



Swedflight PRO airports

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EKCH / CPH

Copenhagen/Kastrup

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version 2.0

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## About the Kastrup airport project



Terminal 3 at Kastrup

(photo reproduced with kind permission of the PR dept. at Kastrup)

Copenhagen-Kastrup is a quite remarkable airport from many points of view. For us as scenery designers it is one of the most wanted airports from users all over Northern Europe and that is the main reason why we have chosen it as our first non-Swedish project. For us as Swedish flyers in the real world it is the airport we see most often outside our country and that is true also for passengers from the whole Scandinavia. It is the airport where we very often wait for flights to other destinations and where we have spent uncountable hours during the years. Therefore a lot of us have a special hate/love relationship to this nice airport.

During the construction of this scenery we have had the great opportunity to see a lot more of the airport than the premises you look at as an ordinary passenger and doing so we have found an airport filled with beautiful and fascinating architecture. We have also been impressed of the interesting history of the airport, which you can read much about in the end of this manual. One of the more remarkable facts is that the airport is among the oldest civil ones in the world and it has furthermore been located at the same place very near the city of Copenhagen since the start in 1925.

Kastrup functions as the largest hub airport for traffic in Northern Europe which can easily be seen in the passenger statistics. About half of its passengers never leave the airport area but fly directly to other destinations from there. A lot of passengers therefore never visit Copenhagen or Denmark but see only the airport. That is also one of the reasons why a lot of money have been invested there in order to make the airport a showpiece of Scandinavian architecture and design. A rather uncommon idea but one that has made the airport to one of the more beautiful around the world. Hopefully we have been able to recreate some of this beauty also in our project.

As a Scandinavian you can if you want also feel very proud that Kastrup airport has from big groups of travellers been voted 'Best Airport' several times. For example:

- 2004 (2 times): Best airport in Europe
- 2003 (2 times): Best airport in Europe
- 2002 (2 times) and 2000: Best airport in the world
- 1999: Best airport in Europe and 3<sup>rd</sup> best in the world

## About the design of the scenery

As said further down in the Data and History section, Copenhagen/Kastrup is a really big airport. It is world famous for its design of the terminals, from the oldest one of Vilhelm Lauritzen from 1939 (now restored and moved to a new location) to the latest from 1999. To recreate all this as a FlightSim Scenery is a real challenge. With the tools of today it is fully possible to make all of these beautiful buildings with every small detail - however if you do so you will directly get into serious frame rate problems. One solution of this is therefore to use pure photo textures and from them get a lot of details 'free'. So we have done here, nearly every texture is from real photos – almost 2000 photos are the base for the photo textures on all objects at Kastrup. But still you are forced to make some shortcuts here and there to make the scenery usable and flyable. Those of you that know the real airport well may therefore find that some details are missing where you would expect them and that some parts have been simplified maybe too much during the construction process. Please excuse us for that.

The emphasis in this scenery project has been on the Runway and Taxiway systems, where we have tried to make it the most detailed and realistic one on the market up to now. If sacrifices have been done they have affected the buildings and not the ground scenery.

The scenery is built to scale with a quite high degree of precision and we hope that the final result is a product that will give you a strong feeling of realism but also of the beauty of the real airport.

Two proprietary features are introduced here for the first time in big scale. The most important of them is the new technique to make the lines in the runway and taxiway system. With this technique it is now possible to make lines with proper width and with any shape, even with totally smooth bends. The greatest advantage is that they need very little power from the graphics system and don't affect the frame rate very much. Therefore it has been possible to draw every important line at the airport, even the double edge lines seldom seen in a scenery before.

The second feature is the new taxi guidance system, made with a technique that need very few resources from the graphics board. The lights are small, don't blur the screen and follow the lines with millimetre precision. You will find them on every taxi line. Together with most of the taxiway guidance signs (almost 500) the result is one of the most advanced runway and taxiway system on the market.

The latest available information has been used and the objects are placed in the proper positions. So to conclude – this should be a airport scenery that suits the real demanding and professional user but that also can be used for sightseeing and slewing around, looking at the many beautiful terminals and other objects.

### The content of the scenery

The Kastrup scenery will be released in at least two parts because of the size of the project. In this first package you will find the following:

- The complete runway and taxiway system will all lines, lights and signs
- The whole North area - except the railway station and some small buildings at the hangar area
- Part of the West area with the tower
- 3D approach lights, 3D PAPI, 3D RGL and working APIS at all gates

You will **not** find the following in this first package:

- The South area
- The East area
- Most of the West area
- The classic Vilhelm Lauritzen terminal from 1939

## Maps of Copenhagen/Kastrup

The latest version of all official maps for this airport can be downloaded from the homepage of the Danish Civil Aviation Administration found at this adress:

<http://www.slv.dk/Dokumenter/dscgi/ds.py/View/Collection-344>

There you will find many PDF documents with the Runway, Taxiway and Parking system, as well as separate SID and STAR maps for all runways. The big maps covering the ground layout are in the files ADC and APDC.

## How to contact us

We hope you will visit our web site now and then, looking for updates or other additions for our sceneries. The adress is: <http://www.swedflight.com>

You can reach us easily on this email adress: [support@swedflight.com](mailto:support@swedflight.com) We will try to contact you back as fast as we can.

## Thanks

We want to thank everyone that have helped us make this project come true and that have given us a lot of assistance when needed, especially the very helpful friends at the PR department at Kastrup who have supported us with invaluable pictures and all sorts of data.

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# Airport data

Every day, 800 aircraft land and depart at Copenhagen Airport, and 50,000 passengers pass through the airport terminals. This makes Copenhagen Airport one of the most important traffic hubs in northern Europe.

Located just 8 kilometres southeast of the Copenhagen city centre, Copenhagen Airport is in Kastrup, a town on the island of Amager.

The airport is northern Europe's main airport, i.e. the transfer airport for air traffic between other parts of the world and the many national and regional airports in Scandinavia and the area south of the Baltic Sea.

The airport is the hub for SAS and thus one of the hubs in the Star Alliance. In addition, the airport is the northern European hub for DHL, the express air freight company.

The airport is owned and operated by Copenhagen Airports A/S, a company listed on the Copenhagen Stock Exchange.

There are about 22 000 employees in the many different companies that together provide the services that have made Copenhagen Airport one of the highest ranking in the world. In terms of passengers, the three largest airlines serving Copenhagen Airport are SAS, Maersk Air and Sterling European.

Direct connections are available from Copenhagen Airport to a total of 119 destinations worldwide, 10 of which are in Denmark including the ones in Greenland and The Faroe Islands, 24 in the other Scandinavian countries, 66 in the rest of Europe and 19 intercontinental airports.

**Number of operations in 2003** (take-offs and landings): 259 002

**Number of passengers in 2003:** 17.7 million

**Cargo volumes in 2003:** 335 731 tonnes

## Main destinations and countries 2003:

Approximately 48% of passengers at Copenhagen Airport are transfer passengers, i.e. passengers who primarily change flights between European and Scandinavian destinations. Copenhagen Airport is the largest traffic hub in Northern Europe and, in terms of the ratio of transfer passengers to total number of passengers, it is the second largest transfer airport in Europe, only surpassed by the airport in Frankfurt.

		Passengers total		
	Country	2003	Share %	Change %
1	Norway	2 057 523	11,6	-4,5
2	Sweden	1 833 313	10,3	-9,7
3	Great Britain	1 667 229	9,4	-2,0
4	Germany	1 508 827	8,5	-7,4
5	Denmark	1 370 329	7,7	-8,2
6	Spain	980 847	5,5	11,5
7	France	824 385	4,7	-6,2
8	United States	680 177	3,8	1,4
9	Finland	670 205	3,8	2,3
10	Italy	653 172	3,7	14,6
11	Netherland	560 503	3,2	-5,9
12	Belgium	460 502	2,6	1,6
13	Switzerland	459 564	2,6	-11,6
14	Greece	388 820	2,2	-5,1
15	Poland	333 987	1,9	-6,7
16	Iceland	322 291	1,8	23,0
17	Thailand	306 660	1,7	-10,4
18	Austria	288 621	1,6	2,8
19	Turkey	198 912	1,1	-11,7
20	Ireland	174 502	1,0	-14,8
	Total	15 740 369	88,9	-3,5
	Other	1 973 638	11,1	0,9
	<b>Grand total</b>	<b>17 714 007</b>	<b>100,0</b>	<b>-3,1</b>

## Top twenty airlines 2003:

	Airline	Passengers total		
		2003	Share %	Change %
1	Scandinavian Airlines	9 961 007	56,2	-9,4
2	Maersk Air	942 048	5,3	-16,0
3	Sterling European	540 675	3,1	29,6
4	Cimber Air	540 478	3,1	20,9
5	British Airways	426 890	2,4	1,9
6	My Travel Airways	318 732	1,8	2,7
7	Icelandair	310 628	1,8	1,2
8	Klm Royal Dutch Airlines	303 689	1,7	-7,5
9	Skyways Ab	299 938	1,7	81,1
10	Air France	288 537	1,6	-1,2
11	Lufthansa	282 092	1,6	-14,6
12	Easy/Go	254 710	1,4	59,8
13	Spanair	227 246	1,3	32,0
14	Wideroe Norskair	198 145	1,1	49,6
15	Air Baltic	165 165	0,9	5,4
16	Thai Airways International	163 475	0,9	-7,8
17	Austrian Airlines	158 815	0,9	7,1
18	Air Botnia	154 778	0,9	-18,4
19	Finnair	145 586	0,8	-1,4
20	Brussels Airways	127 457	0,7	-17,6
	Total	15 810 091	89,3	-4,6
	Others	1 903 916	10,7	12,2
	<b>Grand total</b>	<b>17 714 007</b>	<b>100,0</b>	<b>-3,1</b>

## Kastrup on the Net

If you are interested of more statistics and also other data about the airport, please visit the home page of Kastrup at the following adress: <http://www.cph.dk/CPH/UK/MAIN/>

There you will get statistics for several years back plus a lot of other interesting data about the airport. You will for example find a Guide to Art and Arcitecture which is an exellent presentation of the beatiful architecture and all the different types of modern Scandinavian art that that you will see all over the public areas in the terminals. There is also a fascinating Virtual Airport where you can take different types of Panoramic tours depending what you are interested of.

## Area and runway systems

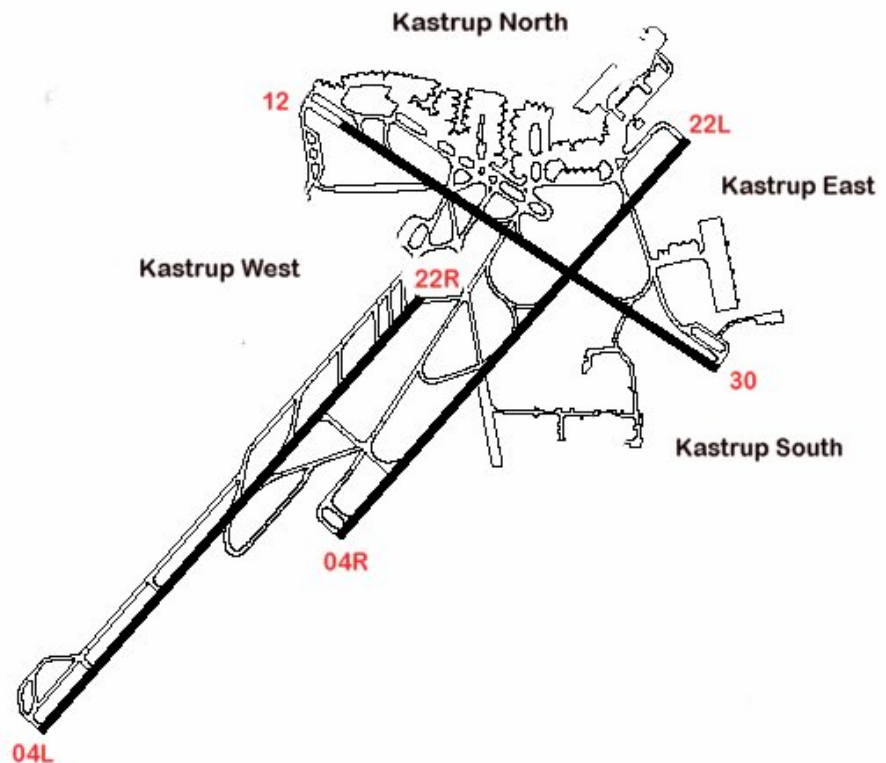
The three runways divide the airport area, which is approximately 11.8 square kilometres, into four geographical areas:

**The North Area**, which contains the three passenger terminals, a railway station, a car park, a police station and other administrative functions, the Gate Gourmet catering facilities, SAS Cargo Center and SAS's technical area, the last with four large hangars.

**The East Area**, which holds cargo terminals for DHL and SAS, the Veterinary and Customs Centre, forwarding agencies and LSG Sky Chefs catering facilities.

**The South Area**, which accomodates technical bases for Maersk Air, Mt Travel, Sterling, Danish Air Transport and North Star.

**The West Area** comprises Naviair traffic control and Copenhagen Airports's technical maintenance facilities.



Physical data ( **only for use in flight simulation, not for real use!** )

RUNWAY	22L	22R	04L	04R	12	30
Ref point ARP	55 37 04.50N 012 39 21.50E					
Height (feet)	17					
Bearing GEO	221.2°	221.2°	041.2°	041.2°	123.2°	303.2°
Bearing MAG	220.0°	220.0°	040.0°	040.0°	122.0°	302.0°
Length (meter)	3300x45	3600x45	3000x45	3300x45	2800x45	2365x45
ILS signal	OXS	KLK	CH	NE	KA	OY
ILS fq (MHz)	109.50	110.90	110.50	109.30	109.90	108.90

The runway system consists of a main system (direction 22/04) with two parallel runways for take-offs and landings (3600 metres and 3300 metres long) and a 2800-metres cross-runway (direction 12/30). The runway used most frequently for landings (22/04) contains equipment ensuring landing even at extremely poor visibility (CAT 3), whereas the other runways contain equipment for poor visibility (CAT 2). Runway 04L and 22L are usually used for landings and in the Swedflight scenery those are equipped with approach lights. For the crossing runway only 30 is normally used for landing because of the noise regulations for runway 12.

The main runway system, with aircraft approaches and take-offs mainly taking place off shore, is used for about 95% of all flights.

The maximum capacity of the runway system is 83 operations (take-offs and landings) per hour. Various measures can increase the capacity to 91 operations per hour.

There are 108 aircraft stands: 43 of which have a jet bridge to the terminal and 54 are remote aircraft stands, 21 of which are cargo stands in the East Area. There are nine domestic stands.

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# Airport history

## It all began in 1925

Founded in 1925, Copenhagen Airport was one of the first civil airports in the world. The early years were characterised by the pioneering spirit in a day and age when flying was for the privileged few.

The airport was an attraction in itself, also for the many people who did not have the opportunity to fly. A Sunday outing to the grass field in Kastrup, from where the large birds took off, soon became an attraction extraordinaire for the Copenhageners. In 1939, when flying was really gaining momentum and construction of Vilhelm Lauritzen's new air terminal was completed, World War II broke out and temporarily stopped the growth of the airport.

But when the war ended in 1945, Copenhagen Airport was ready for tremendous growth, and things have developed quickly since then. From 6,000 take-offs and landings in 1932 to almost 290,000 in 2001.

## The pioneer era

Copenhagen Airport was inaugurated on 20 April 1925. It consisted of a large, impressive terminal built of wood, a couple of hangars, a balloon mast, a hydroplane landing stage and a few grassy meadows that could be used as runways. The grass on the runways was kept short by sheep, which were shepherded away before take-offs and landings.

Aviation was popular then, although mostly among daredevils. For the first few years, aviation was a summertime activity and usually only in good weather. Both pilots and the few passengers onboard were out in the open and there was no navigation equipment. Aviation evolved steadily until 1930, when radio and weather services allowed aviation throughout the year and at night as well. Aircraft grew larger and passengers were offered a seat within a closed cabin (and a few years later pilots joined them), and from then on the pace accelerated.

Det Danske Luftfartsselskab (DDL), the oldest airline in the world, which is called SAS Denmark today, increased the number of scheduled flights it offered. Copenhagen Airport soon became the natural transit airport between the Nordic region and the rest of Europe.

## The growth era

Aviation was fashionable – among those who could afford it. From 1932 to 1939, take-offs and landings rose from some 6,000 to 50,000 annually, and the number of passengers sextupled to 72,000. The airport was becoming too small.

In April 1939, it expanded by a couple of meadows, an aircraft stand of concrete and a new state-of-the-art airport terminal, which was six times the size of the old one. The terminal was designed by Vilhelm Lauritzen, who was considered a pioneer among architects, in terms not only of architecture and construction, but also of service and passenger comfort. On 19 September 1999, the terminal was moved to another location and later restored to its original condition.

1939 was a record year in the history of aviation. New direct scheduled flights were started, and Copenhagen Airport acquired two new four-engine Condor planes. As something new, a stewardess served drinks during the flight. Thus, prospects were bright until World War II broke out at the end of the year.

### **Intercontinental 1940 - 1972**

On 9 April 1940, the war caught up with Copenhagen Airport. Almost all civil air traffic was halted, military squadrons were deployed and camouflage netting transformed the new airport terminal into the only hill in the area. The airport remained untouched by actual acts of war; during the war years there was quite a bit of civil air traffic to Sweden, Berlin, Vienna and a couple of other destinations.

In the spring of 1941, a combination of huge masses of snow and a sudden thaw caused aircraft to bog down in the grass runways of the airport. As a result, the first concrete runway was laid that summer; it was 1,400 metres long and 65 metres wide.

In subsequent years, another three runways and a system of taxiways were constructed. Since at the same time the terminal had barely been used, when WWII ended in May 1945, Copenhagen Airport was the most modern – and unscathed – international airport in Europe.

### **A European hub**

The airport went intercontinental in 1946. Both American Overseas Airlines and the newly founded SAS began operating scheduled flights to the US. In 1948, the airport was the third largest in Europe, with more than 150 daily take-offs and landings and almost 300,000 passengers.

The airport continued its rapid growth. The terminal was expanded several times and new hangars were erected. In 1954, the Los Angeles city limit moved to Copenhagen with the opening of the first polar flights to Copenhagen. The number of passengers climbed to 700,000 – which required new automatic baggage handling facilities.

Aviation was now a necessity for businesspeople, and airmail was increasingly important to international trade; in 1954, 11,000 tonnes of cargo and mail were handled by the airport.

### **The jet age**

In the 1950s, the motto was "larger, better and faster": jet planes were on the way. In 1956, the airport served one million passengers, and a comprehensive expansion programme was launched to make Copenhagen Airport the world's most modern jet airport. The runways were lengthened and fitted with technically advanced equipment. A new giant terminal with a system of piers was erected some distance from the "old" terminal. The first jet plane, which was Russian, landed in 1957, and both SAS and its foreign rivals acquired jet planes with increasing speed. The propeller aircraft phased out by the scheduled airlines formed the basis for a completely new type of airline: the charter companies that flew tens of thousands of Scandinavians to southern Europe each year.

By 10 May 1960, when the new airport terminal (now Terminal 2) was inaugurated, the daily number of jet operations had increased to 28, and still traffic kept on growing. The large new airport terminal soon became too small, and in 1969 yet another huge expansion programme was launched.

Domestic traffic was relocated to a new domestic terminal (the eastern part of Terminal 1). The (current) international terminal was supplemented with a new pier (C) and a separate arrivals hall (the building between Terminals 2 and 3). A new control tower and 3,600 metres of additional runways allowed take-offs and landings to take place at the same time.

When the comprehensive expansion was completed in 1972, the number of take-offs and landings exceeded 180,000 and there were more than eight million passengers.

### **Hub 1973 - 1999**

Throughout the 1970s, airport traffic continued to grow, but the airport was not expanded further. A new large airport on the island of Saltholm (with a connecting bridge to Denmark and Sweden) was on the drawing board. It would be a huge investment, and the proposal was evaluated thoroughly by many experts. In 1980, however, the Danish parliament instead decided to expand the capacity of Copenhagen Airport to 20-22 million passengers by the year 2000. This solution was far cheaper than building a new airport and because the new types of aircraft were less noisy, an airport on Saltholm did not offer a decisive environmental gain.

The expansion of the airport began in 1982, after the necessary period of planning. The intention was not to build Europe's largest airport, but to build transit passengers' favourite airport. A stay at the airport was supposed to be an integral part of the travel experience. Efficiency and precision were obvious demands, but focus was also on generating an oasis where international travellers could relax: beautiful architecture, Scandinavian design, and pleasant, light and comfortable surroundings with plenty of shops, restaurants and other facilities providing enjoyment and pleasure.

The construction of new cargo facilities began in the eastern area of the airport, far from the passenger terminals: new terminals, new aircraft stands (15 in all) and other technical facilities.

### **The airport of our time**

In 1986, the old Pier B was replaced by a new, elegant pier constructed according to the most modern handling and comfort principles. The transit hall was expanded and modernised – among other things it included the world's first 'real' airport shopping centre. The underlying idea was for the light and relaxing surroundings to give travellers an individual experience in terms of shopping and recreation. In 1989, a new main domestic terminal (the western part of Terminal 1) was constructed and the international terminal expanded again. Two multi-storey car parks with a total of 2,400 parking lots were erected, as well as a new Pier A.

A number of important construction projects were completed in 1998: a pier connecting the domestic and international terminals; a new arrivals hall; new modern baggage handling facilities; an underground railway station with two large underground parking facilities; and above it all the spacious and impressive delta-shaped terminal (Terminal 3). The first stage of the new Pier D was completed in the spring of 1999.

### **The airport today 2000+**

A new motorway and railway connection between Copenhagen Airport and Sweden opened on 1 July 2000. The many passengers from Sweden and Denmark now come to the airport by car, bus or train.

It takes four hours to go from Stockholm to Copenhagen Airport by train; it takes two and a half hours from Gothenburg in Sweden and from Aarhus in Denmark; it takes 20 minutes from the centre of Malmö and only 12 minutes from the heart of Copenhagen. The distance from the train platform to the check-in counters is less than 100 metres, and it only takes a couple of minutes to go to the security check and the large airside transfer area, where passengers may stroll freely among 50 shops, 15 restaurants and bars, business class lounges, conference facilities, a hotel area, a sauna and much, much more.

A new large five-star Hilton Hotel with 382 rooms opened in the spring of 2001 as well, and that same year, a new large area for non-Schengen travellers was added to Pier C.

(history part reprinted with the kind permission of the PR dept at Kastrup)

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## Installation advice

### The content of the package

The scenery of Kastrup airport comes packed in a single SWE-EKCH2x.EXE file that is easy to install. Just follow the advice down here.

### Unpacking and installation

The unpacking of the SWE-EKCH2x.EXE file is executed by just running it from where you have placed it temporarily. All necessary steps are described in the installation program that is started automatically and then makes the installation. Just answer the questions in which directory to put the scenery files.

### Activating the scenery

The following procedure is also described with pictures in the accompanying file ACTIVATE.PDF that is placed in the directory <\SwedflightPro> during the installation.

When the scenery files are unpacked and automatically copied to their proper directories you have to activate the EKCH scenery in the flight simulator itself. This Swedflight PRO scenery does **not** need any editing of the setup file for the simulator - in stead you do it simply inside the simulator like this:

- Go to the menu *World/Scenery Library* and click on the button ADD AREA.
- The window 'Select scenery directory' will pop up. Find the main directory where the scenery was installed – if you haven't changed the default position it will be under ADDON SCENERY in the root directory of FS2002 or FS2004.
- Go there and click on the directory SwedflightPro, then EKCH and then SCENERY
- Click OK
- Click OK again in the Scenery library window and the scenery is now activated.

### If you have problems with low frame rate

The airports in the Swedflight PRO series are optimized very effectively with our own unique method that gives unsurpassed frame rate values. But this is a big scenery package that can't be expected to run well on a slow system with older hardware. With modern computers with reasonably fast processors and a graphics board with at least 64 MB memory there are no great problems with frame rate (figures between 25-100 are not unusual). If you experience low frame rate values look first at the following two reasons. Firstly you may have a slower computer than mentioned (e.g. some old PIII with a graphics board with low amount of memory). Secondly the flight simulator itself can also affect the frame rate very badly if you have activated some of its special features and they are more easy to change then switching to a faster computer. We recommend you to start with the following FS9 SETTINGS to ensure good frame rates and nice looking scenery:

(in Settings/Display/Hardware)

Target frame rate	<b>UNLIMITED</b>
Render to texture	<b>ON</b>
Transform and lighting	<b>ON</b>
Anti Aliasing (Very important - see graphics driver)	<b>OFF</b>
Mip Mapping quality	<b>8</b>
Hardware rendered lights	<b>5</b>
Global Max texture size	<b>HIGH</b>

(in Settings/Display/Weather)

Sight Distance	<b>60 mi/96 km</b>
Cloud Draw Distance	<b>40 miles</b>
3D Cloud percentage	<b>50</b>
Simple Clouds	<b>ON</b>
Dusk/Dawn blending	<b>OFF</b>
Autogen density	<b>NORMAL (or OFF)</b>

(in Settings/Display/Scenery)

Terrain Mesh complexity	<b>50</b>
Terrain Texture size	<b>HIGH</b>
Terrain Detail	<b>Land only</b>
Water effects	<b>LOW</b>
Dusk/dawn texture blending	<b>OFF</b>
Extended Terrain textures	<b>OFF</b>
Scenery Complexity	<b>Dense</b>
Autogen Density	<b>Normal</b>

(in Settings/Traffic)

Air Traffic density (AI traffic will not show at all at 0%)	<b>0 - 50%</b>
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(in your PC's Graphics Drivers drivers 3D settings)

Anisotropic Filtering	<b>4x or better set in the display driver (Direct3D). Do NOT set this in FS9 settings!</b>
Anti Aliasing	<b>4x or better set in the display driver (Direct 3D). Do NOT set this in FS9 settings!</b>
Mip map detail level	<b>HIGH</b>

Minimum Graphics card - Nvidia GeForce 4 with minimum 64 Mb RAM

Please observe that a "max" setting in FS9 of all available options will result in very low frame rates. Settings that result in frame rates below 15-20 fpm should be avoided to ensure a smooth flying environment. Carefully determine which of the FS9 "features" you really need and turn OFF the rest as frame rates are a trade-off between features and your computer/graphics card.

January 2005

**SWEDFLIGHT DESIGN GROUP**