



ENVIRONMENTAL REVIEW



# 2009

## Finavia Environmental Work 2006:

### management of fluid emissions and effective processes

#### Pollution From Anti-icing Agents Gradually Under Control

Finavia is responsible for managing the glycol-containing runoff waters from the anti and de-icing agents used by ground handling firms. Because the amount of ice prevention agents used has increased, Finavia has studied the cost-effectiveness of various methods for reducing the burden on water systems at Tampere-Pirkkala, Kuopio and Oulu airports. Ice treatments are carried out on airport aprons, which are specially constructed to take the weight of aeroplanes. Rainwater and surplus ice treatment water is channelled into the surface waters from these extensive aprons.

Tampere-Pirkkala was the first provincial airport to begin using suction vehicles to clean the glycol from the apron – following Helsinki-Vantaa's lead. If these glycol recovery trials, which include temporary storage of the substance and its transport to the treatment plant, prove successful, the same techniques can be extended to other large provincial airports. Under new environmental procedures the users of ice prevention agents will also participate in the costs of reducing emissions.

Helsinki-Vantaa Airport continued a project which aims to have the first centralised ice treatment facility running by autumn 2007. The treatment point can handle some departing aircraft. More treatment points will be built following appraisals.

#### Fire Drill Points Studied

The old rubbish dump and fire drill point at Pori Airport was rehabilitated in accordance with regional environmental centre requirements at a total cost of 0.2M euros. The environmental risks of the fire drill area at Kuopio Airport were studied in cooperation with the defence forces. The area was previously an authorised firing range. The report showed that pollution was under control but that in the event of a change of use the site would have to be rehabilitated.

The fire drill point at Helsinki-Vantaa Airport is heavily used for training purposes. Although oil is separated out, enough practice fuel from the site escaped to justify the renovation of about 600 metres of drainage ditch between the runways – in accordance with official instructions.

#### Licensing Procedure Improvements Successful

The method of drawing up environmental permit applications, which was developed by Finavia in 2005, has proved highly effective. Experts and consultants in the Group administration – in collaboration with airport managers, air traffic controllers and environmental officers – prepare those aspects of the application for which confirmation is sought. The material produced is brought together in a description of lo-

#### PRIMARY ENVIRONMENTAL ASPECTS IN RUNNING AN AIRPORT:

- Finavia manages **skid prevention on runways**
- Ground handling firms carry out **de-icing and ice prevention on aircraft**
- **Aviation** is carried out by airlines or private and defence force operators

We nowadays use more environmentally friendly anti-skid agents on runways than we used to but they still burden water systems. Non-toxic glycol solutions are used in ice prevention, which consume oxygen in surface and ground waters. Aircraft traffic causes noise and exhaust emissions.

cal natural conditions and land use, and the result is a coherent and readable document. Detailed appendices and study reports are compiled in a supplementary file. The local area data system, for which development work began the previous year, has made data collection more efficient. The authorities have found the content and form of these applications to be appropriate.

#### Closer Cooperation With Environmental Officials

By the end of the year under review, applications for six airports were still pending under the new environmental permit procedures which came into force following legislation in 2000. In spring 2006 the North Finland environmental permit authority requested Oulu Airport to apply for a permit. The airport is situated on a water table so the authorities paid attention to the effects of ice prevention and runway anti-skid measures and the possibilities of reducing such effects. Residents' complaints mostly related to the organisation of defence force flights at Oulu. The permit decision is expected during 2007.

Finavia responded to statements and complaints regarding an application for Turku Airport. An environmental permit for Kuopio Airport's operations was applied for from the Eastern Finland environmental licensing authority. The application was drawn up in collaboration with the Karelia Air Command since some of the material concerns military aviation.

The Ahvenanmaa environmental board issued a decision concerning Maarianhamina Airport which was in line with its own provincial legislation on the subject. Finavia has applied for alterations to the decision because of certain formalities.

During the review year the Lapland environmental centre declared that environmental applications should be made for



complaints from residents living in that landing sector.

### **New Methods For Assessing Aircraft Noise**

During the year under review Finavia worked on introducing a new computer program for calculating aircraft noise. A special focus of development was the GEMS system at Helsinki-Vantaa Airport, which monitors aircraft routes and the noise generated, so that it is easier to produce source data for annual noise inspections. The development work also helps us in drawing

up reports required under the environmental noise directive.

### **Air Traffic Infrastructure is Efficient**

Along with other transport infrastructure organisations, Finavia participated in a study between 2004 and 2006 which assessed the consumption of natural resources by Finnish transport – and also, for the first time, infrastructure construction and maintenance. Road and rail network construction consumes large amounts of non-renewable natural resources, contrary to the air traffic infrastructure, which in this regard is highly efficient. The research reports have been published by the Ministry of the Environment and the Ministry of Transport and Communications.

### **Emissions Trading For Airlines by 2011?**

In December the EU commission issued a draft directive which would gradually bring airlines into the emissions trading system from 2011. Emissions trading does not directly concern Finavia but it will affect its clients' operations. Finavia supports the Ministry of Transport and Communications in preparations for this matter and for its own part keeps track of atmosphere related issues. The Ministry and the leading aviation operators in Finland have compiled an internet information pack concerning aircraft emissions and their effect on the atmosphere. The web address is:

**[www.lentoliikennejailmasto.fi/frontpage](http://www.lentoliikennejailmasto.fi/frontpage)**

*Vantaa, March 30, 2007*

*Samuli Haapasalo, President and CEO*

*Mikko Viinikainen, Assistant Director, Environment*

the five airports in its area by June 2010 at the latest. The Western Finland environment centre inspected Kauhava and Vaasa airports in order to assess the need for environmental applications, but so far no decision on such necessity has been made.

### **Wide-bodied Planes A Rare Sight**

The major airlines decided on their fleet renewals during the review year. In the last decade most of the jet aircraft flown in Finland have been SAS Group or Finnair Oyj DC-9s or MD-80s. Finnair stopped flying MD-80s under its livery in August 2006, replacing them with less noisy Airbus 320 planes and Embraer 170s and 190s.

Finnair Oyj's prominent marketing of its developments in long haul traffic raised questions about the number of operations by wide bodied aeroplanes at Helsinki-Vantaa Airport. In practice, however, the journeys made by wide bodied aircraft are so long that they visit Finland to turn round only once a day. Although airlines are expanding their wide bodied fleets, these planes will not be significantly more evident in traffic. There is a knock-on effect, however, in that feeder and onward flights by narrow-bodied planes will increase.

### **Exceptional Summer At Helsinki-Vantaa**

A complete overhaul of the apron at Helsinki-Vantaa began in the summer of 2006, which will continue this summer. Runway utilisation changed between May and October when the primary landing direction from the north was not available. Weather conditions in August were exceptional, with record high temperatures coinciding with prevailing easterly air streams. Because of the wind an unusually high number of landings was made from the west, which resulted in noise

### Airport and Aviation Environmental Data

The appended figures and tables illustrate the amounts of anti-skid and anti-icing agents used at each airport as well accumulated waste and energy and water consumption. The trends in these areas in recent years are also described and explained. Airport traffic volumes and exhaust emissions from aircraft operating at these airports also appear in the tables. Emissions are also shown for Finavia ground equipment. Finavia's calculations of aircraft exhaust emissions in Finnish airspace are published through the LIPASTO system. See <http://lipasto.vtt.fi/>



**Table 1.** Aircraft landings at Finavia airports in 2006 and changes from the previous year.

Airport	2006				Change from previous year (%)			
	Commercial Aviation	General Aviation	Military Aviation	Total	Commercial Aviation	General Aviation	Military Aviation	Total
Enontekiö	59	4	0	63	7	-20	0	5
Halli	2	586	1 438	2 026	-60	-3	-23	-18
Helsinki-Malmi	13	46 077	78	46 168	-43	-2	-24	-2
Helsinki-Vantaa	87 853	2 183	1 021	91 057	5	6	3	5
Ivalo	819	201	59	1 079	-2	-38	-46	-15
Joensuu	1 596	1 406	19	3 021	-2	-11	-56	-7
Jyväskylä	2 394	6 730	6 456	15 580	-1	16	91	34
Kajaani	878	133	14	1 025	-8	-15	-39	-10
Kauhava	1	1 327	5 548	6 876	-92	-59	-7	-25
Kemi-Tornio	1 147	522	4	1 673	12	63	-33	24
Kittilä	1 126	213	232	1 571	0	22	-12	0
Kruunupyö	1 780	1 794	114	3 688	-1	-14	-47	-10
Kuopio	3 146	3 097	4 100	10 343	3	-24	-20	-16
Kuusamo	666	135	28	829	1	-18	40	-2
Lappeenranta	1 532	1 121	106	2 759	0	-38	-30	-21
Mariehamn	3 085	827	0	3 912	36	-23	0	17
Oulu	6 304	3 654	1 088	11 046	-3	-15	-1	-7
Pori	1 824	9 205	27	11 056	-2	7	-46	5
Rovaniemi	2 668	2 291	4 099	9 058	10	-11	-16	-8
Savonlinna	758	168	6	932	1	8	20	2
Tampere-Pirkkala	5 215	8 800	4 320	18 335	-10	7	-24	-7
Turku	5 679	9 832	358	15 869	-6	7	-1	2
Utti	12	1 372	1 653	3 037	9	-36	-29	-32
Vaasa	4 866	2 582	51	7 499	-7	-32	-69	-18
Varkaus	584	65	6	655	0	-36	-82	-9
<b>Total</b>	<b>134 007</b>	<b>104 325</b>	<b>30 825</b>	<b>269 157</b>	<b>3</b>	<b>-5</b>	<b>-6</b>	<b>-1</b>



**Table 2.** Usage of airside anti-skid agents and aircraft ice prevention agents plus accumulated waste at airports in 2006. Finavia uses anti-skid agents while aircraft anti-icing agents are applied by the airlines or ground service firms working for them. The waste volumes also include refuse received under contract by Finavia from other operators at these airports.

Airport	Anti-skid and anti-icing chemicals (winter season 2005–2006)					Energy and water consumption (2006)			Waste volumes (2006)		
	Urea t	Acetate 100% t	Formiate 100% t	Betaine 100% t	Glycol, factory solution m <sup>3</sup>	Electricity MWh	Heat MWh	Water m <sup>3</sup>	Unsorted waste t	Recyclable waste t	Hazardous waste t
Enontekiö	0	0	4	0	24	0*	1 001	188	4	13	5.9
Halli	0	17	13	0	0	35	218	64	3	15	1.9
Helsinki-Malmi	0	0	12	0	0	1 055	2 468	2 606	39	16	2.5
Helsinki-Vantaa	0	295	1 268	0	4 297	51 934	30 467	104 128	893	1 143	12.0
Ivalo	0	28	0	0	52	1 014	1 971	3 116	57	112	1.9
Joensuu	0	0	24	0	21	719	1 871	5 383	19	4	2.1
Jyväskylä	2	44	16	0	42	1 359	2 143	3 807	26	23	0.2
Kajaani	0	0	32	0	17	602	1 212	2 445	11	14	0.8
Kauhava	50	5	14	34	0	105	357	236	2	2	0.1
Kemi-Tornio	0	25	4	0	30	625	1 639	1 609	17	134	2.0
Kittilä	0	52	8	0	56	1 442	1 425	2 389	23	2	0.8
Kruunupyy	0	48	2	0	25	541	1 093	1 830	2	34	0.4
Kuopio	0	0	49	0	85	1 952	2 686	6 323	19	26	3.0
Kuusamo	0	0	17	0	68	463	786	431	25	5	2.3
Lappeenranta	0	0	30	0	2	475	897	1 597	6	9	0.7
Mariehamn	0	6	1	0	3	513	953	2 440	31	16	1.6
Oulu	0	0	40	0	181	3 693	3 091	4 934	42	23	24.5
Pori	16	0	28	0	2	568	1 820	1 651	11	4	0.2
Rovaniemi	0	0	26	0	202	4 086	5 752	8 809	144	27	2.1
Savonlinna	0	0	7	0	6	374	371	583	12	9	1.2
Tampere-Pirkkala	12	2	0	67	137	2 020	1 822	4 113	175	43	11.5
Turku	4	104	12	0	111	1 524	1 725	6 097	68	38	1.9
Utti	0	0	21	0	0	65	133	122	1	2	1.8
Vaasa	0	0	55	0	77	1 390	2 262	3 347	10	29	0.4
Varkaus	0	0	6	0	2	463	323	203	9	49	1.5
<b>Total</b>	<b>84</b>	<b>626</b>	<b>1 689</b>	<b>101</b>	<b>5 440</b>	<b>77 018</b>	<b>68 483</b>	<b>168 450</b>	<b>1 649</b>	<b>1 792</b>	<b>83</b>

\* electrical energy consumption is included in heat energy

**Table 3.** Aircraft fuel consumption and emissions below 915 metres (3000 feet) altitude (during so-called LTO cycle), plus fuel consumption and emissions for each airport from Finavia ground equipment during 2006. Aircraft emissions and fuel consumption during the LTO cycle rose in 2006 by 1–6 per cent compared with 2005. The exceptions were nitrous oxides and hydrocarbons which fell by 2–8 per cent. Overall emissions and fuel consumption from Finavia ground equipment rose by an average of 8–9 per cent.

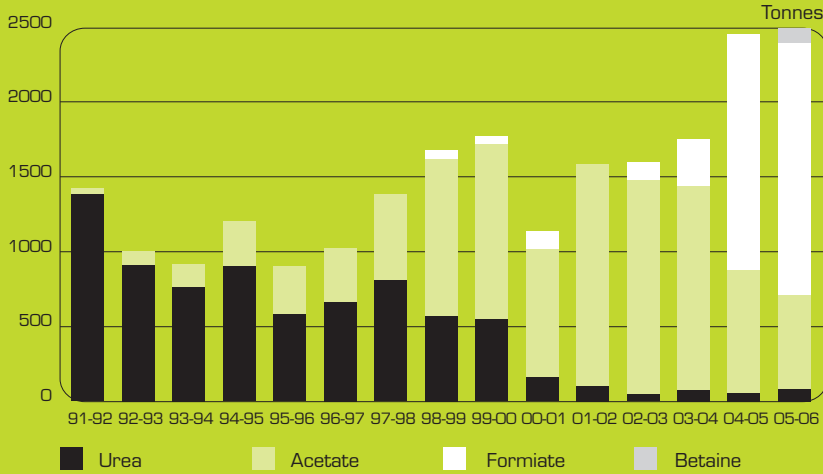
Airport	Aircraft emissions (2006)							Finavia ground equipment emissions (2006)						
	LTO cycle (number)	CO t	HC t	NO <sub>x</sub> t	SO <sub>2</sub> t	CO <sub>2</sub> t	Fuel t	CO t	HC t	NO <sub>x</sub> t	Particulates t	SO <sub>2</sub> t	CO <sub>2</sub> t	Fuel t
Enontekiö	70	1	0.1	0.5	0.0	100	40	0.3	0.1	0.4	0.02	0.001	50	20
Halli	300	3	0.1	0.0	0.0	10	3	0.4	0.1	0.5	0.03	0.001	65	20
Helsinki-Malmi	43 400	330	4.3	0.6	0.1	900	300	0.4	0.1	0.8	0.05	0.001	130	40
Helsinki-Vantaa	88 200	790	80	570	50	161 400	51 600	13.6	4.1	21	1.16	0.030	2 770	880
Ivalo	1 000	10	1.1	7.2	0.6	1 800	600	4.1	0.9	3.0	0.15	0.006	375	120
Joensuu	2 300	12	0.7	5.9	0.6	1 800	600	0.5	0.2	1.0	0.06	0.001	125	40
Jyväskylä	5 200	20	1.1	6.6	0.6	2 000	600	0.8	0.3	1.4	0.08	0.002	180	60
Kajaani	1 000	6	0.7	5.1	0.4	1 400	400	0.4	0.1	0.7	0.04	0.001	90	30
Kauhava	400	2	0.1	0.1	0.0	20	10	0.5	0.1	0.7	0.04	0.001	90	30
Kemi-Tornio	1 700	7	0.6	5	0.4	1 300	400	0.6	0.2	1.1	0.06	0.001	130	40
Kittilä	1 200	10	1.5	11	0.8	2 500	800	0.9	0.4	2.6	0.14	0.003	310	100
Kruunupy	3 400	10	0.5	4.0	0.4	1 200	400	0.4	0.1	1.0	0.05	0.001	120	40
Kuopio	5 300	30	2.7	15	1.4	4 600	1 500	0.7	0.3	2.2	0.12	0.003	260	80
Kuusamo	800	7	0.7	4.7	0.4	1 300	400	0.6	0.2	1.2	0.07	0.002	140	50
Lappeenranta	2 300	10	0.6	1.6	0.2	600	200	0.8	0.2	0.7	0.04	0.001	100	30
Mariehamn	3 300	50	1.1	1.8	0.2	700	200	0.3	0.1	0.3	0.02	0.001	50	15
Oulu	8 900	80	7.4	42	3.8	11 900	3 800	2.0	0.7	4.4	0.24	0.005	510	160
Pori	10 900	60	4.1	3.0	0.3	1 200	400	0.6	0.2	0.9	0.05	0.001	120	40
Rovaniemi	3 800	40	4.1	18	1.6	5 100	1 600	2.3	0.9	5.4	0.31	0.007	720	230
Savonlinna	900	3	0.2	0.7	0.1	300	100	0.5	0.1	0.7	0.04	0.001	90	30
Tampere-Pirkkala	12 600	90	3.0	24	2.2	7 100	2 300	1.1	0.4	2.2	0.12	0.003	280	90
Turku	12 400	110	4.1	17	1.8	5 700	1 800	1.7	0.4	1.8	0.10	0.003	260	80
Utti	800	4	0.1	0.0	0.0	20	6	0.4	0.1	0.3	0.02	0.001	60	20
Vaasa	6 700	30	1.9	11	1.1	3 600	1 200	0.8	0.3	1.4	0.08	0.002	180	56
Varkaus	700	2	0.1	0.4	0.0	200	50	0.2	0.1	0.4	0.02	0.001	50	20
<b>Total</b>	<b>217 500</b>	<b>1 720</b>	<b>130</b>	<b>760</b>	<b>70</b>	<b>216 600</b>	<b>69 200</b>	<b>30</b>	<b>10</b>	<b>60</b>	<b>3.0</b>	<b>0.08</b>	<b>7 240</b>	<b>2 300</b>

Figures have been rounded. Aircraft emissions calculations do not include military aviation, helicopter or glider flights. Aircraft particle emissions are omitted. 1 litre kerosene = 0.800 kg.

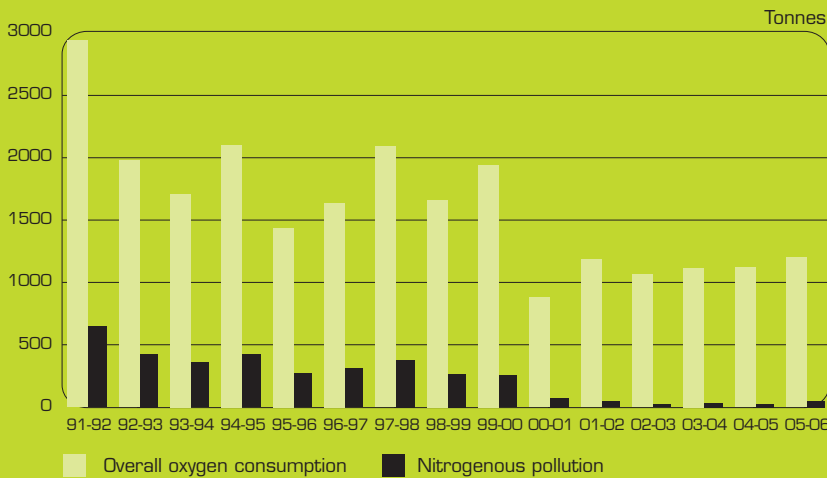
**Table 4.** Consumption of heat, electricity and water at Finavia properties in 2006. The values per passenger do not include Kauhava, Halli, Utti or Malmi airports.

	2006	Change
Heat consumption	68 GWh	-3%
Heat consumption per passenger	4.0 kWh	-10%
Electricity consumption	77 GWh	1%
Electricity consumption per passenger	4.6 kWh	-7%
Water consumption	168 000 m <sup>3</sup>	-4%
Water consumption per passenger	10 l	-10%
Number of passengers	16.4 million	8%

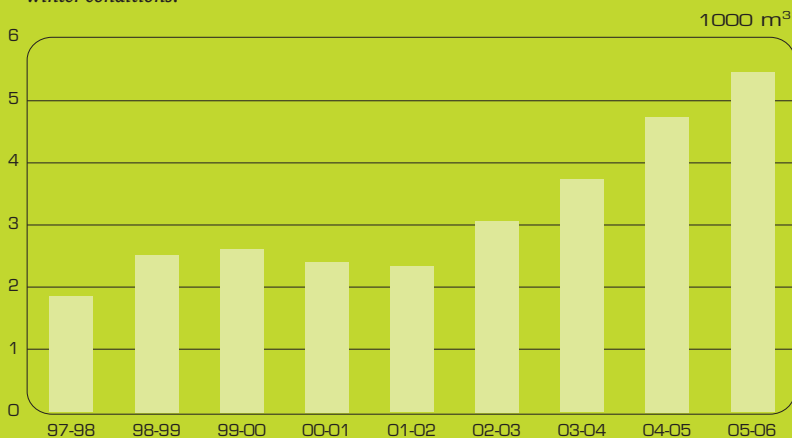
**Fig.1.** Winter season usage of anti-skid agents at Finavia airports for 1991–2006. In calculating the overall volumes the water content (50%) of liquid acetate, formiate and betaine has been deducted. Expanded use of Helsinki-Vantaa's Runway 3 contributed, in conjunction with the weather conditions, to the increased use of anti-skid agents during the past couple of winters. Betaine is a new substance which was used in trials at Tampere-Pirkkala and Kauhava during the winter of 2005–2006.



**Fig.2.** Oxygen consumption and nitrogen burden caused by anti-skid agents for winters 1991–2006. Pollution has declined dramatically in the past ten years with the cessation of urea use. Pollution has remained steady in the past few years despite the increased use of anti-skid agents in the past couple of winters. This is because of the increased use of less polluting liquid formiates.



**Fig.3.** Usage of aircraft de-icing fluids at Finavia airports for winters 1997–2006. The increased volumes are the result of changes in treatment instructions, higher traffic volumes and in part, winter conditions.



**Fig.4.** Breakdown of waste accumulated at Finavia airports during 2006 and 2005, including recyclable and hazardous waste.



**Table 5.** Unsorted, recyclable and hazardous waste collected during 2006 under Finavia's refuse collection system, as well as polluted soil sent for treatment (not included in the total quantity). Table also shows change from previous year. Recyclable waste includes separately collected organic wastes, metals, glass, plastics, recyclable paper and cardboard, waste lubricating oil, used tyres, electrical equipment waste and building materials sent for sorting.

2006	Tonnes	Change
Unsorted waste	1 649	9%
Recyclable waste	1 792	19%
Hazardous waste	83	32%
Total	3 524	14%
Polluted soil	7 242	-57%



## The Civil Aviation Administration adopted the name Finavia in 2006

### FINAVIA

- maintains Finland's airport network and air navigation system
- is a commercial enterprise funded by its customers, which autonomously decides on its own activities, finances and investments
- offers its customers – air passengers, airlines, military aviation and the business community – safe and competitive airport and air navigation services to an internationally high standard
- improves the operational conditions for aviation in accordance with commercial principals
- is a good neighbour

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## Finavia Environmental Organisation

