NOISE CONTOURS STUDY
TORONTO CITY CENTRE AIRPORT

Final Report

Transport Canada
Toronto, Ontario

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Prepared by :
Jacques Savard, M.Sc.

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AGL: altitude above ground level

ASL: altitude above sea level

CAP: Canada Air Pilot, published by Nav Canada, contains aeronautical information for arrival or departure portion of flight instrument approach procedures, standard instrument departure procedures and noise abatement procedures. The publications are updated every 56 days.

CFS: Canada Flight Supplement, published by Nav Canada, is a joint civil/military publication. It contains information on Canadian and North Atlantic aerodromes.

DME: Distance Measuring Equipment, ground based equipment with known exact location on the airport, provides distance to an aircraft using radio signals.

IFR: Instrument Flight Rules, regulations and procedures for flying through clouds.

ILS: Instrument Landing System, ground based system that provides precision lateral and vertical guidance to an approaching aircraft.

Itinerant: movements in which aircraft proceed to or arrive from another location; or where aircraft leave the circuit but return without landing at another airport.

Local: movements in which the aircraft remains in the circuit, generally training flights.

Overflight: flights which communicate with the tower while transiting the tower control zone to another destination without landing at the reporting airport.

Simulated approaches: movements that are either missed instrument or practice instrument approaches without landing.

VFR: Visual Flight Rules, regulations for flying in clear weather conditions.

Summary

The noise exposure contours for Toronto City Centre Airport have been computed in accordance with Transport Canada's methodology for NEF (Noise Exposure Forecast). The surface area within contours was also compiled. Toronto City Centre Airport was the official name of the airport in 2008 before it was changed for Billy Bishop Toronto City Airport. The change became effective February 11, 2010.

The actual (2008) 28 Noise Exposure Contour is not closer at any point, except in a direction westerly of the Toronto City Centre Airport between points "X" and "Y", to the 25 NEF Contour for 1990 than to the 28 NEF Contour for 1990. The actual (2008) 28 NEF Contour is within the 28 NEF Contour for 1990 except for a small area between points "X" and "Y". Points "X" and "Y" as defined in the Tripartite Agreement.

Surface area inside noise contours

NEF	Surface area (km^2)
35 +	0.2
30 - 35	0.5
28 - 30	0.4
25 - 28	1.0
Total	2.2

Contents

Introduction 1

This document presents the noise contours for the year 2008 for Toronto City Centre Airport.

Transport Canada has developed a methodology for assessing the perceived noise in the vicinity of airports. This method is established across Canada and is used for this study. The interpretation of results it produces will be used to establish the magnitude (intensity of noise) and extent (surface area) of areas affected by airport noise.

2.1 Metrics and parameters

The representation of noise generated by airport operations has been normalized by Transport Canada using NEF or « Noise Exposure Forecast » contours. The NEF methodology is not by itself a forecast but a noise calculation, based either on a forecast of future movements or on actual movements. The noise contours for 2008, presented in this report, have been produced using the NEF methodology on the basis of actual movements data from Statistics Canada provided by the Toronto Port Authority. The original data is provided to Statistics Canada by Nav Canada, the country's civil air navigation services provider, for all airports where Nav Canada operates a control tower.

The index provided by the noise contours is used to show the public areas affected by airport noise. This single number rating is easy to interpret, but nevertheless requires a complex evaluation process. It takes into account, for all the movements of the whole year, the type of aircraft, the runway used, the flight path, the flight distance, and the period of day.

A 5 foot step computation grid has been used to assure the highest possible definition of the noise contours and minimize interpolation errors.

2.2 Method of calculation

NEF-Calc 2.0.4.1 software was used to produce the noise contours. It has been developed by the National Research Council for Transport Canada. It is Windows based and replaces the old NEFCAL 1.8 previously used for noise contours calculation. The new windows based software uses the same input data and parameters as the old DOS based software.

The NEF methodology developed by Transport Canada uses the parameter « Peak Planning Day » which will be used to calculate the noise contours. The Peak Planning Day, for the analysis of air traffic, is the 95^{th} percentile of total movements of aircraft. This means that during the year 5 % of annual movements occurred during days busier than the Peak Planning Day. The calculated noise contours are representative of a near to worst case 24 hour period. The use of peak planning day is standard practice for the calculations of noise contours. According to the Request for Proposals for this study, the number of movements of the Peak Planning Day is estimated by averaging the seven busiest days of the three busiest months of the year. The detailed calculation of the peak planning day is presented in Section 3.1.1.

3.1 Calculation assumptions

The aircraft movements' databases from Statistics Canada for Toronto City Centre Airport for 2008 were used to calculate the peak planning day. The composition of the fleet, the peak planning day traffic, and the average annual runway use have also been computed from the Statistics Canada databases.

3.1.1 Calculation of peak planning day

Table 1 below presents the results of the calculation of the Peak Planning Day for itinerant and local movements for 2008 for Toronto City Centre Airport.

Table 1 : Peak Planning Day

Itinerant		Local	
Date	Movements	Date	Movements
May 29	234	May 28	328
May 6	228	May 13	266
May 5	221	May 29	258
May 28	219	May 15	238
May 13	212	May 24	230
May 15	209	May 25	212
May 25	197	May 8	198
July 15	238	June 20	284
July 29	231	June 6	276
July 25	229	June 22	264
July 31	219	June 24	254
July 4	212	June 2	242
July 6	212	June 6	240
July 16	183	June 11	238
August 1	220	July 15	286
August 27	217	July 6	276
August 12	211	July 10	266
August 20	210	July 7	248
August 21	202	July 22	246
August 22	201	July 16	206
August 6	197	July 29	198

Thus, following the methodology of Transport Canada, the number of movements of the Peak Planning Day is found to be 214.4 for itinerant movements and 250.2 for local movements. In comparison, the averages for 2008 are 135 itinerant movements and 114 local movements per day. The number of circuits is half the number of local movements. A movement is either an arrival or a departure; overflights are excluded from the calculation. Overflights are flights transiting in the control zone of the control tower, going to another destination without landing at the airport. It is standard practice to exclude them from the calculations.

The calculation of the noise contours has been made for 214.4 itinerant movements and 250.2 local movements (125.1 circuits), with a total of 464.6 aircraft movements.

3.1.2 Fleet composition and runway use

The data on the composition of the fleet of all operations at Toronto City Centre in 2008 is presented in Appendix A. The document TP-143 – Air Traffic Designators from Transport Canada is the primary source of information for the identification of aircraft types. Other sources, such as Transport Canada's aircraft registration database and commercial databases have also been used.

Helicopter movements have been excluded from calculations since Section 34 (4) of the Tripartite Agreement requires that helicopters be included only if flight paths were required to be followed for at least half of the year, which was not the case in 2008. Helicopter flight paths were established in October 2009.

Figure 1 shows the configuration of runways, taken from the Canada Air Pilot. Figures 2 and 3 summarize the composition of fleet and runway use for the airport in 2008, compiled from the movements database from Statistics Canada. Detailed data is presented in Appendix B. The total number of movements in 2008 amounted to 88 093.

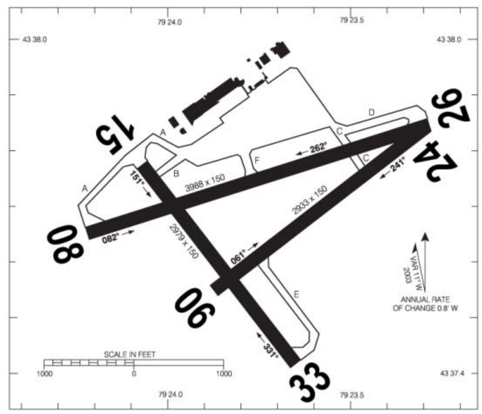
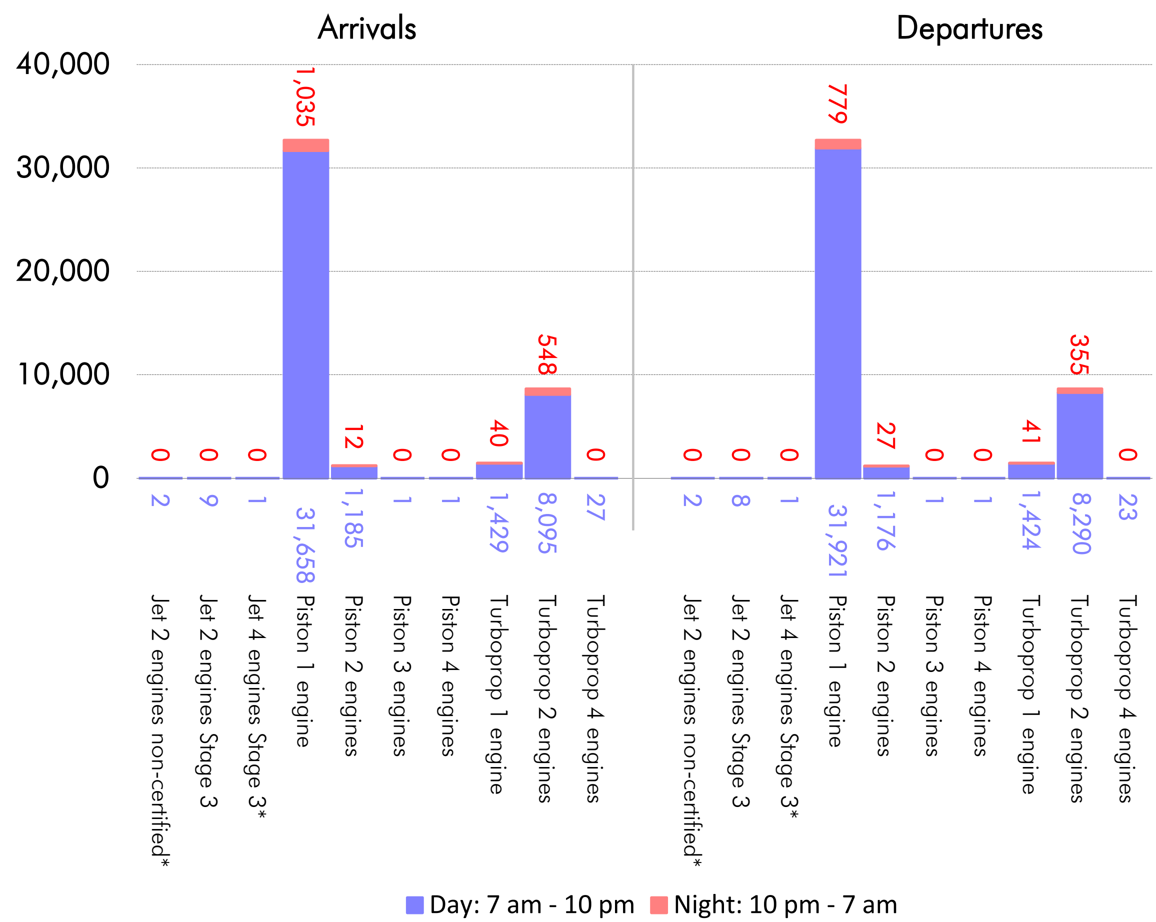


Figure 1 : Runway identification

The movements during the night (10 pm to 7 am) accounted for 3.2 % of total movements in 2008. For the calculation of noise contours, using the methodology of Transport Canada, each nighttime movement is equivalent to 16.67 daytime movements. The 2 838 nighttime movements recorded in 2008 are equivalent to 47 307 daytime movements. The nighttime movements represent an important contribution to the noise contours. However, this contribution cannot be measured simply by the number of movements since nighttime movements involved aircraft that, on average, are lighter and have shorter flight distances thereby being less noisy than daytime movements. It is standard practice to use 10 pm to 7 am for the definition of nighttime movements, the same definition was used in the Tripartite Agreement.



* All jet 2 engines non-certified and jet 4 engines movements are simulated approaches.

Figure 2 : Summary of fleet composition

Overall, single engine piston aircraft are the most frequent aircraft at Toronto City Centre Airport with 74 % of all movements. They are followed by DASH-8 with 16 % of operations.

Figure 3 shows the summary of runway use and table 2 presents the runway use by aircraft type.

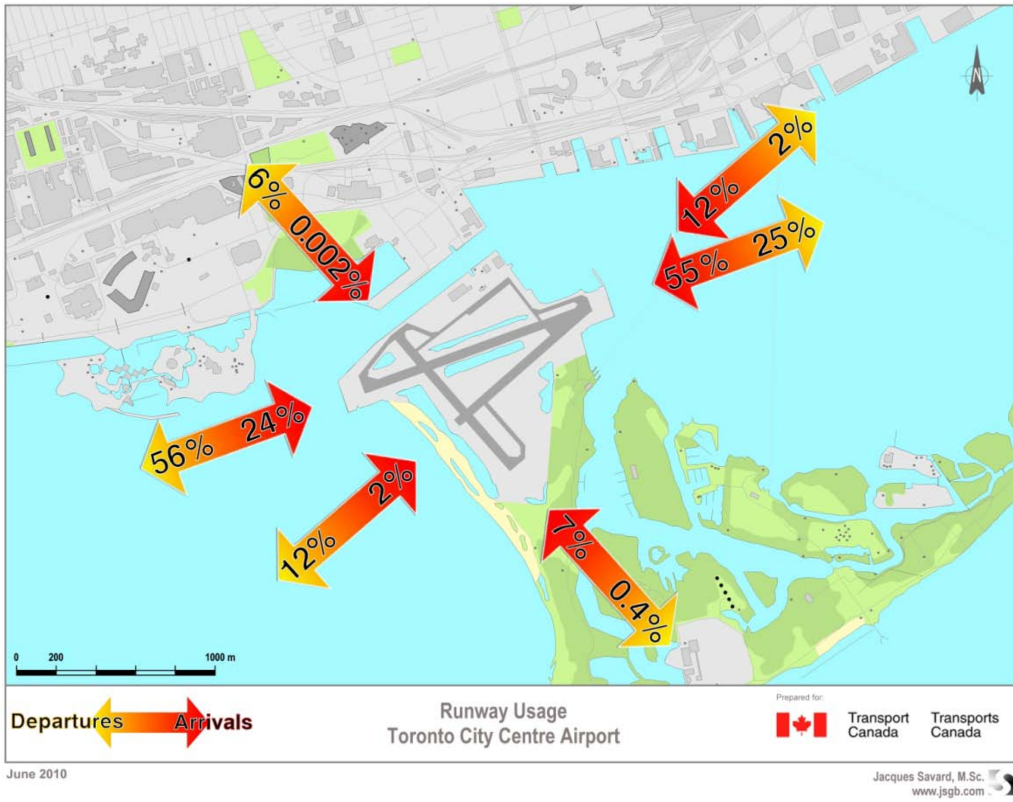


Figure 3 : Summary of runway usage

Table 2 : Runway use by aircraft category

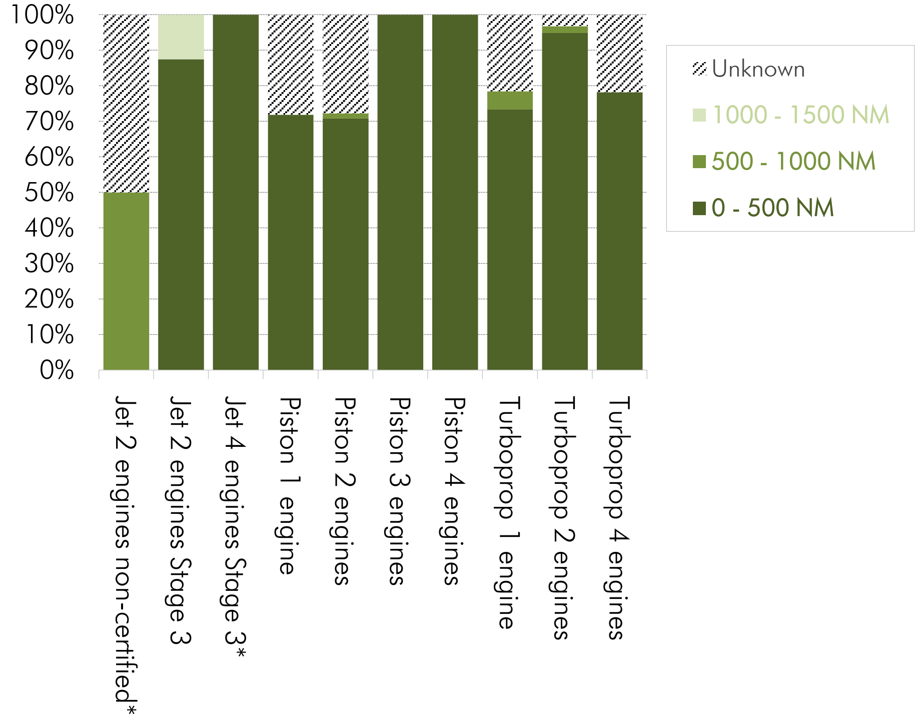
Runway	Global		Jets		Pistons		Turbos	
	Arrivals	Departures	Arrivals	Departures	Arrivals	Departures	Arrivals	Départures
06	743	681	0	0	743	681	0	0
	2 %	2 %	0 %	0 %	2 %	2 %	0 %	0 %
08	10 426	10 679	0	0	7 176	7 214	3 250	3 465
	24%	25%	0%	0%	21%	21%	33%	35%
15	1	159	0	0	1	154	0	5
	0,002%	0,4%	0%	0%	0,003%	0%	0%	0,1%
24	5 178	5 073	0	0	5 176	5 070	2	3
	12%	12%	0%	0%	15%	15%	0,02%	0,03%
26	24 012	24 477	12	11	17 370	17 961	6 630	6 505
	55%	56%	100%	100%	52%	53%	66%	65%
33	3 228	2 514	0	0	3 115	2 513	113	1
	7%	6%	0%	0%	9%	7%	1%	0,01%
Total	43 588	43 583	12	11	33 581	33 593	9 995	9 979
	100%	100%	100%	100%	100%	100%	100%	100%

Table 3 shows the main types of aircraft in each of the categories defined in the calculation. Aircraft with a small number of movements are not shown in this table; they can be found in detail in Appendix A.

Table 3 : Aircraft categories

Aircraft Category	Aircraft Types
Twin Engine Jet	Dassault Falcon 10, Douglas F-18, Airbus A-310, etc.
Four-Engine Jet	Douglas C-17
Single Engine Piston	Cessna 172/150/152/206/182, Cirrus SR-22, Piper Cherokee, etc.
Twin Engine Piston	Piper 23/30/31/34/44/60, Cessna 314/337/402/404/414/421, Beech 55/58/76, etc.
Three-Engine Piston	Britten-Norman Trislander
Four-Engine Piston	Avro Lancaster
Single Engine Turboprop	Pilatus PC-12, Cessna 208, Socata TBM-700, De Havilland DHC2, etc.
Twin Engine Turboprop	De Havilland DHC-8-100/400, Piper PA 31T/42, Beech 90/100/300/1900
Four-Engine Turboprop	De Havilland DHC-7, Lockheed C-130

Figure 4 shows the summary of flight distance for departures for each aircraft category.



* All jet 2 engines non-certified and jet 4 engines movements are simulated approaches.

Figure 4 : Summary of flight distance (nautical miles)

Aircraft with unknown flight distances were assigned the average flight distance calculated for its aircraft type. Figure 4 shows the raw data, before the assignation of unknown flight distance.

This data shows that the main flight range for the users of Toronto City Centre Airport is 0 - 500 NM. Seventy-six percent (76 %) of departures were heading to a destination within the 500 NM radius. The main airports in this category are Ottawa, Montreal, Newark, Buttonville, Sudbury, Hamilton, Oshawa, etc.

3.1.3 Flight Paths

Flight paths for departures, arrivals and circuits have been outlined from information gathered from the CAP, the CFS, Nav Canada, airline operators, and the flight schools.

Departure flight paths:

- Runway 06: right turn at 4400' GDFBR (ground distance from brake release), heading 165
- Runway 08: right turn at 1.9 DME, heading 141
- Runway 15: right turn at 650' ASL, heading 201
- Runways 24 and 26: left turn at 650' ASL, heading 201
- Runway 33: left turn at 6500' GDFBR, heading 270

The glide slope for arrivals is generally 3.0 degrees except for scheduled flights that have a 4.8 degree glide slope when landing on runway 26 under IFR conditions and a 3.8 degree glide slope when landing on runway 08 under VFR conditions.

Runways 24, 26, and 33 have left hand circuits while runways 06 and 08 have right hand circuits. Runway 15 had no circuits in 2008. Circuits initiate their first turn at 500' AGL and have a circuit altitude of 1 000' AGL.

Figure 5 shows the flight paths produced by NEF-Calc for departures and arrivals. Only portions relevant to noise contours are shown.

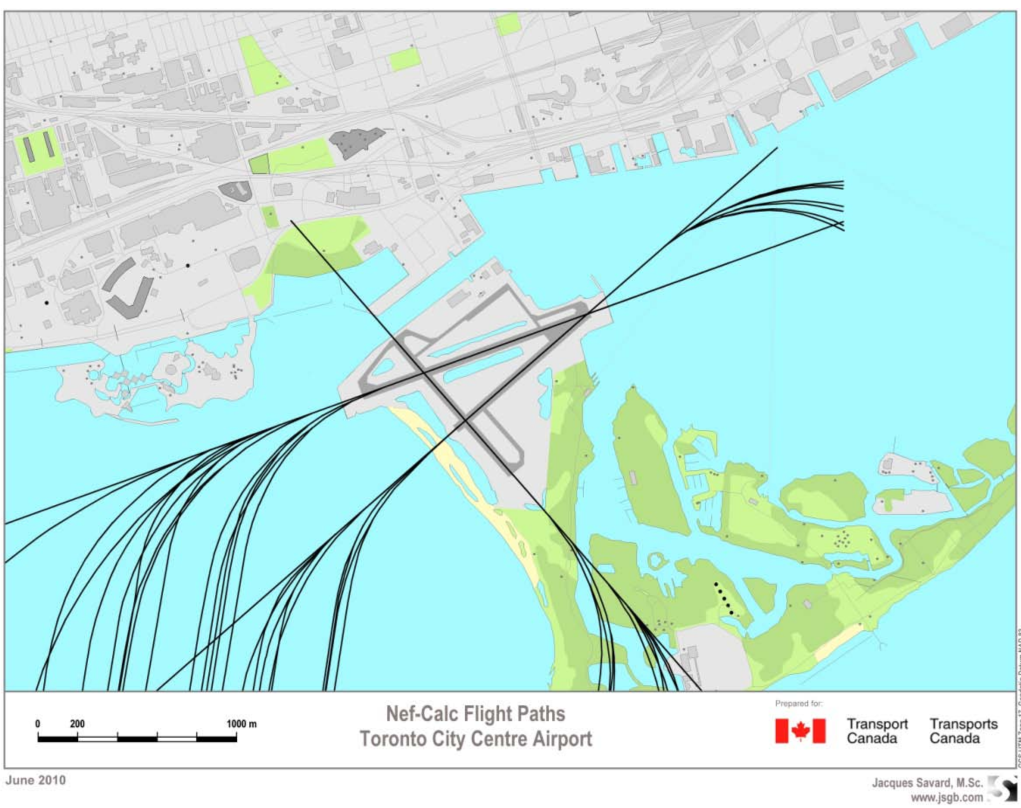


Figure 5 : Flight paths from NEF-Calc

The input files for the NEF-Calc software, as well as all the results, including the movements database and the noise contours in dxf, shapefile and graphic design formats, can be found on the CD attached to this document.

3.2 Results

Figure 6 shows the noise contours for Toronto City Centre Airport, year 2008, along with the 1990 NEF contours. The 1990 NEF contours were prepared in April 1978 by the Canadian Air Transport Administration of the Ministry of Transport for the Canada Mortgage and Housing Corporation.

The review of the data shows that the actual (2008) 28 Noise Exposure Contour is not closer at any point, except in a direction westerly of the Toronto City Centre Airport between points "X" and "Y", to the 25 NEF Contour for 1990 than to the 28 NEF Contour for 1990.

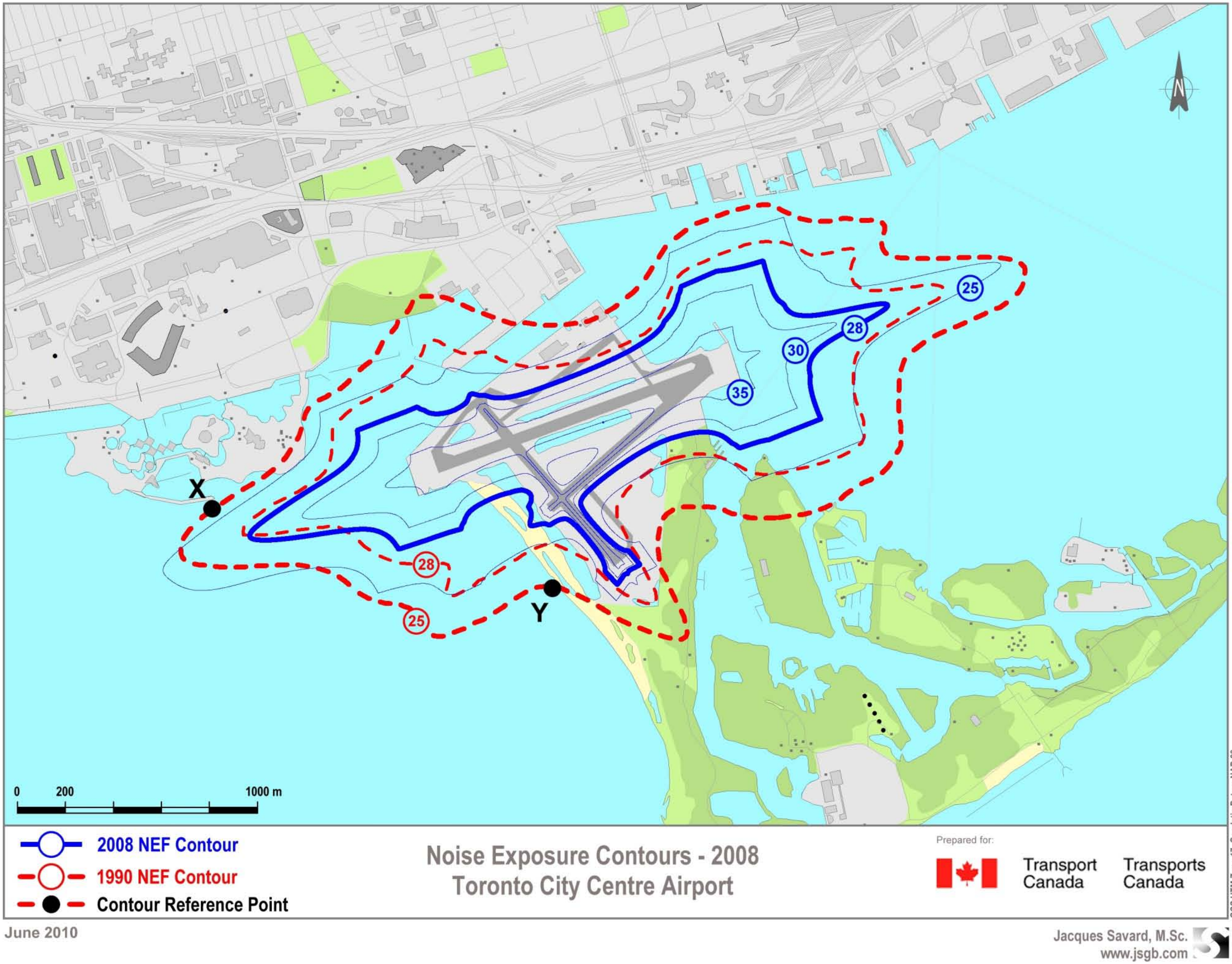


Figure 6 : Noise Exposure Contours - 2008

Figure 7 shows the surface area within the contours. It is the total surface area in each range of NEF values.

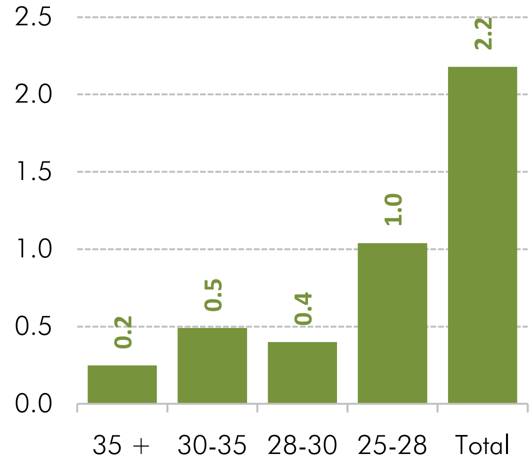


Figure 7 : Surface area (square kilometers)

Conclusion 4

The noise exposure contours for Toronto City Centre Airport have been computed in accordance with Transport Canada methodology. The surface area within contours was also compiled.

The actual (2008) 28 Noise Exposure Contour is not closer at any point, except in a direction westerly of the Toronto City Centre Airport between points "X" and "Y", to the 25 NEF Contour for 1990 than to the 28 NEF Contour for 1990. The actual (2008) 28 NEF Contour is within the 28 NEF Contour for 1990 except for a small area between points "X" and "Y".

INTERNATIONAL CIVIL AVIATION ORGANISATION, Standards and Recommended Practices, Protection of the Environnement, Annex 16 to the convention relative to international civil aviation, Volume 1, "Aircraft Noise", second edition, 1988.

TRANSPORT CANADA, Aviation Group, « NEF micro computer system user manual », June 1990, TP 6907.

TRANSPORT CANADA, « Land Use Planning in The Vicinity of Airports », 8th édition, 2006, TP 1247.

TRANSPORT CANADA, « Air Traffic Designators », TP 143, 2009.

FAA, U.S. Department of transportation, Advisory Circular, « Noise Levels for U.S. Certificated and Foreign Aircraft », 2001.

APPENDIX

A

Fleet Composition

Itinerant movements

Aircraft (Nef-Calc)	Number of movements	Manufacturer	Model	Type of Engine
A310	4	AIRBUS	A310-300/CF6-80C2A2	TFAN
AA5A	59	GRUMMAN	Grumman Cheetah (AA5A)	PROP
AC95	12	ROCKWELL	Aero Commander 695	PROP
BEC100	289	BEECH	Beech King Air 100	PROP
BEC190	246	BEECH	Beech 1900	PROP
BEC200	450	BEECH	Beech Super King Air 200	PROP
BEC23	14	BEECH	Beechcraft Model 23 Musketeer	PROP
BEC24	12	BEECH	Beechcraft Model 24 Sierra	PROP
BEC300	22	BEECH	Beech Super King Air 300	PROP
BEC33	22	BEECH	Beechcraft Model 33 Debonair/Bonanza	PROP
BEC55	34	BEECH	Beechcraft Model 55 Barron	PROP
BEC58	68	BEECH	Beechcraft Model 58 Barron	PROP
BEC58P	322	BEECH	BARON 58P/TS10-520-L	PROP
BEC76	14	BEECH	Beechcraft Model 76 Duchess	PROP
BEC90	294	BEECH	Beech King Air C90	PROP
BL26	13	BELLANCA	Bellanca Super Viking Model 17-30A	PROP
BLCH10	4	BELLANCA	Bellanca Champion Citabria CH10	PROP
BN2A	2	BRITTEN-NORMAN	Britten-Norman BN-2A Islander	PROP
C130	20	LOCKHEED	C-130H/T56-A-15	PROP
C17A	2	BOEING	Globemaster III C-17	TFAN
CLREGJ	1	CANADAIR	Canadair Regional Jet	TFAN
CNA150	4 862	CESSNA	Cessna 150	PROP
CNA152	80	CESSNA	Cessna 152	PROP
CNA170	22	CESSNA	Cessna 170	PROP
CNA172	13 878	CESSNA	Cessna 172 Skyhawk	PROP
CNA177	118	CESSNA	Cessna 177 Cardinal	PROP
CNA17B	32	CESSNA	Cessna 177B or RG Cardinal	PROP
CNA180	151	CESSNA	Cessna Skywagon	PROP
CNA182	797	CESSNA	Cessna 182 Skylane	PROP

Fleet Composition

Aircraft (Nef-Calc)	Number of movements	Manufacturer	Model	Type of Engine
CNA185	129	CESSNA	Cessna Skywagon	PROP
CNA205	6	CESSNA	Cessna 205 Super Skywagon	PROP
CNA206	864	CESSNA	CESSNA 206H / LYCOMING IO-540-AC	PROP
CNA207	2	CESSNA	Cessna 207 Turbo Stationair	PROP
CNA208	957	CESSNA	Cessna 208 Caravan I	PROP
CNA20T	1 834	CESSNA	CESSNA T206H / LYCOMING TIO-540-AJ1A	PROP
CNA210	52	CESSNA	Cessna 210 Centurion/II	PROP
CNA310	45	CESSNA	Cessna 310	PROP
CNA337	20	CESSNA	Cessna 337 Super Skymaster	PROP
CNA340	26	CESSNA	Cessna 340	PROP
CNA402	7	CESSNA	Cessna 402	PROP
CNA404	47	CESSNA	Cessna 404 Titan	PROP
CNA414	143	CESSNA	Cessna 414 Chancellor	PROP
CNA421	48	CESSNA	Cessna 421 Golden Eagle	PROP
CNA425	8	CESSNA	Cessna 425 Corsair/Conquest I	PROP
CNA441	169	CESSNA	CONQUEST II/TPE331-8	PROP
CNA550	2	CESSNA	Cessna Model 550 Citation II	TFAN
DC6	2	DOUGLAS	DC6/R2800-CB17	PROP
DHC2	60	DE HAVILLAND	De Havilland DHC-2 Beaver	PROP
DHC6	6	DE HAVILLAND	DASH 6/PT6A-27	PROP
DHC7	30	DE HAVILLAND	DASH 7/PT6A-50	PROP
DHC8	138	DE HAVILLAND	DASH 8-100/PW121	PROP
DHC830	13 984	DE HAVILLAND	DASH 8-300/PW123	PROP
F4C	4	MCDONNEL DOUGLAS	F-4C/J79-GE-15	TJET
FAL10	10	DASSAULT	Falcon 10	TFAN
GASEPF	1 275	GENERIC	1985 1-ENG FP PROP	PROP
GASEPV	260	GENERIC	1985 1-ENG VP PROP	PROP
GULF1	2	GULFSTREAM	Gulfstream I (G159)	PROP
LA42	83	LAKE	Lake LA-4-200 Buccaneer	PROP
M20J	54	MOONEY	Mooney 201LM and 205 (M20J)	PROP

Fleet Composition

Aircraft (Nef-Calc)	Number of movements	Manufacturer	Model	Type of Engine
M20K	24	MOONEY	Mooney 252TSE (M20K)	PROP
MU2	343	MITSUBISHI	Mitsubishi MU-2	PROP
PA18	20	PIPER	Piper PA-18 Super Cub	PROP
PA22TR	2	PIPER	Piper PA-22 Tripacer	PROP
PA23AP	2	PIPER	Piper PA-23-235 Apache	PROP
PA23AZ	514	PIPER	Piper PA-23 Aztec	PROP
PA24	53	PIPER	Piper PA-24 Comanche	PROP
PA28C2	64	PIPER	Piper PA-28-235E Cherokee 235E	PROP
PA28CA	150	PIPER	Piper PA-28R-200 Cherokee Arrow II	PROP
PA28CH	320	PIPER	Piper PA-28-140 Cherokee 140	PROP
PA30	159	PIPER	Piper PA-30 Twin Comanche	PROP
PA31	422	PIPER	Piper PA-31 Navajo	PROP
PA31T	1 065	PIPER	Piper PA-31T Cheyenne	PROP
PA32C6	32	PIPER	Piper PA-32 Cherokee Six	PROP
PA32LA	78	PIPER	Piper PA-32R-300 Lance	PROP
PA32SG	30	PIPER	Piper PA-32 Saratoga	PROP
PA34	155	PIPER	Piper PA-34 Seneca	PROP
PA36	1	PIPER	Piper 36 Brave	PROP
PA38	8	PIPER	Piper PA-38-112 Tomahawk	PROP
PA42	10	PIPER	Piper PA-42 Cheyenne III	PROP
PA44	112	PIPER	Piper 44 Seminole	PROP
PA46	180	PIPER	Piper PA-46 Malibu	PROP
PA60	38	PIPER	Piper Aerostar Model 600/700	PROP
RWCM12	14	ROCKWELL	Rockwell Commander 112 (Alpine)	PROP
SAMER3	4	SWEARINGEN	Swearingen Merlin III	PROP
SAMER4	11	SWEARINGEN	Swearingen Merlin IV	PROP
SD330	334	SHORTS SKYVAN	SD330/PT6A-45AR	PROP

Local movements

Aircraft (Nef-Calc)	Number of movements	Manufacturer	Model	Type of Engine
CNA150	4 417	CESSNA	Cessna 150	PROP
CNA152	883	CESSNA	Cessna 152	PROP
CNA172	33 374	CESSNA	Cessna 172 Skyhawk	PROP
GASEPF	2 650	GENERIC	1985 1-ENG FP PROP	PROP
PA23AZ	513	PIPER	Piper PA-23 Aztec	PROP

NEF-Calc contains an internal database of aircraft noise emission sets to be used for the calculation of noise contours. Each set corresponds to a specific combination of aircraft and engine model. The number of noise emissions sets in this database is limited and some older or newer aircrafts do not have an exact match in the emission database. In such cases, the closest match was used.

Movements Summary

APPENDIX

B

Fleet Summary

Aircraft	Arrivals			Departures			Total
	Day	Night	Total	Day	Night	Total	
Jet 2 engines non-certified*	2		2	2		2	4
Jet 2 engines Stage 3	9		9	8		8	17
Jet 4 engines Stage 3*	1		1	1		1	2
Piston 1 engine	31 658	1 035	32 693	31 921	779	32 700	65 394
Piston 2 engines	1 185	12	1 197	1 176	27	1 203	2 401
Piston 3 engines	1		1	1		1	2
Piston 4 engines	1		1	1		1	2
Turboprop 1 engine	1 429	40	1 469	1 424	41	1 465	2 934
Turboprop 2 engines	8 095	548	8 643	8 290	355	8 645	17 288
Turboprop 4 engines	27		27	23		23	50
Total	42 408	1 635	44 044	42 847	1 202	44 050	88 093

- Day : 7 h - 22 h
- Night : 22 h - 7 h

* All jet 2 engines non-certified and jet 4 engines movements are simulated approaches.

Runway use - Arrivals

Aircraft	06		08		15		24		26		33		99[1]	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Jet 2 engines non-certified													2	
Jet 2 engines Stage 3									7				2	
Jet 4 engines Stage 3													1	
Piston 1 engine	713	20	6 581	228	1		4 976	138	16 133	568	2 982	68	272	14
Piston 2 engines	10		362	5			62		663	7	65		24	
Piston 3 engines													1	
Piston 4 engines													1	
Turboprop 1 engine			464	13			1		877	26	73		14	1
Turboprop 2 engines			2 590	176			1		5 349	365	40		115	7
Turboprop 4 engines			7						13				7	
Total	723	20	10 004	422	1		5 040	138	23 042	966	3 160	68	439	22

[1] Runway 99 : simulated approach, runway unknown, distributed on existing runways according to aircraft type.

Runway use - Departures

Aircraft	06		08		15		24		26		33		99[1]	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
Jet 2 engines non-certified													2	
Jet 2 engines Stage 3									6				2	
Jet 4 engines Stage 3													1	
Piston 1 engine	653	20	6 683	152	149		4 870	138	16 879	388	2 416	68	271	14
Piston 2 engines	8		366	13	5		62		681	14	29		26	
Piston 3 engines													1	
Piston 4 engines													1	
Turboprop 1 engine			481	18	5		2		922	22	1		13	1
Turboprop 2 engines			2 856	106			1		5 307	242			126	7
Turboprop 4 engines			4						12				7	
Total	661	20	10 390	289	159		4 935	138	23 807	666	2 446	68	450	22

[1]Runway 99 : simulated approach, runway unknown, distributed on existing runways according to aircraft type.

Summary of flight distances (nautical miles)

Aircraft	Departures				Arrivals	Total
	0 - 500	500 - 1000	1000 - 1500	Unknown		
Jet 2 engines non-certified*		1		1	2	4
Jet 2 engines Stage 3	7		1		9	17
Jet 4 engines Stage 3*	1				1	2
Piston 1 engine	23 499	11		9 190	32 693	65 394
Piston 2 engines	852	18		333	1 197	2 401
Piston 3 engines	1				1	2
Piston 4 engines	1				1	2
Turboprop 1 engine	1 075	75		315	1 469	2 934
Turboprop 2 engines	8 206	165	5	269	8 643	17 288
Turboprop 4 engines	18			5	27	50
Total	33 661	270	6	10 113	44 044	88 093

* All jet 2 engines non-certified and jet 4 engines movements are simulated approaches.