



TRANSPORT ACTION ONTARIO
(formerly Transport 2000 Ontario)

Advocating for Sustainable Public and Freight Transportation
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**PRESENTATION TO THE CITY OF TORONTO
PUBLIC HEARINGS ON
RUNWAY EXPANSION AT THE BBTCA**

Toronto City Hall

December 5, 2013

(editorial revisions December 23, 2013)

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EXECUTIVE SUMMARY

Billy Bishop Toronto City Airport has changed over the many years that it has been in existence, but usually in a gradual way in step with the values and needs of Torontonians who either live within the central city, or around the waterfront, or use and enjoy it on a regular basis. Historically, attempts to remove or inhibit public use and enjoyment of the waterfront, including the Toronto Island Park and its facilities, have met with sharp public disapproval and rejection.

Recognizing that many technical questions about Billy Bishop Toronto City Airport (BBTCA) have yet to be addressed by Transport Canada, it is difficult to respond with precision to some issues regarding the proposed expansion of its single runway. This has been indicated in a report published on Transport Action Ontario's website, September 23, 2013. However, on the basis of limited information available, and past experience with several North American airports, the following concerns arise with respect to the present proposal to expand BBTCA to accommodate commercial jet service and the resultant increase in air travel in total.

(1) Noise and Property Devaluation

Currently, there is strong public opposition emerging to the potentially significant increase in aircraft noise and pollution from possible commercial jet traffic on Toronto Island (BBTCA). This could result in a large class action lawsuit brought against the City of Toronto and the Federal Government and its agencies, for reneging on the Tripartite Agreement condition of "No Jets on Toronto Island", twenty years before the agreement comes up for reconsideration.

A commercial jet free zone on the waterfront was the basis for many Torontonians deciding to buy waterfront properties, marine sailing vessels, and commercial vessels, with an expectation of quiet enjoyment of their lake view or harbor front dwellings, and/or use of their marine vessels, without disturbance or constraint from commercial jets, taking off and landing for 18 or more hours per day, over the next twenty years at least. The public entities, who are parties to this agreement, would be thus be liable for their adverse decisions to affected members of the public caused by their reneging on the Tripartite Agreement conditions. Consequently, affected persons may choose to exercise their right to bring suit for damages.

(2) Health and Emergency and Related Safety Implications

Pressure on scarce groundside and airside land and building resources at BBTCA as a consequence of runway expansion for commercial jets will pose a threat to ORNGE with respect to the safety and the priority spatial needs of its helicopter and/or medical aircraft operations and timely accessibility to major central Toronto hospitals.

(3) Public Costs of Increased Aircraft Safety

Commercial jet airport expansion will require significant new expenditures for infrastructure, including Instrument Landing Systems (ILS), marine infrastructure, and for a large marine rescue watercraft.

If an ILS (Instrument Landing System) is required to be established, within the Inner harbor, and within Lake Ontario, offshore to the west of BBTCA's extended runway, the cost to the City of Toronto will likely be significant, as its share of costs for the Island Airport.

(4) Impact on Local Recreational Use

Extension of the airport's single runway, with its minimum requirements for Runway Extension Safety Areas (RESAs) at either end, will create pressure for relocation of one or more yacht clubs, or marinas from the present island or city waterfront, as well as the closing of the Western Gap for most marine traffic, including large commercial ships, sailing craft and tourist boats. This is visually illustrated in a report prepared by my colleague, Gordon Woodmansey, published on the Transport Action Ontario's website, September 23, 2013. Mr. Woodmansey will discuss this and other issues in his presentation to City of Toronto's BBTCA hearings.

(5) Displacement of Basic General Aviation (GA) services from BBTCA and their Replacement Cost

Introducing medium distance commercial passenger jets on Toronto Island will displace a number of GA functions and air services currently available at BBTCA. Relocation of certain General Aviation activities from BBTCA will likely increase pressure to reopen the long dormant, Pickering Airport file. A new GA airport at Pickering, which would have capability to accommodate commercial jets, is conservatively estimated to cost upwards of \$25B.

Together, the total costs of items (1) – (5) to City of Toronto residents and ratepayers, and to other Federal and Provincial taxpayers, including costs of various "externalities" would likely amount to many billions of dollars.

Alternatives to BBTCA Expansion

(1) Electrified Fast Train to Pearson Airport

The 11 minute best travel time projected from Pearson to Union Station by a UP express (fast train) must be compared with 11 minutes in best travel time from Union Station to BBTCA. The difference in total time saved would be zero. However, the public infrastructure expenditure required for BBTCA:

- to fly commercial jet planes in and out safely
- to get everyone to and from their respective planes to downtown, or elsewhere comfortably and rapidly
- to keep all planes safe in the air and residents in the city center and waterfronts, safe, comfortable, and living in reasonably quiet urban surroundings

will be neither affordable, achievable nor sustainable for the City of Toronto and its citizens.

Opening BBTCA to commercial jets will provide greater incentive to every commercial jet airline that wants to get as close as possible to central Toronto to press for its competitive right, under NAFTA, to land at BBTCA. Consequently, the number of commercial passenger jets flying into BBTCA will grow rapidly, and exponentially, to the 24 / 7/ 365 capacity limit of its single runway and associated urban and airport infrastructure. This will be accompanied by increasing accident risk, aircraft noise, air pollution, ground and air traffic congestion, forced relocations, and other deleterious conditions. To achieve this, billions of Canadian tax dollars will have to be allocated to produce an up to six minute travel time advantage, dubious “increased convenience” for relatively few air passengers, but with very significant environmental and economic impacts on citizens of the City of Toronto.

(2) Electrified High Speed Trains to Other Cities:

Given these implications, it is time to consider faster (in total travel time), and environmentally more appropriate, alternatives for higher speed travel between Toronto and various centers 300 – 900 miles away. In Canada, for most short and medium distance travel trips, between major urban centers, *the fastest and most comfortable alternatives will not be by air, but by high speed rail, downtown to downtown. The high speed rail alternatives, used in many other countries, currently generate approximately 1/30 the CO2 emissions of commercial passenger jets, require less than 1/5 the cost of energy per passenger seat, with rail fares much lower than airfares for a more comfortable, safer, and more efficient mode of travel. This can be achieved in Canada.*

FULL REPORT

1. BACKGROUND

The following presentation addresses a number of issues that have arisen in the past, which are now returning in a somewhat different way to attempt to change or adversely alter the balance between public use and enjoyment of the amenity of Toronto Island and its aquatic surroundings and waterfront, and the interests of a relatively small number of city and regional residents and tourists. These air travelers wish to gain a slight advantage, in ground transport travel time ~~saving~~ by using BBTCA to avoid travelling to and from Pearson Airport, even on a ~~getting there~~ UP express train, when flying to and from Toronto by commercial jet.

Runway expansion to accommodate commercial passenger jet aircraft at BBTCA, under all – weather conditions, is more complex and costly to the public, and to the City of Toronto, ~~and~~ ~~complex~~ than acknowledged by present proponents.

Only one short runway currently exists at BBTCA, which is now proposed for lengthening to accommodate commercial passenger jets. The recurring proposal for airport expansion to accommodate jets has a long and colourful history, about which many present Torontonians are unaware.

For example, In the late 1960's, efforts by a Toronto Federal Minister of Transport, then M.P for Etobicoke, together with some provincial officials, civic leaders, and architects, proposed drastic measures for change to the Island Airport. They advocated a proposal for commercial jet airport expansion onto Toronto Island itself, together with large-scale medium rise mixed commercial and residential development. This new development would all be built on the Island (in part, to buffer anticipated airport noise on nearby Toronto waterfront residents).

This would have resulted in a major commercial jet airport, with two transverse runways, located on the Island. It would have substantially altered Toronto's historic waterfront, as well as destroying myriad marine institutions, education and recreation facilities, and a thriving island residential community. It would also have resulted in the permanent loss of Toronto Island as a major public park and open space resource, used by the entire city over the past half century. Strong community and citizen's groups at the time organized and opposed the destruction of Toronto Island Park, and the Island Airport was neither transformed nor altered.

Today, at the existing BBTCA, there is still only one short runway, but there is now a shortage of apron space, taxiways, and aircraft hangar space adequate to handle various aircraft types. The major reason for this recent ground side congestion has been the rapid expansion of air service for passengers flying between BBTCA and destinations within 300 - 400 miles, both by Porter Airlines, and Air Canada turboprop STOL (Short Take Off and Landing) aircraft, within the past 5

years. These flight arrangements have been used as a means to gain an advantage in airport to downtown travel time by using the central Toronto location of BBTCA as a means to reduce travel time to Toronto's downtown. All of this, despite the 170 mph slower air speed of STOL aircraft flying into BBTCA, compared with conventional passenger jets flying into Pearson Airport. *Current proposals and reports by advocates of commercial jet airport expansion appear to have given little attention to such differences in comparative airside performance, as well as various groundside limitations, problems and alternatives.*

2. IMPORTANT ISSUES ARISING FROM BBTCA EXPANSION

Most attention has been focused on extending BBTCA's single runway at either end, and on providing minimum requirements for RESAs (Runway End Safety Areas), which are essential to meet a part of Transport Canada's minimum flight safety conditions for smaller commercial jet airports. Other important issues have been ignored. These include:

(1) Noise and Property Devaluation

If and /or when, [hypothetically], the Island's single runway airport were to be modified and certified by Transport Canada for use by smaller commercial jet aircraft, under NAFTA, numerous US commercial jet airline operators could apply for access to Toronto's waterfront airport. As such, each new air service would be applying for one or more, limited, landing time slots, shared docking positions, and aircraft parking spaces, as well as quick turnaround times for their respective air operations, all within a tight 18 hour plus, daily time window.

In total, considering there will likely be no reduction in Porter's short-haul flight count, there could be a substantial increase in total flights per day. Inevitably, this will increase airside congestion around the airport and bid up prices for available commercial island airport space and landing slots, much of which Porter Airlines already controls.

This will also increase pressure for further infilling of the edge of the Island shoreline along the Western Gap to increase available land for airport ground side infrastructure. It will also increase pressure for additional taxiway space on the south side of the main airport runway, further encroaching on Toronto Island Park.

Since most landing slots would be needed between dawn or early morning, and midnight, or later, it can be expected that BBTCA will be generating continued intense levels of jet and other aircraft activity and related noise for at least 18 hours /day.

Many diverse airlines flying in and out of BBTCA will inevitably use a wider variety of aircraft types. All of these will have different noise, fuel emission and flight characteristics (e.g.

Embraer170, Boeing 737, 700 model, Airbus 319, Mitsubishi, as well as the purported lower noise levels of Bombardier's newest, but not yet certified, CS100.)

Although, landing approaches and take-offs by STOL turboprop aircraft such as the Dash 8, and the Q400, require shorter runway lengths, and are slower and quieter than conventional commercial passenger jets, deleterious noise and pollution from commercial jet aircraft will extend over a longer distance along the City of Toronto lakeshore than that produced by STOL aircraft. This problem will become increasingly evident in inclement weather, when ILS (Instrument Landing Systems) approach and take-off guidance infrastructure, designed to extend landing and takeoffs over longer instrument controlled distances beyond actual runways, are turned on to ensure safe takeoffs and landings under poor visibility conditions.

Inevitably, increased air traffic from commercial jets on a single runway airport will result in more severe noise and exhaust emissions which will annually impact many hundreds of thousands of waterfront users, as well as island and waterfront area residents, property owners, and mariners. The increased intensity of commercial jets landing and taking off every few minutes from very early in the morning until after midnight, at best, will create **“compound noise effects”**. These will be reflected and intensified from the surface of water areas surrounding BBTCA.

Over water surfaces, noise from a broad range of aircraft, operating simultaneously, on the ground and in the air, within a limited volume of ground and airspace, will intensify perceived noise disturbance and air pollution, within a flight path extending from the Beaches to west of the Humber River. Many property owners and renters who have paid premium prices for residences facing Lake Ontario, and never expected serious commercial jet aircraft noise from BBTCA, will soon find that they are less comfortable with the increased noise and air pollution experienced on their patios, balconies or within the interior of their dwellings (e.g. when screen doors or windows are open), from a combination of large numbers of commercial jet aircraft warming up, taxiing, testing their engines, taking off, and landing on a continuous 18 hour+ basis.

Commercial jet airport expansion will thus have the effect of devaluing many waterfront residential and commercial properties, and marine facilities.

Commercial jet aircraft noise will also adversely affect audiences and performers at a number of established waterfront music venues during warmer months. Also adversely affected will be pedestrians and tourists out for a walk along or near the waterfront throughout the year, and students attending nearby schools and daycares during the school year.

(2) Health Emergency and Related Safety Implications

A large increase in commercial passenger jet aircraft traffic in and out of the BBTCA will place ORNGE's helicopter service base at the Island airport at risk, and/or under pressure to relocate, to make room for commercial jet air traffic seeking competitive landing rights at the Island airport within the limited space available. Much increased daily air traffic will significantly intensify airside and ground side congestion, and may interfere with the ability of ORNGE aircraft, medevac jets, and medevac helicopters to taxi, as well as land and takeoff safely. Either that, or ORNGE may have to require periodic closure of the single runway and / or some taxiway, or apron areas, normally used by scheduled commercial flights, to ensure that, at all times, emergency service aircraft and med copters receive first priority access to and from, and around the BBTCA, in responding to emergencies.

If ORNGE relocates from the BBTCA, not only will the costs to Provincial and Federal emergency health care budgets have to increase significantly, but more seriously, timely, emergency helicopter air service to at least 5 major central area Toronto hospitals will be compromised.

(3) Public Costs of Increased Aircraft Safety

Full (IFR) instrument flight rules and an instrument landing system(ILS) will likely have to be established, if large numbers of conventional passenger jets are to be accommodated on a daily scheduled basis. The increased cost to the City of Toronto will be reflected in the City's increased share of BBTCA infrastructure and operational costs. There are at least two significant emerging costs to the City of Toronto for aircraft safety:

(i) There will be an essential requirement for and the cost of installation of ILS infrastructure. This will be necessary to ensure safe all-weather take offs and landings of scheduled commercial jets in inclement weather such as low ceiling, heavy rain, snow, poor visibility, etc. ILS installed within off shore water areas, such as in Lake Ontario, and within the Inner harbour, will also be more costly to install than on land, and more difficult and expensive to service and/or replace.

(ii) Since Toronto Police and Fire Marine divisions do not presently have such a vessel, a fast, large marine rescue watercraft will be required. It will have to be large enough to accommodate all passengers and crew of any commercial jet certified to use BBTCA. It must also be available 24/7/365, in the event of a crash landing on the lake or within the inner harbour area, under the circumstances of an aircraft emergency. Some airports use large hover craft for this purpose.

(4) Impacts on Local Recreational Use

The environmental impact of the installation of IFR (ILS) air traffic control systems will be more significant and costly to the surrounding waterfront and marine community, as well as to BBTCA itself, because of “additional externalized costs” such as:

- (i) major relocation and rearrangement of traditional marine circulation patterns within and around Toronto’s Inner harbour;
- (ii) restrictions on marine use within Lake Ontario, in the Western Gap and within the Inner Harbour by sailing craft and many tourist boats, due to adverse risk of increased flight envelope height restrictions and jet blast effects on marine vessels;
- (iii) a major change of course of City of Toronto harbour ferries and other marine vessels serving the western end of Toronto Island Park.

These points have been documented and illustrated in a report on Transport Action Ontario’s website dated September 23, 2013, by my colleague Gordon Woodmansey, who is also presenting at these hearings.

(5) Displacement of Basic GA Services Away from BBTCA and their Replacement Cost to the Public.

Introducing medium distance commercial passenger jets on Toronto Island will likely displace a number of GA (General Aviation) functions and air services currently available at BBTCA. These include: servicing and fueling of small propeller aircraft; flight training and testing programs for helicopters, float planes and small aircraft; continued airport access for small floatplanes; and leasing and servicing of aircraft and /or helicopters at BBTCA for media and other clients on a daily basis. Relocation of certain General Aviation activities from BBTCA will increase pressure to reopen the long dormant file of Pickering Airport. Some consider Pickering as a replacement for several small GTHA airports, as well as some GA functions proposed to be displaced from BBTCA, including a few from Pearson. A new GA airport at Pickering, also with capability to accommodate commercial jets, is estimated to cost upwards of \$25B.

3. EXPERIENCE IN OTHER CITIES

International jet airports on urban waterfronts which, in various ways, have negatively impacted, commercial and residential areas within their respective urban areas include: San Francisco International Airport, La Guardia Airport (New York City), Ronald Reagan International Airport, Washington D.C., SeaTac (Seattle Tacoma) International Airport, Seattle, Wash.; and Nice International Airport, Nice, France.

There is also the alternate experience of some cities which have faced serious deleterious effects from their waterfront airports. These include: Chicago, Hong Kong, and to a lesser extent Montreal. In these cases, commercial jet traffic was not expanded on urban waterfronts.

(1) Chicago: In its early 20th century plan, Chicago was to have a small airport for propeller aircraft and seaplanes on its waterfront. In the 1920s and 1930's, this plan influenced the City of Toronto to develop a similar airport on its then industrial waterfront. However, when the commercial jet age arrived in the late 1950's, Chicago quickly decided to move commercial jet aircraft inland, away from the lake front, at either Midway Airport within its inner city, or 20 miles northwest at O'Hare International Airport. This major US airport was designed to be, and is linked to downtown Chicago by several major expressways, as well as a subway line which, in part, runs down the middle of one of these expressways.

(2) Hong Kong: Until about 15 years ago, Kowloon, the landside portion of the island city of Hong Kong, contained a major international airport, Kai Tak, located on its central waterfront. Given this location, cheek by jowl in the midst of a jumble of dense buildings, Kai Tak, posed a serious accident risk for commercial jet aircraft. In the 1990's, work began on a new International airport for Hong Kong, Check Lap Lok, situated approximately 20 kms. from Kowloon. Located on Landau Island close to Hong Kong Island, this new airport is linked with the mainland by a causeway carrying a highway bridge, and a double track, semi-automated electrified railway. Trains run every 15 – 20 minutes and provide comfortable, safe, and fast service, at up to 85 mph (135kph), in approximately 20 minutes. The former airport lands in Kowloon have now been cleared and turned into a major underground intercity railway station and subway connection, with offices, shops, residences, institutional and recreational space above.

(3) Montreal: A STOL port with a single runway, initially using Twin Otter type aircraft was planned and initiated during the EXPO and Olympic years (1967 and 1976). Located along the edge of Nun's Island, close to the core of downtown Montreal, it was unsuccessful and closed, not due to its own shortcomings, but to functional changes in other major airports.

In the 1960's, it had been projected that Dorval Airport (subsequently renamed Pierre Elliot Trudeau International airport), 10 -15 miles west of downtown Montreal, would be closed as the city's premier International airport gateway. It would be replaced by a new airport at Mirabel, 40 miles NW near St. Jerome, well before the end of the 20th century. Although Mirabel opened in time for Expo 67, it never replaced Dorval.

Dorval airport, with well- established air freight and passenger related infrastructure already in place, was better situated between major highways, with better access to regional commercial and industrial infrastructure, and to downtown Montreal. It was also located on a major transcontinental rail corridor, with two existing railway stations at Dorval.

Instead of closing down as Mirabel opened, Dorval grew steadily. However, this setback for STOL aircraft on the river edge of Montreal's central area eventually resulted in its termination. Dorval's location could not justify the use of STOL aircraft for a short 15 mile (24 km.) flight from Montreal's downtown to Dorval. However, the longer 40 mile (65km.) flight distance to Mirabel, for which the STOL service had, in part, been initiated, was no longer useful. Mirabel, eventually closed as the premier International Airport for the Montreal region, and now serves as an industrial airport. Consequently, STOL air service from the single runway at the edge of downtown Montreal, also ended.

4. ALTERNATIVES TO BBTCA EXPANSION

(1) UP Express – Fast train service from Union Station to Pearson Airport

A major reason why many Pearson airport passengers have used BBTCA within the past few years was to try to minimize airport to downtown travel time. This was despite the 170 mph. slower air speeds for STOL aircraft landing at BBTCA compared with the higher air speeds of commercial jets flying into Pearson. The slower airspeed of STOL aircraft results in a 1/2 hour longer flight for a 300 - 350 mile trip (e.g Toronto to Ottawa, Montreal, or Newark.) Thus, the present ground transport time advantage of BBTCA over Pearson, for STOL turboprops at BBTCA versus commercial jets at Pearson, is often a wash! For longer trips, jets have an obviously greater travel time advantage.

Currently, bus or taxi ground transport to Union Station in Toronto, from Pearson requires 30 to 45 minutes, or more or less depending on time of day and road congestion. When the new UP express train linking Pearson with Union station is in operation in 2015, the expected travel time for proposed diesel-electric motorized unit trains (DMUs) will be 25 minutes. When the rail line to Pearson is electrified, there will be an additional time saving of at least 6 minutes for electric motorized unit trains (EMUs). Thus, real time ground transport by electrified train will be 15 – 19 minutes, (up to 34 minutes if one must wait up to an additional 15 minutes for the next train.)

The same 10 or 15 minute wait, can also occur at BBTCA, depending on which ground transport mode is selected to get into the City. Cars and taxis will not be able to move thousands of passengers / day between Union Station and BBTCA, or elsewhere within the Central Toronto Area (CTA), without a substantial increase in CTA traffic congestion. Therefore, a \$500M plus investment in public transport will be required to accommodate expected traffic growth between BBTCA and Union Station, and into the Toronto central area, when daily commercial jet air traffic into the Island airport gets underway.

The 11 -15 minute travel time from Pearson to Union Station by (electrified) higher speed train (80 mph.) [Table I below] would be about the same as the current 11 – 15 minute travel time on foot or by airline bus, between Union Station and BBTCA. The travel time for the 2015 conventional speed UP trains (40 mph) is projected to take longer by 6 - 14 minutes, depending on rolling stock and number of intermediate stops. However, there will be very substantial municipal public infrastructure costs, and risks, associated with this modest gain in travel time and increased convenience for some tourists and central city residents. These municipal costs appear to be neither sustainable, nor affordable, by City of Toronto citizens, given the City’s many other urgent transit and transport needs.

TABLE 1: UP EXPRESS – PEARSON AIRPORT TO UNION STATION

COMPARATIVE TRAVEL TIMES, ALTERNATIVE MOTIVE POWER OPTIONS AND STOP ARRANGEMENTS

Distance	Motive Power	Average Speed	Total	Elapsed	Travel	Time
Km. Mi.	Option	Over UP Distance	With 2 Stops	With 1 Stop	With No Stops	
24 15	CSR / DMU	84 kph / 40 mph	25 mins	23 mins	21 mins	
24 15	CSR / EMU	100 kph / 60 mph	19 mins	17 mins	15 mins	
24 15	CSR / EMU	128 kph / 80 mph	15 mins	13 mins	11 mins	

LEGEND: Rolling Stock

CSR: Conventional speed railway rolling stock capable of design speeds of at least 160 kph / 100 mph

DMU: Diesel Motorized Unit train **EMU:** Electric Motorized Unit train

Note: (a) With two stops, all trains would stop at both intermediate stations.

(b) With one stop, alternate trains would stop at either Bloor or Weston.

(c) With no stop, every second or third train would run through as a direct UP express, while all other trains would make either one or two stops on all of their trips.

(2) High Speed Rail in the Windsor – Quebec City Corridor:

Studies of the Windsor - Quebec City railway corridor indicate that it is technically and economically feasible to substantially improve this route for more intensive high speed passenger use, with railway electrification. This would directly link urban centers such as Toronto and Montreal by higher speed trains in 2 1/2 hours or less, Windsor and Toronto in less than 2 hours, and Montreal and Quebec City in an hour or less. An electrified railway system could also connect existing intermediate towns and cities along the line by fast regional trains. An electrified mixed freight and passenger railway corridor could use sustainable electricity generated entirely within Quebec and Ontario, without depending on fossil fuel combustion.

Environmental, energy and cost benefits for a high speed rail (HSR) alternative are substantial: As an example, for an approximate 600 km. distance such as London to Montreal, Quebec City to Hamilton, or Ottawa to London, CO2 emissions would be < 3 kg. / passenger by HSR train, 67 kg./ passenger by automobile and 87 kg./ passenger by commercial jet, (slightly less by STOL). Energy cost / per passenger by HSR train would be < \$10.00, automobile, \$25.00, and commercial jet, >\$50.00.

By comparison, the estimated capital cost of an electrified mixed passenger and fast freight line between Toronto and Montreal would range between \$13B – \$30 B., depending on detailed site design, development strategies and project timing. The estimated cost of a single new GA airport complex at North Pickering to Canadian taxpayers, would likely be upwards of \$25 B.

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Resume: Relevant Airport Analysis and Planning Experience:

1963-64 Architecture, Planning and Urban Design Consultant, Mayerovitch and Bernstein, Architects, Montreal. Review of programme and site design for a heliport on an office building, and analysis of design parameters for an apartment complex, near a flight path approach to Dorval Airport.

1967-68 Project Director, Acres Research and Planning Ltd. Planning and redesign of a USAF Strategic Air Command (SAC Base), town site, and civilian airport, Stephenville, Nfld.

1968 Urban designer and planner, Acres Research and Planning Ltd. Member - multidisciplinary team responsible for planning and design of a new International airport and terminal complex for Calgary, AB. This airport complex is still in operation.

1969 Urban designer and planner, Barton - Aschman Associates, Wash., D.C. Urban designer, planner . Washington. D.C. Reviewed the impact on D.C. urban areas of the introduction of large commercial jet

aircraft at Washington's National Airport, where substantive negative urban impacts resulted from changes in congressional and FAA policies respecting commercial jets at that airport.

1969-70 Planning consultant and urban transport advisor to Alderman Reid Scott, Toronto - Ward 9. Developed strategies to deal with consequences of a proposed commercial jet airport expansion onto Toronto Island, and its projected impacts on the Beaches, the waterfront, and other urban areas.

1974-75 Government of Manitoba. Appointed to a Tri-Level Airport Planning Advisory Committee, as technical representative. With others, was responsible for reviewing the planning and design requirements for Winnipeg's airport, as part of the Winnipeg Area Airport Systems Study (WAASS), carried out within a two year period by Transport Canada.

1981 Deputy Director of Planning, City of Edmonton. Responsible for preparation of the Edmonton Regional Growth Strategy report. Project undertaken in response to a Council decision requesting that Planning prepare a 25 – 35 yr. plan for Edmonton's projected growth, following a Provincial decision to double the City's land area. Council requested that the plan for this new extensive area, be completed within 5 months, and it was delivered on schedule. It also included an assessment of Edmonton's municipal airport, and its implications for future city growth.

1993-94 Member of a multidisciplinary design team, one of seven teams from among 22 nationally, selected to compete for the planning and design of a new town in North Pickering, ON. The proposed town site was located immediately south of lands which previously acquired by the Federal government, for a possible future airport. Our proposal, which was awarded third prize, enabled us to develop unique perspectives on environmental impact issues arising from a major airport in North Pickering.

1995 As a technical advisor to the late Jack Layton, who, at that time, was a Toronto City Councillor, reviewed some environmental implications of the possible introduction of a commercial Jet STOL aircraft (e.g. BAC RJ) at the Toronto Island Airport, (i.e. without runway extensions).