

# ***Additional Uses of Flight Data EASA FDM Conference, April 2016***



Robert Pouliot – Manager Flight Data Services

***FLIGHT SAFETY  
IS  
THE PRIMARY PURPOSE  
OF  
ANY FDM PROGRAM***

# FDA program Breakdown by fleet

## ACA Mainline

- 93 - A319/A320/A321, download via 512 Mb PCMCIA card;
- 20 - EMB190, download via 2 Gb PCMCIA card;
- 17 - B767, download via 512 Mb PCMCIA card;
- 23- B777, download via wireless means;
- 16 - B787, download via wireless means;

## ACr (LCC)

- 20 – A319, download via 512 Mb PCMCIA card;
- 04 – A321, download via wireless means;
- 17 – B767, download via 512 Mb PCMCIA card;

## Remote Card Reader (RDU)

Distributed across our main maintenance facilities in;

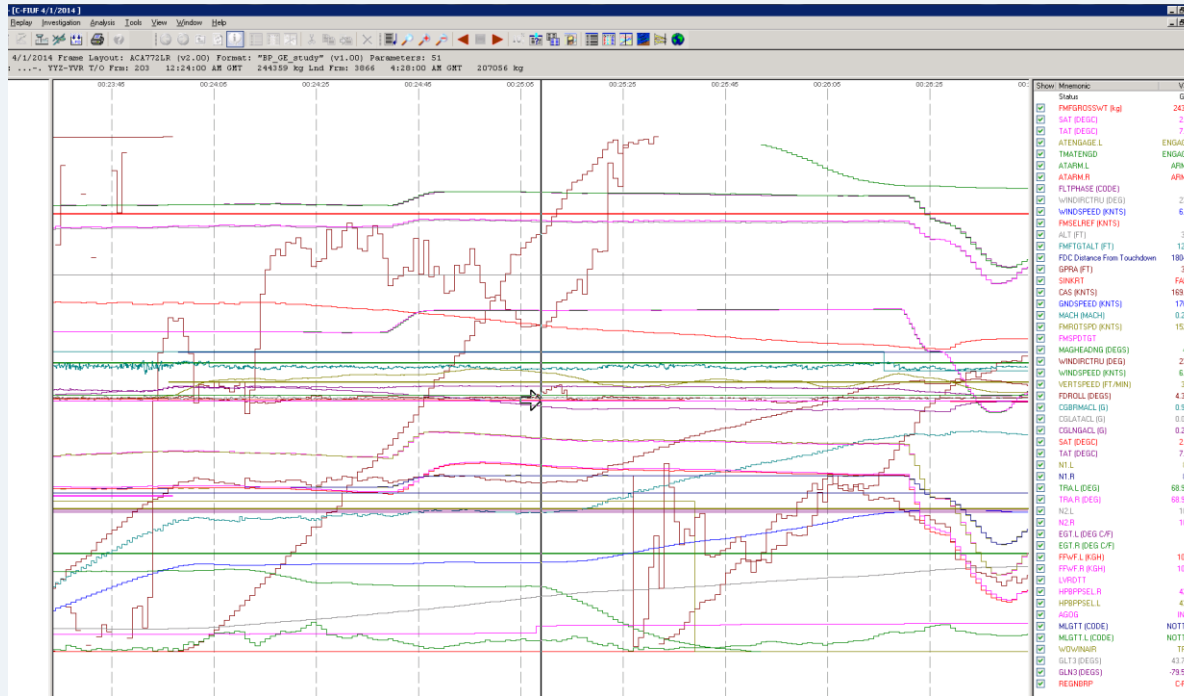
YUL (Montréal)

YYZ (Toronto)

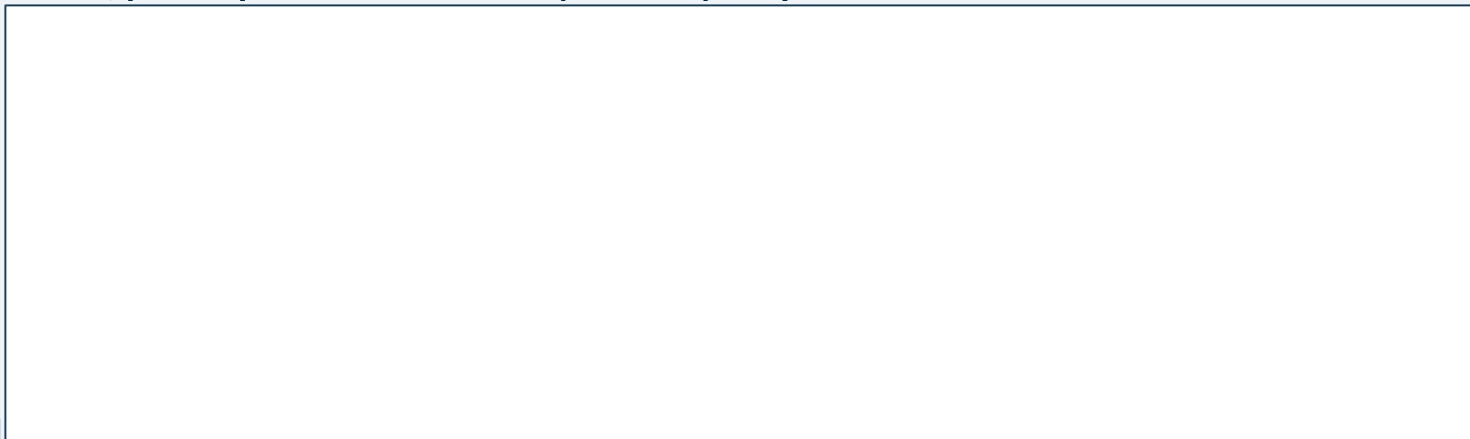
YYC (Calgary)

YVR (Vancouver)

- Data replay and analysis software.



- Flight Operation Analysis Synopsis .



***FDA Risk Assessment Module  
(under development)***

# Risk Assessment Event Detection

*The automated detection event is based on 19 separate events which allocates a weight on a sliding scale in relation to ground elevation.*

Risk Event	Effective Range	Thresholds
Descent Rate @ > 500 ft		
Descent Rate @ < 500 ft		
High speed approach @ > 500 ft		
High speed approach @ < 500 ft		
Low Speed Approach		
Excessive Bank Angle		
Glide Slope @ > 200 ft		
Glide Path @ < 200 ft		
Localizer		
Heading change below 500 ft		
EGPWS / GPWS Warning		
Low Power Approach		
Auto Pilot / Auto Throttle Off		
Long Flare		
Late Landing Gear		
Late Land Flap		
High Speed Turn after Landing		
Landing distance		
Risk Duration		



# Automated Risk Management Event

Flight Manager - 360 flights (1774 events) [Fleet = XA5: Embraer, Type = EMB 190]

Display Settings

Fleet

XA5: Embraer

...

Aircraft Type

EMB 190

...

After Date

01 Mar 15

...

Flight Type

<all>

...

☒ Exclusive (ie. everything except selected Flight Type)

Restrict to

show top 2500 rows

...

Sort Order

Replay ID then Flight ID

...

☐ Hide invalid events?
 ☐ Hide closed flights?
 ☐ Hide validated events?
 ☐ Hide unanalysed flights?
 ☐ Hide non-safety events?

Auto Close never close automatically

History

...

Undo...

Various options are available by selecting & right-clicking items in the list below (use ctrl + click or shift + click for multiple selections)

Select if no events...

Select if all validated...

Refresh Now

☐ Refresh view automatically?

Stat...	Item	Detail
Open	Flight	
	YVR26L-YYC34 F/N =	7 valid event(s), worst = 43%
valid?		317 - Unstick Speed (Max) = 16.75 kt (context = AIRSPEED=159, V2 SPEED=142, VR SPEED=140)
valid?		319 - Pitch Rate at Take-off (Min) = 1.66992 o/sec (context = PITCH=U 8.1, AIRSPEED=161)
valid?		308 - Take off Distance = 4731.35 ft (context = LATITUDE=N49 11.21, LONGITUDE=W123 10.85, WIND DIRECTION TRUE=259.2)
valid?		326 - Climb Out Speed 500 to 1500 ft = 9.75 kt (context = AIRSPEED=149, PITCH=U 14.8, V2 SPEED=142)
valid?		9007 - Rudder Trim = 3.44 o (context = RUDDER TRIM POS=-3.4, PALT=35005)
valid?		834 - Above Glideslope 1000 - 200 ft = 0.63332 d (context = G/S DEV=FD 0.68, ACA_RALT_MAIN=816)
valid?		1005 - Risk Management = 32.3493 % (context = GROUND SPEED=45)

Flight Manager - 360 flights (1774 events) [Fleet = XA5: Embraer, Type = EMB 190]

Display Settings

Fleet

XA5: Embraer

...

Aircraft Type

EMB 190

...

After Date

01 Mar 15

...

Flight Type

<all>

...

☒ Exclusive (ie. everything except selected Flight Type)

Restrict to

show top 2500 rows

...

Sort Order

Replay ID then Flight ID

...

☐ Hide invalid events?
 ☐ Hide closed flights?
 ☐ Hide validated events?
 ☐ Hide unanalysed flights?
 ☐ Hide non-safety events?

Auto Close never close automatically

History

24 Feb 13:01:07: 1 Events (status changed to Invalid)

Undo...

Various options are available by selecting & right-clicking items in the list below (use ctrl + click or shift + click for multiple selections)

Select if no events...

Select if all validated...

Refresh Now

☐ Refresh view automatically?

Stat...	Item	Detail
Open	Flight	
	YUL24L-LGA31 F/N =	8 valid event(s), worst = 78%
valid?		308 - Take off Distance = 3971.94 ft (context = LATITUDE=N45 28.13, LONGITUDE=W073 43.60, WIND DIRECTION TRUE=254.1)
valid?		302 - Control Wheel Movement on TO = 16.29 o (context = CONTROL WHEEL POSN (ROLL) - CAPT=R 16.3, RUDDER PEDAL POSN=R 0.4, GROUNDSP
valid?		9007 - Rudder Trim = 3.36 o (context = RUDDER TRIM POS=-3.4, PALT=28062)
valid?		825 - Path Angle below 1200 ft (Low) = -1.758 o (context = FLIGHT PATH ANGLE=L 1.6, ACA_RALT_MAIN=0, G/S DEV=BAD)
valid?		849 - Heading Change below 500 ft = 35.8397 o (context = HEADING (MAG)=316.3, LOC DEV=BAD)
valid?		824 - Path Angle below 1200 ft (High) = -4.6587 o (context = FLIGHT PATH ANGLE=L 4.8, ACA_RALT_MAIN=0, G/S DEV=BAD)
valid?		838 - Approach Power (N1) 500 to 50 ft = 28.25 % (context = ACA_RALT_MAIN=0, N1 #1=28.4, N1 #2=28.3)
invalid		811 - Descent Rate 50 ft to Touchdown = -1008 fpm (context = ACA_RALT_MAIN=0, ACA_IVV_MAIN=0, AIRSPEED=145)
valid?		1005 - Risk Management = 88.9755 % (context = GROUND SPEED=42)

# Oversight

- The captured data is reviewed daily; an electronic signature is kept on record. Should an event require a Risk Assessment it is also electronically recorded for Quality Control and Oversight.

2									
3	Date reviewed	FDA Mgmt Staff	Status	Gatekeeper Staff	Date reviewed from serial	To Serial	Status	Flights of interest	
4									
5	1-Feb-16							Flight of Interest	1-Feb-16
6	2-Feb-16							Flight of Interest	2-Feb-16
7	3-Feb-16							Flight of Interest	3-Feb-16
8	4-Feb-16							Flight of Interest	4-Feb-16
9	5-Feb-16							Flight of Interest	5-Feb-16
10	6-Feb-16							Flight of Interest	6-Feb-16
11	7-Feb-16							Flight of Interest	7-Feb-16
12	8-Feb-16							Flight of Interest	8-Feb-16
13	9-Feb-16							Flight of Interest	9-Feb-16
14	10-Feb-16							Flight of Interest	10-Feb-16
15	11-Feb-16							Flight of Interest	11-Feb-16
16	12-Feb-16							Flight of Interest	12-Feb-16
17	13-Feb-16							Flight of Interest	13-Feb-16
18	14-Feb-16							Flight of Interest	14-Feb-16
19	15-Feb-16							Flight of Interest	15-Feb-16
20	16-Feb-16							Flight of Interest	16-Feb-16
21	17-Feb-16							Flight of Interest	17-Feb-16
22	18-Feb-16							Flight of Interest	18-Feb-16
23	19-Feb-16							Flight of Interest	19-Feb-16
24	20-Feb-16							Flight of Interest	20-Feb-16
25	21-Feb-16							Flight of Interest	21-Feb-16
26	22-Feb-16							Flight of Interest	22-Feb-16
27	23-Feb-16							Flight of Interest	23-Feb-16
28	24-Feb-16							Flight of Interest	24-Feb-16
29	25-Feb-16							Flight of Interest	25-Feb-16
30	26-Feb-16							Flight of Interest	26-Feb-16
31	27-Feb-16							Flight of Interest	27-Feb-16
32	28-Feb-16							Flight of Interest	28-Feb-16
33	29-Feb-16							Flight of Interest	29-Feb-16

Severity	Consequence types							Likelihood				
	Altitude Level	Value Exceedance	Correction Action	Ground Environment	Duration	Recovery Window	Aircraft/Ground Condition	Remote	Unlikely	Moderate	Likely	Almost Certain
Critical	< 50	Max Alert value + 50	No action or wrong action by crew	Q4 & Q1 -Long Landing % 25 rwy remaining, High Speed runway exit > 80 KTS GS,	Terrain Pull Up,	Windshear Without GA in Severe condition	Full Hyd, Electrical or lost of Multiple Power Plants	2.00	4.00	6.00	8.00	10.00
High	50 to 300	Max Alert value + 40	Over/Under reaction	Q2 & Q3 -Long Landing % 25 rwy remaining, High Speed runway exit > 80 KTS GS,	Too Low Terrain, Don't Sink RA	Windshear With GA	Partial lost of Hyd, Electrical or lost of Power Plant	1.80	3.20	4.80	6.40	8.00
Medium	300 to 500	Max Alert value + 30	Delayed corrective action	High Vertical or Lateral Acceleration	Glideslope, Terrain TA to RA	Turbulence	Flaps or Gear Exceedance, False Master Warning	1.20	2.40	3.60	4.80	6.00
Low	500 to 1000	Max Alert value + 20	Corrective action carried out	Intermittent Ground LOC or GS signal, Parallel rwy	Sink Rate, TA to RA	Vmo, Mmo Exceedance	Lost of all FMS Guidance or Nav Aid	0.80	1.60	2.40	3.20	4.00
Negligible	>1000	Max Alert value + 10	SOP compliance	Known Airport Anomalies (SPWS database)	TA, AP Disconnect	IFR condition, ATC	Minimal aircraft system degradation	0.40	0.80	1.20	1.60	2.00
Likelihood Categories:												
Category:	Measure	Description		GUIDE:								
Remote	Every 10 years	May occur only in exceptional		LOW From 0.01 to 1.20								
Unlikely	Every 5 months	The event could occur at some time/has		MEDIUM From 1.21 to 4.00								
Moderate	Every month	Should occur at some time/has occurred at		HIGH From 4.01 to 8.40								
Likely	Every week	Will probably occur in most		CRITICAL From 8.41 to 10.00								
Almost Certain	More than once/day	Expected to occur in most circumstances/has occurred at Air Canada										



# Risk Management Worksheet

A	B	C	D	E	F	G	H	I	J	K	L
Replay Date	<a href="#">Flight ID</a>	Aircraft	DL Date	TO Airport	<a href="#">TD Airport</a>	Diversion	<a href="#">FDA Severity</a>	Animatrack	Severity	Probability	<a href="#">Initial Risk</a>
XXX	141432	XXX	2016-02-15	YVR	YYC		162	<a href="#">FDA160215_7</a>	Medium	Likely	4.8
XXX	142299	XXX	UK	YYZ	YYT	YHZ	FOAS	<a href="#">FDA160218_8</a>	Low	Likely	3.2

Immediate effect	Descriptor	Root Cause	External Root Cause	Internal Root Cause	HFACS Error	HFACS Violation	FAFS Environment	Condition Flag	Go-Around Rqd	Go-Around	ASR	GK	Final Risk	Date Completed
		7208	6493	7052	10257	9963	9966	10251	yes	yes	filed	TJ		XXX

EMB 190 and ACA Airbus Risk Management Value Query	
Flt. ID 141432	
<u>RISK MANAGEMENT VALUE NAME</u>	<u>VALUE</u>
Autoflight Disengaged	3.0
GPWS	42.6
Heading Change @ < 500 ft	24.4
Localizer Deviation	19.3
Flight Path Angle @ < 200 ft	16.8
Glideslope @ > 200 ft	28.5
High Bank Angle @ < 500 ft	3.9
High Descent Rate @ < 500 ft	16.4
High Descent Rate @ > 500 ft	14.7
Risk Duration	13.8
1005 - Risk Management	162.0

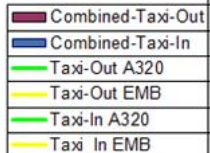
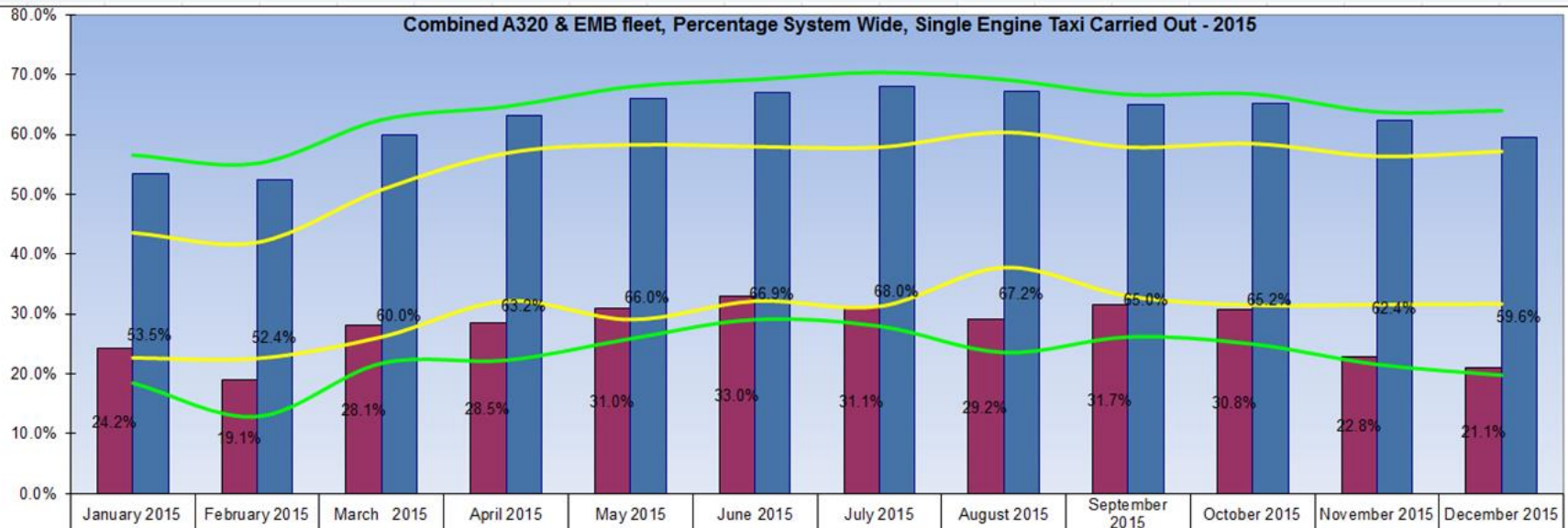


***Commercial Studies***  
***and***  
***Specialized Studies***  
***supported by***  
***FDM***

## ***Commercial Case Studies...***

- Single Engine Study- Taxi in and out
- Gate Wait study
- APU Usage Study
- Packs-Off Takeoff
- Flaps 3 vs Full landing

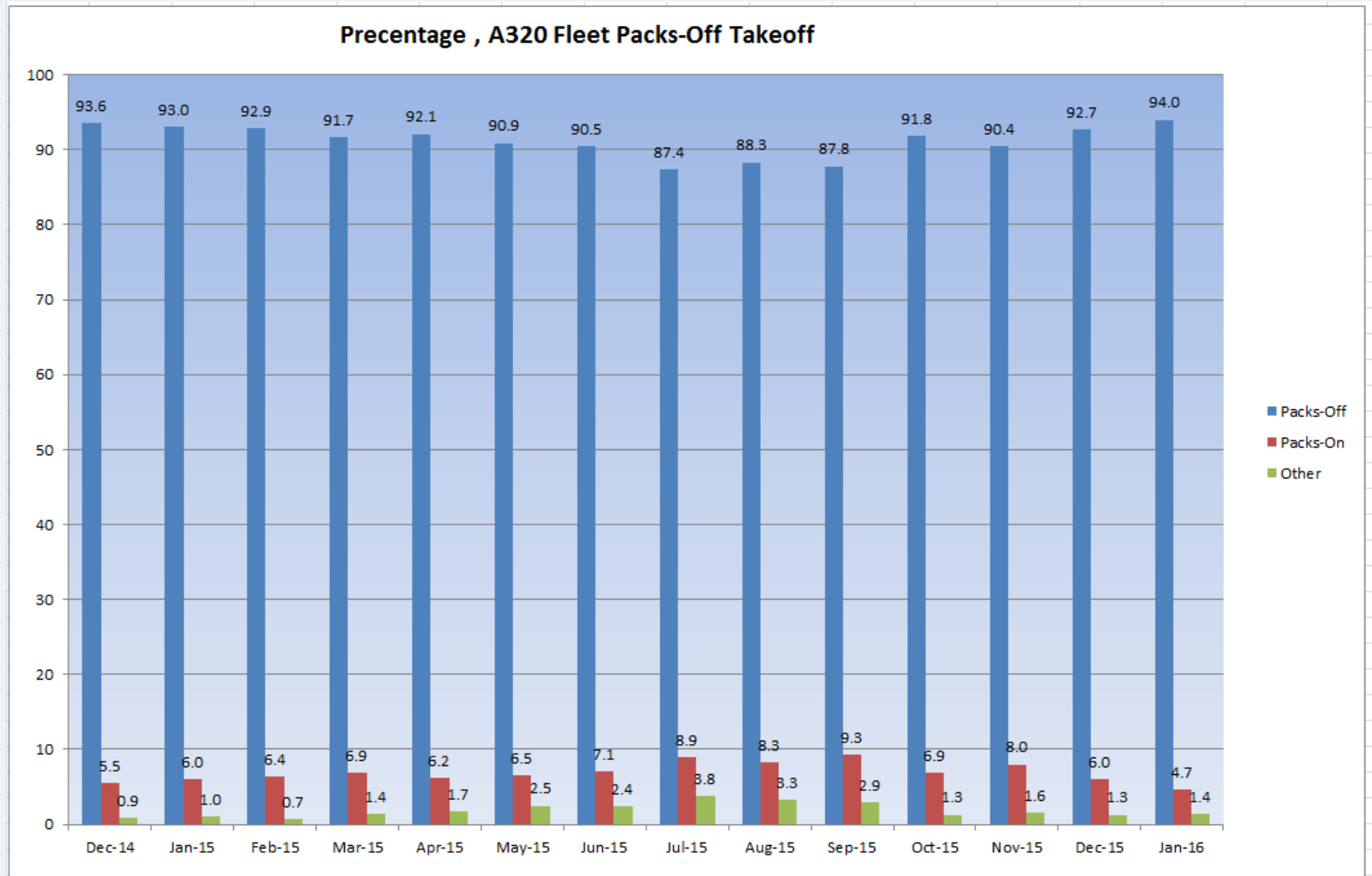
# Single Engine Taxi Carried Out A320 & EMB190



# Combined APU usage & Gate Wait

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# Packs-Off Takeoff





## **YYZ - Rough Runway, 05 at intersection 15R**

**Study carried out on the B777 fleet from January 2011 to June 2011**

FDA event 9015; Rough Taxiway or Runway

- G value limits from  $\leq 0.70$  g to  $\geq 1.30$  g

During that period 1482 flight were analyzed,

201 flights departed Runway 05

75 flights exceeded the event values

max recorded @ 1.53 g

min recorded @ 0.30 g

## **FRA - Rough Runway condition, 25R**

**Study carried out on the B777 fleet from January 2011 to August 2011**

During that period 445 flights departing FRA were analyzed,

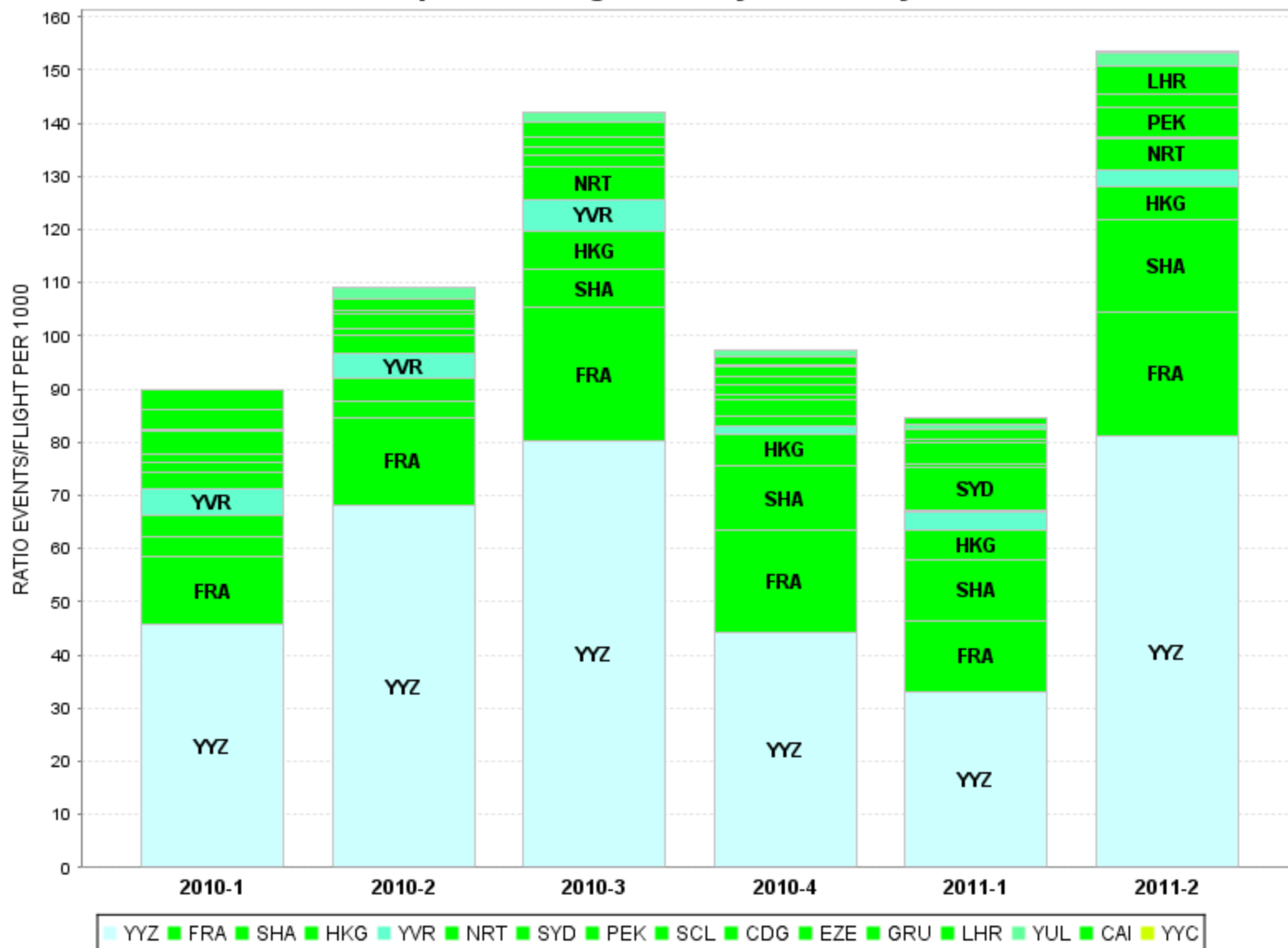
259 flights departed Runway 25R

96 flights exceeded the event values

max recorded @ 1.51 g

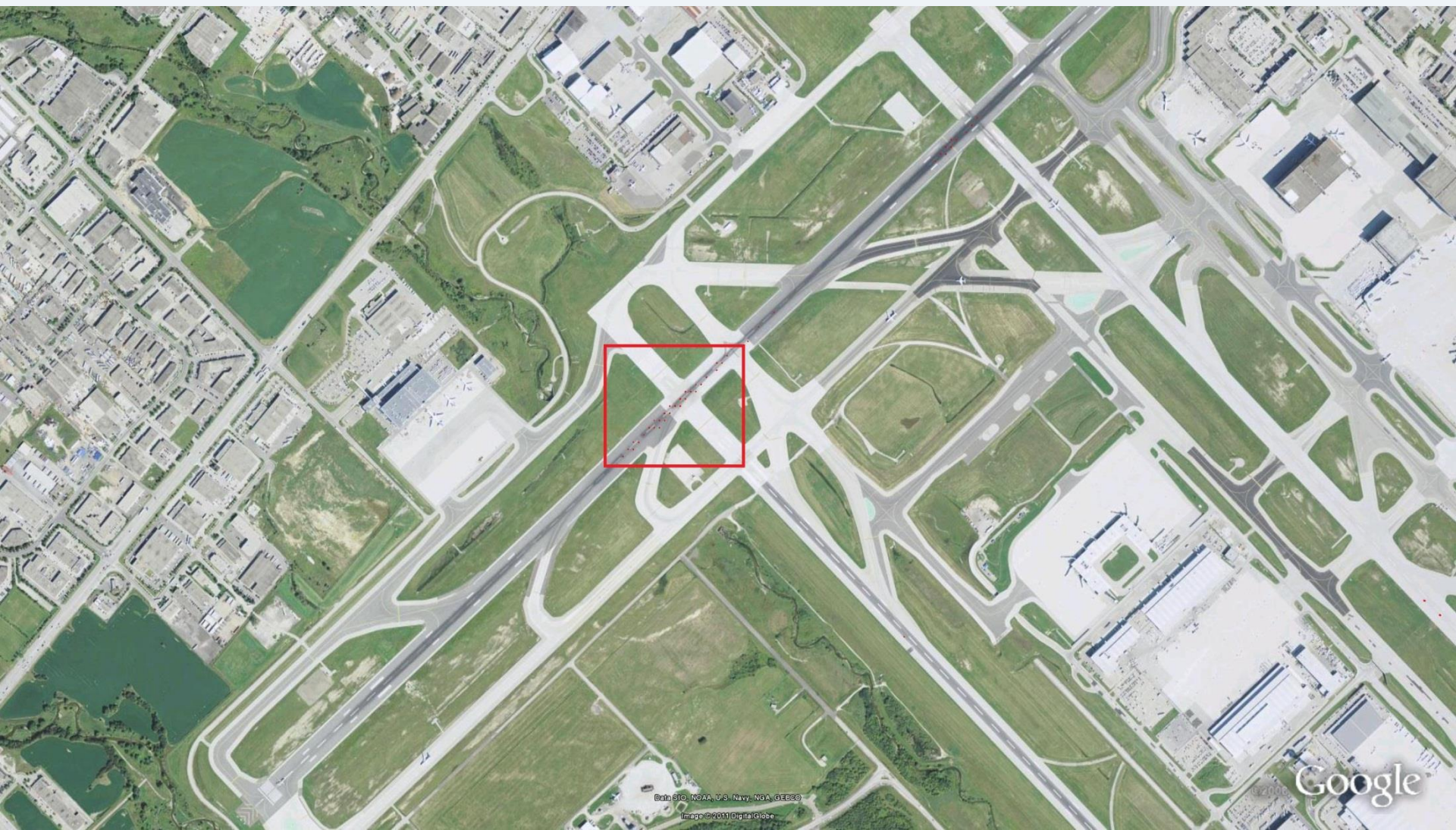
min recorded @ 0.49 g

## Departure Rough Taxiway or Runway



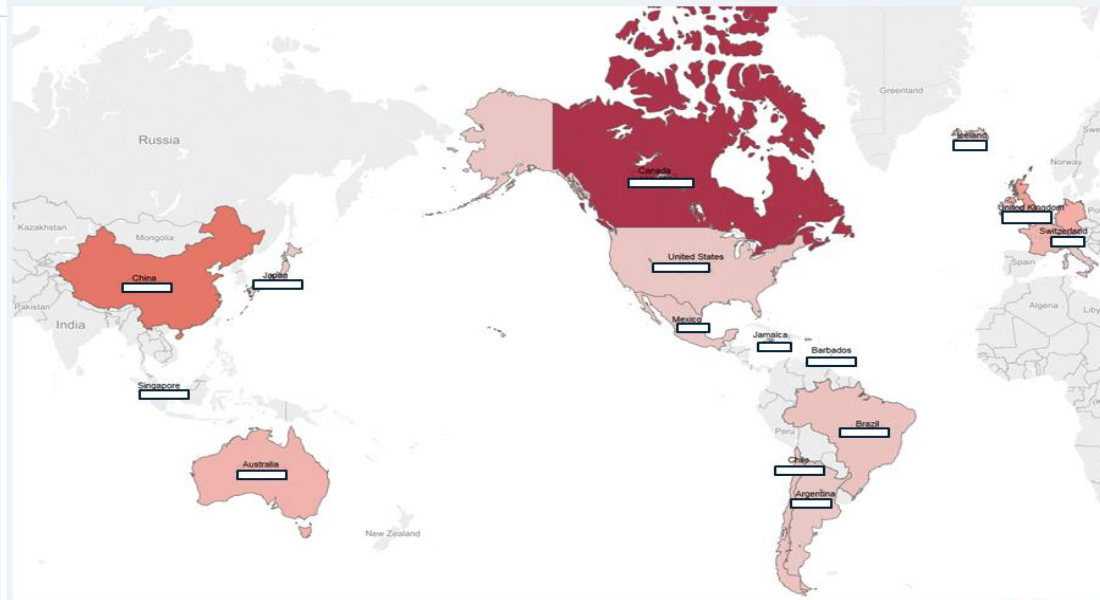
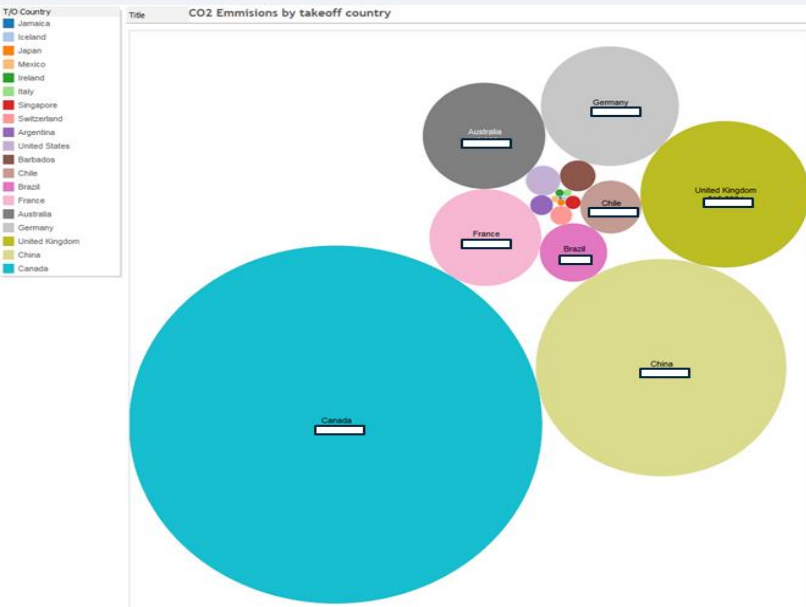
1	Phase	Aircraft	Date	Rwy	Peak Value	Airspeed	Weight	Latitude	Longitude	Departure	Arrival	Serial No.
2	TO	C-	an-11	25R	1.46	156	298210	50.0405	8.5676	FRA	YYZ	168253
3	TO	C-	an-11	25R	1.46	147	291460	50.0403	8.5671	FRA	YUL	160658
4	TO	C-	an-11	25R	1.44	155	312580	50.0403	8.5668	FRA	YYZ	171093
5	TO	C-	an-11	25R	1.43	147	295307	50.0402	8.5666	FRA	YUL	161637
6	TO	C-	an-11	25R	1.43	154	298791	50.0403	8.5673	FRA	YYZ	171807
7	TO	C-	an-11	25R	1.43	161	306193	50.0403	8.5673	FRA	YYZ	161820
8	TO	C-	an-11	25R	1.43	161	290299	50.0403	8.5659	FRA	YYZ	151153
9	TO	C-	an-11	25R	1.42	154	305758	50.0403	8.5674	FRA	YYZ	170777
10	TO	C-	an-11	25R	1.42	161	296541	50.0402	8.5668	FRA	YYZ	150859
11	TO	C-	an-11	25R	1.41	156	301766	50.0403	8.5673	FRA	YYZ	163878
12	TO	C-	an-11	25R	1.41	152	293710	50.0405	8.5678	FRA	YUL	155631
13	TO	C-	an-11	25R	1.41	150	311491	50.0405	8.5676	FRA	YYZ	160396
14	TO	C-	an-11	25R	1.41	151	296033	50.0403	8.5674	FRA	YYZ	172460
15	TO	C-	an-11	25R	1.41	152	301621	50.0403	8.5668	FRA	YUL	172807
16	TO	C-	an-11	25R	1.41	152	295234	50.0403	8.5669	FRA	YUL	175311
17	TO	C-	an-11	25R	1.41	155	302274	50.0405	8.5681	FRA	YUL	159876
18	TO	C-	an-11	25R	1.41	148	287759	50.0403	8.5671	FRA	YYZ	160746
19	TO	C-	an-11	25R	1.40	157	299662	50.0403	8.5669	FRA	YYZ	169296
20	TO	C-	an-11	25R	1.40	148	299589	50.0403	8.5671	FRA	YYZ	171979
21	TO	C-	an-11	25R	1.40	150	289864	50.0403	8.5673	FRA	YUL	151418
22	TO	C-	an-11	25R	1.40	154	284493	50.0403	8.5673	FRA	YUL	154856
23	TO	C-	an-11	25R	1.39	154	296613	50.0403	8.5674	FRA	YUL	170184
24	TO	C-	an-11	25R	1.39	156	304960	50.0405	8.5681	FRA	YYZ	175129
25	TO	C-	an-11	25R	1.38	150	305105	50.0403	8.5673	FRA	YYZ	163589
26	TO	C-	an-11	25R	1.38	151	290662	50.0405	8.5676	FRA	YUL	153844
27	TO	C-	an-11	25R	1.38	155	308733	50.0403	8.5669	FRA	YYZ	142336
28	TO	C-	an-11	25R	1.37	155	300097	50.0403	8.5674	FRA	YYZ	160919
29	TO	C-	an-11	25R	1.37	160	299299	50.0403	8.5673	FRA	YYZ	144728
30	TO	C-	an-11	25R	1.37	160	307354	50.0403	8.5676	FRA	YUL	173424
31	TO	C-	an-11	25R	1.37	152	300605	50.0405	8.5680	FRA	YYZ	152641
32	TO	C-	an-11	25R	1.37	154	309967	50.0403	8.5681	FRA	YYZ	161651
33	TO	C-	an-11	25R	1.37	150	295452	50.0405	8.5676	FRA	YUL	170351
34	TO	C-	an-11	25R	1.37	156	292622	50.0403	8.5668	FRA	YUL	173861
35	TO	C-	an-11	25R	1.37	159	304161	50.0403	8.5671	FRA	YUL	155400
36	TO	C-	an-11	25R	1.37	153	291823	50.0403	8.5673	FRA	YUL	142973
37	TO	C-	an-11	25R	1.37	157	297920	50.0403	8.5668	FRA	YYZ	158509
38	TO	C-	an-11	25R	1.36	156	310911	50.0403	8.5668	FRA	YYZ	152084
39	TO	C-	an-11	25R	1.36	166	301839	50.0403	8.5668	FRA	YYZ	172269
40	TO	C-	an-11	25R	1.36	158	290880	50.0403	8.5671	FRA	YUL	154214
41	TO	C-	an-11	25R	1.36	162	298791	50.0402	8.5666	FRA	YYZ	165741
42	TO	C-	an-11	25R	1.36	158	308516	50.0405	8.5676	FRA	YYZ	170056
43	TO	C-	an-11	25R	1.36	149	283114	50.0405	8.5680	FRA	YUL	159697
44	TO	C-	an-11	25R	1.36	151	299371	50.0403	8.5673	FRA	YYZ	166905
45	TO	C-	an-11	25R	1.36	154	300315	50.0405	8.5676	FRA	YUL	143539



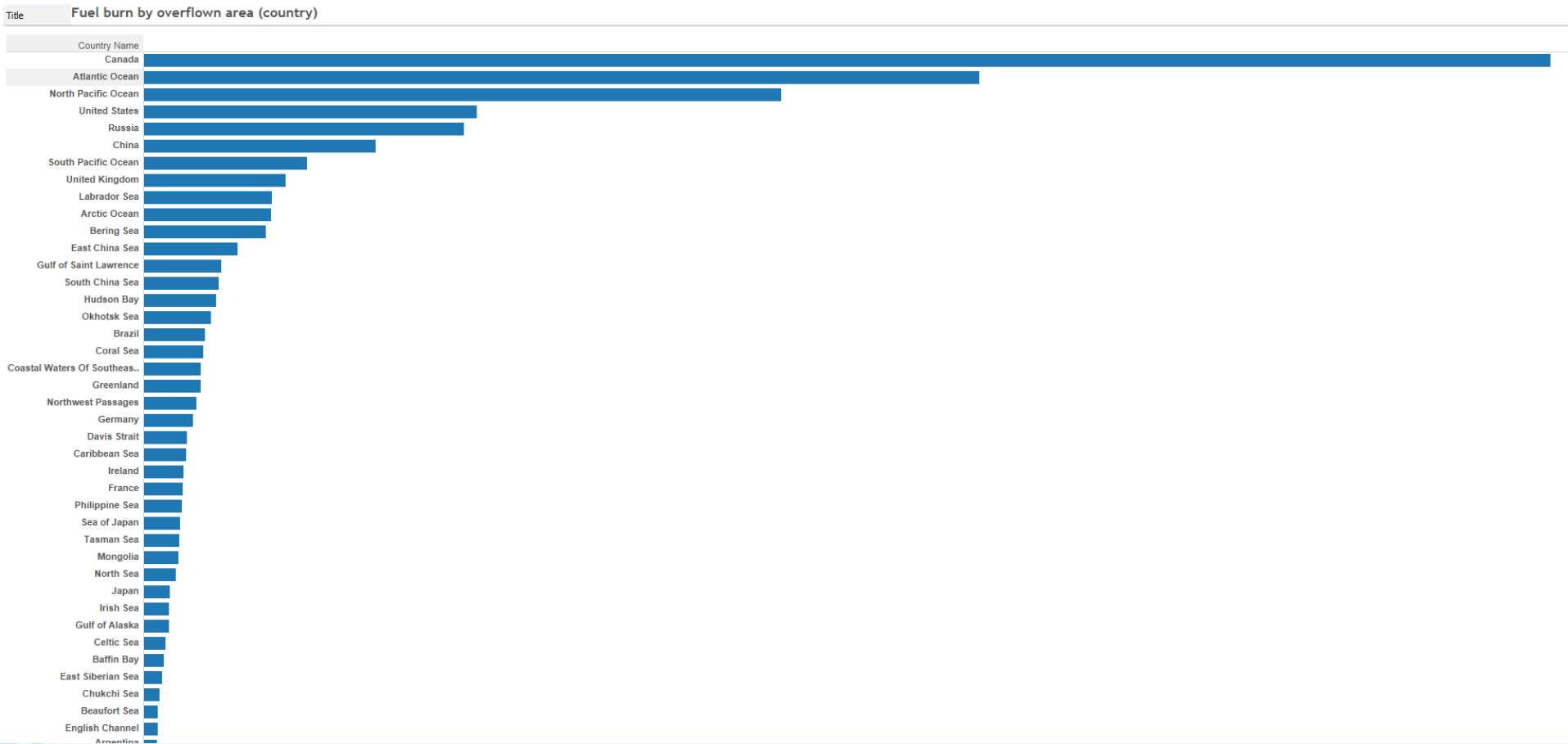




# Greenhouse Emission



# B777 Fuel Burn





# Information Dissemination And Feedback



# New Communication Tool

- FDA kiosk project launched in 2006, program cancelled due to lack of participation from the pilot community.  
...(failed science experiment)
- FDA Web Page has been developed and launched in October 2012 You can find the following tabs;
  - » FDA Introduction;
  - » Intro Videos;
  - » Unique Airports;
  - » Carbon Footprint;
  - » Current Issues;
  - » LOSA;
  - » FDA Mandate;
  - » FDA Team.

# FDA Introduction



Introduction	Intro Videos	Unique Airports	Carbon Footprint	Current Issues	LOSA	FDA Mandate	FDA Team
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## FDA at Air Canada

Established at Air Canada as an official element of the Flight Safety Program in April 2004, FDA was designed to enhance safety through the controlled, automated recording and analysis of flight data generated during routine line operations. Since 2004, the program has moved beyond its core of 80 A319, A320, and A321 aircraft to now include the B777 and selected Embraer aircraft. To find out more about the FDA program at Air Canada, follow the "FDA Mandate" link above.

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# Unique Airports



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Please note that best resolution for animations can be obtained by targeting the Fire Fox or Google Chrome browsers for PC or Safari for MAC or iPad.

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May be reviewed by: ☒ Gate Keeper Only ☐ FDA Team

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\*Details

# Flight Animation





# Questions ?

