

**BILLY BISHOP TORONTO CITY AIRPORT
CAPACITY REPORT**

February 2010

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INTRODUCTION

Billy Bishop Toronto City Airport (BBTCA) currently has one carrier operating scheduled air service, Porter Airlines, which has been adding flights and increasing passenger traffic as new aircraft are delivered.

Other carriers have expressed an interest in operating at the Airport as early as April 2010. The total requested slots are expected to exceed the availability even in 2010 and the pressure for slots will continue to increase over time.

Noise Constraints

Helicopters are now required to follow flight paths and this will trigger their inclusion in the NEF calculations under the Tripartite Agreement for 2010, possibly reducing the slots available for large turboprops:

"The actual NEF Contours prepared in accordance with subsection (1) shall include the noise attributable to helicopters for any calendar year during which flight paths were required to be followed for at least half of that year pursuant to section 35"

Tripartite Agreement

Yet another factor that may reduce the slots available is the flights traffic before 07:00 and after 22:00. To the extent that there are more of these quiet hour flights than forecast, they significantly reduce the available slots.

Other Capacity Constraints

The constraints of the Tripartite Agreement are not the only issues in determining the Airport's capability to deal with increasing traffic volumes. The site is space constrained and other elements of the Airport or Airport access may point to slot limits that are different than those limited by aircraft noise.

The Toronto Port Authority has determined that several of the systems will be at capacity in the near future and the Airport will be required to address these capacity constraints as carrier operations increase.

Several changes are already underway to address some of these shortfalls, including the new air terminal and new ferry and the proposed pedestrian tunnel.

In a constrained environment, slots become important to the airlines on a time basis. It is insufficient for example to allocate a carrier 10 slots between 13:00 and 14:00, or even to allocate a carrier 20 slots a day if the availability of facilities means that in reality those slots cannot be used at commercially useful times. IATA defines a slot as:

"The scheduled time of arrival or departure available for allocation by, or as allocated by, a coordinator for an aircraft movement on a specific date at a coordinated airport."

BBTCA is indeed different from many other airports with slot management. At very large airports, slots are usually managed as a result of runway capacity constraints, and so precise timing of slots is commercially important to the airlines. For example, the runway capacity for departing aircraft may be 25 an hour, yet competing airlines may all want a 07:00 departure. If that were not managed, the 25th 07:00 flight would in fact take off at 08:00.

At BBTCA, the noise based constraints, as well as other constraints may mean that the maximum number of scheduled departures in an hour will be in the range of 7-10, well below runway capacity. At this point, it is clear that management of slots and schedules will be part of the Airport operation from 2010 onwards and that the approach to capacity and schedule management needs to be developed now.

The objectives of this study are:

- To review capacity and forecast demand on all major airport elements;
- To review the impact of the aircraft type mix on capacity and slot use;
- To develop proposed capacity limits and related schedule and slot constraints; and
- To review possible objectives and approaches for slot/schedule management.

To meet the objectives, the consulting team:

- Prepared 2010 movement forecasts to reflect the possibility of growth in movements of the existing and new carriers serving the Airport;
- Compared the capacity and demand for various elements of the airport, including the NEF constrained capacity;
- Developed objectives for managing the slots; and
- Proposed how ongoing slot management can be implemented.

DEMAND FORECASTS

Based on a preliminary assessment at the start of the project that NEF limits under existing demand patterns would limit slots to approximately 166, a demand model for the use of these slots was prepared using existing schedules and commercially viable schedules and destinations for slots not currently in use.

Table 1 provides a summary of the destinations served and numbers of flights assumed under the 166 slot scenario.

Table 1
Assumptions re Destinations Served and Numbers of Flights Under a 166 Slot Scenario

<u>Sector</u>	<u>Origin</u>	<u>Aircraft Departures</u>	<u>Departing Seats</u>
Domestic	YOW	23	1,490
	YQB	3	210
	YQT	3	210
	YSB	1	70
	YUL	20	1,280
	Total Dom.	50	3,260
Transborder	BOS	4	280
	CLE	3	210
	DCA	4	280
	EWR	16	1,120
	MDW	6	420
	Total TB	33	2,310
Total		83	5,570
Total Slots		166	

The minimum number of aircraft gates required by sector assuming a 20 minute buffer time between flights is presented in Table 2. A gate chart for the new 10 gate passenger terminal for the 166 slot flight schedule is presented in Exhibit 1. Exhibit 2 shows the aircraft gate requirements by time of day respectively.

Planning Peak Hour

Based on the nominal schedule and assumed load factors, the planning peak hour numbers are:

- Enplaning domestic passengers 288
- Enplaning transborder passengers 210
- Enplaning Combined passengers 467
- Deplaning domestic passengers 285
- Deplaning transborder passengers 263
- Deplaning combined passengers 530

Exhibit 1
Aircraft Gating Charts for the 166 Slot Flight Schedule

Billy Bishop Toronto Center Airport
Buffer Time: 20 minutes

Gating Chart for Busy Day Constrained to 166 Slots
■ Domestic Service ■ Transborder Service

All flights are International

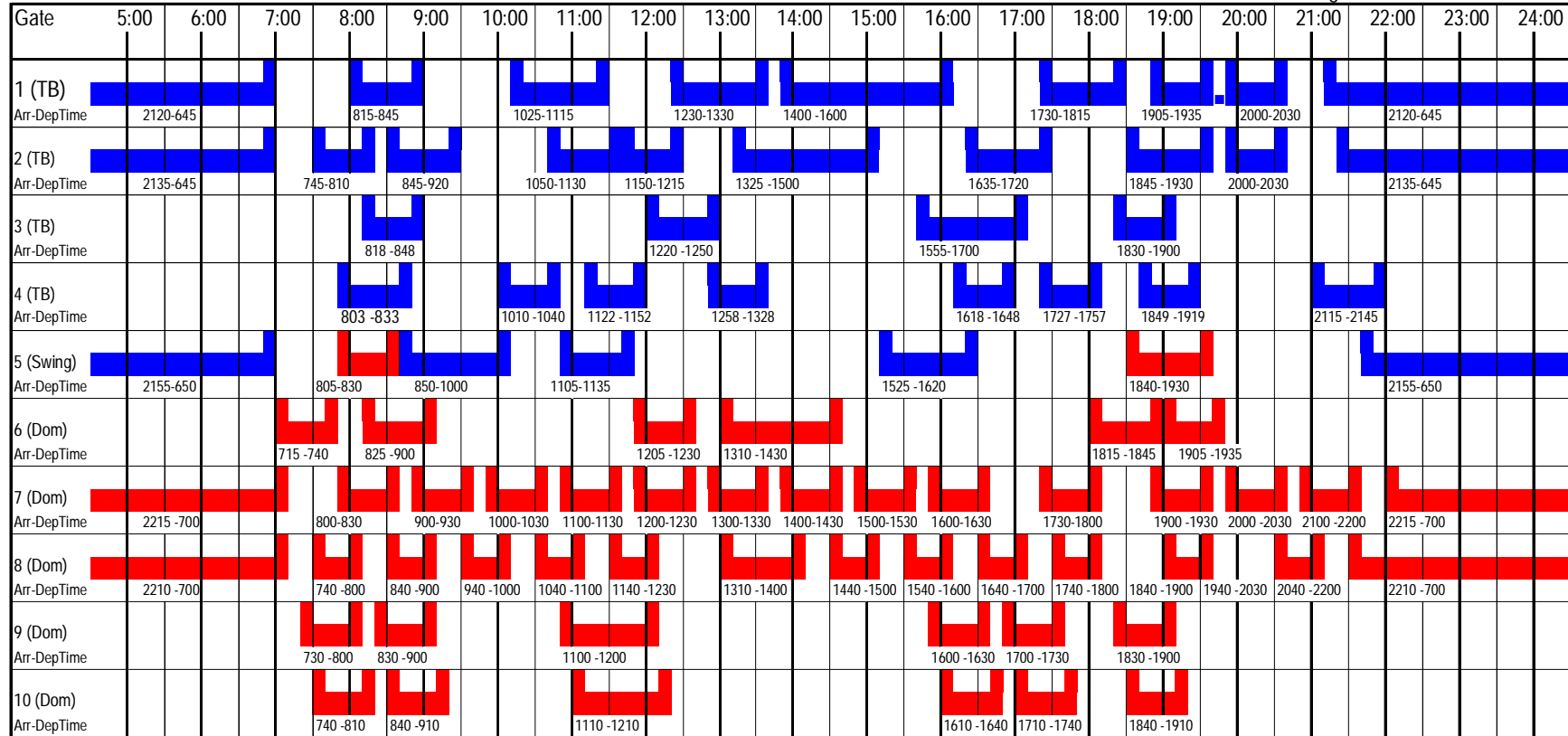
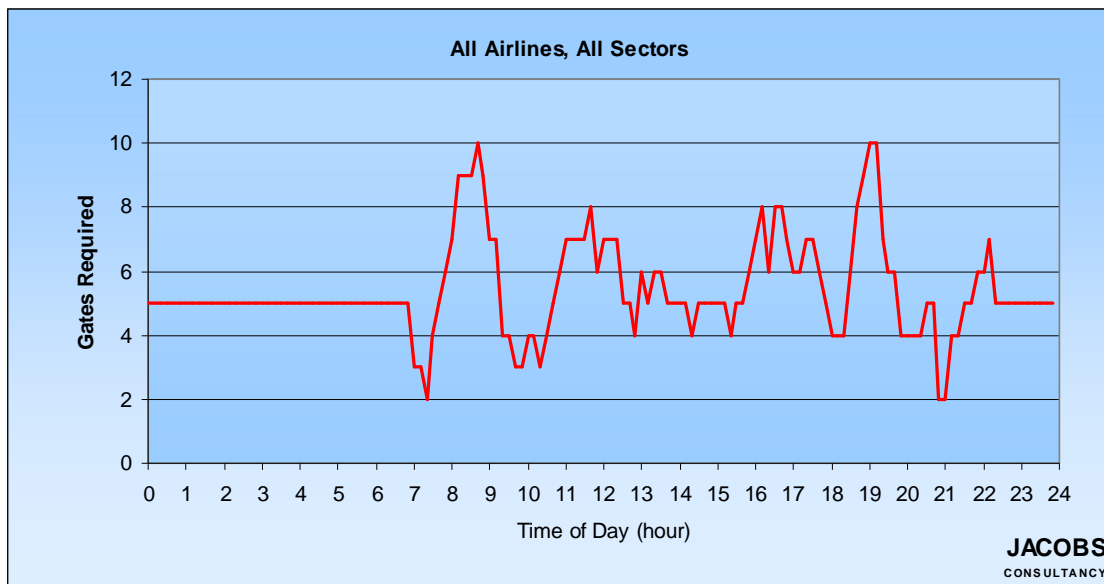


Table 2.
Minimum Number of Aircraft Gates Required by Sector (2010)

<u>Sector</u>	<u>Gates</u>
All	10
Domestic*	5
Transborder*	4
Swing	1

* Excluding swing gate

Exhibit 2
Gate Requirements by Time of Day



CAPACITY/DEMAND ASSESSMENT

Capacity Update

The capacity of the Airport has normally been thought of as governed by the NEF constraints contained in the Tripartite Agreement. While the noise boundary conditions are very likely to govern, as traffic increases, other elements of the Airport may also have capacity constraints. Each major element is discussed below.

NEF Constraints

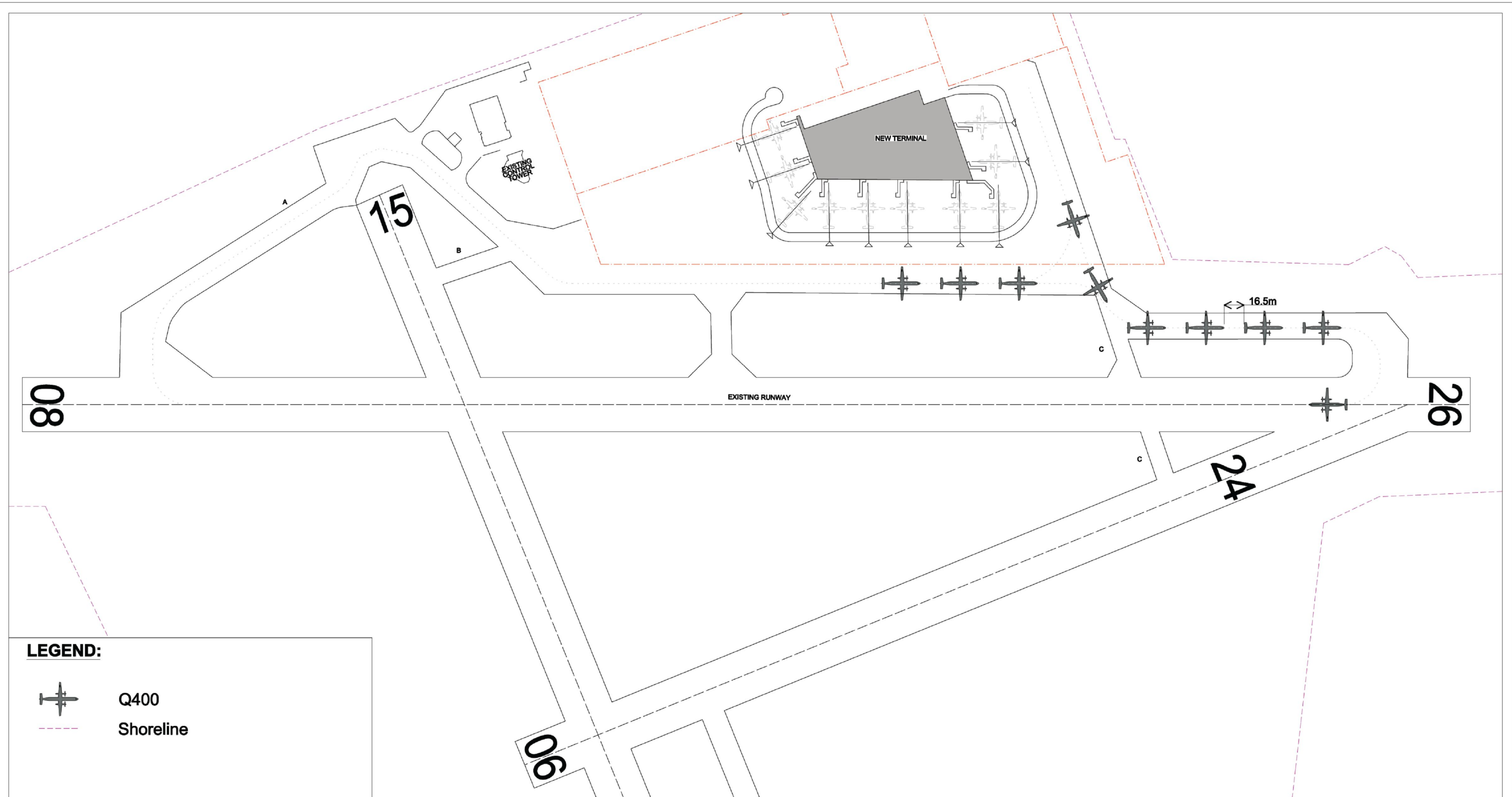
The NEF constraints established in the Tripartite Agreement are dependent on the traffic mix, the time of flights and the approach slope for arriving aircraft:

- The modified Q400 currently operated at the airport (Q402) is quieter than the earlier series of this aircraft;
- Higher approach slopes being flown at the Airport result in a lower noise impact;
- Helicopter operations are required to be incorporated in the noise calculations under some conditions. Less than ½ of the helicopter operations at the Airport are medevac operations;
- The volume of flight training operations and recreational flying affects the noise envelope and therefore the noise controlled slots available for commercial operations; and
- Flights before 07:00 and after 10:00 are heavily weighted in the noise modelling program, so a small change in quiet period operations has a big impact on total noise constrained slots.

Various noise scenarios were developed, with changing mixes of aircraft types, day/night operations and volumes of non-scheduled service traffic (GA, helicopters, etc.). The scenario selected for managing slots that most closely matched the Port Authority's business objectives and its commitments to managing noise (the Operating Scenario) is the scenario that restricts quiet period operations to the seven existing scheduled service flights that operate 22:00-06:59 and to the evening operations of general aviation from 22:00 to 22:59 and in which the forecast fleet mix of heavy turboprops is 90% Q402 aircraft. This scenario yields 202 slots.

Taxiway/Apron Demands

The schedules generally show all gates being used overnight, with up to ten departures in a fairly short period in the morning peak period. This will create a potential congestion issue on the apron when Runway 26 is used for arrivals and departures. The departure queue can potentially block access to several of the gates as Exhibit 3 shows.



KEY PLAN N.T.S.	notes 1. Longitudinal spacing maintained at discretion of following aircraft or vehicle.	project title Billy Bishop Toronto City Airport Capacity and Slot/Schedule Management		drawing title Q400 Queuing- Runway 26 Operations	
		consultant JACOBS Consultancy	date NOV. 23, 2009	revision 1	exhibit Scenario 1
		scale at 11"x17" 1:3000		Exhibit 3. Departure Queue Potential in AM Peak	

Passenger Terminal

The new passenger terminal is in the process of completion: seven gates are expected to be available by March 2010, and a total of ten gates are expected by October 2010, subject to project completion.

Gates

As Exhibit 1 illustrated, with the turn times for the large turboprop aircraft and a 20 minute buffer between flights, the estimated gate capacity is:

- For domestic gates – 13 turns per day;
- For transborder gates – 9 turns per day; and
- For a swing gate – 11 turns per day.

It is important to recognize that a capacity of, say, 13 turns per day on a domestic gate does not mean that all such gates would be used for 13 turns per day. There may be times that a gate is available that are not commercially useful to carriers.

Passenger Terminal Demand Forecast Methodology

The forecast demands on the passenger terminal and access system to the Airport were developed from the schedules developed in Chapter II and the following:

- The forecast schedules were combined with Jacobs Consultancy's terminal demand model to determine peak hour demands on the terminals, given assumed arrival distributions of the passengers at the facilities and other assumptions with respect to load factors by time of day.
- The model was modified to include an additional model element dealing with demands on the ferry, enabling ferry load and cycle time to be modified and showing passengers un-accommodated on ferries if they become overcrowded.

Assumptions re Passenger Arrival Distributions

Outbound passengers arrive at the terminal in a pattern that typically sees some passengers arriving very early – as much as two hours before their flight, and others arriving much closer to flight departure time. In a shuttle type operation primarily involving short haul flights and business travellers, we typically expect most passengers to arrive in the period 70-30 minutes before the scheduled departure time. Exhibit 4 illustrates the assumed distribution pattern used prior to the operation of US Preclearance.

With preclearance, we expect the Transborder traffic distribution to change. Although passengers will continue to come as close to departure as they can, US Homeland Security requires a cut-off of ticketing an hour before departure so that the passenger list can be reviewed. Exhibit 5 illustrates the assumed distribution with preclearance.

Exhibit 4
Distribution of Departing Passengers Arrival Times at the Terminal. No US Preclearance

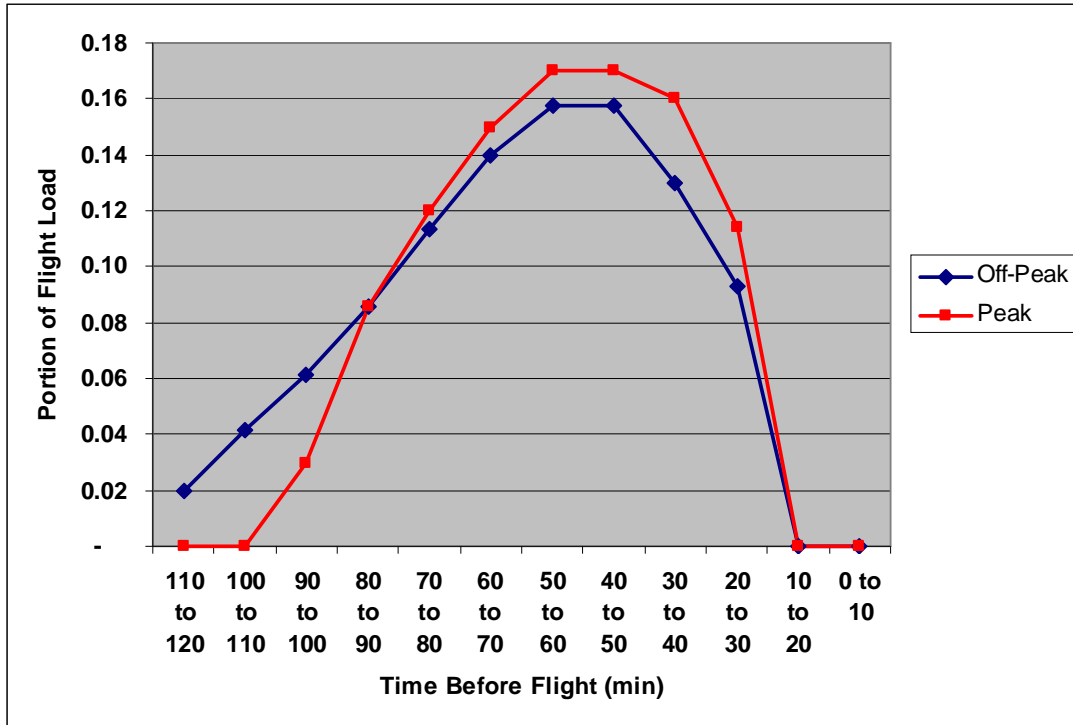
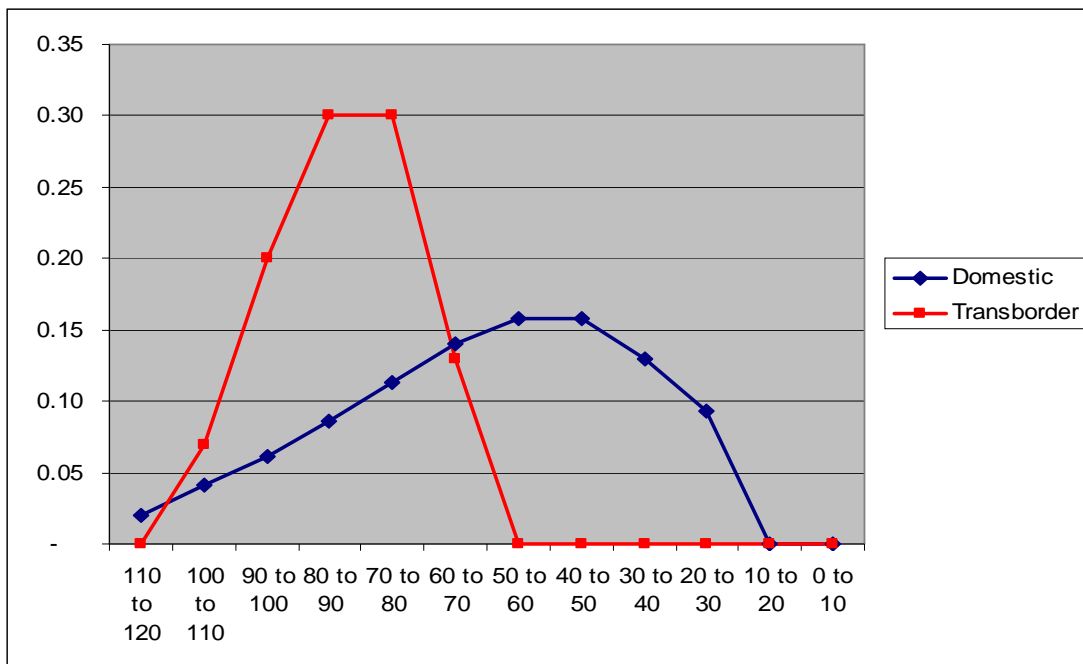
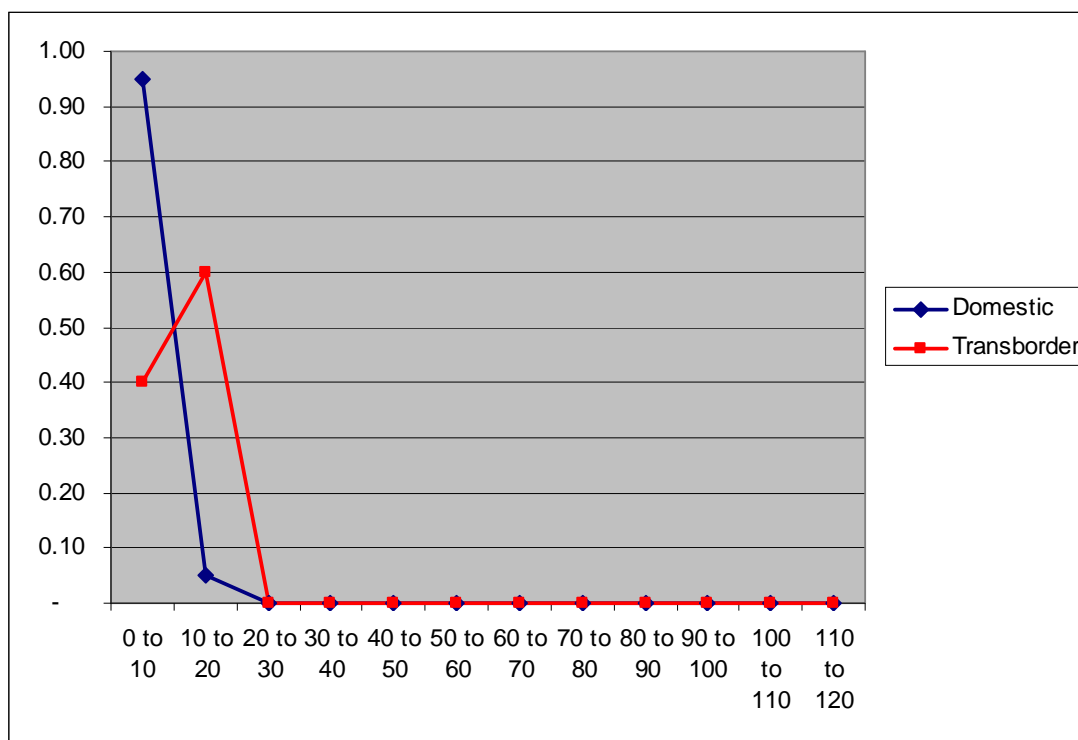


Exhibit 5
Distribution of Departing Passengers Arrival Times at the Terminal with US Preclearance



Inbound passengers have a much different demand characteristic, especially at a primarily short haul, primarily business operation such as BBTCA. Passengers empty the aircraft quickly and move directly through the terminal, only impeded by picking up luggage and, in the case of transborder traffic, by the processing of Customs and Immigration (Exhibit 6).

Exhibit 6
Inbound Passenger Distribution



Assumptions re Load Factors by Time of Day

Load factors do not remain constant throughout the day and we typically expect them to be higher during the peak demand periods. Table 3 illustrates the assumed load factors. These load factors are used to create planning day demands and planning peak hour demand estimates

Table 3
Assumed load factors

Time of Day	Load Factor
5:00am-9:00am	75%
9:00am-3:30pm	60%
3:30pm-7:00pm	75%
After 7:00pm	50%

Air Terminal Demands

Exhibits 7 and 8 illustrate the forecast time of day demands on the air terminal buildings for the 166 slot schedule in 2010.

Exhibit 7
Time of Day Arriving Passenger Demand 2010

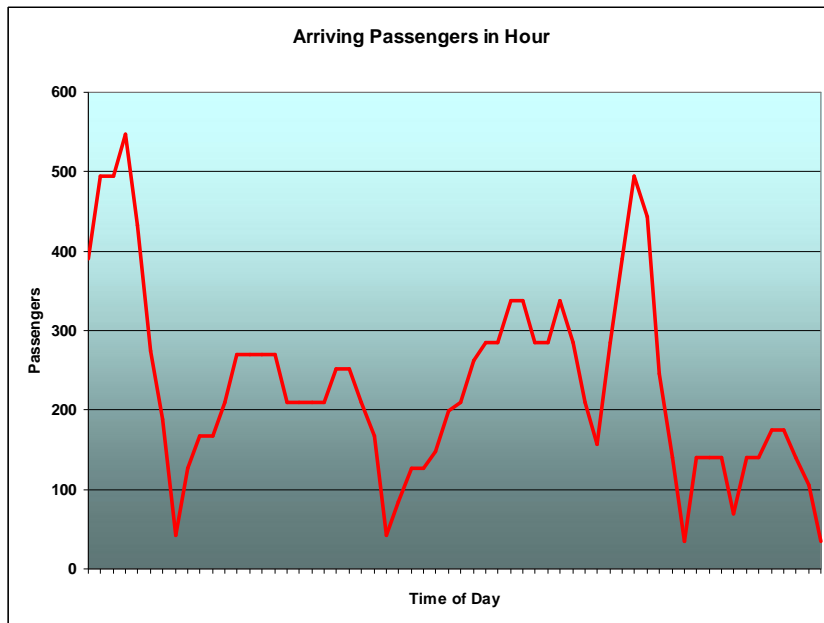
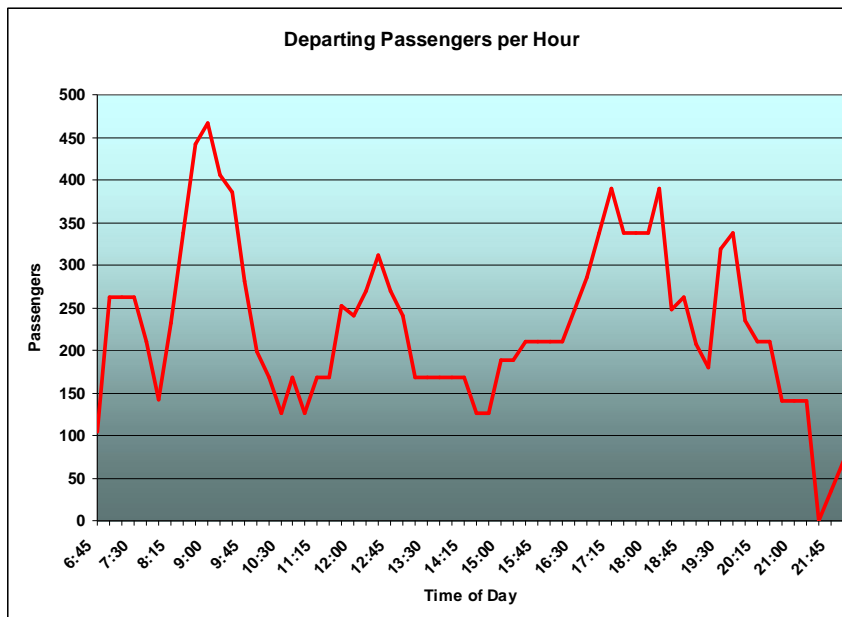


Exhibit 8
Forecast Time of Day Departing Passenger Demand 2010

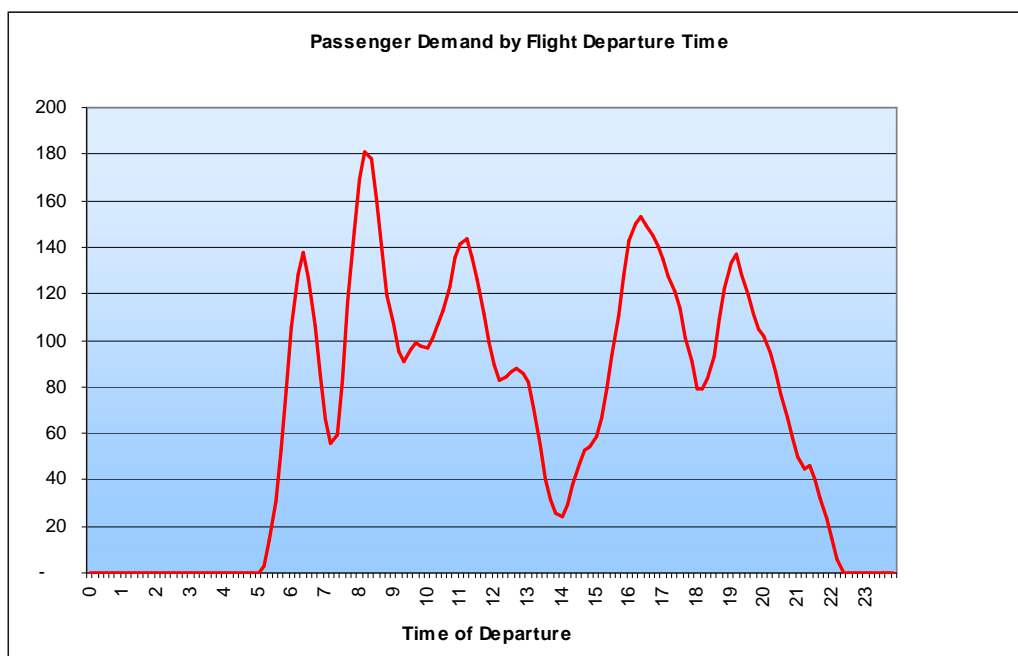


The terminal design was based on planning peak hour passenger levels of 672 departures and 672 arrivals and assumes full staffing by CATSA and CBSA.

Preclearance

The nominal schedules include four departing transborder flights in the peak hour. The peak outbound demand is 210 transborder enplanements. Taking into consideration the distribution of passenger arrivals at the air passenger terminal and the distribution of outbound flights, the peak loading in the preclearance area is approximately 180 passengers in the morning peak, as Exhibit 9 illustrates. This passenger load will typically require a holdroom area of approximately 3,100 sf (290sq.m.). The preclearance hold area is sufficiently large and appears to have been sized for approximately 220 peak hour passengers.

Exhibit 9
Transborder Enplanements Hourly Demand 2010

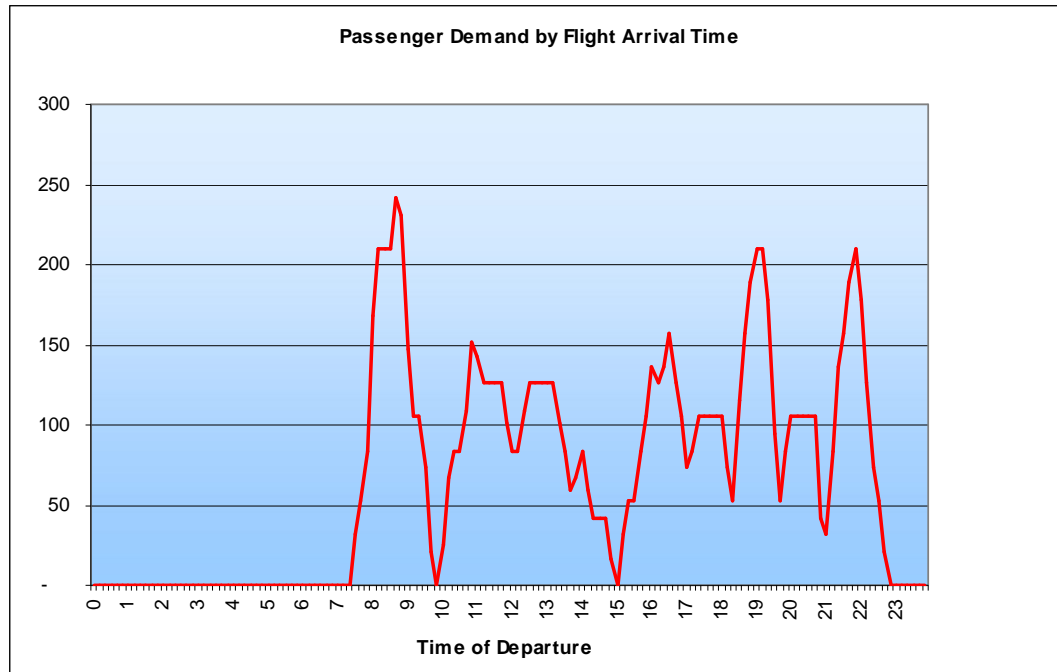


CBSA Facilities

The peak transborder arrivals occur between 8am and 9am, with a peak forecast demand of 263 deplaning transborder passengers. Taking into consideration the distribution of deplanements, the peak loading in the CBSA queuing area is somewhat less at 250 passengers as Exhibit 10 illustrates.

This area, in which there is typically no seating, requires an approximately 2,000sf (190sq.m.) to cope with the forecast peak loading. The area now under construction is approximately 260 sq.m., more than sufficient to handle the forecast peak hour loading, provided that CBSA inspection lines are staffed.

Exhibit 10
Transborder Deplanements Hourly Demand 2010



Ferry

The new ferry will be in service by January 2010 and has an upper deck capacity of 150 passengers, with additional capacity through the use of Shuttle buses on the lower deck. Total people on board, including crew are limited to 200 by the ferry certification.

Ferry Demands

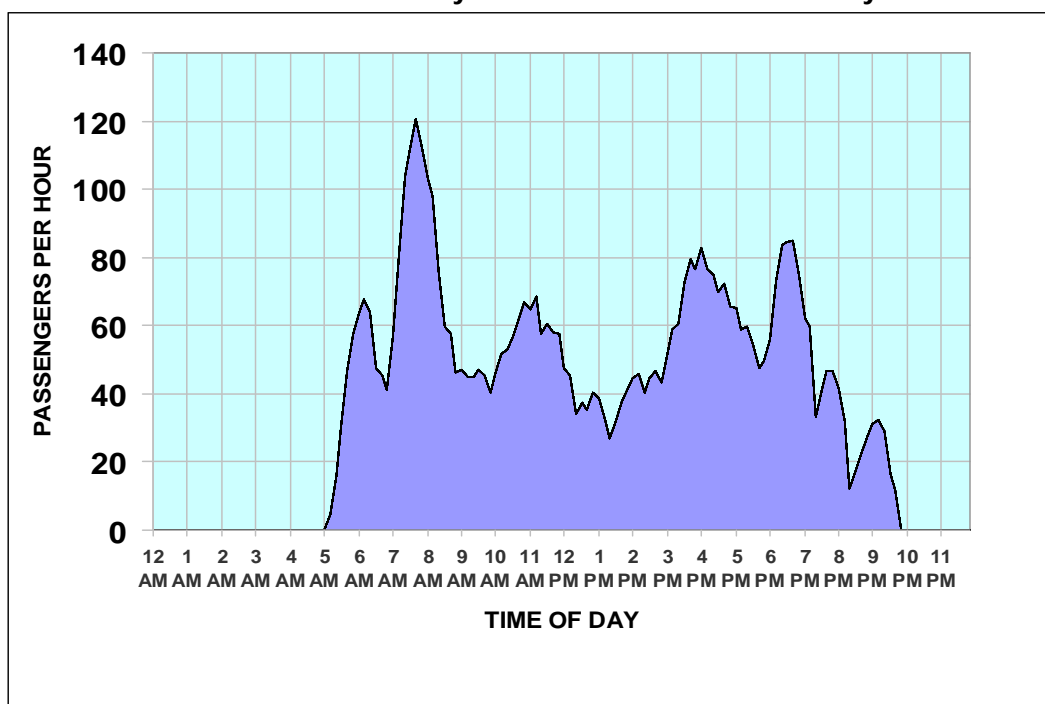
The time of day of arriving and departing air traveller demands translate into demands for ferry and ferry terminal capacity. In simple terms:

- Departing passengers arrive at the ferry terminal in pattern that is driven by their flight departure time (Exhibits 4 and 5);
- Arriving passengers arrive at the ferry terminal very quickly on deplaning (Exhibit 6);
- Passengers queue for the ferry and take the next available ferry unless there is insufficient capacity on the ferry; and
- The accumulation of passengers in the ferry terminals is a function of ferry cycle time and ferry capacity.

To model ferry demands, the aviation demands were translated into ferry demands at a 15 minute ferry headway – i.e., the ferry leaves the Eireann Quay passenger transfer facility every 15 minutes and leaves the Island passenger transfer facility every 15 minutes.

When the pattern of arrival of passengers at the Eireann Quay passenger transfer facility to catch outbound flights is considered, the demands on the ferry are much less peaked than the departure schedules. Exhibit 11 illustrates the projected demands on the ferry departures from the Eireann Quay passenger transfer facility.

Exhibit 11
Forecast Outbound Ferry Loads on 15 minute Headway 2010

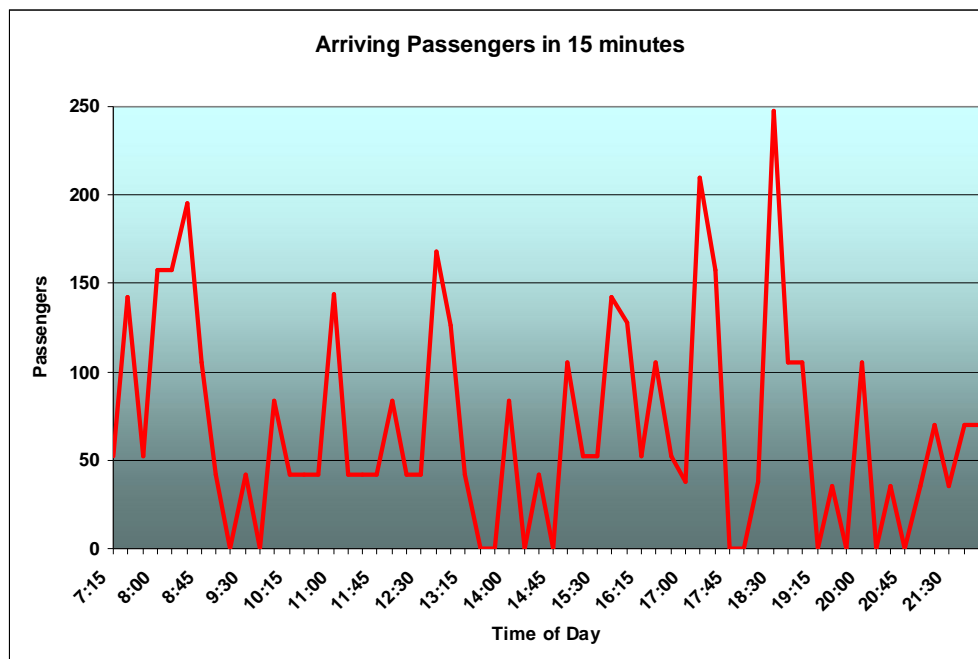


The pattern of departures means that even without taking into consideration the distribution of the passenger’s arrival at the Eireann Quay passenger transfer facility, the new ferry will be able to deal with the loads.

The situation with the inbound demand is similar but with several severe peaks. Because the passenger loads all arrive at the Island passenger transfer facility within 5-10 minutes of the aircraft arriving at the gate, the demand levels can be sharply peaked. Exhibit 12 illustrates the inbound arrivals in 15 minute segments.

The new ferry will go a long way to taking pressure off what would otherwise be the lowest capacity point in the system. Nonetheless, both upper passenger deck and shuttle buses on the car deck will need to be used to meet the forecast demands by October 2010.

Exhibit 12
Inbound (Arriving) Passengers in 15 Minute Segments 2010



The model calculates the passengers that would not be accommodated on the first ferry departure because of capacity constraints (assuming that a reasonable level of service is to be maintained). The model was run with a ferry capacity of 150 (upper deck only) and 200 (upper deck plus car deck). Exhibits 13 and 14 illustrate the inbound passengers not served on the first ferry with only the passenger deck in use and with 50 or more passengers in shuttle buses on the car deck.

With only the upper deck used for air passengers, in the morning inbound rush, some passengers will have to wait for a ferry because of crowding. There is a need to implement the movement of shuttle buses on the ferry as soon as possible.

The need to keep a high level of service cannot be emphasized enough. The Airport's business model is working precisely because the level of service is high in terms of travel time, hassle and congestion. If this model is allowed to break down, the consequences could damage the viability of the entire concept.

Because outbound passengers arrive in less "lumpy" pattern, the same issues do not exist at the 2010 traffic levels, although there is the possibility if only the passenger deck is used to move passengers that there may be some passengers that cannot board one ferry at approximately 07:30.

Exhibit 13
Inbound Passengers Not Served on the First Ferry after their Arrival with 150 Passenger Capacity - Upper Deck Only (2010)

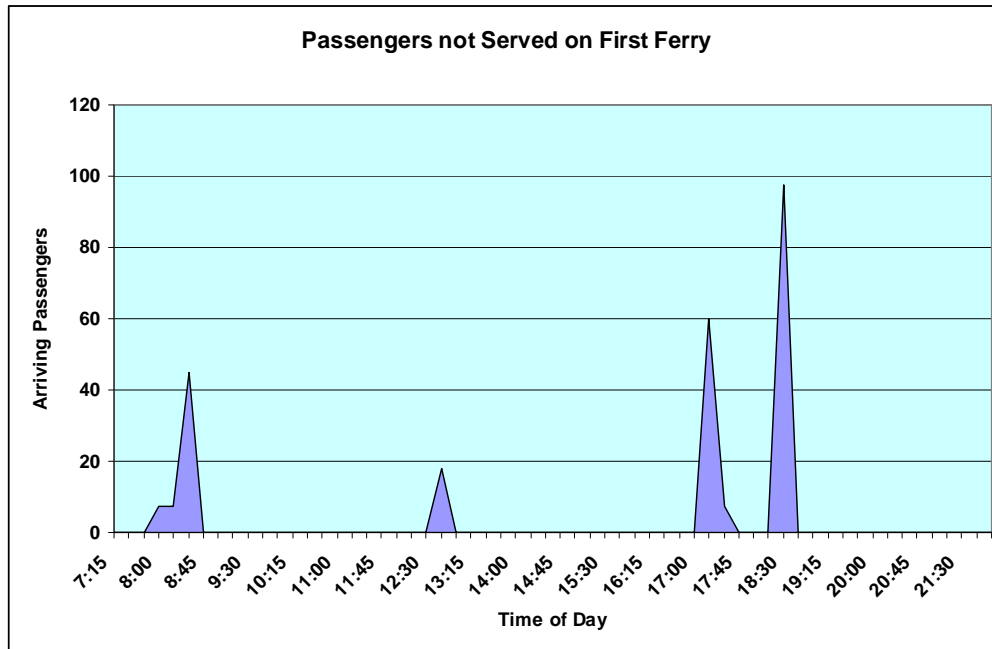
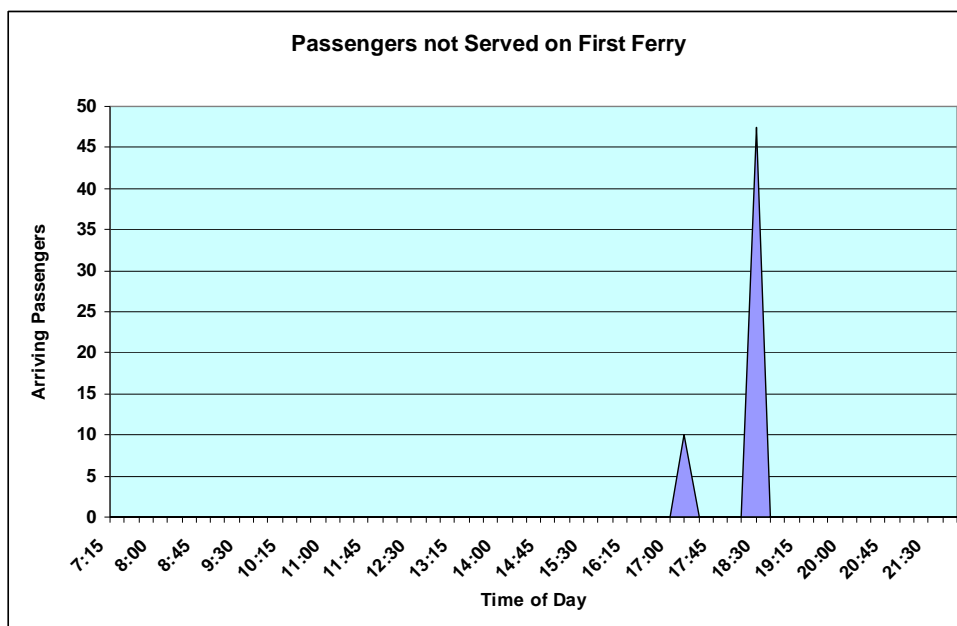


Exhibit 14
Inbound Passengers Not Served on the First Ferry After their Arrival with 200 Passenger Capacity - Shuttle Buses on the Car Deck (2010)



Passenger Transfer Facilities

The two ferry passenger transfer facilities were each designed to cope with a passenger load of 90 passengers at a high level of service. With a single ferry on a 15 minute cycle, the accumulation of passengers in the facilities will exceed the capacity of the buildings. In the Eireann Quay facility, the loading will decrease the level of service, but will be workable. The Island facility will see a peak demand of as many as 200 passengers, meaning that the terminal will be congested with passengers backed up into the corridors to the air terminal.

Ground Access and Curb

The main components of the groundside facilities (excluding the ferry) are:

- The main access road Eireann Quay (formerly Bathurst St.);
- The public parking facilities:
- The spaces on the north side of Western Channel at the foot of Eireann Quay;
- The spaces in the “Stadium” parking lot (on the west side of the park);
- The spaces adjacent to the air terminal building;
- The roadway in front of the passenger transfer facility at the south end of Eireann Quay. This is referred to as the terminal frontage road (TFR);
- The taxi holding area; and
- The shuttle bus that operates between the Royal York Hotel and the passenger transfer facility at the foot of Eireann Quay.

The section of Eireann Quay south of Queens Quay West could be characterized as a minor collector street. Nominally, there are two northbound lanes when parking is prohibited (08:00-18:00). Rigorous channelization is not present in this section of roadway. When vehicles are parked in the northbound curb lane, the capacity of this roadway is significantly reduced. The capacity of this section of roadway is established by the signal timing at the intersection of Eireann Quay and Queens Quay West. The timing of these signals is under the jurisdiction of the City of Toronto.

There are 27 public parking spaces and 1 handicapped parking space on the north side of Western Channel by the passenger transfer facility.

There are 192 parking spaces in the Stadium Road lot. The spaces in this lot are shared by the public and by employees of the Airport. The lot has recently been paved and marked.

The roadway in front of the passenger transfer facility has two lanes. During peak periods vehicles are stopped in both of these lanes to load and unload. Approximately 20 meters of curb length are available in front of the facility.

The taxi holding facilities consist of a two lane queue, 90 meters in length, and three parallel parking spaces on the inbound roadway immediately upstream of the curb in front of the passenger transfer facility. There is nominal capacity for 28 taxis, although as many as 34 can be seen in the queue.

Table 4 compares 2010 forecast demand for landside access facilities to current capacity. The taxi holding areas are currently at capacity during the peak periods of demand. The terminal frontage road is very congested during peak periods. Vehicles are stopped in both lanes to loads and unload. There is limited opportunity to provide more capacity for this facility. Both parking and taxi storage are at capacity now.

The demand for access is also related to the pattern of traffic arrival. The large ferry will deliver passengers to the Eireann Quay passenger transfer facility from the Island in 150-200 person “lumps” putting heavy demands on the taxi queue and terminal curb.

On the Island, the parking area adjacent to the air terminal building has approximately 170 spaces. The surface is asphalt pavement and the individual spaces are well channelized. Officially, both the public and employees can park in this area.

Table 4
Comparison of Forecast Demand for Access Facilities to Capacity

	Peak Hour Passengers (Inbound & Outbound)	Daily Arr/Dep Passengers	Curb Length Required (Meters)		Taxi Holding Required (Vehicles)	Public Parking Demand (Spaces)
			2 Minute Dwell Time	90 Second Dwell Time		
2010 Demand	980	7190	38	28	80	450
Current Supply			20		34	390

TPA OBJECTIVES

Whether the slot cap is controlled by the NEF constraints or other system capacities, there will be a slot cap that will likely be 202 movements per day or less unless and until capacity can be improved. Slot and schedule management requires a rules-based system that is fair to the carriers being scheduled. Generally, when we discuss slot management, we are discussing slots with an associated time or timeframe. The slots limited by the Tripartite Agreement are on a daily basis, but in terms of carrier needs and demands and in terms of the capacity of other elements of the system, they will be time-based.

As a foundation to developing slot allocation rules, it is valuable to propose objectives for the Port Authority in managing the slots. In general terms, the Authority wants to manage a financially sound airport creating maximum economic value for the GTA while respecting the Tripartite Agreement. With this fundamental statement, it appears that the Port Authority’s specific objectives in managing the slots at the airport will be:

- To ensure that the number of slots allocated respects the Tripartite Agreement, and to take measures to adjust the number of slots as necessary to respect the Agreement;
- To ensure that the total number of slots and the timing of the slots takes into consideration the level of service objectives of the Authority and the capacity of all elements of the airport – taxiways, aircraft parking stands, air terminal facilities, ferry passenger transfer facilities, ferries and ground access;
- To ensure that the slot allocation method is logical and fair to users;
- To encourage the use of all slots by the quietest large turboprops;
- To encourage the use of all slots by the largest permitted turboprop aircraft;
- To encourage the use of slots to maximize passenger choice of destinations served, consistent with air carrier's commercial needs for a minimum number of daily services on a route;
- To ensure that all slots allocated are linked to aircraft stands (there must be a place for the aircraft to be served before a slot is granted);
- To ensure that all large turboprop aircraft stands are linked to a permanent terminal facility. This objective is to prevent a recurrence of the “temporary” terminals that were constructed in the past and to ensure that carriers serving the airport have a long term plan for, and commitment to, use of the Airport and are not using services for predatory pricing against those with a more substantial investment;
- To serve all transborder flights with a single pre-clearance area and a single CBSA area; and
- To allocate slots on a take or pay basis so that revenues are not foregone through unused slots.

BBTCA RULES FOR CAPACITY & SLOT MANAGEMENT

The Airport has some unique aspects that may not exist at other airports:

- Slots are both daily constrained and, during peak periods, hourly constrained;
- Airport operating costs should be borne by all carriers pro rata based on slots allocated, regardless of whether or not used; and
- The Port Authority needs to be an active participant in preventing any predatory behaviour that materially harms the Airport.

Taking these unique requirements into consideration, the commercial carrier operating agreements need to have Airport specific rules, including:

- Each carrier should be obligated to sign a CCOA. The CCOA should be similar in all material respects for all carriers;
- The specific overall slot cap number cannot be set in stone: the slot cap will be established from time to time by the TPA taking into consideration the noise cap in the Tripartite Agreement and other capacity constraints;
- A neutral slot coordinator should be appointed;
- Slots need to be allocated on a time basis;
- Slots need to be linked to gate availability;
- Applications for routes already served should be given lower priority than applications for new routes; and
- The TPA needs to be able to withdraw or reduce slots to comply with the Tripartite Agreement or other capacity constraints.

SLOT COORDINATION

Slot management/coordination will be an ongoing role for a coordinator. It will be the coordinator's responsibility to coordinate both the time based slots and the total daily slots to comply with the total slot capability established by the TPA from time to time.

Next Steps for Slot Coordination

The immediate action required in terms of slot coordination is:

- To determine the number of slots that can be made available for 2010 taking into consideration the scheduled service aircraft type mix, the current level of general aviation and helicopter operations and the amount of forecast traffic in the quiet hours. Given the capacity constraints in terms of Eireann Quay, ferry passenger transfer facilities, etc. it is recommended that the slots not exceed 202 in 2010 and only be set as high as this if the shuttle bus operation is enhanced to reduce congestion on Eireann Quay and in the ferry passenger transfer facilities.
- To appoint a slot coordinator; and
- To incorporate the key airport specific elements of the slot coordinated regime in the CCOA.