in the open air. How loud will the blasting jet engines be for a tourist on a tour boat a hundred and fifty metres or less away? The Toronto Island ferry to Hanlan's Point passes within metres of the southeast corner of the MEZ every few minutes. What will be the effect of being so close to jets for the hundreds of people on the ferry on a typical summer day?

Airport personal typically wear large ear protectors when working near jet engines, even when jets are only taxiing or idling. Would similar precautions normally be required for persons 132 metres away, directly behind and in the path of the emissions from twin jet engines blasting at full throttle? Will the noise level be enhanced by wind?

The noise may be more than an annoyance. Some preliminary research suggests twin jet engines suddenly blasting at top power directly towards a person just over a hundred metres away might be loud enough to cause hearing damage, or even shatter an eardrum. These matters should be fully investigated.

There must also be investigation of the exhaust and emissions coming from the suddenly-accelerating jet engines. How will they affect a person in a boat directly behind the engine, 132 metres away? Simply put, will it be safe to breathe jet emissions at that distance?

Assuming jet take offs will occur every few minutes at peak times, an investigation should be done of the cumulative effect of such emissions for boaters and the harbour in general. Might a fog-like pall of jet exhaust soot and other emissions be visible and smellable over the harbour waters? Will this be dangerous for boaters, tourists, and other people nearby?

An investigation should also be done of whether there is any other location anywhere in the world where passing boats continually pass so close behind the engines of jets starting their take-off run. If such an arrangement would be an experiment, untried anywhere else, City Council should be made aware of this fact and potential exposure to liability claims before it votes on whether expansion should go ahead.

Top image: The Oriole, one of Toronto Harbour's many charter boats that pass the MEZ (in red) on a daily basis during the boating season.
Bottom image: Kayaks and boats cross past the MEZ.

NOISE, EMISSIONS

The effect of jet emissions and noise should similarly be investigated for the entire harbour and waterfront area.

Noise and emissions, if not directly and immediately injuring people nearby, are health-related issues with impacts such as sleep deprivation resulting from the airport, and while extremely important, are outside the scope of this paper. The existing concerns about noise at the Island Airport now are also outside the scope of this paper, except perhaps to suggest that the full investigation is required of whether introducing bigger, more powerful jets may have even greater adverse impacts for local residents and waterfront users.

WILL MITIGATION MEASURES FIX THE PROBLEMS?

PortsToronto has proposed a wall-like jet blast deflector at the end of the runway, as shown below. It has also proposed a partial noise barrier, but has not confirmed if these features will be in the final runway design, nor what they will look like.

There must be independent investigation of how effective any such deflector or barrier would be. For example, how will it affect sailboats with sails higher than the deflector? What effect on sound levels will it have? Might it make jet engine noise worse by acting as a resonance chamber, like the body of a guitar?

A blast deflector will presumably have little effect on emissions, although it may change the initial direction in which they are propelled.

It may be that jet blast and sound barriers would not only be ineffective, but would also be unsightly wall-like structures blocking the view of Toronto Island from shore, detrimental to the appeal of Toronto harbour. This should also be investigated.

The visualization of the jet blast barrier presented by the Proponents' consultants is based on an existing blast barrier at Pearson Airport along Airport Road, to protect road traffic. Is that an analogous situation? Cars go much faster than a canoe, and are much less likely to overturn. The passengers in a car are typically enclosed. The jet blast barrier at Airport Road is at a distance from the runway, near the cars, not immediately behind the blasting jet engines as this one would be.

It may be a jet blast barrier at the Island Airport is not feasible. A jet blast barrier at Mumbai's airport was destroyed by engine blast in 2012 because it was too close to jets. It was 400 feet away.[5] A jet blast barrier at the Island Airport would have to be much closer than that due to lack of ground space.

Has a jet blast barrier ever been used to protect boats in similar circumstances? If not, the public and City Council should be advised that the Proponents propose an experiment with boater safety on Toronto Harbour that has never been tried before.

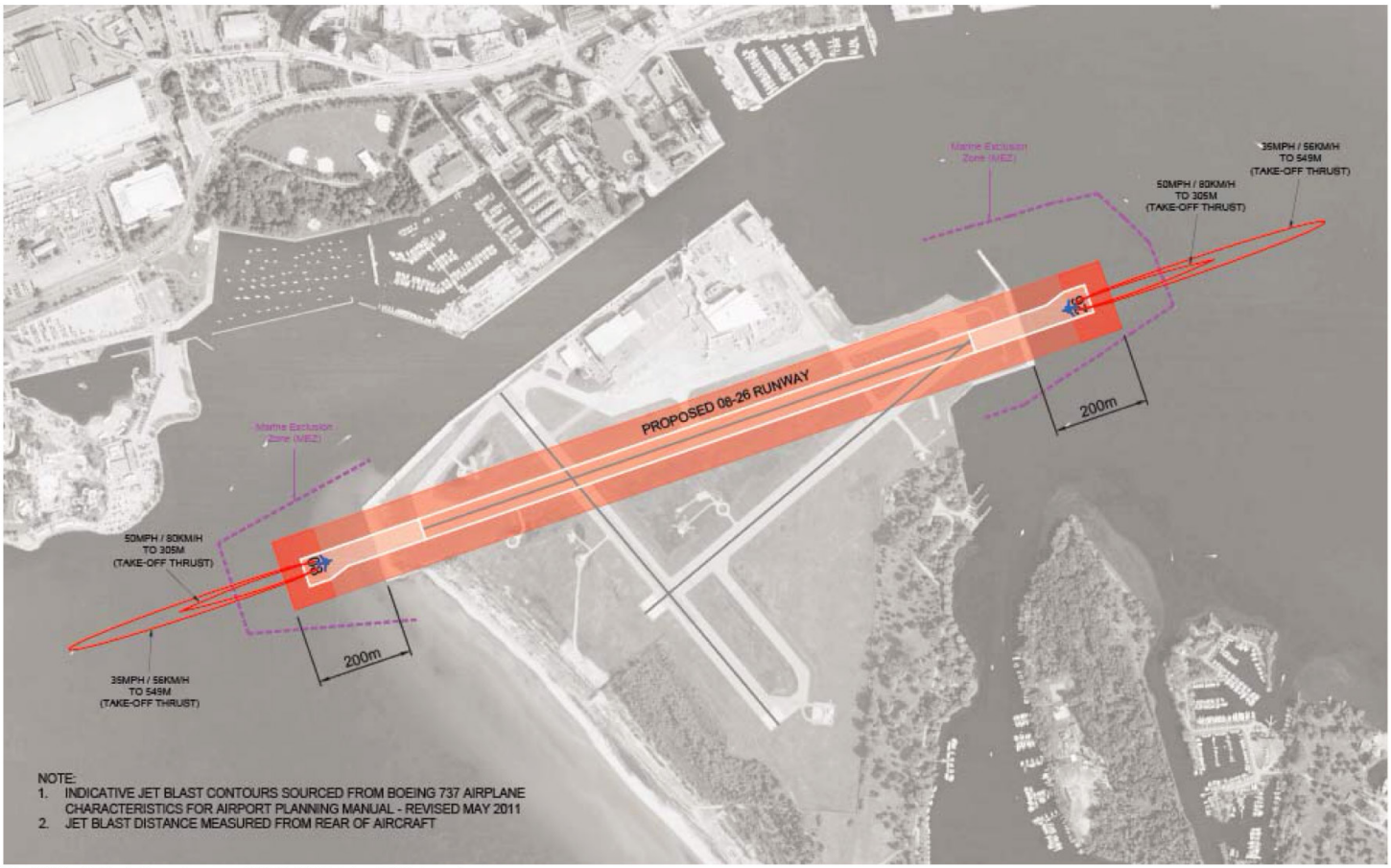


Fig 6.8 Jet Blast Envelopes – B737-600 Take-Off Thrust

Jet blast of a plane equivalent to CS100, going well out beyond MEZs from AIRBIZ Final Report November 27, 2013.
Source: *http://www.toronto.ca/legdocs/mmis/2013/ex/bgrd/backgroundfile-64300.pdf*

WHO REGULATES BOAT SAFETY IN THIS SITUATION?

It used to be thought Transport Canada would decide where the Marine Exclusion Zones should be.

However, it is now clear that the flight regulators at Transport Canada, Civil Aviation, who assess the design for an expanded runway and seem to have some administrative input into the MEZs, do not consider the safety of boaters when assessing where the MEZs should be; they are concerned only with the safety of airplanes. Transport Canada expressly does not evaluate the effectiveness or safety of jet blast deflectors beyond whether they might present an obstacle to aircraft in flight. They consider the safety of boats to be outside their jurisdiction, even if the potential danger comes from jet engines.[6]

The decision as to where the Marine Exclusion Zones must be to keep everyone safe therefore cannot be left to Transport Canada, Civil Aviation officials alone.

It is unclear what regulator has jurisdiction to consider the safety of boaters, ferry passengers, and other water users, or the effectiveness of a jet blast deflector, in this situation.

We have contacted the Navigation Protection Program in Sarnia, a branch of Transport Canada, which enforces and administers the *Navigation Protection Act*, to clarify whether that program has jurisdiction to examine the size of the Marine Exclusion Zones from the point of view of boater safety, but have not yet got an answer.

It may be that Canada does not have a regulatory structure in place to address the unusual safety issues arising from the proposal. Perhaps no one ever expected that anyone would propose having jets take off so close to a crowded harbour and sensitive recreational activity such as boating.

The certified glide slope of 3.5º at Runway 08 from the west has been determined to keep planes a safe distance from boats. If this plane was at 3.5º, it would be about 125ft or 38m above the water. It is about 107ft or 33m. Others have been documented at as little as 75ft or 23m.

WILL VORTEX FROM EXTREMELY LOW-FLYING JETS ENDANGER BOATERS?

Similar safety investigation is necessary of the effects of large jets landing close to boaters. As shown in the photographs previously, planes pass mere metres over boats on the harbour. Here is what a turboprop looks like now, from a kayak going by the Marine Exclusion Zones

Large jetliners create wake turbulence including wingtip vortices, swirling patterns of disturbed air which spin off the ends of the wings and can persist for roughly three minutes. Wingtip vortices have been known to cause other aircraft to crash and to damage roofs. See *https://en.wikipedia.org/wiki/Wake_turbulence*.

At the small distances between boats and planes contemplated by the proposal, will wake turbulence endanger boats, particularly vulnerable sailboats, canoes and kayaks?

Middle image: Actual photo of wake turbulance (not normally visible unless atmospheric conditions are right as in this image).
Bottom image: Intense jet blast upon take-off

WILL INTRODUCING JETS LEAD TO AN UNACCEPTABLE RISK OF COLLISIONS BETWEEN JETS AND SAILBOAT MASTS OR FERRIES?

The proposal means jets will fly over sailboats, crowded ferries and tall ships when landing. Does this pose a danger to jets or boats? This also requires independent analysis.

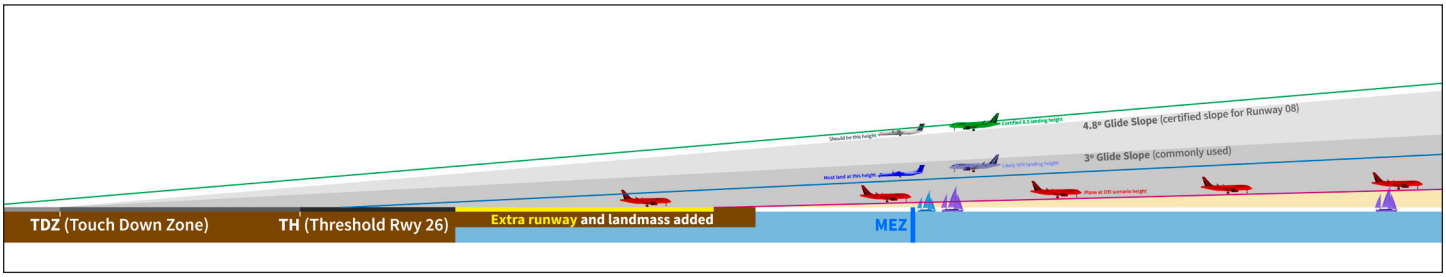
At present, the approved runway approach calls for the airplane to descend at an angle of 4.8 degrees if coming from the east, or 3.5 degrees in coming from the west. These angles are calculated to ensure the aircraft passes above the masts of boats passing just outside the MEZs.

Pilots need not follow and do not in practice follow the approved 4.8 or 3.5 degree angle; they have discretion to approach the runway at a lower angle. We have documented[7] that the existing Q400 turboprops in fact approach the runway at an angle of under 3 degrees. Presumably, jets will do the same.

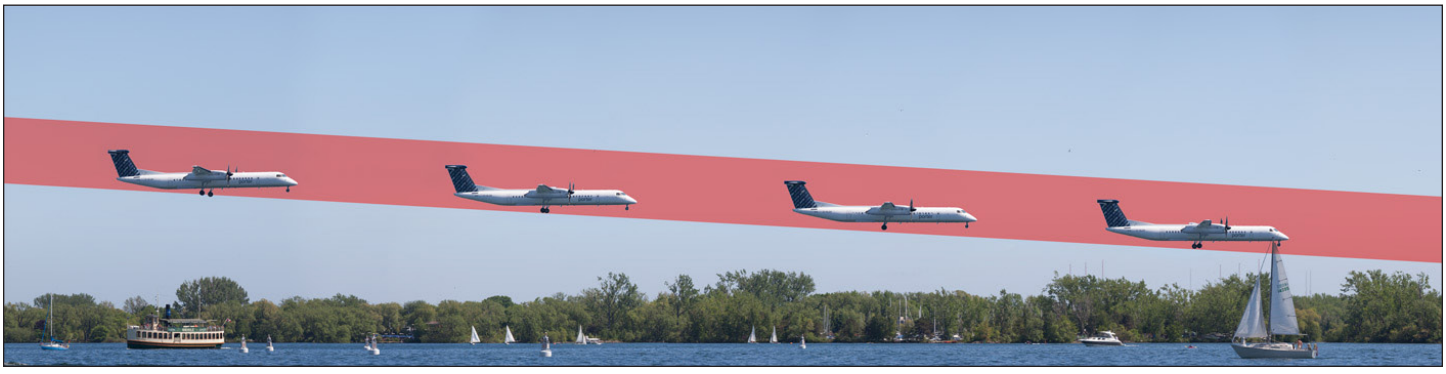
Some planes come in even lower. It is not unknown for commercial jet liners to approach a runway dangerously low, as did Air Canada Flight 624 in Halifax[8] and Asiana Flight 214 in San Francisco.[9] There are no runway approach lights at the Island Airport.

Is there a danger that a jet could potentially collide with the mast of a ship or boat sailing by the MEZs, or with the funnel or upper deck of a crowded ferry or tour boat?

A low approach angle may be safe for turboprops, whose pilots can perhaps maneuver if necessary to avoid sailboat masts or other obstacles. There must be an independent investigation and risk analysis of whether such an approach is safe for CS100 jets which weigh twice as much, are less maneuverable and approach the runway faster than the existing turboprops.



The graphic above is created to exact scale. It gives an indication of both the certified 4.8º glide slope and the 3º slope commonly used around the world. At this airport, we have documented planes flying in even lower than 3º seen below.



WILL JETS CREATE AN UNACCEPTABLE RISK OF DANGER ARISING FROM BIRD STRIKES?

A Bombardier CS100 jet, unlike a turboprop, has engine intakes more than 6 feet in diameter, easily capable of sucking in a Canada goose, swan, cormorant or one of the many other kinds of birds found in abundance around Toronto Harbour.

The well-known accident in 2009 in which U.S. Airways Flight 1549 came down in the Hudson River, after sucking Canada Geese into both engines, has drawn attention to the problem of bird strikes for jets near large waterfowl.

The Davies Commission, a high-level body now investigating the feasibility of possible sites for a new runway in the UK, rejected a proposal for a new airport located in the Thames Estuary in September, 2014.[10] In part, the Commission reached this decision because the risk of bird strikes was too great. Mitigation (essentially, relocating all bird habitat at least 13 km and ideally 20 km away) was unacceptably costly, and not feasible.

The risk of bird strikes cannot be managed simply through bird management measures at the airport itself because dangerous birds may originate off-site, kilometres away from the airport property. The U.S. Federal Aviation Agency, the U.S. flight regulator, recommends "*To address strikes above 500 feet AGL [above ground level], the general public and aviation community must first widen its view of wildlife management to minimize hazardous wildlife attractants within 5 miles of airports*."[11] "*Attractants*" include wildlife refuges and wetlands.

Transport Canada notes that "*large size combined with flocking and migration behaviour make waterfowl particularly hazardous to aircraft operations*."[12] It recommends that there be no "*migratory waterfowl and game refuges or feeding stations*" within 3.2 kilometres of an airport.[13]

From a land use point of view, Transport Canada advises that nearby "*wildlife refuges*" and "*waterfowl feeding stations*" create "*potentially high*" risk of bird strikes.[14]

Toronto Island, the Leslie Street Spit, Humber Bay East, West Parks and other nearby places are grassy, treed areas on migration routes, containing wetland, wildlife refuges, and cormorant-nesting areas. The Toronto waterfront, with thousands of tourists,

picnickers, and restaurants with their attendant trash and food scraps, is in effect a waterfowl feeding station, notoriously attractive to seagulls and Canada geese.

"*Minimizing hazardous wildlife attractants within 5 miles*", or even within 3.2 kilometres, may be feasible at Pearson, surrounded as it is by industrial subdivisions and highways. Doing the same at the Island Airport would be disruptive to its very different surrounding area, and perhaps impossible.

If removing bird attractants for several kilometres around the Island Airport means paving over or greatly altering the nearby park land, bird sanctuary and wild habitat on the Island and the Leslie Street Spit, or limiting access to the Toronto waterfront for people, City Council should be made aware of this before it votes on whether to amend the Tripartite Agreement to allow jets.

Toronto Harbour may be a wholly inappropriate location for a jet airport. The Island Airport is surrounded both by bird habitat and attractants, as well as many nearby tall buildings which also raise safety issues, as discussed below.

Independent investigation is needed as to the potential danger of bird strikes if jets were introduced. To what extent is that risk greater than with the existing turboprops? If a bird strike occurs, are the potential consequences for a jet more serious than for turboprop? If so, how? What mitigation measures to reduce bird strike risk would introducing jets make necessary?

PortsToronto has a Wildlife Management Plan currently in place, which it refuses to make public. The Plan presumably will have to be revised if jets are allowed. The proposed Plan should be made available to independent investigators.

The three airport images above, captured during May and June 2015, clearly illustrate the vast number of birds that populate the Harbour and along the Western Gap at a very close proximity to the airport runways. To disperse birds, loud flare shots are fired directly into the flocks.

WILL USE OF JETS CREATE AN UNACCEPTABLE RISK OF COLLISIONS WITH BUILDINGS?

If a bird strike or other mishap happens, there must be enough airspace around an airport to accommodate emergency measures.

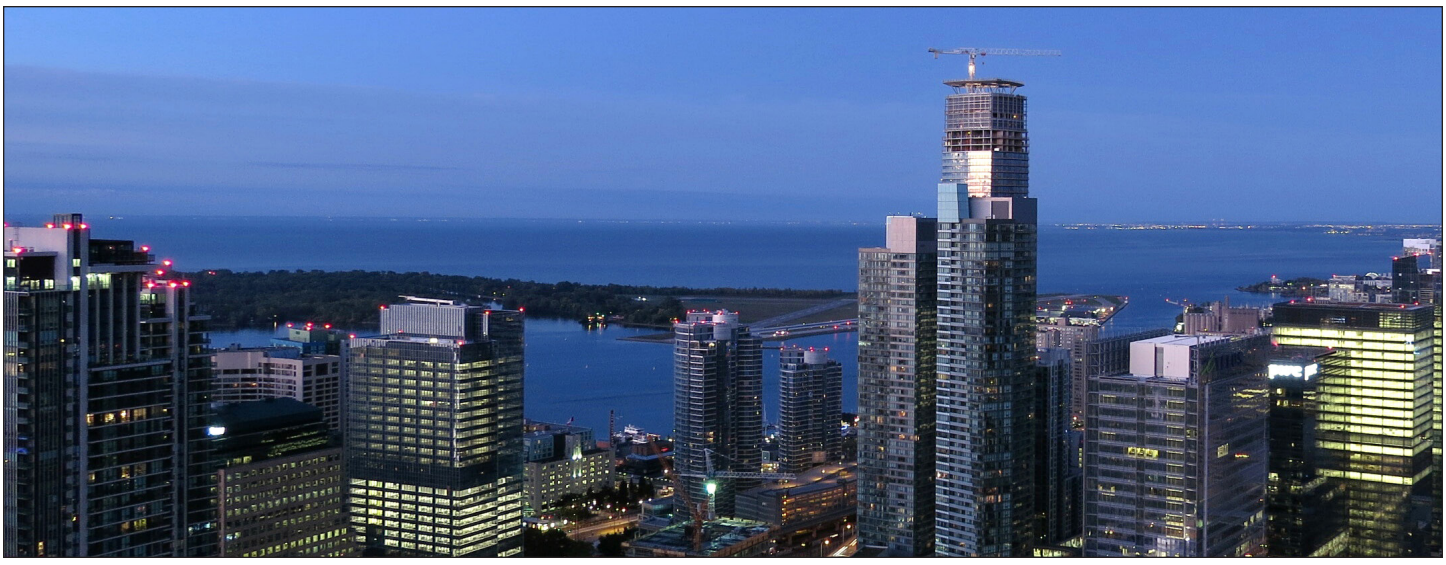
Transport Canada airport safety regulations such as *TP312 4th Edition* require that various defined areas around an airport, known as "*surfaces*", must be clear of obstacles to avoid collisions with obstacles including buildings. A new version of these rules, *TP312 5th Edition*, exists in draft and is some ways more stringent, and will come into force soon although no one knows exactly when.

These safety zones in the sky must be big enough to prevent an accident in an emergency. For example, an airplane coming in for a landing must have enough room to go around and attempt another landing, if it aborts a landing. The safety zone used in this case is known as a "*missed approach surface*".

Similarly, an airplane taking off must have a large area free of obstacles in case it loses an engine on take-off (as happened recently to Flight 235 in Taipei, which suffered an engine flame-out on take-off, and moments later hit a freeway before crashing in a nearby river).

To provide a clear obstacle free space one such regulatory requirement at airports is the Outer Surface. It is a 4000 m (4 km) radius circle centred on the main runway, parallel to the ground at 45 m above the runway.

The Island Airport is already subject to various exemptions from the normal rules, to accommodate the CN Tower and many tall buildings located within a kilometre, and in some cases within hundreds of meters, of the runway. The existing exemptions may be acceptable for slower more maneuverable turboprops. Are they safe for larger, faster, less maneuverable jets?



IS THERE ENOUGH ROOM FOR A "MISSED APPROACH?"

As set out previously, one of the required "*safety surfaces*" around an airport allows room for a "missed approach" (aborted landing). The size of the missed approach safety area will vary depending on what approach procedure the airport is approved for.

There are three runway and approach types. The simplest is a "visual runway approach". A visual runway may only be used by aircraft using visual approach procedures. That means the pilot must be able to see the runway while at or above a defined height, known as a minima, or else must divert to another airport or circle and attempt another landing.

For most of its history the Island Airport runway was a "visual runway". Landings could only be performed using a visual approach procedure. Airplanes needed good visibility to land.

The second type is a "*non-precision instrument approach*" runway. A runway of this type may be accessed by a "*non-precision instrument approach procedure*" approved by the flight regulator, Transport Canada. At such a runway, there is some guiding instrumentation (laterally – that is, along the axis to the right and left of plane) but not enough to guide a pilot to the ground in zero visibility.

Under conditions like fog or poor weather with bad visibility, the airspace needs to be clear of obstacles (tall buildings) over a far larger area than for a visual approach. The landing is being conducted blindly by relying on instruments. Should the pilot need to abort a landing (missed approach), he or she would be relying on instruments to guide the plane because he or she cannot see out the window.

Non-precision instrument landing procedures therefore require a lot of air space around the airport to be clear of obstacles. Transport Canada rules dictate the space that needs to be clear in very specific detail. The number of tall buildings along the waterfront close to the "missed approach surface" for a non-precision approach at the Island Airport has presented serious problems for Porter and great concerns for Transport Canada over the last three years.

The Island Airport runway, after a worrying false start and some confusion, as discussed below, recently without fanfare became a non-precision instrument runway after being approved only for visual runway approach for many years.

The third type of runway is a "*precision approach*" runway. Runways at major airports such Pearson are precision instrument runways. There is full instrumentation, both laterally and vertically, and even more air space free of obstacles for the plane to come around for a missed approach than there would be for a visual or non-precision instrument runway. The plane can land even in zero visibility.

The Island Airport runway has never been and probably never will be a "*precision approach*" runway because there are too many tall buildings nearby. Transport Canada would never allow it. Due to nearby tall buildings, there is not enough room for the necessary "*missed approach*" safety surface.

RECENT CONFUSION OVER HOW BIG THE "MISSED APPROACH" SURFACE MUST BE.

Even using the present much smaller and lighter turboprops, there has been confusion at the Island Airport as to how much air space is needed for the new non-precision instrument "missed approach" surface.

Transport Canada in 2012 approved use of a non-precision instrument procedure at the Island Airport known as RNAV(GNSS). This approach procedure was used in low visibility, that is, snow or fog. In January of 2013, Transport Canada discovered that the designers of the procedure used inaccurate calculations during their design process. Transport Canada did not discover the problem for more than six months.

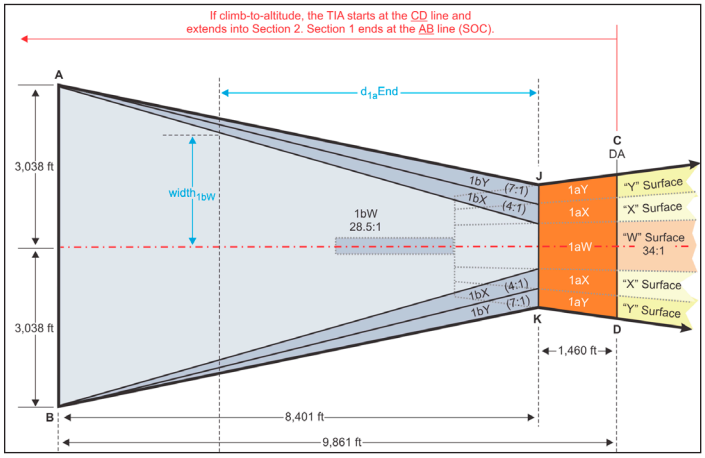
On March 28, 2013, Transport Canada reversed course and revoked permission to use the non-precision instrument procedure at the Island Airport. This was because tall recently-built condominium towers and ones currently under construction had been previously overlooked. Those buildings obstructed the required non-precision instrument "missed approach" surface.

That is, there was risk that a plane going around for a second try at landing in poor visibility might hit the buildings. Transport Canada cited the "*safety of the traveling public*" as its reason for revoking approval to use the RNAV (GNSS) approach. Luckily, there was no accident while planes were landing at the Island Airport using the unsafe non-precision instrument approach procedure.

PortsToronto says Porter has very recently got approval to use a newly re-designed version of this non-precision procedure. The incident, however, shows that the Island Airport is operating close to the line of what is acceptable even using turboprops, let alone jets.

The question therefore is: Is there sufficient air space at the Toronto waterfront for a jet, which weighs twice as much, lands faster and is less maneuverable than a turboprop? Even if safe for a visual approach, is it safe for a non-precision instrument approach, for which the "missed approach" surface must be larger? Because it is going faster and is less maneuverable, a jet needs more room to turn around than does a turboprop.

At what point is the risk that a jet may collide with a building too high? This is a complex question, and must be reviewed by experts independent of the Proponents.



FAA graphic of required obstacle free airspce around the runway.

IF JETS ARE ALLOWED (OR JUST TO HAVE A DISCUSSION ABOUT WHETHER THEY SHOULD BE ALLOWED), IS MORE TRANSPARENCY NEEDED ABOUT AERONAUTICAL SAFETY ISSUES AT THE ISLAND AIRPORT?

Should anyone other than the airport operator, the airlines and Transport Canada have input into or be informed of such safety issues? To recap, over the last number of years the Island Airport has transitioned from a visual runway to a non-precision instrument runway, but then subsequently had its permission to use an instrument approach procedure revoked as that approach procedure was deemed unsafe. It then recently was reapproved to use a re-designed non-precision ILS system. At issue was whether planes flying into the airport were too close to tall buildings to be safe, even with the smaller, lighter, and more maneuverable turboprops now in use.

All this happened without the public or anyone at City Hall being informed. The story emerged only from recent Access To Information (ATI) requests.

This story suggests a need for an appropriate model for transparency on safety issues, even before a decision can be made about jets. The above story took months of volunteer work and many Access to Information requests to piece together. Porter has been vigorous in fighting Access to Information requests in the Courts.[15] There may be other aspects that have not yet come to light.

If jets are allowed, safety issues may arise potentially affecting thousands of waterfront residents and visitors. While any airport will potentially give rise to such issues, the Island Airport is unique in being so close to city towers.

Independent experts may be needed to investigate and propose a transparency regime that is fair in the circumstances. It will safeguard truly confidential airline information, while at the same ensuring there is transparency about safety issues insofar as they impact on local residents, the City, and developers.

BACKGROUND:
The procedure permits approaches at a lower ceiling, which improves access to the airport and reduces diversions to alternate airports in bad weather. TC has conducted an initial review of an amendment submitted by [redacted](the sponsor) that was developed to mitigate new obstacles being erected (condos) and the preliminary determination is that it does not meet the established criteria for obstacle clearance. A Notice to Airmen (NOTAM) is being developed (not yet issued) that says that the approach is not authorized (revoked) for safety reasons.

KEY MESSAGES:
- The safety of the travelling public is a top priority.
- Departmental officials are reviewing the submission with a view to working with Porter to resolve the issues as soon as possible.

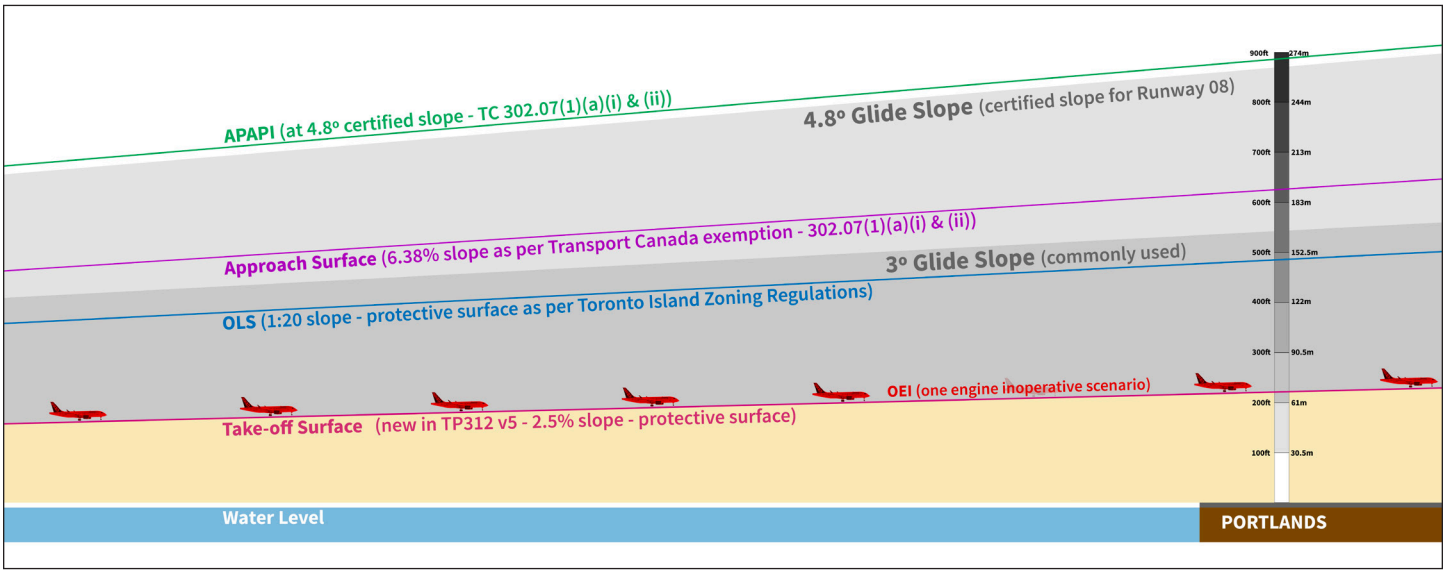
We will be kept apprised as this situation continues to evolve.

A small excerpt from an Access To Information document released by Transport Canada the day before the April 1, 2013 City Council vote. It took us months to decipher the document. Subsequent ATI requests were made based on these findings.

IS THERE ENOUGH AIR SPACE FOR A "ONE ENGINE INOPERATIVE" SITUATION?

Another safety surface lessens the chances of a disaster in what is known as a "*one engine inoperative*" (OEI) situation. That means one jet engine for some reason, perhaps because of a bird strike, stops working on take-off.

When a two-engine jet plane loses an engine, it cannot climb well and may experience loss of control. A one engine inoperative "*surface*" is a safety area in the sky so that a crippled plane with only one engine working will not hit obstructions such as buildings. We calculate that a OEI surface would be only about 70 metres above ground level at the Portlands, as shown in this figure. No building could be built there higher than that.



An OEI surface is not now required under Transport Canada's regulation *TP312, 4th Edition*. It will be required in upcoming regulations currently known as *TP312, 5th Edition Draft*.

Even if the proposed runway does not violate Transport Canada's regulations now, which do not at present require an OEI surface, does that mean buildings can safely be built that might be in the path of a crippled jet with one engine not working? Similarly, might a jet blast deflector be in the path of a jet with one engine inoperative? Might an OEI surface mean the MEZs must change?

What about the future? Proposed rule changes in aeronautical regulations may have profound effect on new development of the Toronto waterfront, affecting the future value and potential taxation revenue for the City from those areas in the coming decades.

An OEI surface may be sufficiently low that it would also restrict boating on the Harbour. In an OEI scenario, all vessels along the flight path would be in danger.

The measures necessary to ensure safety for jets at the Island Airport, in other words, may impose unacceptable consequences on the city in years to come.

All these concerns may arise at a large airport such as Pearson, but will be less critical. Pearson is not surrounded by tall buildings, but by low-lying industrial subdivisions. These questions should be examined by independent experts before jets are introduced at the Island Airport.

APPROACH LIGHTING IS "RECOMMENDED" BY TRANSPORT CANADA FOR AIRPORTS WITH JETS. IS IT SAFE TO IGNORE THAT RECOMMENDATION?

Approach lighting is required for airports where jets fly a precision approach, but only "recommended" at airports such the Island Airport where a non-precision approach is used.[16] Approach lighting would consist of structures 450 up to 750 meters in length *https://www.tc.gc.ca/eng/civilaviation/publications/tp312-chapter5-5-3-931.htm#5.3.5*, extending out into Humber Bay at the western end of the runway, and into the Inner Harbour at the eastern end of the runway.

Presumably, Transport Canada recommends approach lighting for visual approach because it is safer. It increases safety by enabling the pilot to transition from instrument flight to visual flight for landing, reducing the chance of pilot errors in the dark, or in poor visibility caused by fog or snow.

It may be that it is adequately safe for a turboprop to land at night on a visual approach without approach lighting. However, there should be independent investigation as to whether it is acceptably safe or appropriate for safety recommendations to be ignored when the proposed much larger and faster jets will be flying frequently mere hundreds of metres from the tall buildings of Canada's most densely populated downtown area, at night in the dark, where conditions are often fog-bound.

Runway approach lighting at Runway 1 at Ronald Reagan Washington National Airport. At 2,094 meters in length Runway 1 has an approach lighting structure out into the water to a distance of 820 meters from the threshold.

CANADIAN AIRPORTS & APPROACH LIGHTING SYSTEMS USED

AIRPORT	RUNWAY #	LENGTH OF LIGHTING (m)	RUNWAY LENGTH (m)	AT WATER
Toronto CYYZ	05	720	3,389	
	23	720	3,389	
	15 R	720	2,590	
	33 L	730	2,590	
	15 L	720	3,368	
	33 R	800	3,368	
	06 L	900	2,896	
	24 R	730	2,896	
	06 R	780	2,740	
	24 L	730	2,740	
Vancouver CYVR	08 L	720	3,030	Yes
	26 R	720	3,030	
	08 R	1,065	3,505	Yes
	26 L	730	3,505	
Montreal CYUL	06 L	730	3,353	
	24 R	730	3,353	
	06 R	730	2,926	
	24 L	730	2,926	
	10	730	2,134	
Calgary CYYC	28	720	2,235	
	10	450	2,235	
	34	730	3,367	
	16	720	3,367	
Edmonton CYEG	30	720	3,109	
	12	730	3,109	
	02	730	3,353	
	20	435	3,353	
Ottawa CYOW	25	450	2,438	
	07	730	2,438	
	32	730	3,050	
	14	540	3,050	
Halifax CYHZ	05	450	3,200	
	23	450	3,200	
	14	720	2,347	
	32	450	2,347	
Winnipeg CYWG	36	720	3,353	
	18	700	3,353	
	31	700	2,652	
	13	720	2,652	
Island Airport CYTZ	08	0	1,795*	Yes
	26	0	1,795*	Yes

*Proposed new length with expansion and jets

Of the top nine airports (by pax) in Canada, the Island Airport is the only one without an approach lighting system. Even with expansion, it would also have the shortest runway for landing jets.

ENDNOTES

[1] *http://transport-action-ontario.com/wordpress/wp-content/uploads/2014/03/Toronto-Isl-Airprt-Safety-Zones-2014-03-24.pdf*

[2] Transport Canada Aerodrome Standards and Recommended Practices, 4th edition, March 1993, *http://www.tc.gc.ca/Publications/en/tp312/pdf/hr/tp312e.pdf*

[3] *https://www.youtube.com/watch?v=Q6AKVMtj5Kc*

[4] Porter Airlines Proposal Review, Final Report" November 27, 2013, p. 62. *http://www.toronto.ca/legdocs/mmis/2013/ex/bgrd/backgroundfile-64300.pdf*

[5] *http://theflyingengineer.com/tag/blast-shield*

[6] Stated orally by Clifford Frank, Transport Canada, Civil Aviation official, at Stakeholder Advisory Committee (SAC) meeting February 19, 2015

[7] Images produced by Jim Panou over a period between January 2014 to the present.

[8] *http://avherald.com/h?article=483e7337*

[9] *http://en.m.wikipedia.org/wiki/Asiana_Airlines_Flight_214*

[10] "*Inner Thames Estuary Airport, Summary and Decision Paper",* September 2014*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/349518/decision-and-summary.pdf*

[11] *http://wildlife.faa.gov/downloads/StrikeReport1990-2012.pdf*, p. xiii

[12] *TP 13549 "Sharing the Skies, an Aviation Industry Guide to the Management of Wildlife Hazards" http://www.tc.gc.ca/publications/en/tp13549/pdf/hr/tp13549e.pdf*

[13] *ibid., Chapter 8, "Solutions: the airport and surroundings"*

[14] *https://www.tc.gc.ca/eng/civilaviation/publications/tp1247-part3-1428.htm*

[15] Porter Airlines v. Canada (Attorney General), 2014 FC 392
http://decisions.fct-cf.gc.ca/fc-cf/decisions/en/item/71582/index.do?r=AAAAAQAPUG9ydGVyIGFpcmxpbmVzAAAAAAE
Porter Airlines v. Canada (Attorney General), 2013 FC 780
http://decisions.fct-cf.gc.ca/fc-cf/decisions/en/item/62456/index.do?r=AAAAAQAPUG9ydGVyIGFpcmxpbmVzAAAAAAE

[16] *TP312, 4th Edition.* s 5.3.5
https://www.tc.gc.ca/Publications/en/tp312/pdf/hr/tp312e.pdf

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