



**ENVIRONMENTAL REPORT  
2004**

## **ENVIRONMENTAL WORK IN A SENSITIVE NATURAL ENVIRONMENT**

The interaction of air transport and the environment can be significantly enhanced by modern aircraft and technology, high quality environmental management and a corporate culture that respects the environment. Finnair operates amidst the sensitive and unique nature of the North, which requires a quality approach to environmental activity. Finnair, moreover, wishes to be one of Europe's leading airlines in environmental matters.

The milestones of environmental work in 2004 were the decision to acquire a new type of aircraft, the Embraer 170, environmental auditing of the Group's operations, more efficient collection of energy waste, and participation in an air transport MIPS research project (Material Impact Per Service, the use of natural materials in service provision).

### **Engine emissions, flight noise and waste management the key challenges**

A responsible and open environmental policy is a permanent feature of the company's way of doing business. Finnair pays special attention to the most pressing environmental challenges, which are aircraft noise, engine emissions and waste management. These are addressed through investing in an efficient, environmentally sound fleet, developing the effectiveness of the airport environment, training personnel and promoting a highly tuned, value-based environmental philosophy throughout the entire organisation. Partners are required to pay similar attention to environmental matters.

### **Fleet renewal the cornerstone of environmental work**

International air traffic is forecast to grow further in the future. In terms of competitiveness and the environment it is therefore important to operate with a fleet that loads the environment to the minimum possible extent. Finnair has, in financially challenging conditions, systematically continued the long-term, environmentally sound modernisation of its fleet. This is only possible, however, if operational profitability is maintained.

The Airbus A320A series aircraft acquisition programme, which was concluded during 2004, and the decision to invest in Embraer 170 aircraft will have a significant impact on Finnair's environmental work. The modern fleet is more efficient and environmentally sound. The engines of the new Airbus 320 fleet fulfil the future emissions criteria decided upon in autumn 2004, and the aircraft's economic fuel consumption and low carbon dioxide emissions support Finnair's efforts to meet the emissions targets set for air transport.

### **International guidelines and cooperation**

In all its activities Finnair adheres to current environmental legislation and the environmental protection principles of the International Civil Aviation Organisation ICAO. As a member of the International Air Transport Association IATA, the company is also committed to reducing the environmental effects of its operations in an economically reasonable manner without jeopardising air safety. In addition to legislation and international commitments, successful environmental work is based on voluntary action and independent initiative, taking the special features of the local operating environment into account.

## Greenhouse gas emissions and waste management the priorities for 2005

Finnair will also be actively involved in improving the management of air transport greenhouse gas emissions during 2005. Decisions made in order to find a fuel-efficient and suitable fleet for Finnair's route network have proved to be correct from an environmental standpoint. Finnair has been able to keep key figures describing environmental efficiency, such as fuel consumption and carbon dioxide emissions per passenger kilometre, at low levels. Particular attention will be paid to the quality and quantity of waste during 2005. In terms of future material streams, the company will increasingly select products which are recyclable and which load the environment as little as possible. Priority areas include cabin service and technical services.

## FINNAIR FLEET - NOISE VALUES

### Balanced progress basis for noise prevention

The Finnish Civil Aviation Administration is in charge of noise management at Finnish airports. The goal is for the smallest possible number of people to be affected by aircraft noise, and central to reaching this goal is to plan land use close to airports so that as little housing as possible exists in the vicinity of takeoff and approach routes.

For its own part, Finnair is responsible for decreasing the effects of noise by renewing its fleet and optimising its takeoffs and approaches from a noise perspective. The newest members of the Finnair fleet, the Embraer 170s the first of which arrives in September 2005, already meet the stricter noise limits set for the future. The Embraer 170s are 100 seat aircraft especially suited for regional traffic. They have a significantly lower takeoff weight than the MD-80s. This factor together with new engine technology result in a lower noise levels.

Noise certification standards for aircraft are determined by the International Civil Aviation Administration ICAO. Noise measuring points are located beneath the takeoff and landing routes as well as at specific locations on the side of the runway. Noise limits for each measuring point are determined on the basis of the aircraft's maximum takeoff weight.

Aircraft type	Engine type	Noise category	Takeoff noise/ ICAO noise limit	Sideline noise/ ICAO noise limit	Approach noise/ ICAO noise limit
MD-11	GE CF6-80C2D1F	chapter 3	94.7 / 102.3	96.2/1018	104.1 / 105.0
B757-200	P&W 2040	chapter 3	87.3 / 93.7	94.4 / 98.2	98.1 / 101.8
B757-200	P&W 2040	chapter 3	89.7 / 94.1	94.2 / 98.4	98.1 / 102.0
A319-112	CFM56-5B6/2P	chapter 3	83.4 / 90.9	93.0 / 96.4	94.7 / 100.2
A320-214	CFM56-5B4/2P	chapter 3	83.6 / 91.3	94.1 / 96.7	96.0 / 100.4
A320-214	CFM56-5B4/2P	chapter 3	84.9 / 91.6	93.9 / 96.9	96.0 / 100.6
A321-211	CFM56-5B3/2P	chapter 3	86.4 / 92.2	97.9 / 97.2	97.0 / 100.9
A321-211	CFM56-5B3/2P	chapter 3	88.3 / 92.6	97.6 / 97.5	97.0 / 101.1
MD-82	P&W JT8D-219	chapter 3	87.7 / 90.8	97.2 / 96.3	92.9 / 100.1
MD-82	P&W JT8D-219	chapter 3	88.6 / 91.0	97.1 / 96.5	92.9 / 100.2
MD-82/83	P&W JT8D-219	chapter 3	90.8 / 91.4	97.2 / 96.7	93.7 / 100.5
ATR 72	P&W124B	chapter 3	86.5 / 89.0	84.7 / 94.0	94.1 / 98.0

**Table 1.** Finnair's aircraft types, engine types, noise certification classes, noise certification values and ICAO noise certification limits at different measuring points. Values in EPNdB (effective perceived noise). The noise values of the same aircraft type may differ due to different take-off weights.

## AIR TRAFFIC EMISSIONS

### Reduction of greenhouse gas emissions well under way

In 2004 the number of Finnair flight operations decreased because the entire ATR-72 fleet was transferred to Estonian subsidiary Aero. At the same time the number of MD-80 operations decreased as aircraft were transferred to Swedish subsidiary flynordic and other companies. Total fuel consumption went up by one percent in the same year because the Boeing MD-11 fleet grew by one aircraft and its number of operations by 26 percent.

The fleet's eco-efficiency improved significantly in 2004. Despite total fuel consumption and carbon dioxide emissions increasing by one percent, the growth in revenue passenger kilometres (RPK) was as much as 17.1 percent. Thus carbon dioxide emissions in relation to RPKs have come down by 13.8 percent and carbon monoxide emissions by 13.5 percent. The decrease in emissions is for a large part thanks to the departure of DC-9 aircraft from the fleet, the decrease in the number of MD-80 operations and the replacing of these with Airbus 320 flights.

In aircraft engine emissions, figures for nitrogen oxides, unburned hydrocarbons, carbon monoxide and carbon dioxide are reported. Fuel consumption, number of operations as well as performance in revenue passenger kilometres (RPK) and revenue tonne kilometres (RTK) are also reported. Revenue tonne kilometres include the combined mass of passengers, baggage and cargo as well as the distance travelled.

	Number of operations	Nitrogen oxides tonnes	Unburned hydrocarbons tonnes	Carbon monoxide tonnes	Carbon dioxide tonnes	Fuel consumption tonnes	Flight time hours
Year 2002	99 000	6 950	510	3 070	1 690 000	540 000	175 000
Year 2003	94 000	7 100	510	3 620	1 710 000	547 000	176 000
Year 2004	79 000	7 200	500	4 020	1 730 000	552 000	171 000
Change 03/04	-15,7%	1.3%	-3.5%	11.2%	1.0%	1.0%	-3.0%

**Table 2.** Number of flights, engine emissions, fuel consumption and total flight time from 2002 through 2004 including relative change from previous year.

	Million passenger miles	Nitrogen oxides g/RPK	Unburned hydrocarbons g/RPK	Carbon monoxide g/RPK	Carbon Dioxide g/RPK	Fuel consumption g/RPK
Year 2002	11 500	0.61	0.040	0.27	147	47
Year 2003	12 900	0.55	0.033	0.28	133	43
Year 2004	15 000	0.48	0.033	0.27	115	37
Change 03/04	17.1%	-13.5%	-17.6%	-5.0%	-13.8%	-13.8%

  

	Million tonne kilometres	Nitrogen oxides g/RTK	Unburned hydrocarbons g/RTK	Carbon monoxide g/RTK	Carbon dioxide g/RTK	Fuel consumption g/RTK
Year 2002	1 410	5.0	0.36	2.2	1 200	383
Year 2003	1 420	5.0	0.36	2.5	1 200	384
Year 2004	1 680	4.3	0.29	2.4	1 030	324
Change 03/04	18.2%	-14.3%	-18.3%	-5.9%	-14.6%	-14.6%

**Table 3.** Emissions from air traffic compared with revenue passenger kilometres (rpk) and with revenue tonne kilometres (rtk) from 2002 through 2004.

## VOLATILE SOLVENT EMISSIONS

VOC (volatile organic compound) emissions come under an environmental authority permit. Finnair has been able to halve VOC emissions in aircraft maintenance and repair even though business has grown. Emissions have been cut by utilising low-solvent paints, preferring water-based cleaning processes and recycling solvents and using them again. The increase in hydrocarbon emissions in 2004 is explained by the number of new clients at Finnair Technical Services.

	Aliphatic hydro-carbons kg	Aromatic hydro-carbons kg	Ketones kg	Alcohols kg	Halogenated hydrocarbons kg	Misc. solvents kg	Total Year 2004 kg	Total Year 2003 kg	Total Year 2002 kg
Paints						5 000	5 000	3 800	4 600
Paint removers					6 000		6 000	5 000	7 800
Adhesives						400	400	700	800
Solvents		150	1 000	2 050		4 450	7 650	5 500	6 600
Anticorrosion agents	750						750	500	1 900
Cleaning agents						300	300	400	900
Mineral oil solvents	3 050	380					3 430	4 000	4 500
Trichloroethylene					2 050		2 050	1 100	2 200
<b>Total</b>	3 800	530	1 000	2 050	8 050	10 150	25 580	21 000	29 300

**Table 4.** Solvent emissions in the Finnair technical area in 2004 and the respective figures for 2002, 2003 and 2004. The table shows both the type of solvent and the source of emissions.

## GROUND EQUIPMENT FUEL EMISSIONS

**Table 5.** The emissions from Finnair's ground equipment at Helsinki-Vantaa Airport from 2000 through 2004 in tonnes. The carbon dioxide emissions have been calculated directly from fuel consumption on the basis of rates give by fuel suppliers. Finnair has approximately 850 ground equipment vehicles.

Ground support equipment at other domestic stations produced about 4% emissions.

	2004 / tonnes	2003 / tonnes	2002 / tonnes
<b>Carbon dioxide (CO<sub>2</sub>)</b>	4 907	5 090	3 300
<b>Carbon monoxide (CO)</b>	27	29	32
<b>Hydrocarbons (HC)</b>	7.4	7.6	8.4
<b>Nitrogen oxides (NO<sub>x</sub>)</b>	23	23	27

## FINNAIR CATERING AND CABIN SERVICE

Waste from catering and cabin services is managed by Finnair Catering. Aluminium, glass and some plastics are sorted in the cabin. Finnair Catering implements the ISO 14001 environmental management system.

Since 2004 Finnair Catering and cabin services have been paying special attention to the recovery of energy waste and the reduction of the amount of unsorted waste. From 2003, the amount of unsorted waste has plummeted by almost 40 percent. The amount of exploitable waste in proportion to the total amount of waste has increased from 31 to 48 percent.

	<b>Total 2004 tonnes</b>	<b>Total 2003 tonnes</b>	<b>Total 2002 tonnes</b>
<b>Unsorted Waste</b>	1 198	1 914	1 795
<b>Biodegradable waste</b>	61	51	60
<b>Energy waste</b>	210	186	81
<b>Glass</b>	258	229	219
<b>Cardboard</b>	203	155	159
<b>Paper</b>	305	372	404
<b>Plastic (recyclable)</b>	4	7	11
<b>Aluminium (total)</b>	33	20	11
<b>Metals</b>	15	12	20
<b>Exploitable waste total</b>	1 089	845	973
<b>Total</b>	2 287	2 759	2 767
<b>Exploitability %</b>	47.6	30.6	35.1

**Table 6.** Waste volumes from Finnair cabin services and Finnair Catering by category from 2002 through 2004.

## WASTE FROM AIRCRAFT MAINTENANCE

Finnair Technical Services maintains not only the Finnair fleet but also their customer airlines' aircraft. The target is to keep the sorting and recycling rate of waste at a high level.

A large amount of problem waste is produced in aircraft maintenance. The collection and disposal of this waste is done responsibly by the Technical Services storage organisation. These activities are also controlled by strict environmental authority permits.

<b>Waste</b>	<b>Waste in 2004 tonnes</b>	<b>Waste in 2003 tonnes</b>	<b>Waste in 2002 tonnes</b>
<b>Ultrafiltration concentrate</b>	22.9	13	19
<b>Metallic hydroxide sediment</b>	1.4	1.4	2.0
<b>Cleaning solvent</b>	19.2	32	46
<b>Waste oil</b>	105.7	64	57
<b>Waste adhesives and paint</b>	13.2	34	21
<b>Paint thinner</b>	10	10	10
<b>Other waste solvent</b>	16.4	15	3.0
<b>Items containing heavy metals, such as batteries</b>	18.9	1	18
<b>Dust from plastic blasting equipment</b>	8.0	5.8	4.1
<b>Electronics waste</b>	1.1	0.8	3.4
<b>Scrap metal</b>		58.7	130
<b>Tires</b>		11	21
<b>Cardboard</b>	26.0	30	33
<b>Paper</b>	5.0	70	72
<b>Biodegradable waste from personnel canteens</b>	59.8	38	37
<b>Municipal waste</b>	306.6	260	870

**Table 7.** Waste produced in aircraft repair and maintenance from 2002 through 2004.

## WATER COMSUMPTION

Finnair aims to contribute to the decrease in water consumption by training and giving guidelines to personnel. Wastewater quality is regularly monitored and is controlled by environmental authority permits.

<b>Year</b>	<b>Water consumption (m3/a)</b>
2004	132 000
2003	113 000
2002	116 000

**Table 8.** Water consumption by Finnair facilities at Helsinki-Vantaa Airport from 2002 through 2004

Finnair Technical Services are responsible for approximately 50% of the water consumption described in table 9. The share of Finnair Catering is approximately 30%. Water consumption has been under special focus and has been successfully reduced.

Aircraft de-/anti-icing fluids create a dominant share of the wastewater burden at Finnair. The consumption can be seen from table 12. The quality of wastewater is controlled by samples taken from three different points. In addition, the treatment quality of wastewater containing cadmium is controlled separately.

## GROUND EQUIPMENT FUEL CONSUMPTION

In 2004 the amounts of fuel consumed by ground equipment has come down due to the decrease in the number of flight operations and renewal of the ground equipment itself.

	<b>2004 / litres</b>	<b>2003 / litres</b>	<b>2002 / litres</b>
<b>95E gasoline</b>	79 000	80 000	53 000
<b>Diesel</b>	507 000	537 000	413 000
<b>Heating oil</b>	1 250 000	1 290 000	784 000

**Table 9.** The volumes of liquid fuels used by Finnair's ground support equipment from 2002 through 2004.

## HEATING FACILITIES

Thermal energy consumption at Finnair facilities is greatly affected by the heating of large aircraft hangars in the winter. Opening the doors of the hangars makes a great impact on thermal energy consumption. A significant amount of energy can be saved if several aircraft can be moved in to the hangar at one time. Outside temperature also greatly influences consumption figures.

<b>Year</b>	<b>Consumption of thermal energy in Finnair facilities MWh</b>
2004	92 000
2003	63 000
2002	57 300

**Table 10.** Consumption of thermal energy in Finnair facilities from 2002 through 2004.

## ELECTRICITY CONSUMPTION

Most of modern technology is based on technology that uses electricity. Despite the fact that modern electrical appliances consume less electricity than old ones, the expansion of operations and increase in the use of electrical equipment in aircraft maintenance and facilities can be seen in the figures presenting electricity consumption.

<b>Year</b>	<b>Electrical Energy Consumption at Finnair, MWh</b>
2004	58 200
2003	55 300
2002	54 200

**Table 11.** Electrical energy consumption at Finnair from 2002 through 2004.

## INCOMING MATERIAL FLOWS

Material acquisitions by Finnair Catering as well as purchased equipment, spare parts and metallic materials are not included in the table. The consumption of aircraft fuel is presented in the chapters dealing with engine emissions.

	<b>2004</b>	<b>2003</b>	<b>2002</b>
<b>De-icing fluids</b>	2 905	2 870	2 190
<b>Adhesives and sealants</b>	3.7	2.8	2.9
<b>Paints</b>	9.8	7.1	12
<b>Paint removers</b>	23.6	14	14
<b>Welding filler rods and thermal spray powder</b>	0.6	0.9	0.9
<b>Chemicals for plating and water treatment</b>	2.7	21	16
<b>Anticorrosion agents</b>	1.4	1.5	1.8
<b>Cleaning agents containing solvents</b>	65.7	84	76
<b>Oils and hydraulic fluids</b>	64.8	59	66

**Table 12.** Amounts of environmentally significant raw materials and supplies used by Finnair Technical services from 2002 through 2004.