Benefits of Reduction of Aircraft Taxi Times at Zurich Airport

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1 Introduction

Once aircraft leave their parking positions and taxi with self power, they emit pollutants through their main engines. Accordingly, efforts are taken by airports, airlines and air navigation service providers to minimise the taxi times of aircraft.

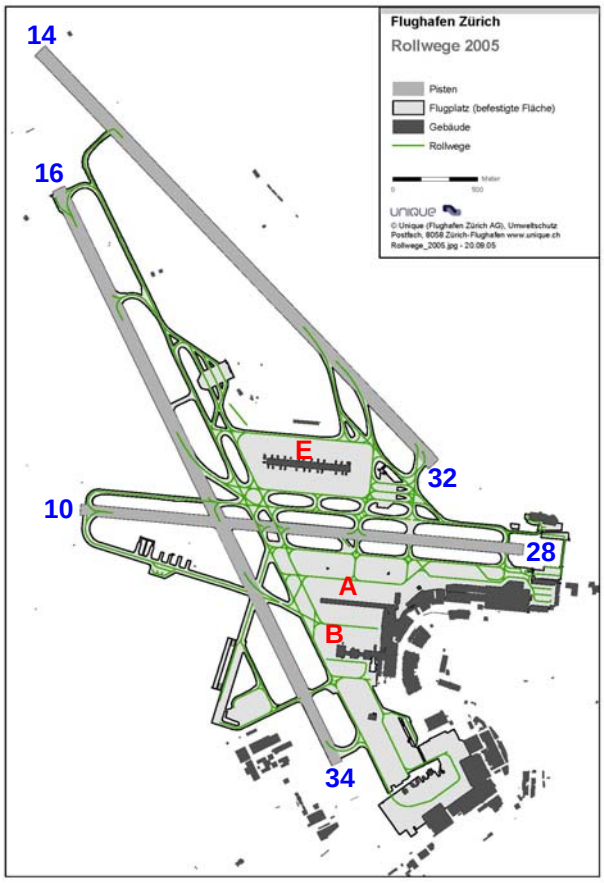

Figure 1: Zurich Airport Layout (10-34: Runways; A, B, E: Piers, remote stands are not labelled)

This short study quantifies the emission benefits when reducing the average taxi-out time by 1 minute for each departing operation for Zurich airport in 2005. The study reflects the actual aircraft operations, considering aircraft size, stand allocation and actually used runway for landing and departure (figure 1). All fixed wing aircraft operations have been taken into account with their respective taxi-times (table 1).

Taxi-times are the times between off-block and departure at runway threshold and between runway exit and on-block respectively.

Table 1: Aircraft operations in 2005

Aircraft Group	Movements	Taxi-out (min)	Taxi-in (min)
Large Jets	8,912	15.7	5.3
Medium Jets	12,717	15.5	5.3
Small Jets	143,510	13.7	5.2
Regional Jets	54,469	11.9	5.3
Turboprops	18,330	6.0	6.0
Small Aircraft (Piston)	25,021	6.0	6.0
Total	262,959		

2 Results

Table 2 shows the detailed results for the various substances first with the actual operations and second with the scenario that all departing aircraft use 1 minute less taxi-time.

Table 2: Emission reduction results

1. Results with actual operations (t/a)					
Substance	Total airport[1]	LTO[2]	LTO % of airport	Taxi	% of LTO
NOx	1,266	1,115	88%	116	10.4%
HC	280	124	44%		
CO	910	849	93%		
CO_2	320,375	258,662	81%	89,415	34.6%
2. Results with scenario of -1 minute taxi-out time (t/a)					
Substance	Total airport	LTO	LTO % of Airport	Taxi	% of LTO
NOx	1,260	1,109	88%	110	9.9%
HC	275	118	43%		
CO	874	813	93%		
CO_2	315,871	254,158	80%	84,911	33.4%
3. Change of taxi emissions					
Substance		t	% of LTO		
NOx		-6	-0.5%		
HC		-6	-5.1%		
CO		-36	-4.4%		
CO_2		-4,504	-1.8%		

[1] Total airport emissions include aircraft (LTO cycle, APU, engine start), all handling activities, airside traffic and all airport infrastructure emissions.
[2] LTO emissions are calculated with the ICAO certification cycle with only the taxi-time being the actual logged operational taxi-time (default values for turboprops and small aircraft).

The results show that in this specific scenario taxi emissions account for approximately 10% of the overall NOx emissions and 34% of the CO_2 emissions. The average reduction of 1 minute of taxi-time results in savings of approximately 6 tons of NOx and 4,500 tons of CO_2 per year with an equivalent of approximately 1,450 tons of fuel. The base scenario results already reflect optimised taxi procedures through the system "darts" and also the new infrastructure with pier E in the centre of the airport.

Reference:

Unique (Flughafen Zürich AG), 2005; Aircraft Engine Emission Reduction Programme Zurich Airport, Zurich-Airport, December 2005.