

*“The airline industry can grow only within the framework of international endeavors to achieve more sustainable environmental development. If we wish to expand, we must therefore continue – in cooperation with aircraft manufacturers and other stakeholders – to develop technology that is both environmentally sound and cost-effective.”*





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Issue of the next Environmental Report is planned for March 1998.  
Terms and abbreviations are explained at the end of this report.

# SAS in Brief

## OPERATIONS

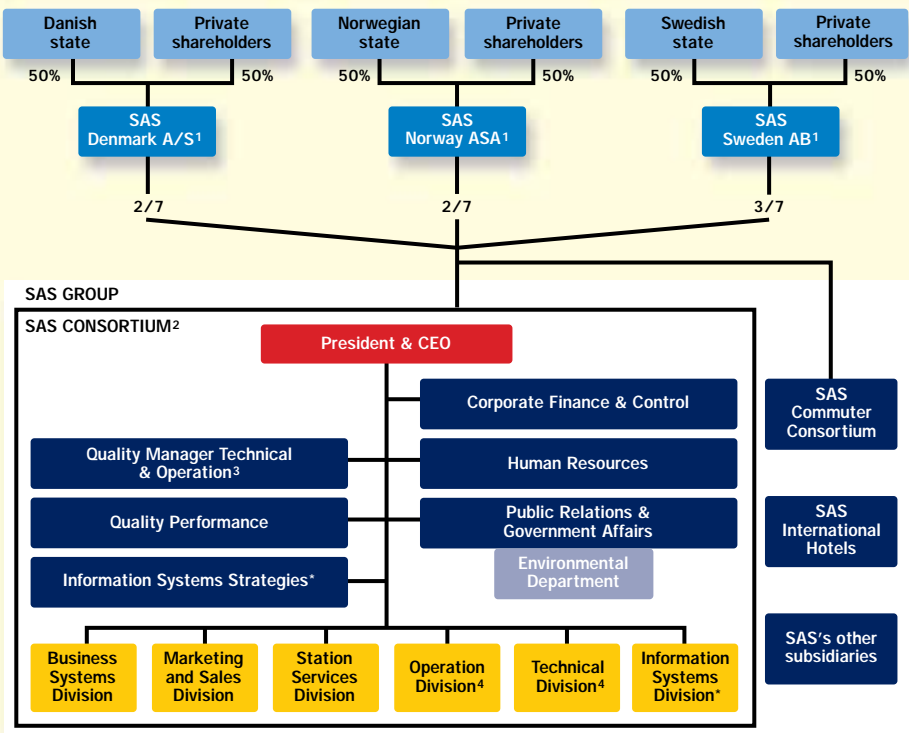
### AREAS OF OPERATIONS

The SAS Group conducts passenger transportation, freight services (SAS Cargo), sale of goods on board aircraft and at airports (SAS Trading), and hotel operations through SAS International Hotels under the SAS Hotels Worldwide trademark. SAS offers Scandinavian air routes at domestic, intra-Scandinavian, European and inter-continental level.

### SCOPE OF OPERATIONS

During 1996 SAS carried 19,828,000 (18,835,000) paying passengers to 104 destinations in Scandinavia and the rest of the world, and SAS Cargo transported 247,000 (206,000) tonnes of freight. The SAS Group's aggregate turnover in 1996 was 35,189 MSEK.

### OWNERSHIP AND ORGANIZATION



\* Joint functions and management.

<sup>1</sup> Listed companies.

<sup>2</sup> The SAS Consortium comprises SAS airline operations and SAS Trading, and is owned by the three national airlines SAS Denmark, SAS Norway and SAS Sweden.

<sup>3</sup> Created in 1997.

<sup>4</sup> In 1996 the Operation Division and Technical Division together formed what was then the Production Division.

The SAS Environmental Report for 1996 includes SAS Consortium and parts of SAS Commuter. However, hotel operations – which conduct their own environmental work (see also p. 4) – are excluded.

## KEY INSTALLATIONS<sup>1</sup>

SAS's main airports are in Copenhagen, Oslo and Stockholm, where the company conducts extensive operations with close to 12,000 employees. The bulk of maintenance work on SAS's aircraft fleet takes place in the company's workshops in Oslo, where there are some 1,000 employees. In addition, SAS has its own staff at 32 line stations in Scandinavia and another 38 in the rest of the world. The head office, with about 1,200 employees, is located in Frösundavik, Stockholm. Altogether, SAS employs more than 21,000 people, of whom approximately 7,500 work in Denmark, 5,600 in Norway and 7,900 in Sweden.

<sup>1</sup>The above figures for average personnel strength in 1996 include SAS Commuter (see also p. 4).

## PRODUCTION AND TRAFFIC<sup>1</sup>

	Available Tonne Kilometers (ATKs)			Revenue Tonne Kilometers (RTKs)			Load Factor	
	[Million Tonne Km]	Change [%]	Share [%]	[Million Tonne Km]	Change [%]	Share [%]	[%]	Change [% points]
1996								
Intercontinental	1,753	26	41	1,268	18	51	77.4	-4.8
Europe	1,339	8	32	626	6	25	46.8	-1.1
Intra-Scandinavian	294	6	7	147	7	6	49.9	0.7
<b>International</b>	<b>3,386</b>	<b>17</b>	<b>80</b>	<b>2,041</b>	<b>13</b>	<b>82</b>	<b>60.2</b>	<b>-1.7</b>
Denmark	95	0	2	49	-2	2	51.9	-1.4
Norway	307	15	7	166	9	7	54.2	-3.0
Sweden	297	6	7	166	-1	7	55.9	-3.9
<b>Domestic</b>	<b>699</b>	<b>9</b>	<b>16</b>	<b>382</b>	<b>3</b>	<b>16</b>	<b>54.6</b>	<b>-3.1</b>
<b>Total (scheduled traffic)</b>	<b>4,085</b>	<b>15</b>	<b>96</b>	<b>2,423</b>	<b>12</b>	<b>98</b>	<b>59.3</b>	<b>-1.9</b>
<b>TOTAL (incl. other prod.)</b>	<b>4,238</b>	<b>15</b>	<b>100</b>	<b>2,479</b>	<b>10</b>	<b>100</b>	<b>58.5</b>	<b>-2.6</b>

<sup>1</sup>Including SAS Commuter (see also p. 4).

## KEY FINANCIAL STATISTICS<sup>1</sup>

	1991	1992	1993	1994	1995	1996
Operating revenue [MSEK]	23,471	24,560	29,723	32,365	33,819	<b>33,480</b>
Income before taxes [MSEK]	1,133	-883	-865	428	2,592	<b>1,744</b>
Investments [MSEK]	4,344	2,731	702	1,256	1,289	<b>4,132</b>
Return on capital employed [%]	12	10	5	7	15	<b>10</b>
Number of employees	21,850	21,890	21,352	20,888	20,384	<b>21,348</b>

<sup>1</sup>Including SAS Commuter (see also p. 4).

## IN THE ENVIRONMENT

### KEY ENVIRONMENTAL STATISTICS

	1994	1995	1996
Environmental index	100	98	<b>100</b>
Proportion of Chapter III aircraft [%]	67	71	<b>81</b>
Fuel efficiency [kg/RPK]	0.058	0.058	<b>0.061</b>
Cabin factor [%]	65.5	65.0	<b>63.6</b>
Emissions of carbon dioxide (CO <sub>2</sub> ) [1,000 tonnes]	3,397	3,528	<b>3,815</b>
Emissions of nitrogen oxides (NO <sub>x</sub> ) [tonnes]	- <sup>1</sup>	13,400	<b>14,400</b>
Packaging in cabin operations [g/passenger]	- <sup>1</sup>	60	<b>59</b>
Newspapers/magazines in cabin operations [g/passenger]	- <sup>1</sup>	222	<b>239</b>
Energy efficiency of plants managed [kWh/m <sup>2</sup> ]	- <sup>1</sup>	458	<b>452</b>
Environment-related charges [MSEK]	approx. 200	approx. 480	<b>approx. 600</b>

<sup>1</sup>Not available.

## THE INS AND OUTS OF OUR OPERATIONS

For the sake of clarity, this environmental balance sheet includes only items with a significant environmental impact.

In	Operations & production	Out	See page
<ul style="list-style-type: none"> <li>● Fuel</li> <li>● Engine oil</li> </ul>	<div style="background-color: black; color: white; padding: 5px; text-align: center;"> <b>FLIGHT</b>                      Number of RPKs (revenue passenger kilometers) 1996: 19,784,000,000                 </div> 	<ul style="list-style-type: none"> <li>● Carbon dioxide (CO<sub>2</sub>)</li> <li>● Water vapor</li> <li>● Nitrogen oxides (NO<sub>x</sub>)</li> <li>● Hydrocarbons (HCs)/VOCs</li> <li>● Noise</li> <li>● Jettisoned fuel</li> </ul>	<ul style="list-style-type: none"> <li>11</li> <li>11</li> <li>11</li> <li>12</li> <li>10, 38</li> <li>14</li> </ul>
<ul style="list-style-type: none"> <li>● Food (catering)</li> <li>● Packaging</li> <li>● Newspapers, magazines</li> <li>● Chlorinated water</li> <li>● Bactericides</li> </ul>	<div style="background-color: black; color: white; padding: 5px; text-align: center;"> <b>CABIN</b>                      Number of passengers 1996: 19,828,000                 </div> 	<ul style="list-style-type: none"> <li>● Organic waste</li> <li>● Aluminum boxes</li> <li>● Paper</li> <li>● Glass</li> <li>● Plastic</li> <li>● Waste water:</li> <li>● Emptying and transport</li> <li>● Disposal</li> <li>● Waste from lavatories:</li> <li>● Emptying and transport</li> <li>● Disposal</li> </ul>	<ul style="list-style-type: none"> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> <li>15</li> </ul>
<ul style="list-style-type: none"> <li>● Glycol (purchasing, storage and consumption)</li> <li>● Urea/acetate</li> <li>● Water</li> <li>● Maintenance chemicals</li> <li>● Halons</li> <li>● CFCs</li> <li>● Spare parts</li> <li>● Energy:                         <ul style="list-style-type: none"> <li>- Lighting, machinery (electricity)</li> <li>- Heating (oil, LPG, electricity)</li> </ul> </li> <li>● Office supplies</li> </ul>	<div style="background-color: black; color: white; padding: 5px; text-align: center;"> <b>GROUND</b>                      Number of takeoffs and landings 1995: 300,000                      Managed installations 1996: 672,005 m<sup>2</sup> </div> 	<ul style="list-style-type: none"> <li>● Glycol (collection)</li> <li>● Urea/acetate</li> <li>● Noise</li> <li>● Heavy metals<sup>1</sup></li> <li>● Oil, oil sludge<sup>1</sup></li> <li>● Sulfur dioxide (SO<sub>2</sub>)</li> <li>● Carbon dioxide (CO<sub>2</sub>)</li> <li>● Nitrogen oxides (NO<sub>x</sub>)</li> <li>● Hydrocarbons (HCs)/VOCs</li> <li>● Halons</li> <li>● CFC</li> <li>● Waste</li> <li>● Special waste</li> <li>● Office waste</li> </ul>	<ul style="list-style-type: none"> <li>21</li> <li>17</li> <li>18</li> <li>19</li> <li>17</li> <li>17</li> <li>17</li> <li>17</li> <li>18</li> <li>18</li> <li>20</li> <li>19</li> <li>19</li> </ul>
<ul style="list-style-type: none"> <li>● Fuel (diesel, gasoline)</li> <li>● Oil</li> <li>● Electricity</li> </ul>	<div style="background-color: black; color: white; padding: 5px; text-align: center;"> <b>GROUND VEHICLES</b>                      Number of ground vehicles 1996: 1,721                 </div> 	<ul style="list-style-type: none"> <li>● Carbon dioxide (CO<sub>2</sub>)</li> <li>● Nitrogen oxides (NO<sub>x</sub>)</li> <li>● Hydrocarbons (HCs)/VOCs</li> <li>● Noise</li> <li>● Special waste</li> </ul>	<ul style="list-style-type: none"> <li>19</li> </ul>

● SAS's responsibility.  
 ● Airport operator's responsibility.

<sup>1</sup> SAS's concession.  
<sup>2</sup> Applies to Copenhagen, Oslo and Stockholm.

# An Amplified Environmental Report

SAS's current environmental strategy, adopted by SAS's executive management with unanimous support from the Board, expresses our wholehearted commitment to the task of promoting the environmental performance of the Group's operations.

Our commitments in the environmental strategy include issuing an account of our environmental work every year, in the form of a special Environmental Report. This year's Report contains e.g. details of our ongoing replacement of old Chapter II aircraft by the new Chapter III generation with lower noise levels. This replacement is to be concluded by the year 2000. We passed a landmark in our development when, on October 16, we took delivery of the first MD-90 from McDonnell Douglas. Among present-day large passenger aircraft, this is one with the very best environmental characteristics, especially regarding noise. On pages 38-39 of this Report, you can read about what makes the MD-90 the world's least noisy jet airplane in its class.

In the cabin operations, too, we have taken a major stride forward in environmental work. Here, 50 subprojects aimed at effecting environmental improvements were initiated during the year; together, these have both reduced environmental impact and improved economy. On page 35 you can read more about this solid achievement in our cabin work.

In ground operations, efforts continued to reduce waste volumes and step up sorting at source. We also implemented a large-scale inventory of the roughly 250 items of real estate owned by SAS, and from this year we can therefore also report environmental data on these with more reliability than last year.

Among the gratifying events of 1996, we also count the positive reception of last year's Environmental Report among various interest groups. Since it was SAS's first ever, we had devoted much energy to finding out which environmental facts the market wanted us to report, and to creating routines for reliable collection of these data. It

was therefore a welcome reward for our efforts when SAS's Environmental Report for 1995 was nominated the year's best in both Norway and Sweden – two prestigious awards that should be seen as a high-level acknowledgment and powerful encouragement to all staff members who helped in the considerable work involved.

This year, I hope it is already noticeable that these nominations have inspired us in our endeavor to attain even higher quality. In their statements, the juries for the two awards confirmed that we are on the right track in our ambition of openly informing others about SAS's environmental impact as objectively as we can, and also clarifying as far as possible the effects of environmental work on the company's financial results. During the year, we engaged in a more in-depth dialog with the market on which environmental data it wishes us to report and in what manner, and we have continued to develop our routines for data collection. Our goal is, by the time of the next Environmental Report – that for 1997 – to have attained a quality level that corresponds to international requirements and can be verified by an external auditor.

In developing the content further, we have benefited greatly from the specific wishes and views we obtained from various interest groups – especially the more than 200 reply cards sent in by readers of last year's Annual Report. Examples of new features and major changes this year are:

- Development of the quantitative summary of the Group's environmental impact, "Whole of SAS" (pp. 8-9).
- An environmental index with more complete data, which thus reflects SAS's true environmental impact more accurately than last year's first attempt (p. 8).
- Additional information on the connections between SAS's environmental work and its economic effects (p. 9).
- More – and more reliable – key statistics on cabin and ground operations (pp. 15-16 and 17-24).
- Compilation of a complete computer register of all SAS's

real estate, which raises the quality of all key statistics relating to floor space managed by us.

Like last year, we describe part of the background to SAS's and the airline industry's environmental work, to enable it to be set in a broader context more easily. On page 27 one of Sweden's international authorities in his field reports on the recent development of life-cycle assessment, a method based on a comprehensive view of environmental work that is currently being adopted by more and more companies. Page 29 contains a description of

**SAS'S ENVIRONMENTAL STRATEGY**

**Goals**

- Within the framework of SAS's financial and qualitative goals, all operations must be conducted in such a way as to cause the least possible environmental impact.
- SAS must develop into one of the airline industry's leading companies in the environmental sphere.

**Strategies**

- Environmental work must be conducted at all levels and within all units of SAS, thus creating increased environmental awareness throughout the organization.
- Environmental aspects must be included in all documentation for decision-making.
- SAS must utilize and introduce the methods that minimise the environmental impact of production, characterized by low energy use, maximal recycling potential and minimal emissions.
- SAS must issue an account of its environmental work in a separate annual report.
- SAS must promote understanding among external associates of the role and environmental impact of air transportation.

*Originally adopted by the SAS Management Team June 1995 and thereafter revised annually according to plan. SAS's Board has studied the environmental strategy in considering this Environmental Report in March 1997.*

how, in various national and international forums, SAS pursues issues concerning the framework of aviation that are crucial to our continued development.

Nonetheless, the Environmental Report is only one part of SAS's overall environmental work; although we shall continue to improve it year on year, our actual environmental work should, of course, be the focus of our efforts. This forms a natural part of SAS's general quality work, conducted according to the Total Quality Management (TQM) model. For more details about TQM and how we use the model to attain our explicit goal of creating one of the industry's leading environmental programs, see page 41.

Increasingly often, I see specific examples of the importance of environmental work for SAS's business operations and results. In the stock issue in SAS Denmark (ex-DDL) associated with the 1996 change in Group ownership, Den Danske Bank stipulated that, in order for it to guarantee the issue, the prospectus would have to cover environmental issues as well. And in the Norwegian state's current procurement of air transportation services – a deal worth several hundred million Norwegian kroner – environmental information was an essential prerequisite for submitting a tender. These are only two examples, but they alone

suffice to provide ample justification for the status of environmental issues at strategic level in SAS. In the day-to-day work we all do there are other examples, and to date the great majority of environmental measures taken have proved to exert a direct impact on results – in the form of either boosted earnings, when environmental arguments have helped us to compete for customers, or cost savings (see e.g. the project reports on pages 14, 16 and 23).

Customers and the finance market are but two of the target groups for this Report. The mass media, which play a key part in monitoring the environmental work carried out by business and industry, should be able to glean relevant data easily here. Authorities and decision-makers in the environmental sphere are another important target group; so, too, are SAS employees, who need factual feedback on their environmental inputs.

Our efforts to provide environmental information are prompted partly by our view that not only SAS but the entire airline industry today have an environmental image worse than that actually reflected in current environmental data. Our business is, of course, a major energy user and environmental impacter – as all transportation business is, and will remain for the foreseeable future. But a great deal has happened in aviation over the past decade to make our mode of transportation a competitive alternative from the environmental viewpoint as well. By combining SAS's general objective – that of developing profitably by delivering, in free competition, the benefits from air transportation that society demands – with optimal resource utilization and minimal environmental impact, we seek to assume our responsibility in society's joint endeavor to attain sustainable development.

I personally would appreciate it if you cared to comment on our environmental work and this Report, e.g. using the reply card on the last page.



*Jan Stenberg  
President and  
Chief Executive Officer*

# SAS and the Environment in 1996

This year's environmental data include – besides the SAS Consortium – the portion of SAS Commuter's operations involving ground services and technical maintenance. Accordingly, this report includes all the essential parts of SAS's operations except the hotel business, which conducts its own environmental work. The figures for comparison from previous years have been adjusted to take into account the difference in scale compared with the 1995 report, where environmental data were lacking for certain minor parts of SAS's operations on SAS Commuter's behalf. Otherwise, SAS Commuter's environmental impact has not been included in the description of the SAS Consortium's system of environmental management, since as a self-contained consortium in the SAS Group it has independent legal environmental responsibility and conduct its own environmental work.

In the jointly owned companies where SAS is represented on the board (e.g. SAS International Hotels), SAS's directives to its board for each company's environmental efforts to be conducted and documented in accordance with SAS's environmental approach and strategy.

SAS's board approved the present Environmental Report in March 1997.

## FLIGHT OPERATIONS

It is in the flight operations that by far the greater part of SAS's environmental impact arises. For example, these operations alone account for 95% of SAS's total emissions into air. It is therefore natural for SAS to devote extensive environmental efforts here, in particular. The essential environmental factors in flight operations are consumption of nonrenewable fuel, emissions of carbon dioxide and nitrogen oxides, and generation of noise.

With the continuing expansion in operations, SAS's total fuel consumption rose in 1996 by 8.6% to 1,533,200 (1,411,400) m<sup>3</sup> of fuel. In terms of the number of passengers transported and distance flown, SAS's fuel efficiency dete-

riorated slightly to 6.1 (5.8) kg/100 RPK, corresponding to 7.32 (6.94) l/100 RPK. This deterioration has two causes. First, there is the fact that the 1996 figures include SAS's new freight jumbo, which boosts the figure for fuel consumption by some 3,000 m<sup>3</sup> but adds no passenger-kilometers to divide it by. Secondly, the cabin factor declined slightly, to 64% (65%). SAS's environmental index, which weights together factors from the whole of SAS's operations, including freight operations, nonetheless showed an upward trend. By way of comparison it may be mentioned that SAS's partner Lufthansa, with an aircraft fleet that is roughly half as old as SAS's, consumed 4.2 kg/100 RPK in the 1995/96 financial year, corresponding to 5.3 l/100 RPK.

SAS's fuel consumption and distance flown in 1996 correspond to emissions of 3.8 (3.5) Mtonnes of carbon dioxide, 14,350 (13,400) tonnes of nitrogen oxides and 3,590 (3,400) tonnes of hydrocarbons. These volumes make up 2-3% of total emissions in the Scandinavian countries. The corresponding figures for Lufthansa during the 1995/96 financial year were 9.65 Mtonnes of carbon dioxide, 33,800 tonnes of nitrogen oxides and 1,700 tonnes of hydrocarbons.

Noise levels fell with the introduction of the new MD-90 aircraft in the fleet and continued hushkitting of the DC-9s. The proportion of Chapter II aircraft in the SAS fleet fell over the year, from 29% to 19% (the corresponding figure for Lufthansa is 8%). SAS's target is to operate only Chapter III aircraft from winter 1999/2000. This will boost profitability and increase flexibility in the deployment of the SAS fleet, since the majority of the airports used by SAS already apply some form of noise restrictions and/or charges.

SAS's new MD-90-30 from McDonnell Douglas is among the aircraft that can show the best environmental characteristics in its class (141 seats in the SAS version). The noise values lie 9 EPNdB below the level required for Chapter III aircraft, and fuel consumption is 30% lower than the DC-9s that the new airplane is to replace, which also means 30% less carbon dioxide emitted. In October 1996 the first



aircraft was put into service, and during the year a total of six of the eight planes ordered were delivered (delivery of the other two is planned for 1997) – altogether, an investment of some 3,000 MSEK. SAS was, accordingly, the first European carrier to take this aircraft model into service, and will use it for flights in Scandinavia and on densely plied routes in Europe. The phase-in of the eight MD-90s into SAS's aircraft fleet also involves a reduction in the fleet's carbon dioxide emissions per ASK.

During the year, the hushkitting of SAS's DC-9s, type 41, proceeded according to plan. By year-end 1996, 16 of SAS's 28 DC-9s had been equipped to meet the Chapter III noise limits, qualifying them to continue flying after April 1, 2002 when the EU's total ban on use of Chapter II aircraft comes into force. The hushkitting program, representing an overall investment of 400 MSEK (of which 335 MSEK in 1996), will be completed during the second half of 1997.

The decision was taken during the year to supplement the Fokker F-28s in SAS's aircraft fleet on flights to Finland and Swedish domestic routes. For this purpose four Saab 2000s, accommodating 47 passengers, have been hired and will be put into service, starting with two airplanes in February 1997. The Saab 2000 is a new turboprop aircraft with flight performance like that of a jet aircraft and will, thanks to its high cruising velocity, be used on the same timetable as the Fokker planes. The Saab 2000 has excellent noise characteristics, with certification values exceeding present-day requirements by more than 10 EPNdB. The 85 dB(A) noise footprint measures only 0.33 km<sup>2</sup> for

takeoffs – one-eighth of the area of Landvetter Airport in Gothenburg, for example. The Saab 2000 is expected to consume 5.1 l of fuel per 100 ASK, which is just over 20% less than the Fokker F-28 and involves a corresponding reduction in carbon dioxide emissions.

CABIN OPERATIONS

Although the cabin operations, broadly speaking, are less significant in terms of SAS's overall environmental impact than the flight operations, they are the aspect of operations that have the most obvious interface with our customers, and SAS's cabin staff also perceive them as highly important. In 1996, SAS therefore devoted substantial resources to environmental resources in this area as well.

The primary environmental factor in cabin operations is waste, in the form of paper, aluminum, glass, plastic and organic matter. During 1996, 50 subprojects were initiated in the cabin operations with the dual aim of reducing environmental impact and improving economy. Close cooperation was initiated with SAS's suppliers with the aim of integrating environmental criteria in all contracts, as laid down in SAS's purchasing policy. Simultaneously, packaging used in on-board catering was modified along environmentally sound lines and sorting at source was increased. For example, catering in the form of gate buffets was introduced on several Swedish domestic routes and between Oslo and Stockholm, and disposable materials were replaced by reusable ones in catering on Norwegian domestic flights.

Smoking is prohibited on all SAS's flights on Nordic,

WHAT HAPPENED IN 1996? Priority areas	Progress in 1996
Trend toward an aircraft fleet with less environmental impact, through replacement and modifications of older aircraft.	Delivery of SAS's first six of a total of eight MD-90s ordered from McDonnell Douglas (among the aircraft with the best environmental data in its class), continued hushkitting of SAS's DC-9s, and preliminary studies before upcoming major purchases of new aircraft.
Environmental measures in cabin operations, e.g. reduction in waste volumes and stepped-up sorting at source.	Commencement of extensive action plan with 50 subprojects for environmental improvement, incl. tightening-up of environmental requirements for suppliers, waste reduction and pilot projects with gate buffets on short routes and sorting at source in the cabin.
Environmental measures in ground operations, e.g. reduction in waste volumes and further improvements in waste disposal.	Evaluation of aggregate material use, stepped-up sorting at source, improved separation of special waste, tightening-up of environmental requirements for suppliers of waste management through renegotiated agreements, and enhanced reliability of environmental data collected.
Environmental modification of construction projects in which SAS is taking part.	Development of environmental control in the construction of more than 475,000 m <sup>2</sup> of premises in Scandinavia altogether.
Intensified provision of information and internal training on the environment.	Further training in environmental matters of managers and key personnel, and increased scope for environmental issues in SAS Internal Information.
Commitment to develop the environmental framework of aviation by participating in central industrywide, national and international forums.	Assistance in ICAO's, IATA's and AEA's aviation environment work, in the Swedish Civil Aviation Administration's working groups to develop a new system of environmental charges and systems for fair environmental comparisons in the transportation sector, and also in SAS's own Environmental Partners' Forum which is discussing e.g. development of industrywide key environmental statistics.
Work on improving SAS's environmental image so that it corresponds to actual environmental data.	Participation in several environmental trade fairs and environmental seminars, production of advertisements with environmental themes, sponsoring of environmental projects (support for the Clean up Sweden campaign, corporate friend of the World Wide Fund for Nature) and good coverage of awards received for the 1995 Environmental Report.
Further development of environmental reporting in line with external requirements.	Development of the specific links between environmental work and its economic consequences, continued work on harmonization and supplementary data collection.

N. and W. European routes. In the next two years SAS will evaluate a possible smoking ban on longhaul flights as well, starting with N. America, E. and S. European destinations.

#### GROUND OPERATIONS

Ground operations, too, are less important than flight operations in terms of SAS's overall environmental impact, but they are highly significant for local residents and in terms of the work environment for SAS's employees. In this area, too, environmental issues were therefore given high priority in 1996.

The main environmental factors in ground operations are emissions of carbon dioxide, nitrogen oxides and hydrocarbons from the large number of vehicles used by SAS for transportation within, as well as to and from, airports and their consumption of nonrenewable fuel. Other essential environmental factors in ground operations are consumption of glycol for aircraft deicing; special waste and chemical consumption in the service workshops; emissions of SO<sub>2</sub>, CO<sub>2</sub> and NO<sub>x</sub> from the heating plants; water consumption, energy use and office waste.

Although SAS's production (ATKs) increased by 15%, consumption of diesel in the ground vehicles used in the airport areas (some 1,720 altogether) decreased by 8%, and that of gasoline by 18%. Overall, then, fuel efficiency on the ground was greatly improved.

In Stockholm, work commenced on evaluating the scope for replacing the diesel fuel – or mixing it with biological fuels (rapeseed oil) – in all SAS's ground vehicles in Scandinavia. It should be possible to evaluate these attempts during 1997.

Last year, it was already evident that the vehicle fleets in SAS's own airport bus operations in Copenhagen and Oslo had attained an environmental standard well on a par with specialist bus companies. During 1996 the phase-out of older vehicles in favor of those with a less harmful environmental impact continued. At the end of the financial year, SAS owned a total of 35 buses, of which over half are now equipped according to the EU's most stringent requirements. These account for more than two-thirds of the total distance covered by the bus fleet.

In 1996, total waste volume decreased to 3,339 (4,465) tonnes. The reason was an evaluation of aggregate material use and increased sorting at source of paper and cardboard, in particular.

At Bergen Airport in Norway, the Civil Aviation Administration has a concession for glycol emission in conjunction with deicing of aircraft. During 1996 SAS exceeded its allotted portion, and measures were instigated to remedy the problem. Otherwise, SAS kept within current concessions. Following the report from the municipality of Sigtuna in Sweden submitted in 1995, concerning a suspected breach of a permit relating to emissions of water-based solvents, the Public Prosecution Authority resolved

after a police investigation in 1996 to take no further action on the matter.

During the year, use of Halons as a fire-extinguishing agent in Stockholm was discontinued and 2,813 kg was transferred to fire-suppression systems on board in Copenhagen. The drain at Hangar 1 at Stockholm Arlanda was reconstructed, with an oil separator and computerized environmental alarm system.

During the year, SAS took part in extensive projects, mainly at Oslo's new airport Gardermoen, where SAS is erecting its own premises measuring more than 80,000 m<sup>2</sup>, and in the extension of Copenhagen Airport. During the construction work at Gardermoen, SAS and Oslo Lufthavn are collaborating in preparing for environmental incidents, if any. In conjunction with the construction work for SAS's new freight terminal on land owned by Copenhagen Airport, previous pollution with oil and solvent and a grenade from the second world war were discovered. SAS and the airport operator, KLH A/S, immediately embarked on a remediation of this contaminated site. By year-end 1996, only a little work remained to be done. The division of costs of this cleanup operation (totaling approx. 16 MSEK) is the subject of discussions between SAS and the airport operator.

The remediation in Copenhagen – started in 1995 – of an area contaminated with heavy metals owing to deposition of discarded wheel parts (cost: 2 MSEK) was completed in 1996.

Besides the above, no environmentally related disputes connected with SAS's operations are under way. SAS's assessment, based on a review of historical data on SAS's real estate, is that no land owned by the company should be regarded as contaminated in terms of the limits imposed by national health and environmental conservation authorities.

SAS's insurance covers the company's liability for environmental impact in the event of accidents and sudden occurrences. SAS is prepared – either under its own aegis or in cooperation with the airport operator – for crashes, accidents and incidents resulting in contamination. On a rota basis, SAS carries out preventive maintenance of tanks, containers, pipes, etc in order to reduce pollution risks.

In 1996, SAS's energy use was 452 (458) kWh/m<sup>2</sup> in ground operations. Most of the heat for SAS's premises is produced in district (Copenhagen) and geothermal (Stockholm head office) heating plants, and a minor share comes from purchased electricity. Since altered conditions in the energy market have made it more profitable to utilize oil than electricity for heat production, however, the proportion of heat produced in SAS's own oil and LPG facilities (Oslo and Stockholm Arlanda) increased. Emissions of sulfur dioxide, carbon dioxide and nitrogen dioxides therefore doubled.

SAS's water consumption fell by 7.6%. This figure includes a fall of some 30% in water consumption at the Oslo maintenance bases, which had previously been high.

During 1996 a comprehensive inventory of all real estate owned by SAS was carried out. The ensuing data were entered in a newly established database. As of this year's Environmental Report we can therefore, with high precision, relate various categories of consumption to the area managed. SAS's assessment is that the real-estate stock is not burdened with any environmental debt. This also applies to the part of the stock acquired by SAS in conjunction with the parent companies' harmonization in 1996.

#### OTHER ENVIRONMENTAL EFFORTS

Environmental efforts in SAS form a natural part of our overall work on Total Quality Management (TQM). During 1996, work continued according to the three-year plan adopted by the SAS Management Team in 1995 (see p. 42).

In cooperation with some of our partners – Lufthansa, THAI, United Airlines, Air Canada and Varig – SAS has created a forum for joint issues and strategies in the environmental sphere. South African Airways is also a member. In 1996 the group's first meeting was held, at which work began on developing joint key environmental statistics and listing other feasible joint environmental projects.

In accordance with SAS's environmental strategy (see p. 3), SAS worked actively on its environmental profile during the year. The 1995 Environmental Report, which was SAS's first, was presented in April at a press conference in connection with the Swedish environmental trade fair in Sollentuna, and a total of 90,000 copies were distributed in 1996, in the seat pockets on board SAS's flights in May and by other means. The Report was very well received; in September it was awarded the prize for "Best Environmental Report" in Norway by a jury comprising environmental authorities, employers' and employees' organizations, chartered accountants and financial analysts, and in October it received Företagsekonomiska Institutet's and the publication Affärsvärlden's prize for "Best Environmental Report of the Year" in Sweden.

The Environmental Report also served as an important internal information channel. Further environmental information for SAS's staff was conveyed in editorials in the inflight magazine Scanorama, articles in SAS's staff magazine Inside and a theme issue on the environment in SAS's internal video Focus. In the stringent overall cost priorities in SAS adopted in 1996, other environmental training of the workforce had to be postponed.

#### ENVIRONMENTALLY RELATED COSTS

SAS's total environmental charges and taxes rose by 24% in 1996 to 600 (485) MSEK (see p. 9). This increase was due to the fact that 1996 was the first whole financial year with

the environmentally related passenger charges in Norway introduced April 1, 1995.

Of taxes paid in 1996, 116 MSEK relates to the environmental tax on domestic air traffic that has been levied in Sweden since 1989. During 1995, SAS and the other Swedish domestic airlines sent a letter to the European Commission (EC) requesting an examination of whether the Swedish environmental tax contravened the EU's "mineral-oil directive", which – as protection against competition – prohibits excise taxes on fuel in commercial aviation (see also p. 32). The EC found that this was the case, and in February 1996 wrote to Sweden's EU representatives with a request for information on which measures the Swedish authorities were planning to change the situation. In May, the Swedish government replied that it was intending to abolish the tax as of January 1, 1997, and a Riksdag decision was taken on this matter in the winter of 1996. In response to the EC's ruling that the levying of this tax had no legal basis, SAS ceased to pay the tax from September. SAS also requested repayment of amounts of environmental tax that had been paid since Sweden joined the EU January 1, 1995 – a total of 209 MSEK, of which 116 MSEK related to 1996. This is not deemed to represent any cost for SAS.

During the fall of 1996 a request was made that the Swedish Civil Aviation Administration inventory alternative charge models capable of exerting better environmental control. SAS is actively engaged in the matter through representation in the working group on aviation noise and emission-related landing charges (BARLA), which is investigating the matter.

#### HEALTH AND SAFETY

Work to develop a safe and satisfactory work environment is taking place within the framework of SAS's business strategies and the national legislation in the countries where SAS operates. The work is governed by a special work-environment strategy and integrated with the line manager's responsibility.

During 1996 a series of potential improvements in the work environment were identified, and these have now begun to be introduced to make improved service quality attainable. A new method of target-oriented health examinations has been tried out, with good results, in Malmö. In an extensive project to improve quality and the environment in baggage handling in Copenhagen, SAS has used a method that is included in the upcoming official requirements for workplace evaluation in Denmark. In the building of Oslo's new airport and the new freight terminal in Copenhagen, creating a good work environment is a central task.

For a more complete account of SAS's work in the area of health, the work environment and safety, please refer to p. 70 in the Annual Report.

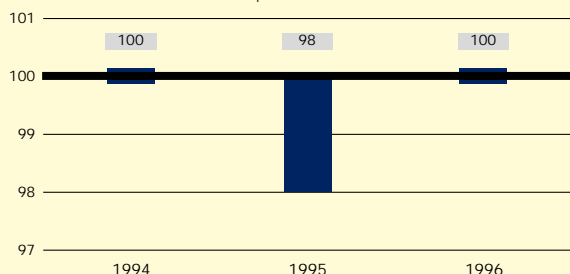
*Like last year, we have compiled a series of quantitative data on SAS's environmental performance in a format corresponding to the statements of income and balance sheets in the Annual Report. When we began the work of data collection for the 1995 Environmental Report our ambition was, within three years, to obtain a complete set of quantitative environmental data related to SAS's goals and other players' performance regarding the various parameters concerned. This year we have taken another*

*step in this direction: besides trends regarding last year's parameters we also report data on noise restrictions in SAS's transportation systems, emissions of water vapor, fuel consumption/RTK and relative energy use. Our account of environmentally related financial effects has been developed further, and supplemented with an environmental impact analysis. However, like last year, we have confined ourselves to including relatively reliable data, and refrained from making more or less rough estimates.*

# Whole of SAS

## ENVIRONMENTAL INDEX

[1994=100] The higher the index figure, the greater the resource utilization and the smaller the relative environmental impact.



SAS's environmental productivity index expresses resource consumption in relation to production, thereby indicating SAS's ecoefficiency. The formula used is:

$$\frac{\text{No. of tonne kilometers} + \text{number of international baggage items} + \text{kg of cargo and mail} + \text{dm}^2 \text{ floor area}}{\text{liters of aviation fuel} + \text{liters of fuel for ground vehicles} + \text{kWh energy for ground operations}}$$

The base year used is 1994, with an index of 100. The improvement in 1996 is due to raised fuel efficiency in the expanding cargo operations.

SAS is working to make the index increasingly representative of the entire Group. The calculation formula was therefore changed this year to express the primary production figure in tonne kilometers instead of last year's passenger kilometers, thereby including all cargo operations as well. As a further step to assign a fair weighting to cargo traffic, goods and mail are now measured in kilograms. This year, too, energy use in ground operations is expressed in relation to floor area (which, to pinpoint energy efficiency on the ground, is expressed in dm<sup>2</sup>). This gives a better measure of true environmental efficiency than absolute energy use alone, which is affected by changes in the real-estate stock that are entirely unconnected with energy efficiency.

Other minor changes have also been made: For 1996, data on tonne kilometers, cargo and mail, and fuel consumption refer to SAS's whole line network, including SAS's new freight jumbo. The key statistics for international baggage and energy used in ground operations include Copenhagen, Oslo and Stockholm. The figure for the ground vehicles' fuel consumption relates to Copenhagen only. Other differences in key statistics between 1996 and previous years are due to the greater completeness of data submitted from ground operations, in particular, this year. To facilitate comparisons, indices for previous years have been recalculated on the same basis as that for 1996. SAS will continue developing the environmental index into a fair measure of our ecoefficiency.

## EMISSIONS AND RESOURCE CONSUMPTION

Key statistics	Change 1995-96, %					1995	1996	
	-100	-50	0	+50	+100			
Fuel consumption						1,411	<b>1,533</b>	[1,000 m <sup>3</sup> ]
Carbon dioxide						3,528	<b>3,815</b>	[1,000 tonnes]
Water vapor						1,383	<b>1,502</b>	[1,000 tonnes]
Nitrogen oxides						13.4	<b>14.4</b>	[1,000 tonnes]
Hydrocarbons						3.4	<b>3.6</b>	[1,000 tonnes]
Glycol consumption						2,888	<b>3,200</b>	[m <sup>3</sup> ]
SO <sub>2</sub> , NO <sub>x</sub> and CO <sub>2</sub> from heating plants						7,753	<b>13,838</b>	[tonnes]
Diesel, ground vehicles						3,115	<b>2,868</b>	[m <sup>3</sup> ]
Gasoline, ground vehicles						2,802	<b>2,307</b>	[m <sup>3</sup> ]
Emissions of heavy metals (cadmium, chromium)						5.9	<b>4.6</b>	[kg]
Packaging in cabin operations						1,122	<b>1,164</b>	[tonnes]
Newspapers/magazines in cabin operations						4,175	<b>4,729</b>	[tonnes]
Waste paper/cardboard						246	<b>510</b>	[tonnes]
Garbage						4,219	<b>2,829</b>	[tonnes]
Special waste						521.6	<b>480.8</b>	[tonnes]
Water consumption, buildings						240.9	<b>222.7</b>	[1,000 m <sup>3</sup> ]
Energy use, buildings						197.4	<b>214.8</b>	[GWh]
Relative energy use						458	<b>452</b>	[kWh/m <sup>2</sup> ]
Comparative figure: ASK						29,422	<b>31,055</b>	[x 10 <sup>6</sup> ]

## ENVIRONMENTAL STATEMENTS

### THE ENVIRONMENT AND FINANCES

Environmentally related earnings and cost reductions <sup>1</sup> [MSEK]	1995	1996
Decrease in noise charges due to phase-out of Chapter II aircraft	>100	>110
Decrease in costs due to reduction in waste volumes, improved sorting at source and increased recycling	5-10	5-10
Reduction in packaging charges due to return of aluminum (Norway, domestic routes)	8	9 <sup>4</sup>
Environmentally related charges and taxes <sup>2</sup> [MSEK]	1995	1996
Seat and passenger charges (Norway)	353	469
Including:		
Seat charges	127	145
Passenger charges, international	183	221
Passenger charges, domestic	43	103
Environmental tax on emissions (Swedish domestic)	102	116 <sup>6</sup>
Noise charges	30	15 <sup>7</sup>
Environmentally related investments and costs <sup>3</sup> [MSEK]	1995	1996
Management of waste and special waste, operation of purification plants, oil separators, etc	10-20	10-20
Investments and costs in cabin operations – environmentally related share	n/a	1-2
Investments and costs in construction and ground operations – environmentally related share	n/a	5
Environmental Report, environmental profiling, environmental sponsoring	n/a	3
McDonnell Douglas MD-90s <sup>8</sup>	-	60
Hushkitting of Douglas DC-9s <sup>9</sup>	8	335

<sup>1</sup> Environmentally related earnings and cost reductions connected with operations. Cost reductions are estimated in relation to costs in the preceding year.

<sup>2</sup> Costs of environmentally related charges and taxes connected with business operations – both extra costs of charges and taxes debited to operations and costs incurred even if the environmentally best available process or equipment has been used.

<sup>3</sup> Investments in assets, and costs of measures, to prevent, reduce or repair environmental damage arising from business operations. These investments are neither profitable on their own financial merits nor aimed at meeting up-coming, more stringent environmental requirements.

<sup>4</sup> The full agreed charge reduction was made in 1996 although SAS did not meet the official Norwegian requirement of a 90% return rate for aluminum; the rate attained was only 72%.

<sup>5</sup> Passenger charges for domestic flights introduced April 1, 1995, when passenger charges for international flights were raised by 100%.

<sup>6</sup> SAS paid Swedish environmental tax on domestic air traffic in 1995 and 1996. Since the EC has found that Swedish legislation contravenes Community law, the imposition of environmental tax lacked legal grounds and is accordingly deemed not to represent any cost for SAS during the period from January 1, 1995 through December 31, 1996.

<sup>7</sup> The cause of this decrease is the continued phase-out of Chapter II aircraft. In Norway noise charges, for example, decreased from 16 to 7 MSEK.

<sup>8</sup> SAS has purchased eight MD-90s (six were delivered in 1996) for a total of some 3,000 MSEK. The environmentally related extra cost is estimated at 10 MSEK per aircraft, i.e. the price difference between the MD-80 and the MD-90.

<sup>9</sup> The amounts stated are budgeted costs. The hushkitting program was commenced in 1995, with the first aircraft converted in 1995, and the program is to be concluded during 1997. The total cost is estimated at 400 MSEK.

### Environmental impact assessment

In the work of developing the framework of aviation, the following are the primary current issues:

- The mineral-oil directive is on the EU agenda for 1997. This may mean that fuel for aviation also becomes subject to environmental charges, which for SAS and all other European airlines may entail an increase in charges in the order of several hundred million SEK unless a redistribution throughout the tax and charge system simultaneously takes place.
- Swedish government agencies are investigating a new system of environmental charges to supersede the environmental tax on domestic flights that was abolished January 1, 1997. They are also considering an adjustment in differentiated noise charges. For SAS's part, this may in the short term entail new environmental costs, though probably not exceeding the rate of the tax now abolished. The new noise charges should not affect SAS in the long term at all since the plan is to phase out all Chapter II aircraft or convert them to Chapter III standard during the year 2000. SAS belongs to the working group for the investigation.

- Tightening-up of environmentally based restrictions and charges may be expected for the many European destinations in SAS's route system that have introduced them. In the short term, before SAS has completed the phase-out of all Chapter II aircraft in the year 2000, this may make utilization of the aircraft fleet less flexible. In the longer term, SAS's costs will rise as airports introduce higher charges for Chapter III aircraft with an inferior environmental performance.

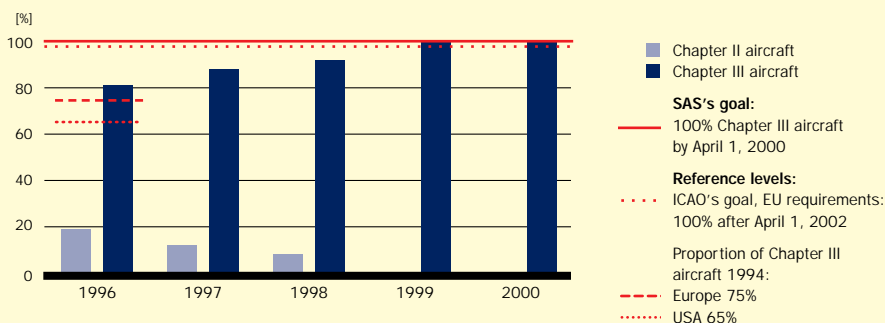
Tighter environmentally based restrictions, increased differentiation of the noise-related landing charges and/or a change in certification requirements for new aircraft may affect SAS's scope for utilizing the MD-80 fleet and the hushkitted DC-9s. The secondhand value of these aircraft may also deteriorate.

SAS knows of no further changes in international and national environmental regulations that may come to exert any significant financial effects. Nor does SAS expect any essential changes in environmental concessions, dispensations or permits with a major bearing on the company's financial results.

# Flight operations

## NOISE, EMISSIONS INTO AIR

### SAS's Phase-in of Chapter III Aircraft



**Comments:** Noise levels in civil aviation are controlled by means of ICAO's certification requirements, supplemented by local traffic restrictions in SAS's route systems for many airports, especially European ones. As of April 1, 2002 only aircraft with the current certification, Chapter II, will be permitted to fly in the EU. The next generation of certification requirements are expected to reduce noise by a further 2-4 EPNdB.

### Development of SAS's Aircraft Fleet

Aircraft type	Fuel consumption [l/ASK]	Max. values under ICAO's certification requirements [g/kN]			Noise footprint [km <sup>2</sup> /85 dB(A)] <sup>1</sup>	Number of aircraft in SAS				
		Nitrogen oxides	Hydrocarbons	Carbon monoxide		1996	1997 <sup>2</sup>	1998 <sup>2</sup>	1999 <sup>2</sup>	2000 <sup>2</sup>
<i>Chapter II</i>										
Douglas DC-9-41	0.054	57.6	39.5	139.8	12.1	12	3	-	-	-
Fokker F-28	0.063	89.4	8.3	115.0	7.6	19	16	14	-	-
<b>Total [number]</b>						<b>31</b>	<b>19</b>	<b>14</b>	<b>-</b>	<b>-</b>
<b>Total [%]</b>						<b>19</b>	<b>12</b>	<b>8</b>	<b>-</b>	<b>-</b>
<i>Chapter III</i>										
Boeing 767-300ER	0.038	61.1	3.4	33.3	3.9	14	14	14	15	16
Douglas DC-9-21 (hushkitted)	0.068	57.6	39.5	139.8	- <sup>3</sup>	4	4	4	2	-
Douglas DC-9-41 (hushkitted)	0.068	57.6	39.5	139.8	- <sup>3</sup>	12	20	20	20	20
Douglas MD-81	0.045	73.4	15.2	41.1	4.7	31	29	29	29	25
Douglas MD-82	0.047	73.4	15.2	41.1	5.2	12	14	15	16	22
Douglas MD-83	0.045	73.4	15.2	41.1	7.9	2	2	2	2	2
Fokker F-50	0.038	- <sup>4</sup>	- <sup>4</sup>	- <sup>4</sup>	0.8	22	22	22	22	22
SAAB 2000	0.051	- <sup>4</sup>	- <sup>4</sup>	- <sup>4</sup>	0.4	-	4	4	4	4
Boeing 737-300QC <sup>5</sup>	0.045	40.3	4.7	72.9	- <sup>3</sup>	2	-	-	-	-
Douglas DC-9-81	0.047	73.4	15.2	41.1	4.7	8	8	8	8	-
Douglas MD-87	0.047	73.4	15.2	41.1	4.1	18	18	18	18	16
Douglas MD-90-30	0.041	56.2	0.4	30.6	1.7	4	8	8	8	8
Boeing 737-600	0.036	35.3 <sup>6</sup>	11.8 <sup>6</sup>	92.0 <sup>6</sup>	1.2 <sup>6</sup>	-	-	10	26	41
Boeing 747-200BC	0.204 <sup>7</sup>	64.3	37.3	99.0	- <sup>3</sup>	1	1	1	1	1
<b>Total [number]</b>						<b>130</b>	<b>144</b>	<b>155</b>	<b>171</b>	<b>177</b>
<b>Total [%]</b>						<b>81</b>	<b>88</b>	<b>92</b>	<b>100</b>	<b>100</b>

<sup>1</sup> Manufacturer's specification. Relates to takeoff.

<sup>2</sup> Planned development.

<sup>3</sup> Data from manufacturer lacking.

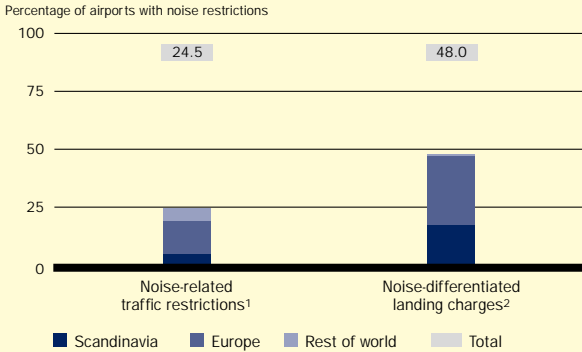
<sup>4</sup> Not certified.

<sup>5</sup> On daytime lease from Falcon Aviation.

<sup>6</sup> Estimate only.

<sup>7</sup> Relates to ATK.

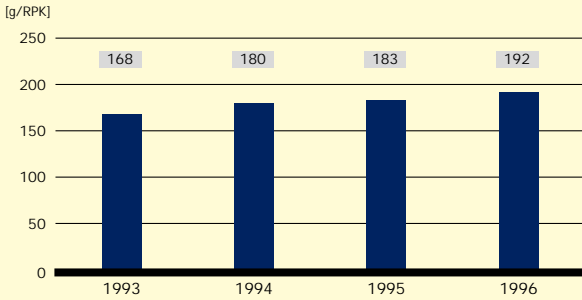
Noise Restrictions in SAS's Route System



**Comments:** Many airports, especially in Europe, already apply noise restrictions of various kinds, and the proportion is expected to increase. This prompts SAS to invest in aircraft with low noise ratings, thereby both reducing costs and enhancing flexibility in their use.

<sup>1</sup>Prohibition on operating at certain times of day.  
<sup>2</sup>Higher for Chapter II than for Chapter III, and/or higher at certain times of day.

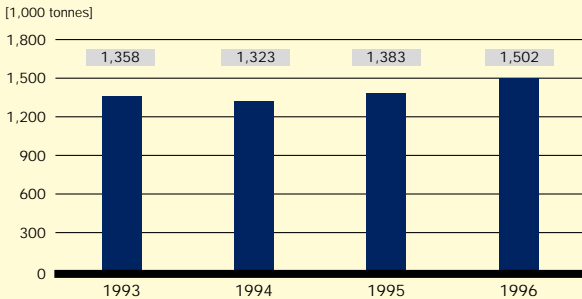
Carbon Dioxide (CO<sub>2</sub>)



[1,000 tonnes]	1993	1994	1995	1996
<b>Total</b>	<b>3,440</b>	<b>3,397</b>	<b>3,528</b>	<b>3,815</b>

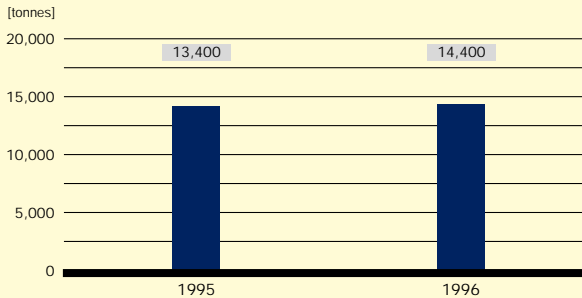
**Comments:** Estimates of CO<sub>2</sub> emissions of aviation are based on fuel consumption (3.15 kg of carbon dioxide is formed per kg of fuel burned). Total CO<sub>2</sub> emissions are subject to national regulations. The target in Denmark is to stabilize CO<sub>2</sub> emissions at the 1988 level by 2005; in Norway at the 1989 level by 2000; and in Sweden at the 1990 level by 2000, and to reduce them thereafter. SAS is working continuously to reduce relative fuel consumption, since fuel is a substantial cost item, and CO<sub>2</sub> emissions are showing a proportional decrease.

Water Vapor (H<sub>2</sub>O)



**Comments:** Water vapor is formed in proportion to fuel consumption (1,238 kg of steam per kg of fuel). Vapor condenses in certain conditions, forming the "condensation trails" that are visible behind aircraft at high altitudes. Water vapor contributes to the greenhouse effect.

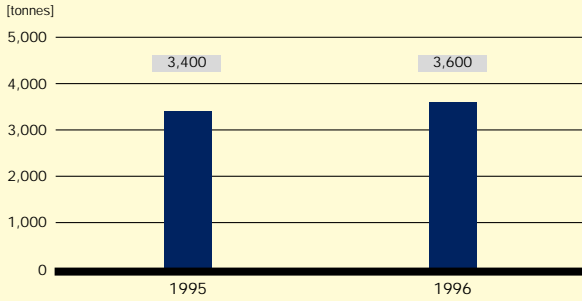
Nitrogen Oxides (NO<sub>x</sub>)



**Comments:** Estimates of the NO<sub>x</sub> emissions of aviation are based on distance flown, with a coefficient of 0.060 kg per km. The increase is explained by a rise in distance flown to 239 million km GCD. Total emissions are subject to national regulations. The target in Denmark is to reduce NO<sub>x</sub> emissions by 40% of the 1988 level by 2005; in Norway by 30% of the 1989 level by 2005; and in Sweden by 50% of the 1980 level by 2000. ICAO's certification requirements also reduce the NO<sub>x</sub> emissions of aircraft engines, and the next generation of certification requirements are expected to reduce emissions of NO<sub>x</sub> further with effect from the year 2000. As of 1998, SAS will be phasing in aircraft with engines using double annular combustor (DAC) technology, which will reduce emissions by 40% compared with older aircraft.

# ENVIRONMENTAL STATEMENTS

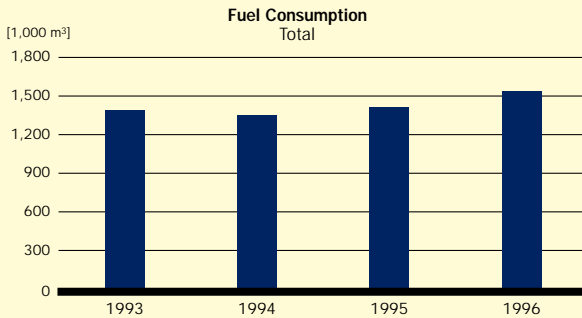
## Hydrocarbons (HCs)



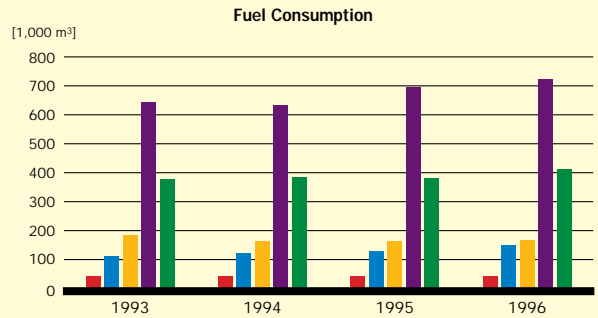
**Comments:** The data refer to hydrocarbons (HCs), excluding other volatile organic compounds (VOCs), on the same scale as in ICAO's certification. The hydrocarbon emissions of aviation are estimated on the basis of distance flown, with a coefficient of 0.015 kg per km. This increase is explained by an increase in distance flown to 239 million km GCD. Total emissions are subject to national regulation. The target in Denmark is to reduce emissions of HCs and other VOCs by 30% of the 1985 level by 1999; in Norway by 30% of the 1989 level by 1999; and in Sweden by 50% of the 1988 level by 2000. ICAO's certification requirements also reduce the HC emissions of aircraft engines. The modern aircraft SAS is currently phasing in have emissions more than 90% lower than those of the older aircraft.

## ENERGY USE

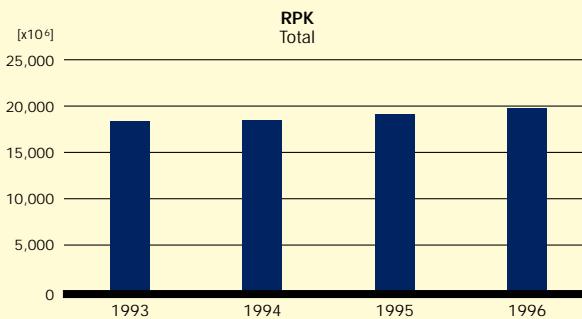
### Fuel Efficiency



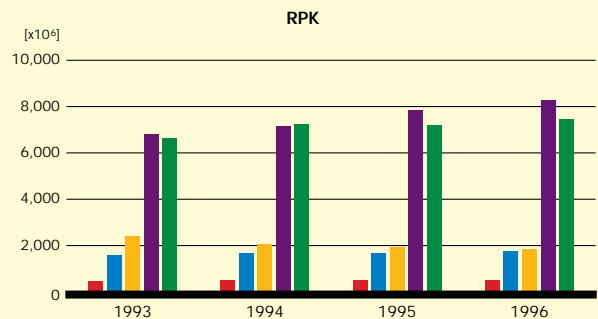
[m³]	1993	1994	1995	1996
<b>Total</b>	<b>1,386,424</b>	<b>1,351,027</b>	<b>1,411,413</b>	<b>1,533,191</b>



[m³]	1993	1994	1995	1996
Denmark	43,879	42,788	43,365	43,107
Norway	112,702	122,861	129,048	149,691
Sweden	184,781	165,357	164,111	166,888
Europe	644,746	632,060	694,276	723,418
Intercontinental	379,158	385,035	380,612	412,885



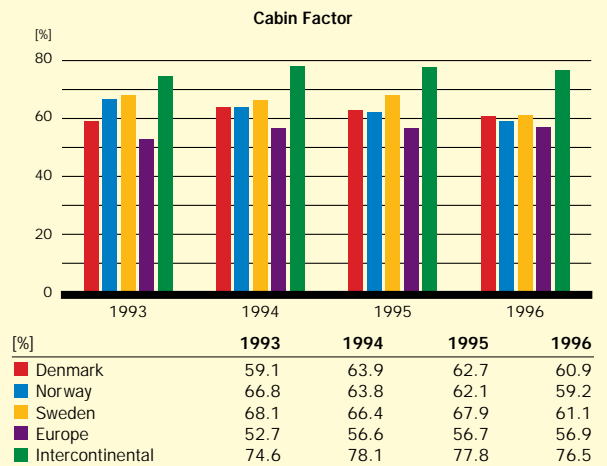
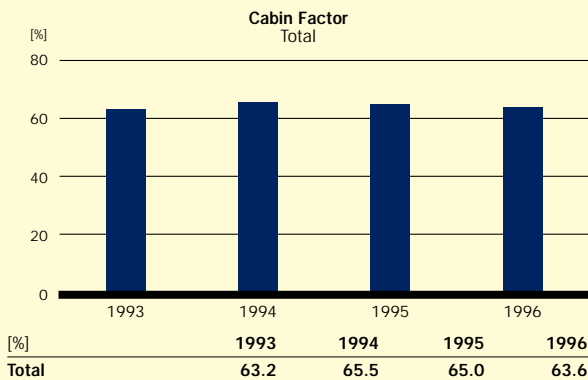
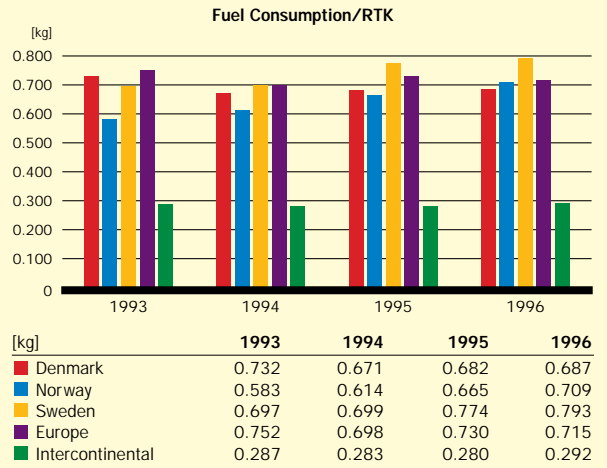
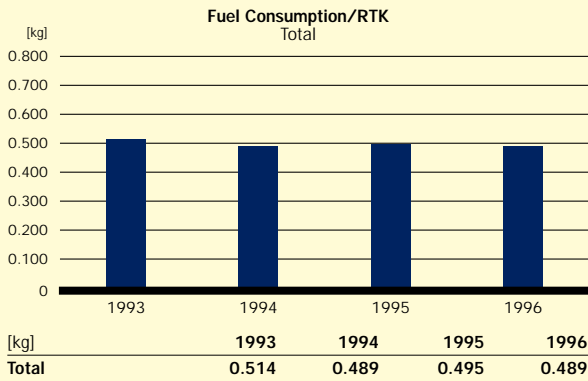
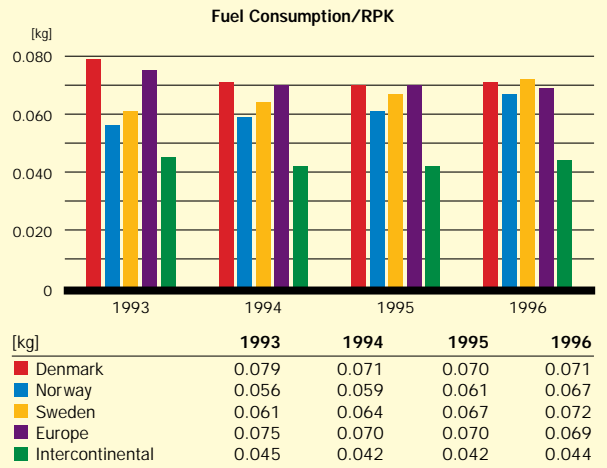
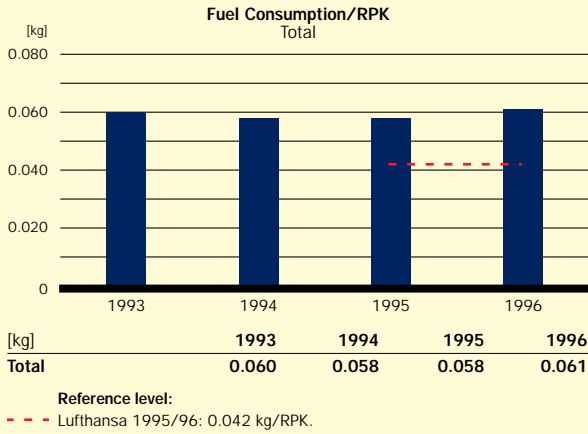
[x10⁶]	1993	1994	1995	1996
<b>Total</b>	<b>18,325</b>	<b>18,525</b>	<b>19,137</b>	<b>19,788</b>



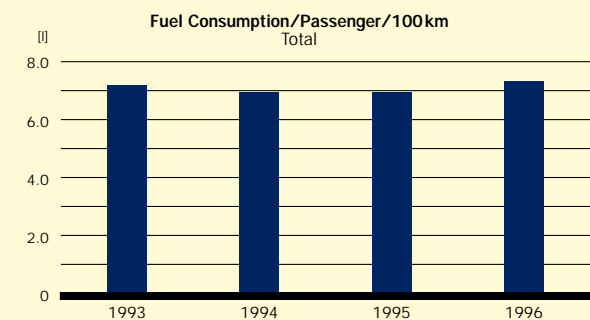
[x10⁶]	1993	1994	1995	1996
Denmark	441	475	493	479
Norway	1,583	1,648	1,660	1,763
Sweden	2,381	2,052	1,938	1,839
Europe	6,811	7,137	7,857	8,266
Intercontinental	6,634	7,213	7,189	7,442



# ENVIRONMENTAL STATEMENTS

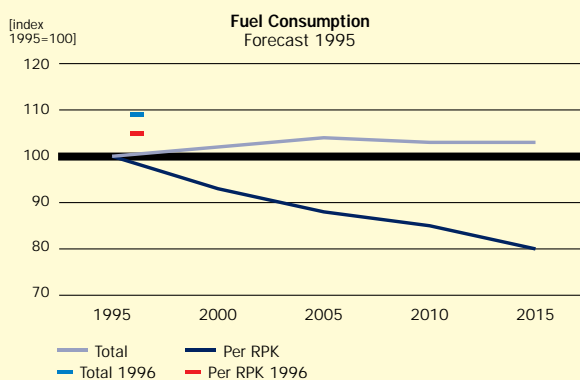


## ENVIRONMENTAL STATEMENTS



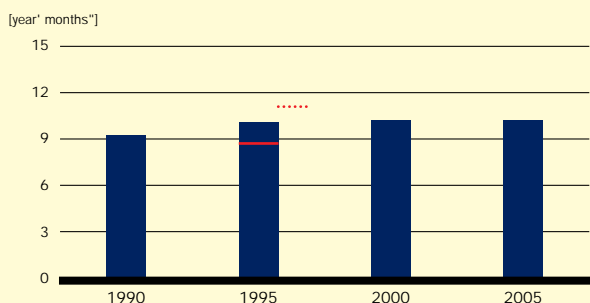
[l]	1993	1994	1995	1996
<b>Total</b>	<b>7.20</b>	<b>6.94</b>	<b>6.94</b>	<b>7.32<sup>1</sup></b>

<sup>1</sup>The rise in consumption is due both to a lower cabin factor and to the inclusion of SAS's new freight jumbo – which boosts fuel consumption, but not the number of passengers – in the year's figure.



### OTHER INFORMATION

#### Average Age of Fleet



[year + months]	1990	1995	2000 <sup>1</sup>	2005 <sup>2</sup>
<b>Total</b>	<b>9'2"</b>	<b>10'1"</b>	<b>10'2"</b>	<b>10'2"</b>

..... SAS 1996: 11'1"  
 — AEA average 1995: 8'7"

<sup>1</sup>Planned development.  
<sup>2</sup>Forecast.

#### Fuel Jettisoning

Ten of SAS's Boeing 767s are equipped with a system for jettisoning fuel in the event of an emergency, so that the aircraft's weight can be reduced more rapidly to the maximum permitted landing weight. The regulations for such jettisoning of fuel require it to take place over nonresidential areas and above a certain altitude, so that only a few percent of the fuel reaches the ground in such a situation – and, moreover, in concentrations as low as a few hundredths of a gram per square meter. During 1996 SAS was compelled to use this emergency system on five occasions, and jettisoned a total of 85.2 tonnes of fuel.

#### Emergency Plan to Prevent Radioactive Contamination

SAS has a special task force, the Radioactive Contamination Group (RCG), to initiate various measures when radioactive contamination of aircraft and/or cargo has taken place. RCG is also charged with preparing SAS's emergency action in the event of an accident involving nuclear power. The Group also cooperates with AEA airlines for the exchange of information, and with national and international bodies responsible for air transportation, to interrupt and cancel flights promptly if necessary. During 1996, SAS developed contacts with Scandinavian government agencies in the area and contacted several clean-up firms to establish emergency-action agreements.

### PROJECTS

#### Development of the Aircraft Fleet ➔

The measures with the greatest potential for affecting SAS's environmental impact are those connected with the development of the aircraft fleet. A special department in SAS is charged with ensuring that the aircraft fulfill not only safety and commercial requirements, but also environmental requirements. After completing the purchase of SAS's new mediumhaul aircraft, the MD-90,

and the next shorthaul and mediumhaul aircraft, the Boeing 737-600 – both of which show environmental data that are among the best in the industry – SAS has now embarked on preliminary studies prior to the purchase of the next generation of commuter and longhaul aircraft.

● Target 100% attained    ◐ Target 50–99% attained    ○ Target not attained by >49%  
 ➔ Current project with subsequent date for measurement of target fulfillment    ★ New project started in 1997

# Cabin Operations

## EMISSIONS INTO WATER

### Bactericides<sup>1</sup>

Consumption <sup>2</sup> (kg)	1995	1996
Denmark	14,500	12,800
Norway	15,000	15,200
Sweden	56,000	— <sup>3</sup>

<sup>1</sup> Quadivalent ammonia compound in Copenhagen and Oslo, sodium hydroxi-methane sulfonate in Stockholm.

<sup>2</sup> Includes other airlines serviced by SAS.

<sup>3</sup> No data available from supplier.

**Comments:** Bactericides are added to sanitizing fluid in the lavatories on board to minimize the risk of infection. At airports, the lavatories are emptied and discharged into the municipal drains within the framework of local airport concessions.

### Chlorine<sup>1</sup>

Consumption <sup>2</sup> [l]	1995	1996
Denmark	178	150
Norway	390	423
Sweden	60	— <sup>3</sup>

<sup>1</sup> Chlorine compounds (sodium hypochlorite in a concentration of 3 ppm).

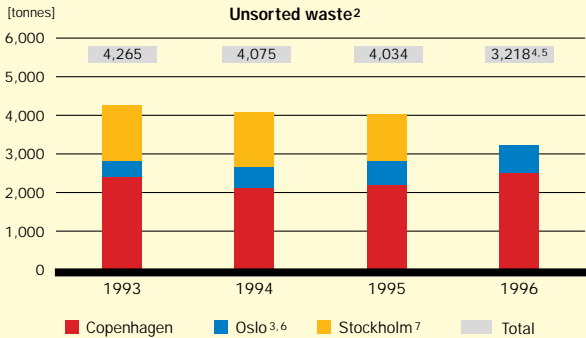
<sup>2</sup> Includes other airlines serviced by SAS.

<sup>3</sup> No data available from supplier.

**Comments:** Chlorine is added to the water on board to prevent the growth of microorganisms in the water tanks. Used water is flushed direct into the municipal drains at SAS bases.

## WASTE

### Catering waste<sup>1</sup>



<sup>1</sup> Waste disposed of by SAS's catering suppliers, estimated on the basis of data on SAS's share in the latter's total quantity of waste.

<sup>2</sup> Some of this waste is sorted. A study carried out at Copenhagen Airport in 1992 showed that catering waste comprised 60% organic waste, 17% glass, 12% plastic, 6% untouched meal trays, 5% aluminum and 1% other, nonbiodegradable material. Since then, SAS has only slightly changed its cabin operations in this respect, and the proportions should therefore be roughly the same.

<sup>3</sup> Excluding paper.

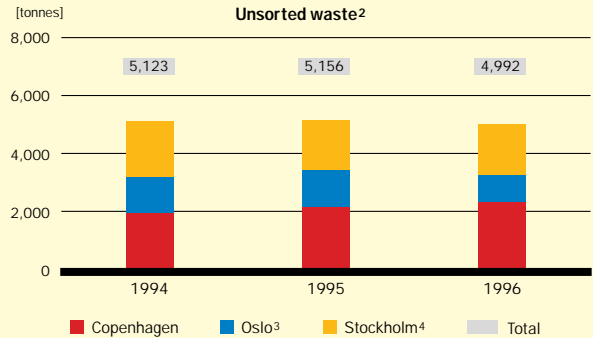
<sup>4</sup> At the end of the year a new service concept that reduces waste volume was introduced on SAS's Norwegian domestic flights. This measure is estimated to have reduced waste by 24 tonnes in 1996.

<sup>5</sup> The total refers to Copenhagen and Oslo only, since no report for 1996 was received from subcontractors in Stockholm. However, production reports indicate no increase compared with 1995.

<sup>6</sup> Annual data for 1993, 1994 and 1995 were corrected after the 1995 Environmental Report.

<sup>7</sup> Annual data for 1995 were corrected after the 1995 Environmental Report.

### Cleaning waste<sup>1</sup>



<sup>1</sup> Waste disposed of by SAS's subcontractors when cleaning the aircraft.

<sup>2</sup> The data also include newspapers, which are sorted (see Comments). A study carried out at Copenhagen Airport in 1992 showed that cleaning waste comprised 41% paper, 27% organic waste, 12% glass and 20% miscellaneous materials (plastic, aluminum, etc). Since then SAS has only slightly modified its cabin operations in this respect, and the proportions should therefore be roughly the same.

<sup>3</sup> Data for 1994 and 1995 are volumetric measures converted to tonnes, while data for 1996 were already in terms of tonnes at the time of collection.

<sup>4</sup> Annual data for 1994 and 1995 were corrected after the 1995 Environmental Report.

**Comments:** During the year a total of 1,164 (1,122) tonnes of packaging were loaded on board (1,022 tonnes of glass, 31 tonnes of plastic and 111 tonnes of aluminum boxes), making 59 (60) g/passenger. Collection of aluminum packaging on domestic routes for recycling takes place in Norway (by law) and Sweden (in Denmark, aluminum beverage packaging is prohibited). In 1996, 19.3 tonnes of aluminum was collected in Norway and 13 tonnes in Sweden. The 90% target for aluminum collection in Norway agreed by SAS with the authorities was thus not met (only 72%). Altogether, 4,729 (4,175) tonnes of newspapers and magazines were loaded on board in 1996, i.e. 239 (222) g/passenger. In Oslo and Stockholm, newspapers are collected for recycling. Between 1992 and 1995, catering waste decreased by some 25%. Cleaning waste decreased by 3% from 1995 to 1996. In 1996 the routines were reviewed to improve material use further from the environmental point of view and promote on-board sorting at source. This is being carried out in close cooperation with SAS's suppliers. In the future, increased differentiation may be expected between charges for sorted and unsorted waste, and this gives SAS even more motivation to develop routines for sorting at source.

PROJECTS

Improving Environmental Performance in the Cabin Operations ➔

**Purpose:** To reduce emissions, raw-material and water consumption, energy use and waste volumes throughout the cabin operations while maintaining or improving overall economy.

**Objectives:** All purchases are to be subjected to environmental valuation, all main suppliers are to be examined in terms of the environmental policy and action plan, and environmental criteria are to be included in all new, as well as old, contracts with suppliers.

**Action plan:** The general objectives are to be broken down into a large number of subprojects (see below).

**Timetable:** Fifty projects were initiated in 1996 and will continue until the work is completed. In 1997 numerous other subprojects will be initiated.

**Persons in charge:** Anders Westerholm, Martin Porsgaard Nielsen.

**Cost:** 1 MSEK (net).

**Strategic Projects**

1. Environmental assessment of all procurement in Product & Services (cabin operations).
2. Verification that all main suppliers have an environmental policy and action plan.
3. Integration of environmental criteria into all new meal and tray specifications.
4. Integration of environmental criteria into all new catering contracts and as additions to existing ones.
5. Integration of environmental criteria into all new material and equipment contracts.
6. Integration of environmental criteria into all new newspaper and magazine contracts.
7. Integration of environmental criteria into all new contracts that SAS's catering suppliers make with subcontractors.

**Operational projects**

8. Unpackaged butter is being tested on European flights with hot meals departing from Stockholm and Gothenburg.
9. Butter packaging based on chalk instead of plastic is being tested on Swedish domestic flights.
- 10-21. Environmentally superior packaging is being developed by eliminating mixed materials for: (10) butter dish; (11) biscuits; (12) coffee packaging; (13) towelette; (14) juice cup; (15) water beaker; (16) jams; (17) cheeses; (18) catering packaging; (19) cream; (20) peanuts; and (21) yoghurt.
22. Sorting and collecting aluminum cans on board Swedish and Norwegian domestic flights, and evaluating an extension of these procedures to flights between the Scandinavian capitals on SAS Express.
23. Polypropylene plastic instead of aluminum boxes is being developed and tested.
- 24-27. Replacing reusable plastics by environmentally superior polypropy-

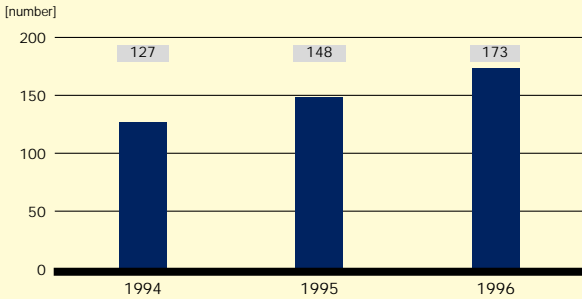
- lene plastics in: (24) trays; (25) juice jugs; (26) catering boxes; (27) salt and pepper containers.
28. Replacing old materials by environmentally superior ones throughout the paper and cardboard range.
- 29-31. Reducing waste volumes by gate buffet in: (20) Karlstad; (30) Kiruna; (31) Kristianstad.
- 32-34. Reducing waste volumes by SAS Express gate café in: (32) Copenhagen; (33) Oslo; (34) Stockholm.
35. Reducing waste volumes by eliminating cardboard lunch box on domestic flights in North Norway.
36. PVC-free protective plastic film on meals.
37. Reusing and returning newspapers and magazines standardized at main bases and internationally.
38. Environmentally superior forms for the passenger survey.
39. Environmentally superior bags for forms for the passenger survey.
40. Environmentally superior pens for the passenger survey.
41. Washing of blankets instead of dry-cleaning in Copenhagen, and subsequently at all laundry facilities.
42. Reduced use of plastic packaging and environmentally superior plastic for blanket storage and transportation.
43. Water-based instead of lacquer-based paint on seat neck support.
44. Direct delivery of brewery products in Bangkok instead of delivery from Copenhagen.
45. Evaluating reuse of aluminum boxes and lids for meal portions.
46. Evaluating an aluminum instead of china box for food, owing to water consumption and energy use.
47. Evaluating waste compression for the next generation of large aircraft.
48. Recovery of packaging from the fruit buffets at exits to Swedish domestic flights.
49. Reducing packaging in fruit deliveries in Copenhagen.
50. Eliminating plastic in packaging for tea bags.

● Target 100% attained   ● Target 50–99% attained   ○ Target not attained by >49%  
 ➔ Current project with subsequent date for measurement of target fulfillment   ★ New project started in 1997

# Ground Operations

## NOISE

### Engine Tests<sup>1</sup>

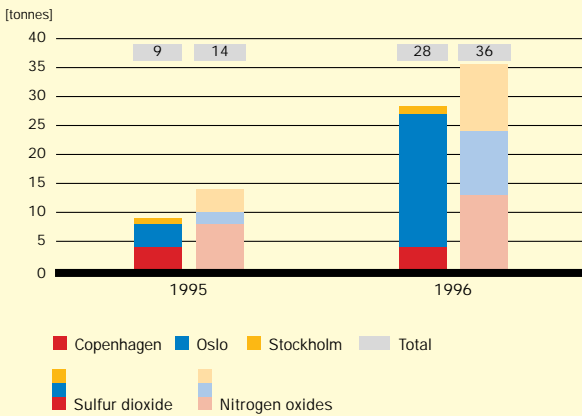


**Comments:** Engine tests involve running the aircraft engines with varying thrust, to ensure correct functioning after maintenance. All the engine tests take place in special, noise-protected locations. The tests reported are solely those carried out in conjunction with engine replacement. Corresponding tests also take place in connection with engine repair and maintenance. The increase for 1996 is explained by the fact that SAS had carried out a large number of engine replacements in various aircraft in the MD-80 fleet.

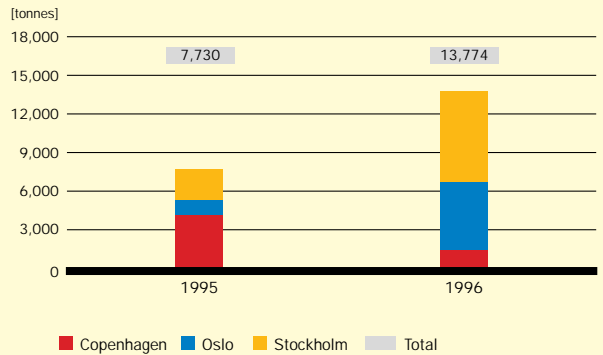
<sup>1</sup> Tests after engine replacement only.

## EMISSIONS INTO AIR

### Sulfur dioxide, nitrogen oxides



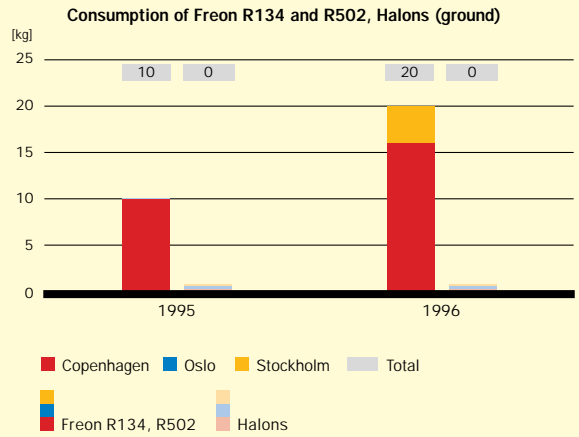
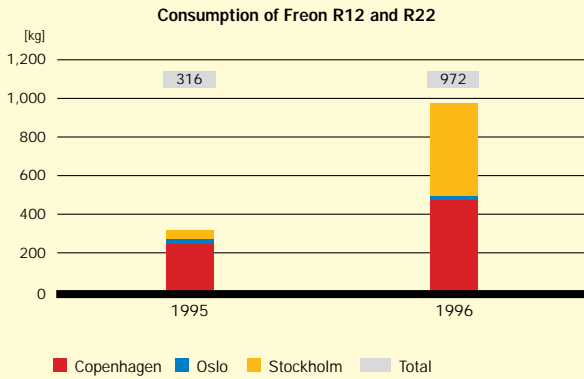
### Carbon dioxide



**Comments:** Emissions in Oslo (oil firing) and Stockholm (LPG firing) are regulated by concessions. The increase in emissions in Oslo is due to the fact that changed conditions in the energy market have made it more profitable to use oil instead of electricity for heat production. In Copenhagen, SAS has increased the proportion of district heating, which has resulted in a massive reduction in carbon dioxide emissions. SAS's head office in Stockholm is 78% supplied by a geothermal heating installation that, in 1996, contributed 6,101 MWh. As of 1997, SAS at Arlanda Airport is switching to district heating from a new, biofuel-fired heating station.

# ENVIRONMENTAL STATEMENTS

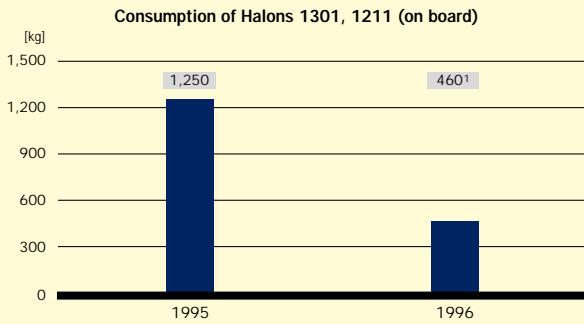
## CFCs, Halons



**Installed volume**

1996 [kg]	Freon R12, R22	Freon R134, R502	Halons
Copenhagen	2,482	86	-
Oslo	290	-	40
Stockholm	1,187	121	-
<b>Total</b>	<b>3 959</b>	<b>207</b>	<b>40</b>

**Comments:** Both Halons (fire suppression) and the Freons that contain CFCs (airconditioning) are being phased out. The consumption reported is caused by normal leakage during maintenance.

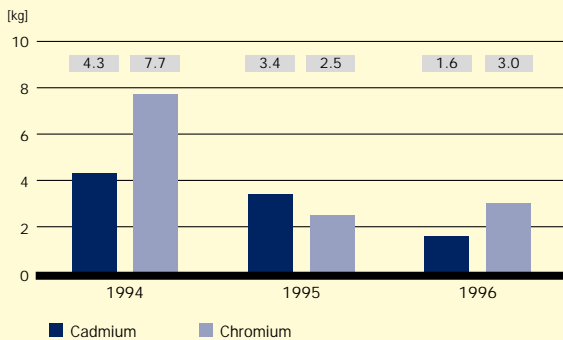


**Comments:** Like other airlines, SAS has a dispensation for using Halons for fire suppression in the aircraft fleet. In Stockholm SAS entirely replaced Halons as fire-extinguishing agents, and 2,813 kg were thereafter transferred to Copenhagen. In Copenhagen SAS has a Halon recovery facility that, besides SAS, serves 15 other airlines. The facility recovered 3,200 kg in 1996 and there was a loss of 500 kg. SAS has some 5,000 kg of stored Halons.

<sup>1</sup>Includes 126 kg from other airlines.

## EMISSIONS INTO WATER

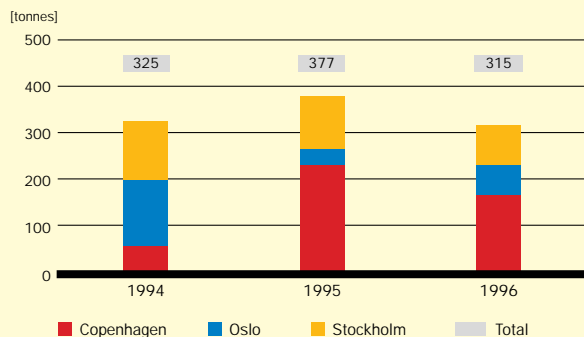
### Heavy metals



**Comments:** SAS's emissions of heavy metals are derived from maintenance of spare parts and cleaning of aircraft, and regulated by concessions. During 1996, aggregate emissions of heavy metals decreased by 22%, thanks to improved routines and e.g. a new cleaning unit at the electroplating workshop in Oslo.

## ENVIRONMENTAL STATEMENTS

### Oil, Oil Emulsions



**Comments:** All installations are equipped with cleaning plants and/or oil and gasoline separators. Oil tanks and oil separators are inspected annually to prevent leakage etc. Drains and separators at SAS Arlanda were improved further during 1996, partly through the installation of a computerized environmental alarm system. The volume changes reported here may depend on whether emptying took place before or after a year-end. SAS is reviewing its routines so that actual volumes can be reported better for calendar years in the future. All oil residues are disposed of by subcontractors with an approved environmental performance.

### WASTE

#### Special waste

[tonnes]	1994	1995	1996
Oil/oil sludge	324.5	377.0	319.3
Waste oil	56.6	57.6	73.1
Oily waste	39.6	33.4	23.3
Solvents without halogens	14.4	11.8	15.8
Solvents with halogens	8.0	2.1	2.7 <sup>3</sup>
Paint, lacquers, other organic solvents	12.7	22.0	25.3
Alodin solvent (contains heavy metals) <sup>4</sup>	4.7	4.6	3.8
Acids <sup>3</sup>	0.558	0.180	5.350
Alkalis	0.825	0.715	2.0
Waste containing heavy metals (sludge)	3.6 <sup>3</sup>	4.8 <sup>3</sup>	0.9
Waste from brake maintenance <sup>2</sup>	0.825	4.6	3.7
Waste containing cyanide	0.516	2.291	3.805 <sup>3</sup>
Waste containing asbestos	0.085	- <sup>1</sup>	1.0 <sup>2</sup>
Mercury <sup>3</sup>	0.007	0.002	0.001
Freons, Halons <sup>3</sup>	0.565	- <sup>1</sup>	0.025
Isocyanates	- <sup>1</sup>	0.5 <sup>3</sup>	0.8
Photochemicals <sup>3</sup>	- <sup>1</sup>	- <sup>1</sup>	0.224
Batteries	- <sup>1</sup>	- <sup>1</sup>	7.8
Electronic waste <sup>4</sup>	18.2	2.0	25.0

**Comments:** Special waste is generated mainly in maintenance bases. It includes waste from chemicals that cannot be deposited on municipal waste dumps but must be disposed of in a special way. SAS delivers all its special waste in Denmark, Norway and Sweden to approved subcontractors for processing, recycling or destruction, and reports on this to the authorities. In the tables, detailed information from each country has been summarized in major groups for the sake of clarity. Altogether, the volumes of special waste decreased by 7–8% during 1996. The reported increase in acids is due to the fact that several of the routine changes of cyanide baths coincided in 1996. The reported decrease in waste containing heavy metals is due to periodic purchases. As of this year, photochemicals, batteries and electronic waste are also reported. The quantity of electronic waste increased in 1996 owing to replacement of computer equipment, and this increase is expected to continue.

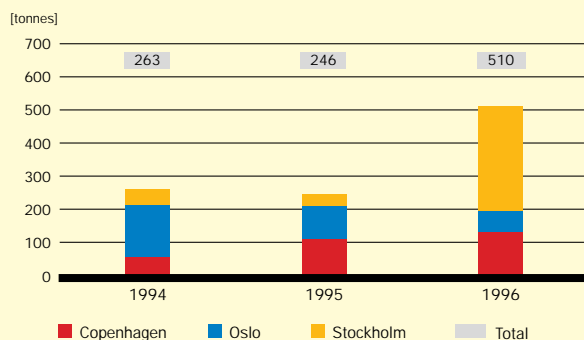
<sup>1</sup> Not available.

<sup>2</sup> This material is sorted in Copenhagen only.

<sup>3</sup> Oslo only.

<sup>4</sup> Copenhagen and Stockholm only.

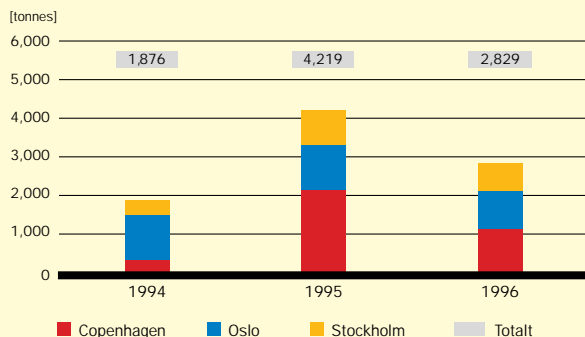
#### Paper, cardboard



**Comments:** All paper and cardboard go to an approved subcontractor, who sorts the waste for recycling. The amounts of paper and cardboard sorted at source have almost doubled. The reported increase in paper and cardboard waste in Stockholm is due to the inclusion of SAS Trading for 1996.

# ENVIRONMENTAL STATEMENTS

## Garbage



**Comments:** All garbage goes to an approved subcontractor for sorting and partial recycling. The reduction of almost 1,400 tonnes is due to the efforts made to reduce waste volume, by increased sorting at source and other means.

## EMISSIONS INTO SOIL

### Incidents

After a police investigation in 1996, the Public Prosecution Authority decided to take no further action on the 1995 report submitted in Sweden, from the municipality of Sigtuna, concerning a suspected infringement of the concession for emissions of water-based solvents.

During the construction work at Gardermoen, SAS and Oslo Lufthavn are cooperating in emergency preparedness for environmental incidents, if any. In conjunction with the construction work on SAS's new freight terminal on land owned by Copenhagen Airport, old contamination by oil and solvents and also a grenade from the second world war were discovered. SAS immediately embarked on remediation of this contamination. By the end of 1996, only a little

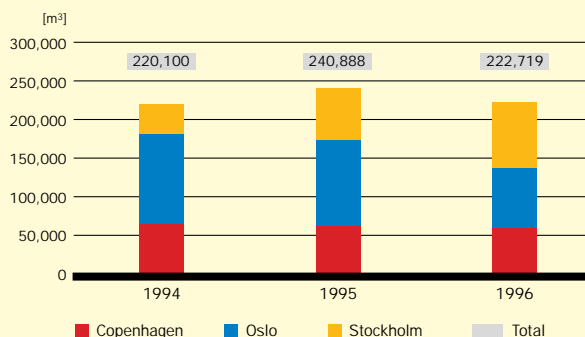
remediation work remained to be done.

At Bergen Airport in Norway, the Civil Aviation Administration has a concession for emission of glycol in conjunction with aircraft deicing. In 1996 SAS exceeded its share of this concession, and measures were initiated to tackle the problem.

SAS's assessment, based on a review of historical data for SAS's real estate, is that no land owned by the company is contaminated in relation to the requirements of the national health and environmental conservation authorities. SAS carries out preventive maintenance of tanks, containers, pipes, etc on a rota basis for the purpose of reducing pollution risks.

## RAW-MATERIAL CONSUMPTION

### Water

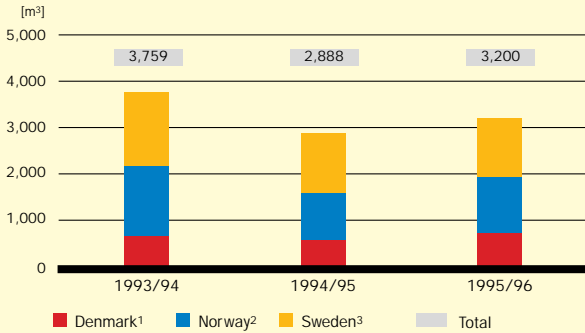


**Comments:** The previous high water consumption in Oslo was due to the airport's maintenance responsibility for all SAS's DC-9s and MD-80s. In 1996 Oslo reduced water consumption by 30% by such means as replacing water-based refrigeration apparatus by equipment based on other refrigerating media.



CONSUMPTION OF CHEMICALS

Glycol



**Comments:** Glycol is sprayed on aircraft wings to prevent the formation of ice in cold weather. Two mixtures are used, with varying glycol concentrations for different temperatures; here, these have been recalculated in terms of 100% glycol. For obvious reasons, glycol consumption is measured by the winter, rather than by the year. Comparing glycol consumption from one winter to the next is meaningless, since use is entirely governed by weather conditions and essential safety requirements. The aspect worth striving to influence is the collection rate, which in 1996 reached around 80–90% at most airports. However, this is dealt with by the airport operator concerned subject to concessions from national authorities, and is therefore not included in SAS's Environmental Report.

<sup>1</sup> Copenhagen only.  
<sup>2</sup> Fornebu and line stations only.  
<sup>3</sup> Arlanda only.

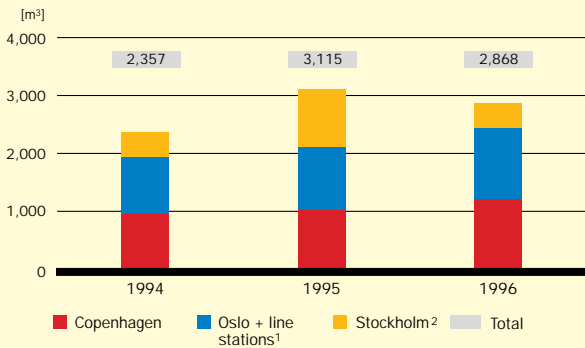
ENERGY USE

Ground Vehicles

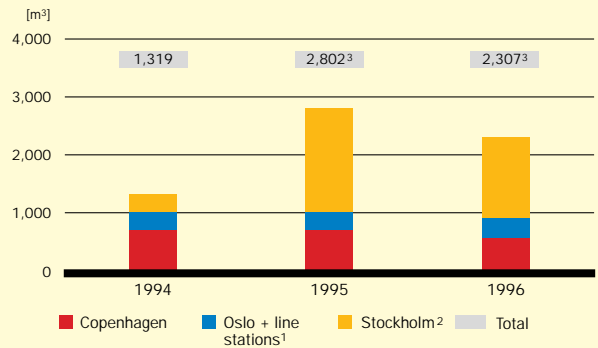
[number]	1995	1996
Denmark	750	800
Norway	607	622
Sweden	256	299
<b>Total</b>	<b>1,613</b>	<b>1,721</b>

**Comments:** SAS uses vehicles fueled by gasoline, diesel and gas, and electricity-powered vehicles, for numerous purposes: aircraft towing, baggage transportation and loading, ordinary passenger transportation, airport bus services (operated by SAS in Copenhagen and Oslo) and so on. The aim is to continue reducing consumption of fossil fuels and switch to alternative fuels to an even greater extent.

Diesel



Gasoline



<sup>1</sup> Estimates from several sources.  
<sup>2</sup> For 1994 from ground operations at Arlanda Airport only.

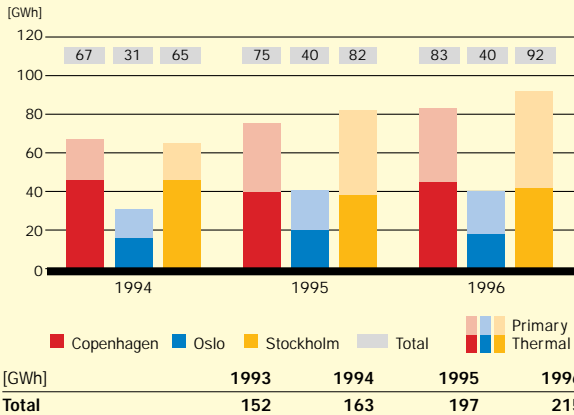
**Comments:** SAS strives to use only diesel of the best environmental quality in each country. In Stockholm, SAS has initiated a pilot project of replacing diesel by biofuel. In addition to the volumes reported here, SAS's catamarans between Malmö and Copenhagen Airport used 1,987 (2,120) m<sup>3</sup> of diesel in 1996.

<sup>1</sup> Estimates from several sources.  
<sup>2</sup> For 1994 from ground operations at Arlanda Airport only. For 1995 and 1996, gasoline for SAS's leasing cars is also included.  
<sup>3</sup> Volumes for 1994 and 1995-96 are not directly comparable; see Note 2.

**Comments:** SAS strives to use unleaded gasoline only, and already does so in most places.

# ENVIRONMENTAL STATEMENTS

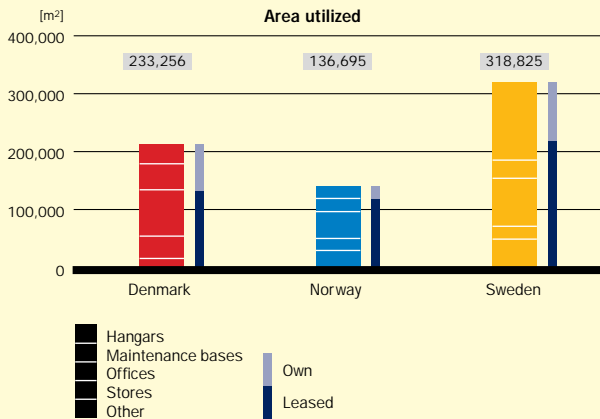
## Electricity and Heating



**Comments:** SAS uses two forms of energy – primary (electricity for lighting and operating machinery) and thermal (electricity, oil or LPG for heating). The major energy users are light and heating for hangars and maintenance bases, air compressors, electricity for aircraft, electroplating baths and electricity for offices (lighting, heating and computer equipment). In Copenhagen district heating is used for heating purposes, in Oslo 50% environmentally modified oil and 50% electricity, and in Stockholm LPG. SAS conducts energy-saving campaigns at all its bases, and between 1986 and 1994 energy use decreased by 45% at one of SAS's biggest energy users, the Koksa maintenance base in Oslo. SAS's head office in Stockholm obtains some 80% of its energy from a geothermal plant, which produced 6,101 MWh in 1996. The rise in overall use is due to the fact that energy use in 1996 relates to more buildings. Owing to deregulation of the electricity market (in Norway since 1993, in Sweden since 1996), SAS can choose where to buy its electricity, and this is expected to reduce costs.

## OTHER INFORMATION

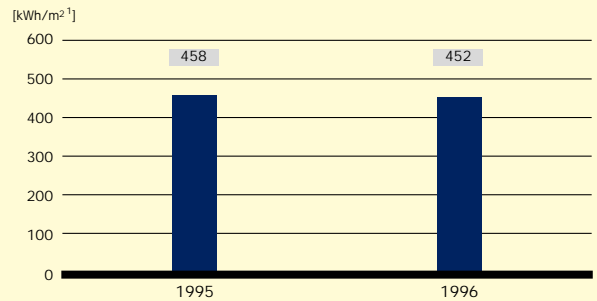
### Managed Installations



[m²]	Total area utilized		Total area with registered resource consumption	
	1995	1996	1995	1996
Own	447,992	468,312		
Leased	240,652	203,693		
<b>Total</b>	<b>688,644</b>	<b>672,005</b>	<b>430,767</b>	<b>475,266</b>
of which				
Denmark	233,054	213,140	176,175	157,674
Norway	136,695	140,040	93,701	93,701
Sweden	318,825	318,825	160,891	223,891

**Comments:** In much of the premises used by SAS, no activities involving resource consumption or environmental impact for SAS's part are conducted. A large portion of the environmental data should therefore be compared with total floor area where registered resource consumption takes place, to indicate SAS's environmental efficiency. In the inventory carried out in 1996 to obtain complete data, there was an increase of some 45,000 m² on the previous year.

### Relative Energy Use



	1995	1996
Electricity and heating [kWh]	197,360	214,821
Area used [m²] <sup>1</sup>	430,767	475,266
Energy efficiency [kWh/m²]	458	452

<sup>1</sup> Total area with registered resource consumption.

PROJECTS

Towing of Aircraft (Copenhagen) ➔

**Purpose** To reduce fuel consumption, emissions and noise in the towing of aircraft in Copenhagen by obviating the need to start the aircraft's auxiliary power units (APUs) to generate power, thereby also reducing costs.  
**Target** To replace the aircraft's navigation lights by mobile lamps for towing purposes, thereby cutting costs by some 1 MSEK a year.  
**Action plan** SAS has applied for exemption from the rule that the aircraft's fixed navigation lights must be used, but this was refused. SAS has appealed against the decision.  
**Timetable** A decision on SAS's appeal is expected in 1997.  
**Person in charge** Jens Andersen.  
**Cost** Approx. 120,000 SEK.

Special Waste at SAS's Workshops (Copenhagen) ➔

**Purpose** To reduce the wheel and brake workshop's solvent use, oil discharge, water consumption and waste volumes, with consequent cost reduction.  
**Target** To reduce the volume of special waste by 400,000 liters, with a cost reduction of 500,000 SEK.  
**Action plan** Testing of new rinsing methods using soap-based products, and also design planning of a wastewater treatment plant enabling effluents to be purified and reused instead of removed and destroyed.  
**Timetable** Completion during 1997.  
**Person in charge** Claus Øster.  
**Cost** 550,000 SEK.

Laundering/Dishwashing Routines (Copenhagen) ★

**Purpose** To reduce the use of laundry and dishwashing products with an adverse impact on the environment, e.g. chlorine, both by evaluating alternatives with less environmental impact and by shifting future purchases toward materials and structures that can be washed in an environmentally sound way.  
**Target** All laundering and dishwashing routines must be modified to improve environmental performance within the existing cost framework.  
**Action plan** All products that can be laundered or cleaned by means of chemicals, e.g. uniforms, blankets and seat covers, are being reviewed. Use of energy, resources and chemicals and alternative methods are being evaluated, and the environmentally optimal method will then be selected.  
**Timetable** Laundering routines for blankets have already been changed from drycleaning to washing in water. The whole project will be completed in 1997.  
**Person in charge** Peter Toft.  
**Cost** None.

Energy Saving (Copenhagen) ●

**Purpose** Reducing energy use and improving the work environment at SAS's office premises in Copenhagen.  
**Target** Reducing by at least 50 MWh a year the office premises' energy use.  
**Measures** Switch to more energy-saving lighting.  
**Person in charge** Benny Hartmann Andersen.  
**Cost** 100,000 SEK.  
**Effect** Reduced energy use in the office premises in 1996.

Laundering of Uniforms (Copenhagen) ◐

**Purpose** To reduce the environmental impact of the laundering of uniforms at Copenhagen Airport, conclude an agreement with the supplier regarding further improvements in environmental performance, and utilize experience from the project in drawing up environmental criteria for SAS's purchasing manual.  
**Target** To cut water and chemical consumption and energy use by at least 20%.  
**Measures** Certain modifications in laundry routines.  
**Person in charge** Martin Porsgaard Nielsen.  
**Cost** None.  
**Effect** No measurable environmental effects were attained, but a reciprocal environmental agreement between SAS and the supplier was drawn up. Experience from the project has formed the basis for the environmental criteria in SAS's purchasing manual.

Switch to District Heating (Copenhagen) ➔

**Purpose** Reducing atmospheric emissions from SAS's heating plant in Copenhagen.  
**Target** Cutting by 90% the emissions of carbon dioxide, sulfur dioxide and nitrogen oxides from SAS's own heating plant.  
**Action plan** Conversion to district heating of hangar 5 at Copenhagen Airport and the office building in Hedegårdsvej.  
**Timetable** Hangar 5 converted in 1996, office building to be converted during 1997.  
**Person in charge** Ib Reinholt Pedersen.  
**Cost** 4.5 MSEK.

Water Used in Vehicle Washing (Copenhagen) ●

**Purpose** To reduce water consumption in the vehicle-washing facility at Copenhagen Airport and thereby also cut costs, by recycling the washing water instead of diverting it into wastewater outlets.  
**Target** Maximized recycling rate with proper water purification and retention of washing quality, within the framework of an acceptable depreciation period.  
**Measures** Installation of circulation plant with effective water purification and recycling.  
**Person in charge** Nils Kirkelund.  
**Cost** approx. 500,000 SEK.  
**Effect** A recycling rate of 82% has cut current annual water consumption from 3,900 m<sup>3</sup> to less than 1,000 m<sup>3</sup>. The reduced water costs mean a repayment period for the project (including service and maintenance) of some seven years.

New Freight Terminal (Copenhagen) ➔

**Purpose** To reduce environmental impact during the erection and future operation of SAS's new freight terminal at Copenhagen Airport.  
**Target** By selecting energy-saving methods, materials and equipment, to achieve at least a 20% reduction in operating costs in terms of lighting, process energy, ventilation, heating, etc for the new terminal compared with the old.  
**Action plan** A technical specification including environmental requirements and an environmental management plan have been drawn up and are included in the agreements with the general contractor. A cooperation agreement on environmental management has been concluded with the client (Copenhagen Airport).  
**Timetable** The construction work was commenced early in 1997, and the terminal is to be ready for operation in mid-1988.  
**Persons in charge** Per Heymann Andersen and Flemming Borch.  
**Cost** The specific costs of environmental management cannot be estimated (total construction cost: 500 MSEK).

● Target 100% attained   ◐ Target 50–99% attained   ○ Target not attained by >49%  
 ➔ Current project with subsequent date for measurement of target fulfillment   ★ New project started in 1997

New Airport (Oslo) ➔

**Purpose** To improve the environmental performance of SAS's facilities for service, technical maintenance and freight at Oslo's new Gardermoen airport, and thereby create a better work environment for SAS's employees, reduce SAS's environmental impact and cut SAS's costs of waste disposal.

**Target** All buildings for which SAS is the client must meet both present-day environmental requirements and those arising within the foreseeable future. SAS's waste-disposal costs are to be reduced.

**Action plan** Environmental requirements will be made a natural and integral part of the work both in the design-planning and in the construction phase.

**Timetable** The buildings are to be ready for trial operation from 1 August 1998 and permanent operation from 4 October 1998.

**Person in charge** Erik Isachsen.

**Cost** The specific costs of environmental modification cannot be estimated (total construction cost: 1,200 MSEK).

Phase-out of Halons (Stockholm) ●

**Purpose** Reducing the risk of emissions of chemicals with an impact on the ozone layer.

**Target** Replacing Halons as fire-extinguishing agents in SAS's ground operations at Arlanda, by new detector and fire-suppression systems.

**Measures** The installed volume of Halons (2,813 kg) was transferred to SAS in Copenhagen.

**Person in charge** Anders Norin.

**Cost** 700,000 SEK.

**Effect** All Halons used by SAS at Arlanda have been eliminated.

Reduction/Purification of Wastewater (Stockholm) ★

**Purpose** To reduce and purify wastewater in the ground operations at Arlanda Airport, e.g. from washing and painting/lacquering of aircraft and ground vehicles. Parts of the project must also contribute to improved environmental documentation, management and reporting at the base.

**Target** To ensure that the new concession requirements are fulfilled within the stipulated 18-month period following official decisions.

**Action plan** Erection of new facilities for washing of aircraft and vehicles.

**Timetable** Completion during 1998.

**Person in charge** Bengt Noreskog.

**Cost** 25–30 MSEK.

Chemicals and Special Waste (Stockholm) ★

**Purpose** Development of routines for storage of chemicals and special waste.

**Target** A risk-free means of storing environmentally hazardous waste at Arlanda in a building not used for aviation-related activities.

**Action plan** Setting up a separate, environmentally sound building for storage of special waste.

**Timetable** To be completed not later than during 1998.

**Person in charge** Bengt Noreskog.

**Cost** 2–4 MSEK.

Biofuel for Ground Vehicles (Stockholm) ★

**Purpose** Reducing emissions of carbon dioxide from the vehicles in operation around the terminals that are currently diesel-powered.

**Target** Replacement of diesel by rapeseed oil in the vehicles where this is practical and financially feasible.

**Action plan** In a three-month test phase, six ramp vehicles are being test-run on rapeseed oil. Subsequently, the scope for converting the remainder of SAS's ground vehicles to rapeseed oil will be evaluated.

**Timetable** Completion of the test phase in mid-1997 and subsequent evaluation.

**Person in charge** Göran Jaxeus.

**Cost** 100,000 SEK.

Switch to District Heating (Stockholm) ➔

**Purpose** Reducing atmospheric emissions from the heating plant at Arlanda.

**Target** Cutting by 90% the emissions of carbon dioxide, sulfur dioxide and nitrogen oxides from SAS's own heating plant.

**Action plan** Connection of SAS's heating plant to a newly built district-heating plant fired with biofuel.

**Timetable** To be completed during 1997.

**Person in charge** Anders Norin.

**Cost** 250,000 SEK.

Sorting at Source (Oslo, Stockholm) ➔

**Purpose** Reducing volumes of waste.

**Target** Increased sorting at source in terms of both volume and number of components sorted, and reduced costs.

**Action plan** Suitable siting of waste containers, implementation of information programs, establishment of a statistical target-monitoring system.

**Timetable** Completed at Arlanda Airport during 1996. To be implemented at Fornebu Airport during winter 1997.

**Persons in charge** Bjørn Nordby (Oslo), Anders Norin (Stockholm).

**Cost** 250,000–300,000 SEK.

Harmonization of Ground Vehicles and Equipment ★

**Purpose** Reducing environmental impact and improving the work environment by harmonizing SAS's purchasing criteria for ground equipment in the Station Services Division with the requirements in each Scandinavian country. The project forms part of the endeavor to enhance the flexibility and cut the costs of administration and maintenance, and generally improve reliability and quality.

**Target** The same requirements and standards for SAS as for the authorities in Denmark, Norway and Sweden in the areas of purchasing routines, prices, technical specifications, documentation, the environment and the work environment. The project is intended to result in lower overheads.

**Action plan** Following a review of existing SAS and official requirements in each country, a joint standard purchasing policy is to be introduced.

**Timetable** To be completed during 1997.

**Person in charge** Geir Steiro.

**Cost** The specific costs cannot be estimated.

Recycling of Newspapers and Magazines ★

**Purpose** Manual sorting and disposal of read newspapers and magazines in an environmentally sound way.

**Target** Recycling of at least 50% of the newspapers and magazines.

**Action plan** valuation and development of the recycling system at Arlanda and inducing SAS's other stations to introduce corresponding systems where practically feasible.

**Timetable** To be completed by year-end 1997.

**Person in charge** Linnar Borén.

**Cost** None.

● Target 100% attained   ● Target 50–99% attained   ○ Target not attained by >49%  
➔ Current project with subsequent date for measurement of target fulfillment   ★ New project started in 1997

