NUAC Programme

Socio-economic analysis

May 2008

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1 Executive summary

The NUAC Programme Management Team has carried out a socio-economic analysis in order to seek validation of the initial indications of possible external effects for the customers (the airlines) and other stakeholders including the passengers and the society if a closer cooperation between Naviair and LFV is established.

The two Air Navigation Service Providers (ANSPs) Naviair and LFV are already today efficient as recognised in the EUROCONTROL benchmarking analysis of European ANSPs[1]. However, the future will require further efficiency improvements and volume of scale for the European ANSPs.

In this report three scenarios for closer cooperation between Naviair and LFV/ANS are considered:

- A Merger of Naviair and LFV
- An Operational Alliance
- An Alliance between the two ANSPs with main focus on support functions

For scenario definitions please refer to the "NUAC Programme-Definition Phase Supplementary Report".

The airspace design for the Merger and the Operational Alliance scenarios are the same, which means that the external effects will be similar for the two scenarios. However, the internal effects are different and are therefore shown for each scenario.

The scenarios will result in more efficient airspace management and reduced flying time both for internal Danish-Swedish traffic, for domestic traffic and for transit traffic. The reduced flying time is a result of a more optimal design of the airspace.

These time savings will result in cost reductions for passengers and airlines and in environmental benefits (reduced emissions) to the society.

The key results from the socio-economic analysis are summarized overleaf (the benefits specifically related to Swedish and Danish airlines and passengers are shown in brackets). The analysis is based on results from a fast time simulations carried out by the Swedish ATS Academy (SATSA) and verified by EUROCONTROL by use of the "System for Airspace Analysis at Macroscopic Level" simulator (SAAM)[2]. The two set of simulations produced almost identical results with respect to gains in the scenarios.

[1] Performance Review Report 2006, Performance Review Commission, Performance Review Unit, EUROCONTROL April 2006

[2] Appendix 1 to this report: The Eurocontrol letter on NUAC SAAM fast time simulation

	Merger scenario (in mill. Euro)	Operational alliance scenario (in million Euro)	Alliance scenario (in mill. Euro)
Internal effects			
Initial investments (2006-2020)	30,1	18,4	17,3
Internal cost reductions NPV 2006-2020	172,4	72,6	68,8

External effects			
Annual cost savings for the airlines [3] (2006)	21,2 (14,5)	21,2 (14,5)	20,6 (14,1)
Annual value of time savings to passengers (2006)	9,3 (3,3)	9,3 (3,3)	9,0 (3,2)
Annual value of reduced emissions per year (2006)	4,6	4,6	4,5
Total annual effects based on 2006 simulations	35,1 (22,4)	35,1 (22,4)	34,1 (21,8)
Accumulated external effects 2011-2020	500,0 (298,9)	500,0 (298,9)	487,8 (291,2)
NPV [4] of accumulated external effects 2011-2020. Discounted to 2011.	380,4 (227,4)	380,4 (227,4)	371,1 (221,6)
NPV [5] of accumulated external effects 2011-2020. Discounted to 2006.	298,1 (178,2)	298,1 (178,2)	290,7 (173,6)

Table 1: Annual effects of the scenarios compared to today's situation for NAVIAR and LFV as well as for airlines, passengers and the society (the figures in brackets are related to traffic carried out by Danish and Swedish carriers with Danish and Swedish passengers).

The above results include:

- all costs and benefits of the scenarios for LFV and Naviair,
- all benefits to airline companies operating in the airspace of the two countries,
- all time related benefits to passengers onboard these aircraft, and finally
- the environmental benefits to the society. It is assumed that the environmental effects will be the same when assessing the total traffic and the DK-S traffic as the environmental impact from transit traffic will also appear in the DK-S case.

It should be noted that this analysis is carried out for the period 2011 to 2020 while the internal analysis is carried out for the period 2006 to 2020. However, the economic effects

[3] The cost savings include Direct Operational Costs (DOC) and Fixed Operational Costs (FOC).
[4] Net Present Value, discount factor 5%
[5] Net Present Value, discount factor 5%

will in all three cases not appear until 2011 while the internal investments will be made before 2011 (2009-2011).

Assuming:

- that the effects of the scenario will start in 2011 and will remain throughout the rest of the forecast period (2011-2020),
- that the air traffic will increase 4% per year from 2006,
- that the environmental improvements through new engine techniques and in the longer run new types of fuel will be 2% per FH (Flight Hour) in the forecast period and,
- that the discount rate will be 5% per year.[6]

Then the overall NPV (Net Present Value) of external benefit in the Merger and Operational Alliance scenario will be 380,4 million Euro. Out of this 227,4 mill. Euro will be related to traffic with Danish and Swedish passengers onboard Danish and Swedish aircraft.

The comparable accumulated figures for the Alliance scenario show a NPV benefit of 371,1 million Euro. Out of this figure 221,6 mill. Euro will be related to traffic with Danish and Swedish passenger's onboard Danish and Swedish aircraft.

These NPV values are based on a calculation where the basis year is 2011 when the external benefits are expected to start. The calculation of the internal costs is based on a calculation with 2006 as the basis year. If the NPV calculation for the external costs are based on 2006 as the basis year then the NPV values will be approx. 27% lower than the figures mentioned above. Both NPV calculations are shown in table 1.

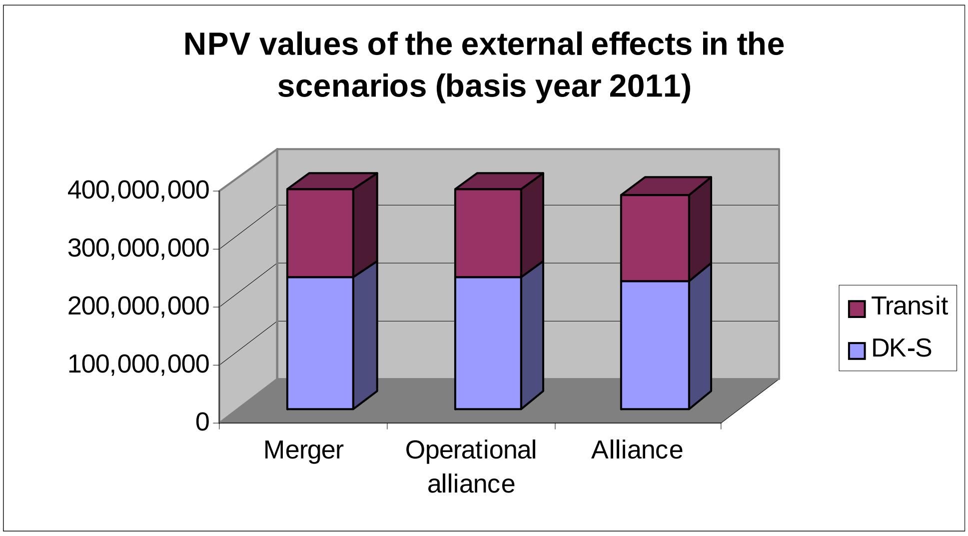

Figure 1: NPV (in Euro) of the accumulated economic benefit of the scenarios

The results are robust due to the fact that the major part of the savings are related to "true costs" like fuel savings, maintenance savings etc. while only a minor part is based on estimated values of time savings to passengers and estimated costs of environmental burdens.

In the Merger and Operational Alliance scenario the airlines will gain 63% of the total benefits while passengers will get 27%. 10% will be benefits to the environment. In the Alliance

[6] The discount rate of 5% has been used which is equal to the discount rate used in the analysis of the internal savings

scenario the percentage figures are the same due to the very small NPV differences between the scenarios.

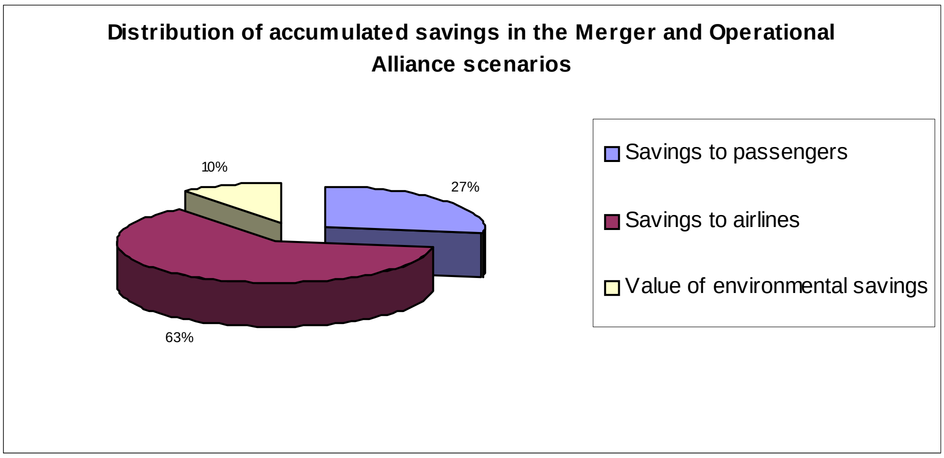

Figure 2: Distribution of benefits in the Merger and Operational Alliance scenarios

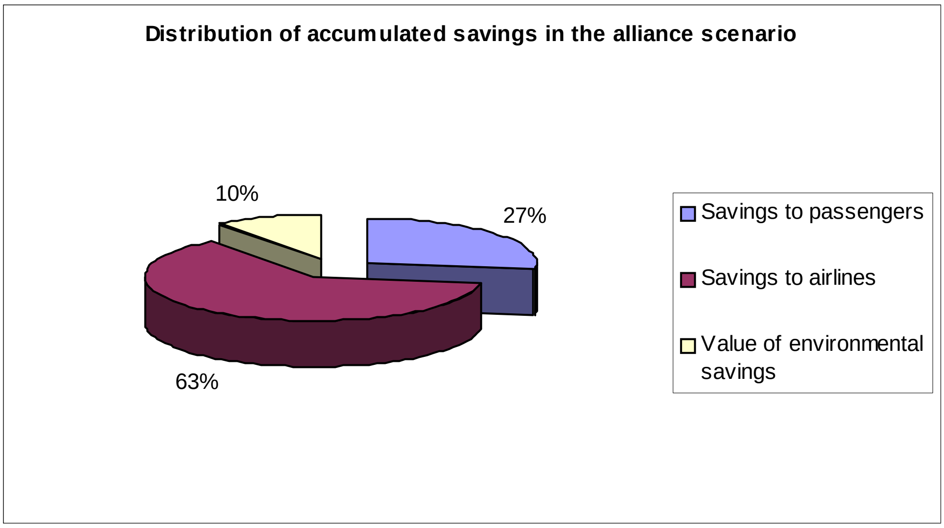

Figure 3: Distribution of benefits in the Alliance scenario

The ANSPs are important links in the value chain for provision of air traffic services to the final user – the air traveller. Improvements in the ATM sector will benefit the next link – the airlines and improvements with the airlines will benefit the ultimate user – the passenger.

In this way the scenarios will contribute positively to the value chain and thereby to the overall EU policy and specifically to the SES objectives – to promote efficiency in the European aviation sector and thereby to reduce transport costs. The actual distribution of the benefits from the ANSPs to the following links is very much a political issue and a matter of pricing policies with the operators in the value chain.

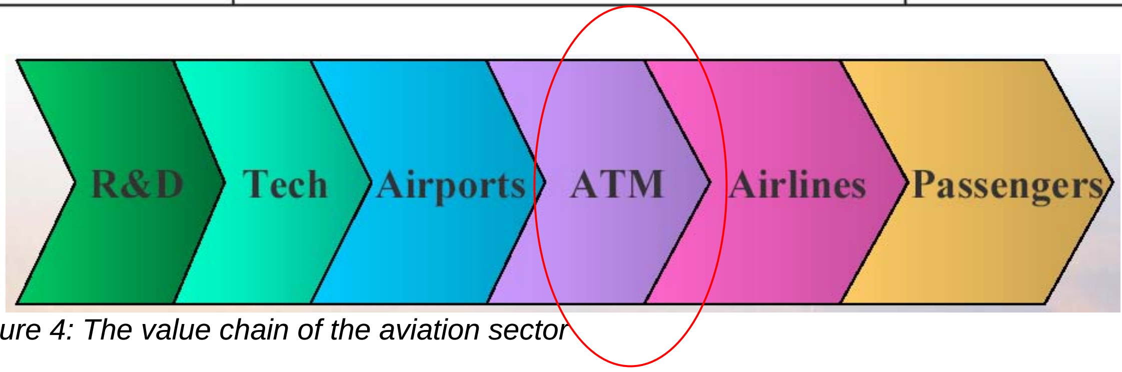

Figure 4: The value chain of the aviation sector

In addition to the benefits to the airlines and to the passengers it is important to notice that the scenarios will provide a solid reduction in emissions from the air traffic which will benefit the Danish and Swedish societies specifically and the society in general.

Implementation of the Merger and Operational Alliance scenarios will save the environment from 52.000 tons of CO_2 per year, the contrails will be reduced by 20.000 tons of water and other emissions will also be reduced considerable. The parallel figures for the Alliance scenario are 49.000 tons of CO_2 and 19.000 tons of water turning into contrails, which contribute to global heating.[7]. For comparison a volume of 50.000 tons of CO_2 is equal to the emission from approx. 16.000 cars driving 20.000 km per year [8]. The environmental savings are especially important seen in relation to a proposal regarding a European Emissions Trading scheme for the aviation sector put forward by the EC in the autumn 2006.

It is the consultants opinion that the strong market position of merged or closely integrated ANSP´s will promote the Scandinavian and Nordic interests in the EU, EC and in the EUROCONTROL-sphere and will yield a stronger influence and negotiation power in the creation of the future structure of the European air space. This will only to some extent be achieved in the Alliance scenario.

In addition to the quantitative results related to financial, economic and environmental gains it is expected that the Merger and Operational Alliance scenarios will provide a solid basis for a potentially larger ANSP operator with the base in the Scandinavian countries.

A closer cooperation between the two ANS providers will also be in line with the Swedish and Danish transport and aviation policies expressed in policy papers presented by both Governments in 2006[9]. This applies for all scenarios.

Furthermore, a closer cooperation whether it is a Merger, Operational Alliance or Alliance will support technological research and development in the Danish-Swedish region.

A final overview of the internal and external, quantitative and qualitative effects is shown in Table 2.

[7] Based on Emission Calculator, see: http://www.sasems.port.se/
[8] Energiinformation om nye danske personbiler, Færdselsstyrelsen, 2007
[9] Moderna Transporter, Swedish Government 2006 and Dansk Luftfart 2015, Ministry of Transport and Energy, 2006

Effects in Million €	Merger scenario	Operational Alliance	Alliance scenario
Quantitative effects			
Internal savings (NPV 2006-2020)	172,4	72,6	68,8
External effects (NPV 2011-2020, basis year 2011)	380,4 (227,4)	380,4 (227,4)	371,1 (221,6)
Qualitative effects			
Military issues	No conflicts of interest	No conflicts of interest	No conflicts of interest
Compliance with SES	Compliance with the SES	Compliance with the SES	Compliance with the SES
Compliance with DK-S policies	Compliance	Compliance	Compliance but with less focus at the visions included in the DK-S policies
Regional effects	Strong regional effects	Strong regional effects	Regional effects

Table 2: Overview of the socio-economic effects in the scenarios (all figures in mill. Euros)

2 Foreword

2.1 The NUAC Programme

In 2005, the NUAC Programme Management Team was established and tasked with developing a high level Decision Platform and robust Case for Change regarding a possible closer cooperation between LFV/ANS and Naviair in the provision of Air Navigation Services (ANS) in Swedish and Danish airspace. During the autumn 2005 the team initiated the work in the Programme's Definition Phase.

In 2005/2006 public procurement for third party assistance regarding the work was initiated and the Danish Consultancy company Rambøll Management was chosen to carry out the socio-economic study.

The socio-economic study is an important part of the study complex as it addresses the economic effects to the society and the effects for the external users of the Air Navigation Services.

The regional effects of a stronger common institutional structure are also addressed in the socio-economic study.

Lastly, it should be mentioned that the socio-economic study is closely linked to the previous studies in the NUAC programme as all the basic traffic data, forecasts and simulations stem from these studies. In this respect the estimated internal effects are used as input for this socio-economic analysis.

2.2 The structure of the report

The report is structured in such a way that the objectives of the NUAC Programme and the general international and the Danish-Swedish political framework is presented in the introductory chapter (Chapter 3 overleaf).

The methodology, definitions and assumptions are presented in Chapter 4.

The key-chapters will be Chapter 5 and 6 where the socio-economic effects are presented for the Merger and Alliance scenarios respectively.

Chapters 7 and 8 deals with the compliance to the SES and the Danish and Swedish aviation policies. The interfaces with the interests of the armed forces are also addressed.

Chapter 9 deals with contribution to the regional development.

The Final Remarks with a very short summary are provided in Chapter 10.

A list of abbreviations is found in Annex 1.

Consultation statements received from trade unions have been added as Annex 5.

3 Introduction

3.1 Background

3.1.1 The international context of the NUAC programme

Air Transport in Europe is going through a profound change driven by increasing demand for air transport and the liberalization of the air transport industry in Europe. The change has spurred the EU Commission to produce the SES initiative to promote an integration of the European Airspace to ensure more airspace capacity and more cost efficient services to the users.

In line with the European policies the NUAC Programme has analysed four possible scenarios[10] for a closer cooperation between LFV/ANS and Naviair in order for the companies to lower their costs and to meet the pressure for change in compliance with the Single European Sky (SES) legislation and the national strategic directions as outlined in Denmark and Sweden respectively[11].

These analyses have determined that there are substantial and growing incentives for LFV/ANS and Naviair to seek a closer and more formalised cooperation - in other words, "to do nothing is not an option". Such cooperation can in the right form meet the strategic rationale behind the NUAC Programme, give higher cost-effectiveness and through harmonisation and standardisation potentially enhance flight safety - as reflected in the "NUAC Programme – Definition Phase Final Report" and "NUAC Programme – Definition Phase Supplementary Report"

A number of initiatives throughout Europe are currently considered in the context of SES and the ongoing changes in the ATM industry, however the NUAC programme has the potential for a first mover advantage and experience that will allow for a cooperation between LFV/ANS and Naviair where the risk/return relationship of a closer cooperation makes up for a strong Case for Change. This is shown both in terms of the financial benefits and the non-financial benefits and indications of a positive socio-economic effect.

These initiatives also follow the trend towards strong consolidation of the value chain of the Air Transport industry among key stakeholders: airports, commercial air carriers, civil and military aviation and consolidations among ANSPs can also be expected.

The expected results are substantial changes to the organisation of the European airspace and to the organisation of European Air Navigation Service Provision.

3.1.2 The political context of the programme

3.1.2.1 Single European Sky

In the last decades there has been a sharp rise in delays to aircrafts. This has major repercussions for users and places a substantial financial burden on airlines. The delays are

[10] In this report, a strategic Scenario is defined as a plausible description of how the future cooperation may develop, based on a coherent and internally consistent set of assumptions about key relationships, driving forces of the ATM industry and the specific characteristics of LFV/ANS and Naviair.
[11] As stated in government publications "Dansk Luftfart 2015 – muligheder og udfordringer" and "Moderna transporter - Transportpolitisk proposition 2006".

due to a combination of factors: insufficient capacity of the air traffic control system, adverse weather, problems of airports or within airline operations.

The Single European Sky concept launched by the European Commission was drafted with the following objectives:

- to restructure European airspace as a function of air traffic flows, rather than according to national boundaries;
- to create additional capacity; and
- to increase the overall efficiency of the air traffic management system.

Thus the Single European Sky is an ambitious initiative to reform the architecture of European air traffic control to meet future capacity and safety needs.

Preparations for implementation of the SES concept are already made by the different European ANS providers, which tend to plan for establishment of clusters of merged ANS's or alternatively different forms of alliances and cooperation.

3.1.2.2 Swedish and Danish political statements

In line with this European policy the political visions of the Swedish and Danish governments stress the need for more international and Scandinavian/Nordic cooperation to secure a high standard in national air transport concerning a broad selection of regional and international air routes, attractive airports, an innovative air transport industry and a high level of regularity.[12]

Even though the present NUAC Programme is focussed on Swedish and Danish airspace, the programme has the potential of being the backbone in a Scandinavian and Nordic cooperation of ANS providers, which could become a strong player in the future European SES environment.

The political issues will be further elaborated in Chapter 7 and 8.

3.2 Objectives

3.2.1 Objectives for the socio-economic analysis

The general objective for the NUAC Definition phase is to develop a robust platform for decision-making regarding a possible closer cooperation between the Swedish and Danish ANS providers. The full decision basis consists of the following sub-projects: A consolidated Case for Change including Vision & Strategic Rationale, a Business Case, Integration Strategy, Stakeholder Care Programme, HR and Risk Management Plan. Finally the socio-economic analysis has been added to the decision platform.

The specific objective of the present study is to carry out a socio-economic analysis of three types of potential cooperation (the Merger, the Operational Alliance and the Alliance scenarios) between Naviair and LFV as defined in the NUAC Programme.

[12] Source: "Dansk Luftfart 2015 – muligheder og udfordringer", Transport- og Energiministeriet, 2005 and "Moderna transporter", Näringsdepartementet, 2006.

3.3 The stakeholders

Naviair and LFV have a wide range of stakeholders, which are more or less involved in and influenced by the business performance of the two ANS providers.

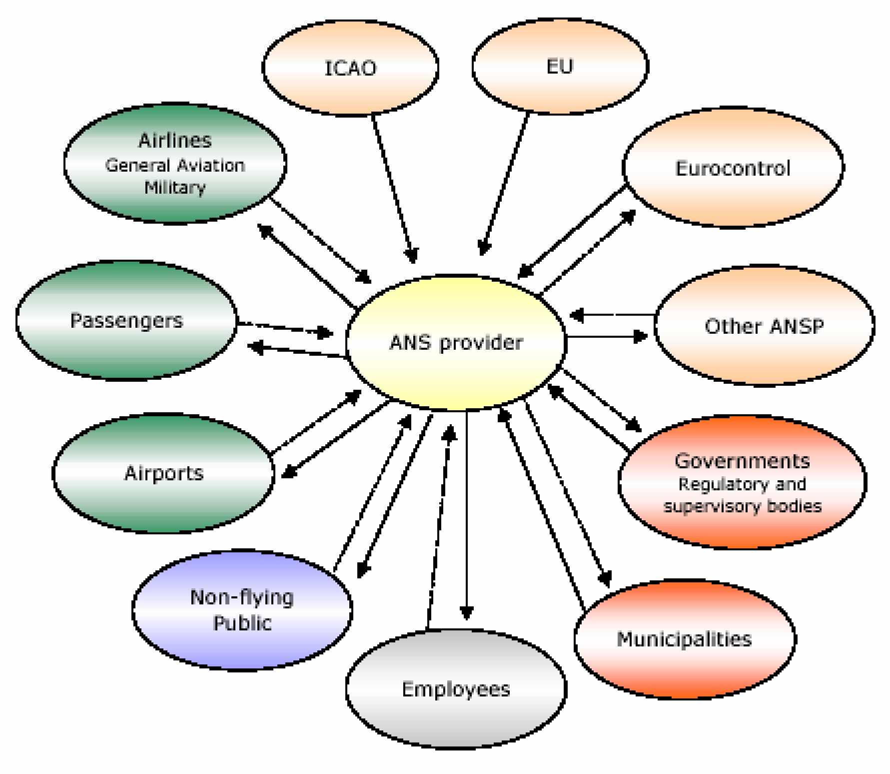

Figure 5: Stakeholders for Naviair and LFV

The key stakeholders in the socio-economic analysis will include the following stakeholders:

- Airline operators (Danish, Swedish, and foreign), which are the customers of the two ANS providers.
- Passengers, who are dependent and influenced by the service and performance level of the ANS providers. The passengers will be travellers on Swedish and Danish aircraft as well as on foreign flights servicing Danish and Swedish destinations and passengers who will be in transit in the Swedish and Danish airspace.
- The Swedish and Danish society and the society in general influenced by the environmental impacts (emissions) from all types of air traffic.

The environmental issues and effects are of special importance to the society as the emissions and greenhouse effect of air transportation is heavily debated and focussed on these years.

In addition the following stakeholders also have an interest in the possible changes and improvements:

- The airports
- The military
- The local societies in Stockholm, Norrköping, Malmö and Copenhagen.

- The European Commission and EUROCONTROL, which have an interest in the implementation of the SES and in the general cooperation with Naviair and LFV.
- Other ANS providers.

3.4 The scenarios

In the NUAC programme, four scenarios have been considered. In this socio-economic study the number of scenarios have been narrowed down to three (the original NUAC/SKAANE projects are presently put on hold) plus a base scenario describing the situation as of today (2006). The scenarios are described in the "NUAC Programme – Definition Phase Supplementary Report, July 2007" as shown underneath.

	Merger scenario	Alliance scenario	Operational Alliance scenario
Description	• Merger of relevant parts of the two organisations LFV/ANS and Naviair into one organisation • NUAC is responsible for the carrying out the Air Traffic Service provision within Danish and Swedish airspace and working in a FAB environment with possibility of one en-route charging zone and a common unit rate. • Drive the cost base down through innovative approaches to organisational structure and resource allocation	• As independent organisations in a closer corporation LFV/ANS and Naviair are establishing a co-owned Alliance Company for the carrying out of certain support functions. This with only minor changes to the operational parts of the two organisations working in a FAB environment with possibility of one en-route charging zone and a common unit rate.	• LFV/ANS and Naviair as co-owners of a NUAC Company carrying out the provision of Air Navigation Services within Danish and Swedish fully integrated airspace • The services covers all Air Navigation Services except MET, AIS and TWR. • Support functions will be provided in NUAC Company in accordance with Common Requirements and when necessary to reach the full potential of the operational core business
Rationales	• To investigate the feasibility and effects of the most comprehensive Scenario for cooperation in order to ensure highest possible degree of cost-effectiveness/cost reduction and strategic alignment with Single European Sky regulations as well as the national strategies • To show clear and formalised lines of command in a merged company and entail management of all core processes and related support processes	• The Scenario should to the largest extent possible be in alignment with Single European Sky regulations and the national strategic directions outlined in Denmark and Sweden • Find out to what extent the cost-effectiveness could be reached without influencing the core business within LFV/ANS and Naviair • To give the answer regarding to what extent the Strategic Rationales for the NUAC Programme could be met.	• To investigate the feasibility and effects of an scenario with focus on cost effectiveness and national corporate strategies without compromising SES and national strategic directions • To investigate to what extent the cost-effectiveness/cost reductions could be reached when only including the core business in the NUAC Alliance Company

Figure 6: The Scenarios

4 The applied model for the socio-economic analysis

4.1 General approach

The socio-economic analysis is complementary to the internal analysis carried out in other parts of the NUAC Programme.

	Internal benefits/costs	External benefits/costs
Financial	• E.g. reduced operational costs	•Operational costs for airlines because of shorter flying time •Value of reduced flying time for passengers •Reduced environmental impacts
Non-financial and Qualitative	• E.g. improved customer orientation	• Compliance with SES • Compliance with Swedish and Danish aviation policy • Military issues • Regional Development

Figure 7: The two parts of the NUAC programme

The socio-economic assessment has been carried out as a cost-benefit analysis at global as well as at Danish-Swedish level. Thus the starting point is an analysis of the total effects followed by an analysis of the subordinate effects to Danish and Swedish stakeholders.

The economic effects are defined as economic costs and benefits for the ANSPs, their customers and users, and for the society as a whole (the Swedish and Danish societies).

The effects include both investments and current costs and benefits. Furthermore, the effects include both economic and non-economic impacts, both tangible and intangible impacts, as well as impacts that can be assessed in monetary terms and those that cannot. Intangible impacts and other impacts that cannot be assessed in monetary terms will be qualitatively described and assessed.

Different principles and methods can be applied in relation to a cost- benefit analysis. In this study an approach similar to the model developed and recommended by the Danish Ministry of Transport and Energy has been applied.

4.2 The Ministry of Transport and Energy model

The model for economic analysis recommended by the Danish Ministry of Transport and Energy is the most recently updated Danish model for socio-economic analysis and is considered well suited as a framework for the socio-economic assessment of the scenarios analysed in this study.

The model is designed for application in connection with:

- Comparison of alternative long term investment,
- Comparison of possible solutions to a specific transport policy problem (cost effectiveness analysis),

- Comparison of alternative transport sector projects,
- Comparison of alternative details of a given project, and
- Assessment of the economic value of an individual project.

The general model for economic analysis is made operational in the Teresa application (Transport- og Energiministeriets Regnearksmodel til Samfunds-økonomisk Analyse = Calculation model for Economic Analysis of the Ministry of Transport and Energy), which is a detailed application model for calculation of costs and benefits of traffic infrastructure investments.

The scenarios to be assessed in this NUAC study are different from a normal traffic infrastructure investment project, but the principles used in the model of the Ministry of Transport and Energy and in the Teresa application are still relevant as a reference model for the analysis.

Airline costs are not included in the database for the Teresa application, and estimates have been established on the basis of key figures from airlines and from other sources within the Aviation industry (i.e. aircraft manufactures, ANSP, Regulators).

4.3 Description of the socio-economic model for the NUAC programme

The inputs used are categorized as follows:

4.3.1 Investment costs

The investments costs include investments in NAVIAIR and LFV for organizational restructuring, needed training, new premises, and new soft- and hardware, which will be needed for the restructuring.

The investment and restructuring costs and investments have been calculated in the NUAC Report "Definition Phase Final Report" and "NUAC Programme – Definition Phase Supplementary Report" and have been copied from these reports.

4.3.2 Operating costs for the ANSPs

The main impacts of the current costs of Naviair and LFV include reduced staff and salaries as well as reduced operational costs, training costs, costs for procurement, maintenance and costs for R&D.

These effects have also been calculated in the above mentioned NUAC Reports addressing the internal effects of the scenarios analysed.

4.3.3 Cost impacts for airlines

The airlines costs include Direct Operational Costs (DOC):

- Fuel
- Maintenance reserves
- Other DOC.

and capacity costs, Fixed Operational Costs (FOC):

- Crew
- Insurance,
- Flight administration etc.
- Depreciation
- Interest.

Some operational costs (fuel costs) are related to both flying time and distance, whereas others (maintenance reserves) are related to flying time, calendar time and cycles. Capacity costs (for instance crew) are mainly related to flying time.

The FOC costs are assumed to be related to flying time. A reduced flying time reduces the required capacity and in the long term, this reduces the capacity costs proportionally to the time savings. All FOC are converted into an hourly cost rate by dividing the total annual FOC by the assumed average number of annual flight hours (FH) per aircraft amounting to of 4.000 FHs.

Depreciation and interest is calculated as an annuity over the assumed lifetime of 20 years and on the basis of a 5% annual rate of interest.

All DOC and FOC are based on 2006 figures except for fuel costs. Due to the dramatic increase in fuel costs in 2007 and 2008 it has been decided to use the fuel price as of May 2008.

The actual cost savings depend on the specific aircraft type. In this respect it should be mentioned that new aircraft are becoming more fuel and cost efficient[13] which means that the DOC costs per flying hour will be reduced in the forecast period.

In order to calculate the effects and to take these factors into account the "model aircraft" for this socio-economic analysis is a Boeing 737-800, which is used on inter-Scandinavian routes and on medium haul European scheduled and charter routes. It is considered to be a representative average of a large group of aircraft used in the Scandinavian airspace.

The Boeing 737-800 aircraft type is relatively new and is selected as a basis for the cost estimates in order to take account of the future improvements in fuel efficiency. This aircraft type will thus be considered as representative over the forecast period. It will be slightly better than average in the first part of the period and lower than average in the last part of the period where new technologies will improve fuel, cost, and environmental efficiency even further.

The transit traffic includes both regional traffic for instance from Helsinki to Europe and long-haul flights. For the short- and medium haul traffic the Boeing 737-800 is used as the model aircraft. For the long-haul traffic an Airbus 330-300 is used as model aircraft. This is a modern medium sized long-haul aircraft, which is considered representative for the long-haul transit flights over the forecast period. In the transit traffic it is assumed that 80% will be Boeing 737-800 traffic and 20% will be A330-300 traffic[14].

[13] See: IATA: Environment Summit - Remarks by Giovanni Bisignani, April 2006
[14] Based on traffic simulations as of April 20, 2006

4.3.4 The value of time for passengers

The value of the time savings are basically assessed on the basis of unit values applied for socio-economic analyses of road and infrastructure projects. A distinction is normally made between value of saved time for passengers in connection with business travels, travels to and from work, and leisure travels respectively. In this analysis only a split between business and leisure travels will be made.

The values of time identified in the catalogue of key figures from the Danish Ministry of Transport and Energy, are based on analyses of transport at ground-level (trains, busses, cars etc.), and does thus not identify values of time for airline travel.

The table below shows the estimated values of time for passengers in different comparable studies:

EURO/hour (2003-prices)	Cowi, 2004*	Swedish studies**	Norwegian studies**	Danish studies***
Business	31,8	19,0	44,4	35,3
Leisure	17,4	11,9	23,1	4,7

Table 3: Value of time for passengers in other studies[15] (all figures in Euro)

As illustrated in the table, the value of time for passengers used in other studies vary significantly.

The values of time identified in the Cowi-study are based on Swedish and Norwegian studies of values of time for airline travel and the values are calculated as an average of Swedish and Norwegian prices. In addition, the Cowi-study assumes as a starting point that business ticket holders are business travellers and that economy ticket holders are leisure travellers. It acknowledges, however, the fact that a significant number of business travellers are travelling on economy tickets.

As the values identified in Swedish studies are related to the values of time for airline travel specifically, the values used in this study are based on the Swedish studies (converted to 2006-prices). The value of the time for the business passengers is thus fixed at Euro 21.3 per hour while the value of time for the leisure travellers is fixed at Euro 13.2 per hour.

4.3.5 Noise

The environmental impacts will only include emissions as no noise effects will result from the operational ATC changes included in the scenarios.

The noise impact from en-route traffic or transit traffic in upper air space is far from any noise restrictions and will not be considered in this study. The impact will be marginally lower due to shorter flight distances and flying time, but the effect will be without importance.

Some noise impact can be recorded from the holdings areas around the big airports. However, this noise is not necessarily generated by ATC factors but mostly by runway

[15] Notes to the table:
*Study conducted by COWI for SAS in November 2004 (Luftfarten i Skandinavien - værdi og betydning)
** Based on Swedish and Nowegian studies of the value of time. Source: Study conducted by COWI for SAS in November 2004 (Luftfarten i Skandinavien - værdi og betydning)
***Source: The catalogue of key figures from the Danish Ministry of Transport and Energy: ”Nøgletalskatalog – til brug for samfundsøkonomiske analyser på transport-området” (4th ed., June 2006).

capacity limitations in the airports and for instance due to temporary poor weather conditions, which increase the separation minima and thus reduce the runway capacity.

4.3.6 Emissions

The emissions from aircraft include:

- CO_2 Carbon Dioxide
- H_2O Water
- SO_2 Sulfurdioxide
- Nox Nitrous Oxide
- HC Hydrocarbon
- CO Carbon Oxide

A number of studies have analysed the values of reduced emissions at ground level (from trains, cars, busses etc.), but few studies have identified the values of reduced emissions from aircraft.

The interviews with stakeholders and other parties have indicated that the effects of CO_2, H_2O and NOx are higher at flight level than at ground level. The interviewees have estimated that the effects and value of emission from CO_2, H_2O and NOx are 3 to 5 times higher at high altitude than at ground level. The values of reduced emissions at high altitude used in the calculations are thus estimated to be 3 times higher than the values at ground level. This applies only to the values for CO_2 and NOx, which are based on the catalogue of key figures from the Danish Ministry of Transport and Energy.

The Swedish study of the marginal economic costs of air traffic estimates the value at high level with respect to H_2O-emissions. Consequently the Swedish study is used for H_2O emissions. H_2O (water) itself is not dangerous. The problem is that the water can generate contrails, which can develop into clouds, which again has a negative greenhouse effect.

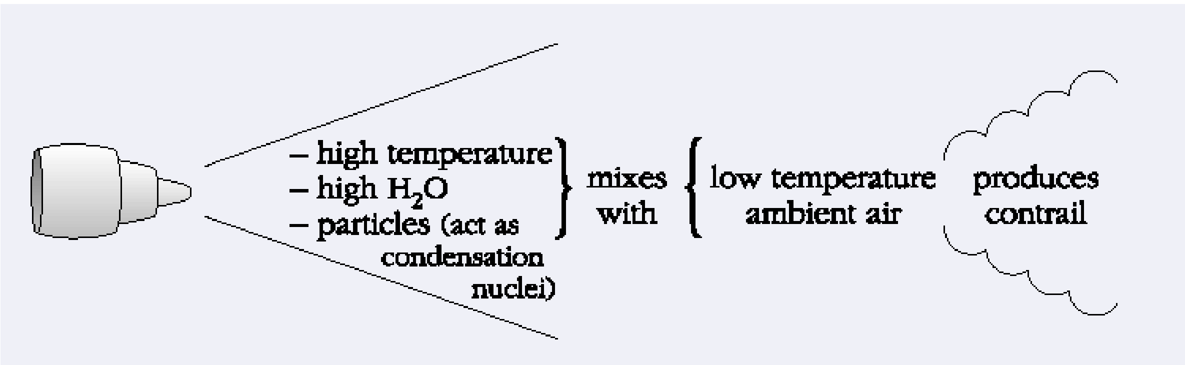

Figure 8: The effects of H_2O emissions from aircraft

The study on external costs of transport, conducted by the Danish Ministry of Transportation in 2004[16], which has been used as basis for the unit values used in the TERESA-model, have identified the following values of emission at ground level[17]:

	Euro/Kg, 2006 (ground level)*
CO_2	0,019
SO_2	6,548
Nox	2,206
HC	0,569
CO	0,001

Table 4: Value of reduced emissions at ground level[18]

Taking the high level factor into consideration the following values for emissions are estimated:

	Euro/Kg, 2006 (high level)
CO_2*	0,056
SO_2*	6,548
Nox*	6,619
HC*	0,569
CO*	0,001
H_2O**	0,018

Table 5: Value of reduced emissions at flight level

For further background information about the environmental impact from the aviation sector please see Annex 2: Environmental impact from the aviation sector.

4.3.7 ATC delays

It is assumed that there are no ATC generated delays coming from lack of ATC capacity and management of the airspace in Denmark and Sweden.

The possible delays are assumed to come from for instance airport congestions, lack of runway capacity in peak hours, operational and technical delays caused by airline operators, weather conditions, and other factors external to the provision of ATC services.

Thus delays are not influenced by choice of scenario.

4.3.8 Flight safety

It is assumed that flight safety will never be compromised in any of the scenarios and that the safety issue will always be dealt with in accordance with ICAO, EU, LS (Luftfartsstyrelsen) and SLV (Statens Luftfartsvæsen) standards and recommended practices. Thus the flight

[16] “External Costs of Transport: 2nd Report - Marginal external cost matrices for Denmark” (July 2004)
[17] Source: The Danish Ministry of Transport and Energy: ”Nøgletalskatalog – til brug for samfundsøkonomiske analyser på transport-området” (4th ed., June 2006), and the spreadsheet-model for socio-economic analysis developed by the Danish Ministry of Transport and Energy (TERESA).
[18] The value of reduced emissions are calculated as an average of the values of emission for urban and extra-urban areas.

safety will as a minimum remain the same (despite increased traffic volumes) or will be improved due to new technologies and procedures.

Thus there is not foreseen any changes with respect to the level of flight safety.

4.3.9 Forecast period

The forecast period is 2007-2020. However, it is assumed that the efficiency improvements in all three scenarios will not start until 2011. This is similar to the period used in other parts of the NUAC programmes.

4.3.10 Air Traffic growth rate

It is assumed that the number of aircraft movements will increase by 4% per year in the forecast period. This average growth figure is confirmed by forecasts carried out by IATA [19], EU [20], and the aircraft producers Boeing and Airbus [21].

4.3.11 Environmental improvement rate

The engine and aircraft hull producers continuously improve the environmental efficiency due to demands from the airline customers and from the society in general. It is also likely that new types of aircraft fuel will be introduced in the future.

It is assumed that the environmental improvement from this technological development will amount to 2% per flight hour/year within the forecast period[22].

4.3.12 The applied discount rate

The valuation of future costs and benefits against impacts today is done by the use of a “social discount rate” of 5% per annum. This rate is equal to the discount rate used for the calculation of the internal costs savings.

4.4 Traffic simulations

Referring to the Fast Time Simulation Report, version 012 prepared under the NUAC Programme a parallel and specific simulation was prepared for the purpose of the socio-economic analysis. This was carried out by SATSA – the Swedish ATS Academy.

For a specific representative day, namely April 20, 2006 (same day as used in the Fast Time Simulation report) a special simulation was carried out simulating the traffic flows in the base scenario and in the Merger/Operational Alliance and Alliance scenarios as defined in Figure 6 page 19. These simulations were based on “Flight Plan” data. The definitions used in the simulations are similar to the definitions used in the NUAC Airspace Report.

Furthermore in the period February-October 2007 a subsequent verification process of the SATSA analysis was carried out in cooperation with EUROCONTROL based on further and

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[19] Passenger Forecast 2006 http://www.iata.org/ps/publications/9265.htm
[20] A Single European Sky http://ec.europa.eu/transport/library/press-kit-package-en.pdf
[21] Boeing Market Outlook, 2006 http://www.boeing.com/commercial/cmo/ and Airbus Market Forecast http://www.airbus.com/en/corporate/gmf/
[22] http://ec.europa.eu/environment/climat/pdf/ia_aviation.pdf

more detailed simulations of data from the Danish and Swedish airspace. Authentic tracks were delivered by the CFMU with respect to the Danish airspace and LFV delivered the tracks for the Swedish airspace.

The software and programme for the verification was the “System for Airspace Analysis at Macroscopic Level” (SAAM). The basis for the SAAM simulation was the above mentioned input data and the airspace report made as a part of the “NUAC Programme –Definition Phase, Final Report from June 2007.

The primary goal for the simulation was to validate the NUAC airspace design and the findings from the SATSA simulations of the route optimisation. It also addressed the tactical dimension with regard to ATCO intervention on a day-to-day basis. The latter was made possible by using authentic radar track data from the CFMU – “Central Flow Management Unit” made available to the SAAM simulator.

In that context and in order to ensure a full picture of the changes in a socio-economic perspective the simulations were completed in two dimensions:

1) The essential “Planning Dimension” showing the effects for the airlines at the planning level
2) The “Day to Day Dimension” showing the effects of the ATCO intervention on the day to day basis

In the latter simulation it is recognised that the ATCOs through their professional intervention already today quite often provide shorter flying distances and flying time than recorded in the flight plans. This is of course highly appreciated by airlines.

However, for planning purposes these professional initiatives by the ATCO’s are incalculable as they vary not only from day to day but also from hour to hour. Thus they have no input on the airlines operational planning with respect to e.g. scheduling, fuel uplift, maintenance reserves and crew planning. All these planning issues are based on flight plan data. Consequently the actual shortening of the flying distances and time from the ATCO intervention has variable and incalculable socio-economic effects that should be seen as an unpredictable added value with regards to some fuel savings and consequently reduced emissions.
Only an improvement of flying distances and time at the planning level will bring reliable performance improvements and cost reductions to the airlines and time savings to the passengers.

The simulations show that the possibilities for ATCO intervention at tactical level still exists but with a lesser effect due to the optimisation of the Danish and Swedish route structure steaming from the NUAC airspace design [23].

The simulations have been split into two parts in order to provide a socio-economic picture in a broader sense and a specific Danish-Swedish assessment. The two parts are defined as follows:

- All traffic activities or flights in the Swedish and Danish airspace including domestic traffic, traffic to and from Denmark and Sweden and transit traffic over-flying the two countries’ airspace. Thus this assessment includes all stakeholders whether they are Danish, Swedish, or international.

[23] NUAC Programme Fast Time Simulations

- Flights carried out by Danish and Swedish airlines only (called DK-S in the tables) and only servicing Danish and Swedish passengers. Thus this part is strictly related to a cost-benefit assessment of the effects to the Danish and Swedish stakeholders.

The time gains on this specific day (expressed in minutes) in the two scenarios compared to the base line scenario have been identified as follows:

	All Traffic	**DK-S**[24]
Base scenario	112429	85376
Merger / Operational Alliance scenarios	111518	84684
Alliance scenario	111541	84702
Change in %, Basis – Merger/Operational Alliance	0,81%	0,81%
Change in %, Basis - Alliance	0,79%	0,79%

Table 6: Time gains in minutes for all traffic and for Danish-Swedish traffic

Thus the time gain in the Merger and Operational Alliance scenario is 0,81% and 0,79% in the Alliance scenario. It should be remembered that the airspace design in the Merger and in the Operational Alliance scenarios are identical and consequently the savings will also be the same.

It should be added that the differences between the SATSA and SAAM simulations were only 0,02% - 0,03% with respect to flying distances, which shows that the simulations are robust. Two different simulations and methodologies have produced basically the same result. The above gains of 0,81% and 0,79% respectively are based on the results in the SAAM simulations. The results in the SATSA simulation were 0,84% and 0,81% respectively. By using the SAAM results the following assessment of the effects in the scenarios are “on the safe side” – the lowest percentage of gain has been used.

[24] DK-S means Danish and Swedish passengers flown by Danish and Swedish airlines

5 The Merger and Operational Alliance Scenarios

5.1 Internal effects

As mentioned previously in the report the Merger and the Operational Alliance scenarios are based on the same airspace design and consequently the external effects are the same in the two scenarios. Only the internal effects differ because of different organisational, operational and technical set-ups. Due to this fact both scenarios are described in this chapter under the same heading.

The internal effects of the scenarios are described in other NUAC reports and will not be further elaborated in this report. The internal benefits for LFV and Naviair are shown in table 7 below.[25]

Key figures for internal effects (in million Euro)	Merger	Operational Alliance
Investments and integration costs (2006-2020)	30,1	18,4
Savings per year (based on 2020 figures)	29,5	13,0
NPV (2006 to 2020)	172,4	72,6

Table 7: Internal effects in the Merger and Operational Alliance scenarios

The whole ATM sector is a link in the value chain for provision of air transport to the ultimate end user – the traveller. Furthermore the ANSPs are basically non-profit organisations. Depending on the political decision how to use the above mentioned internal savings this could mean that the savings will not only benefit the ANSPs but also the airlines through lower ATC charges. In the end the potential airline savings may also reduce the fares offered by the airlines to the travellers.

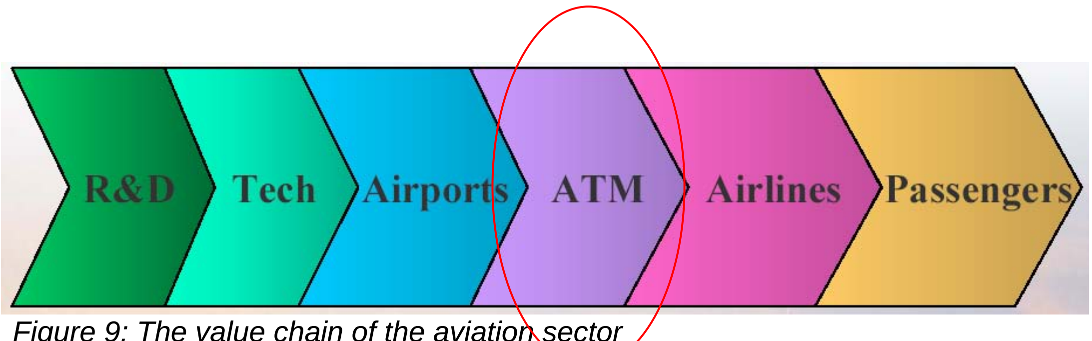

Figure 9: The value chain of the aviation sector

[25] Definition Phase Final Report, October 2006, and NUAC Programme – Definition Phase Supplementary Report, July 2007

5.2 Time savings

In continuation of chapter 4.4 Traffic simulations the following time-savings have been calculated for the scenarios. These time-savings will be used for calculation of cost savings to airlines, for calculation of the value of time savings to passengers and for calculations of the value of the reduced environmental impacts.

Savings	All Traffic	DK-S
Saving in minutes per day	911	692
Flights per day	2,784	2,135
Savings in minutes per flight	0.33	0.32
Savings in hours per day	15.18	11.54
Savings in hours per year (349 days per year)	5,296	4,026
Number of pass. per year	101,048,064	62,962,218

Table 8: Time savings on a yearly basis compared to base line scenario

5.3 Effects for airlines

5.3.1 The direct operational costs (DOC) include:

- Fuel consumption
- Time related maintenance costs
- Other DOC.

The calculation of airline savings can be summarised as follows:

	All Traffic	DK-S
DOC		
Saved hours per year	5,296	4,026
Fuel		
Weighted fuel consumption in ltr. pr. FH in mixed p-to-p and cruise	4125	3438
Fuel price per ltr in Euro (average dec 05 - nov 06)	0.56	0.56
Fuel saving in Euro	12,233,933	7,749,501
Maintenance		
Maintenance reserve pr. FH, weighted	220	200
Maintenance saving in Euro	1,165,137	805,143
Total DOC	13,399,070	8,554,644
FOC (Fixed Operational Costs)	7,756,986	5,896,332
Total DOC and FOC savings	**21,156,056**	**14,450,976**

Table 9: Airline savings per year expressed in 2006 figures

The calculations are explained in the following chapters.

5.3.2 Fuel consumption/costs

Due to the approx. 0,81% shorter flying time calculated at 0,33 minute per flight the airline operators will in total reduce the flying time by 5.296 (4.026) hours per year. The figures in brackets show the specific figures for the Danish-Swedish and domestic traffic.

In the calculation for the overall traffic the weighted fuel consumption per hour is estimated at 4.125 litres based on a mix of 80% Boeing 737-800 traffic and 20% A330-300 traffic. In the domestic and internal Danish-Swedish traffic only the consumption of a Boeing 737-800 equal to 3.438 litres per hour is used.

The result is a yearly fuel saving of 12,2 (7,7) million Euro for the airlines in total.

5.3.3 Reduced maintenance reserves and other direct operational costs

Other types of operational costs than fuel costs are directly related to flying time. The main component is maintenance costs where each flying hour triggers a certain amount for a maintenance reserve covering maintenance of engines, hull, avionics, etc. It should be mentioned that only maintenance reserves related to flying time is included. Other types of maintenance reserves are related to cycles and calendar time.

The reserves vary from one type of aircraft to the other. For the "model aircraft" the Boeing 737-800 the flying time related maintenance costs amount to 200 Euro per flying hour. The amount for the A 330-300 amounts to 300 Euro per hour.

This means that the value of the time saving related to maintenance amounts to 1,2 (0,8) million Euro per year in total.

5.3.4 Better utilisation of aircraft and crews

The shorter flying time will in some cases allow aircraft and crew to carry out extra production within the available production capacity and point system for crews provided that these time savings are sufficient to be included in the official schedule and sling plans. This will of course not happen every time but even a few times a year will improve the overall productivity and cost efficiency. The total FOCs for one aircraft have been calculated to 5,9 mill Euro and it is assumed that each aircraft will fly on an average 4.000 hours per year.

The saved FOC amounts to 7,8 (5,9) mill Euro per year in total.

5.3.5 Total savings with the airlines

Thus based on the above estimates the DOC and FOC savings in the airline link in the value chain will amount to 21,1 (14,5) million Euro per year expressed in 2006 figures (except for fuel which are calculated by use of 2008 figures).

5.4 Effects for the passengers

The effect for the airline passengers is saved time due to the more direct flight path in the scenarios.

Value of time to pass.	All Traffic	DK-S
Total saved pax minutes	33,047,508	20,410,375
Total saved pax hours	550,792	340,173
Share of DK-S passengers	-	0.6
Business pax share	0.45	0.45
Leisure pax share	0.55	0.55
Value of 1 hour for business-pax euro	21.3	21.3
Value of 1 hour for leisure-pax euro	13.2	13.2
Total value to passengers per year euro	**9,278,088**	**3,323,523**

Table 10: Value of time for passengers on a yearly basis expressed in 2006 figures

As shown in the overview the average time saving for the passengers is 0,33 (0,32) minutes per flight, which in an accumulated level for all passengers sum up to 550.792 hours per year. Out of these, 340.173 hours are estimated to be related to Swedish and Danish passengers.

Based on information from airlines it is assumed that 45% of the passengers on the routes included in this study are business travellers and 55 % are leisure and segments of travellers. And in the analysis of the DK-S traffic it is assumed that 60% of the passengers are Danes or Swedes [26].

As mentioned in the methodological chapter 4.3.4 there are uncertainties related to the value of time and the results of the analysis are sensitive to higher or lower values on time. In this analysis the values are estimated at 21,3 Euro and 13,2 Euro for business and leisure travellers respectively. On this background the total benefit can be calculated to 9,3 (3,3) million Euro.

[26] Information provided by SAS

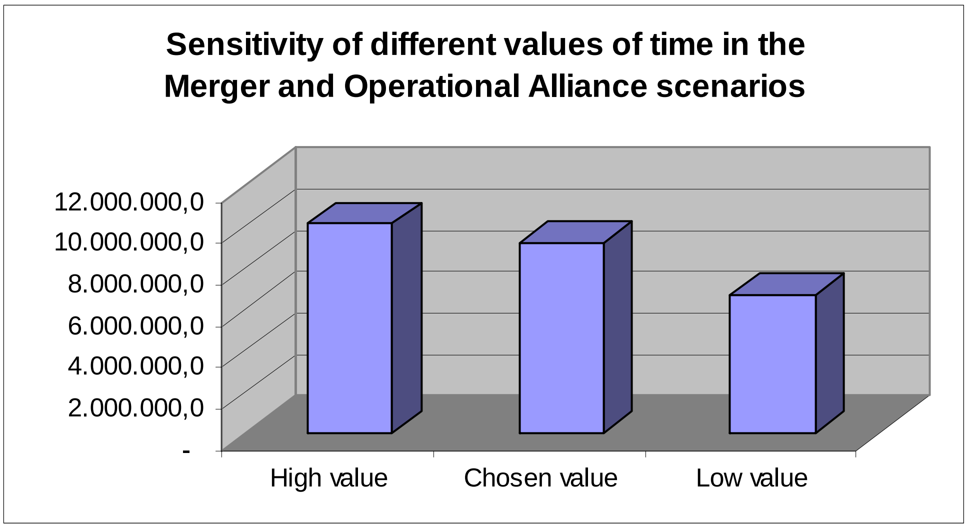

Figure 10: Sensitivity of different values of time (in Euro)

Based on the assumptions made in chapter 4.3.4 the passengers will save 9,3 (3,3) million Euro per year. Different values of travel time can be applied but any reasonable value of travel time means that the passengers will gain from a substantial benefit of saved travel time.

Additional gain will be achieved in case of ATCOs intervention at the tactical level. This gain should be seen as an incalculable added value to the passengers.

5.5 Environmental effects

5.5.1 Emission effects

The emission effect is related to the total traffic volume as the Danish and Swedish population will be affected by all types of flights whether these are internal Swedish-Danish, domestic, or transit traffic.

The emissions for the domestic and cross-border traffic are based on Boeing 737-800 aircraft including climb, cruise, and descent within one hour flight. The emissions for the transit traffic are as mentioned before based on 80% Boeing 737-300 traffic and 20% Airbus 330-300 traffic. It is assumed that the A 330-300 transit traffic will be at cruise level all the way.

Value of reduced emissions			
Reduced flight hours per year			5,296
	Kg. per hour (weighted average)	Value pr. kg	Total value per hour in Euro
CO_2	9412	0,056	527,08
H_2O	3698	0,018	66,57
SO_2	3	6,548	19,46
NOX	38	6,619	251,11
HC	4	0,569	2,07
CO	28	0,001	0,03
Total value of all emissions per hour			866
Total value per year (in Euro)			**4,588,079**

Table 11: Value of reduced emissions expressed in 2006 figures

Based on these assumptions the total gain from the shorter flying time can be estimated at 4,6 million Euro per year (in 2006 figures) for all flying activities in the Danish and Swedish airspace.

Furthermore a gain will be at achieved in case of ATCOs intervention at the tactical level. This gain should be seen as an incalculable added value to the environment.

As mentioned in the methodological chapter 4 the value of emissions can be debated but it cannot be debated that the Merger scenario will save the environment from 52.000 tons of CO_2 per year, that the contrails will be reduced by 20.000 tons of water, and that the other types of emissions will also be reduced considerably.

For comparison a volume of 50.000 tons of CO_2 is equal to the emission from approx. 16.000 cars driving 20.000 km per year [27].

5.6 Total external effects in the merger and operational alliance scenario

The total external effects to airlines, passengers and the environments per year (2006) can be summarised as follows:

	All traffic in Euro	DK-S in Euro
Airline savings	21,2	14,5
Value of time savings to passengers	9,3	3,3
Environmental benefits	4,6	4,6
Total external effects	35,1	22,4

Table 12: Total external benefits in the Merger scenario per year expressed in 2006 figures and in Euro

[27] Energiinformation om nye danske personbiler, Færdselsstyrelsen, 2007

6 The Alliance Scenario

6.1 Internal effects

The internal effects of the Alliance Scenario will amount to a financial improvement of Euro 12,0 million per year or a NPV of Euro 68,8 million for the entire forecast period to 2020.[28]

The investments and integration costs for the Alliance scenario are estimated at Euro 17,3 millions.

Key figures for Alliance Scenario (in million Euro) Issue: Internal effects	
Investments and integration costs (2006-2020)	17,3
Savings per year (based on 2020 figures)	12,0
NPV to 2020	68,8

Table 13: Internal effects in the Alliance scenario

Also, in the Alliance scenario it is possible that the internal savings will have a positive effect throughout the value chain and will to some extent benefit both the airlines and the final users – the passengers.

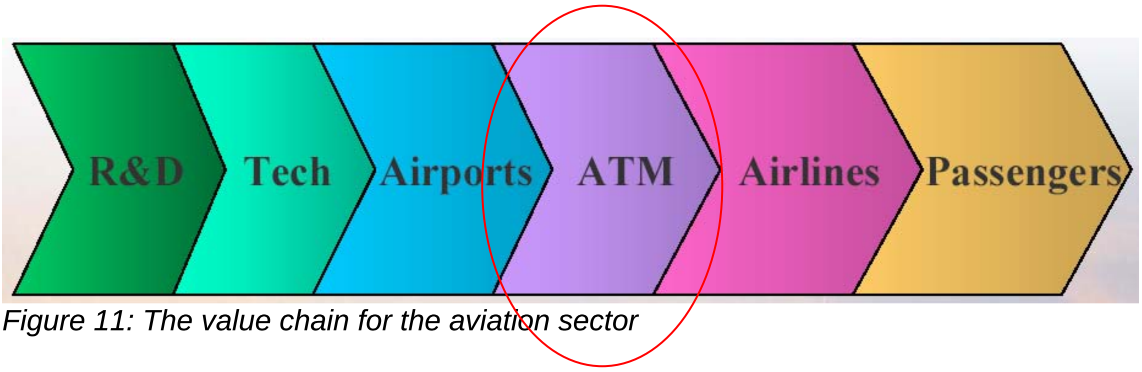

Figure 11: The value chain for the aviation sector

[28] Definition Phase Final Report, October 2006, p. 67

6.2 Time savings in the Alliance scenario

With reference to chapter 4.4 Traffic simulations the following time-savings have been calculated for the Alliance scenario. These time-savings will be used for calculation of cost savings to airlines, for calculation of the value of time savings to passengers and for calculations of the value of the reduced environmental impacts.

Savings	All Traffic	DK-S
Saving in minutes per day	888	674
Flights per day	2,784	2,135
Savings in minutes per flight	0.32	0.32
Savings in hours per day	14.79	11.24
Savings in hours per year (349 days per year)	5,162	3,921
Number of pass. per year	101,048,064	62,962,218

Table 14: Time savings on a yearly basis

6.3 Effects for airlines

6.3.1 Reduced direct operational costs

The direct operational costs for airlines can be summarised as follows:

	All Traffic	DK-S
DOC		
Saved hours per year	5,162	3,921
Fuel		
Weighted fuel consumption in ltr. pr. FH in mixed p-to-p and cruise	4125	3438
Fuel price per litre in Euro (average dec 05 - nov 06)	0.56	0.56
Fuel saving in Euro	11,924,894	7,547,954
Maintenance		
Maintenance reserve pr. FH, weighted	225	200
Maintenance saving in Euro	1,161,516	784,203
Total DOC	13,086,409	8,332,157
FOC	7,561,038	5,742,981
Total DOC and FOC savings	**20,647,448**	**14,075,138**

Table 15: Airline savings per year expressed in 2006 figures

6.3.2 Fuel consumption/costs

Due to the 0,79% shorter flying time calculated at 0,32 (0,32) minute per flight the airline operators will reduce the flying time by 5.162 (3.921) hours per year. The figures in brackets show as mentioned before the specific figures for the Danish-Swedish and domestic traffic.

In the calculation for the overall traffic the weighted fuel consumption per hour is estimated at 4.125 litres based on a mix of 80% Boeing 737-800 traffic and 20% A330-300 traffic. In the domestic and internal Danish-Swedish traffic only the consumption of a Boeing 737-800 equal to 3.438 lifters per hour is used.

The result is a yearly fuel saving of 11,9 (7,5) million Euro for the airlines.

6.3.3 Reduced maintenance reserves and other direct operational costs

As mentioned under the Merger scenario the main item of other DOCs is maintenance costs where each flying hour triggers a certain amount for a maintenance reserve covering maintenance of engines, hull, avionics, etc.

The reserves vary from one type of aircraft to the other. For the "model aircraft" the Boeing 737-800 the flying time related maintenance costs amount to 200 Euro per flying hour. The amount for the A 330-300 amounts to 300 Euro per hour.

The flying time related maintenance costs in the Alliance scenario have been calculated the same way as in the Merger and Operational Alliance scenario and amounts to 1,2 (0,8) million Euro per year.

6.3.4 Better utilisation of aircraft and crews

The shorter flying time will in some cases allow aircraft and crew to carry out extra production within the available production capacity and point system for crews provided that these time savings are sufficient to be included in the official schedule and sling plans.

The total FOCs for one aircraft have been calculated to 5,9 mill Euro and it is assumed that each aircraft will fly on an average 4.000 hours per year.

6.3.5 Total savings with the airlines

Thus based on the above estimates for airline savings in the Alliance scenario it is assumed that the total savings will amount to 20,6 (14,1) million Euro per year.

6.4 Effects for the passengers

The effect for the passengers in the Alliance scenario has been calculated as follows:

Value of time to pass.	All Traffic	DK-S
Total saved pax minutes	32,212,700	19,879,546
Total saved pax hours	536,878	331,326
Share of DK-S passengers		0.6
Business pax share	0.45	0.45
Leisure pax share	0.55	0.55
Value of 1 hour for business-pax euro	21.3	21.3
Value of 1 hour for leisure-pax euro	13.2	13.2
Total value to passengers per year euro	**9,043,716**	**3,237,086**

Table 16: Value of time to passengers

As shown in the overview the average time saving for the passengers is 0,32 (0,32) minutes per fight, which, in an accumulated level for all passengers, sum up to 536.878 hours per year. Of these, 331.326 hours are estimated to be related to Swedish and Danish passengers.

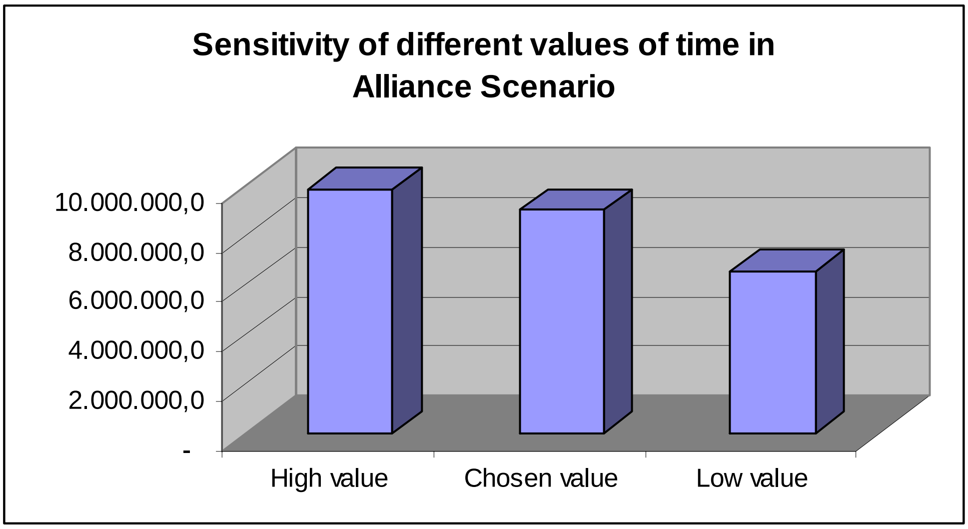

Figure 12: Sensitivity of different values of time

Based on the assumptions made in chapter 4.3.4 the passengers will save 9,2 (3,3) million Euro per year. Different values of travel time can be applied but any reasonable value of travel time means that the passengers will gain from a substantial benefit of saved travel time.

Finally some gain will be reached in case of ATCOs intervention at the tactical level. This can be seen as an incalculable added value to the passengers.

6.5 Environmental effects

6.5.1 Emission effects

As mentioned in the chapter on the Merger and Operational Alliance scenarios the emission effect is related to the total traffic volume only, as the Danish and Swedish population will be affected by all types of flights whether these are internal Swedish-Danish, domestic, or transit traffic.

The calculation looks as follows for the Alliance scenario:

Value of reduced emissions			
Reduced flight hours per year			5,162
	Kg. per hour	Value pr. kg	Total value per hour in Euro
CO_2	9412	0,056	527,08
H_2O	3698	0,018	66,57
SO_2	3	6,548	19,46
NOX	38	6,619	251,11
HC	4	0,569	2,07
CO	28	0,001	0,03
Total value of all emissions per hour			866
Total value per year in Euro			**4,472,180**

Table 17: Value of reduced emissions expressed in 2006 figures

Based on these assumptions the total gain from the shorter flying time can be estimated at 4,5 million Euro per year for all flying activities in the Danish and Swedish airspace.

Furthermore a gain will be at achieved in case of ATCOs intervention at the tactical level. This gain should be seen as an incalculable added value to the environment.

As mentioned in the methodological chapter 4 and in the Merger and Operational Alliance chapter 5.6.1 the value of emissions can be debated but it can not debated that the implementation of the Alliance scenario will save the environment from 49.000 tons of CO_2 per year, that the contrails will be reduced by 19.000 tons of water, and that the other types of emissions will also be reduced considerable. For comparison a volume of 50.000 tons of CO_2 is equal to the emission from approx. 16.000 cars driving 20.000 km per year [29].

6.6 Total external effects in the Alliance scenario

The total external effects to airlines, passengers and the environments can be summarised as follows (per year expressed in 2006 figures except for fuel, which has been calculated on the basis of May 2008 price level):

	All traffic in Euro	**DK-S in Euro**
Airline savings	20,6	14,1
Value of time savings to passengers	9,0	3,2
Environmental benefits	4,5	4,5
Total external effects	34,1	21,8

Table 18: Total external benefits in the Alliance scenario per year expressed in 2006 figures

[29] Energiinformation om nye danske personbiler, Færdselsstyrelsen, 2007

7 Compliance with Single European Sky

7.1 The Single European Sky – in short

The Single European Sky (SES) concept was drafted with the following objectives[30]:

- To improve and reinforce safety
- To restructure the European airspace as a function of air traffic flows rather than according to national borders
- To create additional capacity
- To increase the overall efficiency of the air traffic management system

The legal framework for the SES is based on a package of four regulations:

- Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation)

- Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the single European sky (the service provision Regulation)

- Regulation (EC) No 551/2004 of the European Parliament and of the Council of 10 March 2004 on the organisation and use of the airspace in the single European sky (the airspace Regulation)

- Regulation (EC) No 552/2004 of the European Parliament and of the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation)

7.2 The Merger scenario

The above mentioned objectives for the SES are met in the Merger scenario and the scenario is in compliance with the framework regulation 549/2004 and the sub-ordinated more specific regulations.

This evaluation of the consultants is supported by the comments from DG TREN to the NUAC "Definition Phase Final Report" from October 2006. The response states: "That from the perspective of the European Commission the most interesting option would be the merger option as it offers the most coherence with the overall Single Sky objectives"[31].

In this context it should be taken into account that the overall European policy is to reduce costs and promote efficiency. This may entail bigger organisational structures if economies of scale can be achieved. If the Scandinavian and Nordic countries with their relatively small traffic volumes want such a volume of scale and a competitive European position it will be

[30] Victor M. Aguado: EUROCONTROL and the Single Sky, ACI Communique
[31] Response sheets from DG TREN received by the NUAC Programme Management Team, December 2006

necessary to join forces both with respect to institutional size and with respect to R&D, training and education.

In some ways the situation can be compared with the alliances and mergers within the airline industry. However, such mergers and alliances in the airlines industry are only approved under the EU Competition rules if it can be demonstrated that benefits will be produced for the users of the services of the alliance or merger.

7.3 The Operational Alliance

The Operational Alliance will also be in full compliance with the SES regulations as it will have the same efficiency driven airspace design and consequently it will provide the same external savings as the Merger scenario.

The Operational Alliance scenario has a common Danish and Swedish airspace/FAB, with the future possibility for a common Charging Volume of Airspace (CVA) identical with the FAB and a possible common charging rate for the entire NUAC FAB. These issues are cornerstones in the SES concept.

The internal cost savings are less than in the Merger scenario but still substantial. Meanwhile the savings will give less room for reductions in the charging rates than in the case of the Merger scenario.

However, on an overall basis the Operational Alliance will be in full compliance with the objectives and policies of the SES.

Finally the creation of an Operational Alliance for the Danish-Swedish airspace can in the longer run become a solid basis for expansion of the FAB in the Nordic rim or for provision of services to other ANSPs.

7.4 The Alliance scenario

An Alliance scenario based on the existing Danish and Swedish airspace and the national borders can be seen as a step in the direction of the EU SES policy. It will lead to lower costs and better interoperability between the Danish and Swedish airspace.

The Alliance scenario seems not to support the development of a strong and powerful organisation, which can ensure long-term survival as a major player among the big European ANSP organisations. In this respect it is also obvious that the Alliance scenario will only to some extent promote a strong regional competence within IT research and development.

However, it should be underlined that the Alliance scenario is in compliance with the EU SES policy and concept regarding a common airspace based on Functional Airspace Blocks (FAB) rather than an airspace defined by national boundaries. Naviair and LFV would continue to be designated and certified by Denmark and Sweden respectively and Naviair and LFV/ANS would provide the air navigation service within a possible future common Danish/Swedish FAB. Reference is made to the report “NUAC Programme, Airspace Design, October 2006”.

Thus it can be concluded that this scenario will bring the Danish and Swedish ANSPs in a better position than the “do-nothing” scenario both with respect to cost savings and with respect to compliance with the future EU SES policy and market framework.

8 Compliance with Swedish and Danish aviation policy

8.1 The Swedish policy

In the Swedish Government proposition “Moderna Transporter” from 2006 [32] it is stated (page 208):

> Sverige bör enligt regeringens uppfattning bidra till genomförandet av det gemensamma europeiska luftrummet under de kommande åren. De tekniska aspekterna av det gemensamma europeiska luftrummet behandlas inom projektet SESAR (Singel European Sky ATM Research) som förväntas pågå fram till 2020. Luftfartsverket deltar aktivt i utformningsfasen av SESAR som sträcker sig över två år och syftar till att ta fram en gemensam europeisk generalplan för genomförandet av hela projektet. En strävan bör vara att långsiktigt få samtliga nordiska och/eller andra länder att delta i ett eller flera gemensamma funktionella luftrumsblock. Luftfartsverket bör, i samarbete med Luftfartsstyrelsen, delta i internationaliseringsprocessen genom att fortsätta utreda förutsättningarna för de nordiska projekt som bedrivs inom flygtrafiktjänstområdet och som syftar till att på ett effektivt sätt utnyttja resurser och kompetenser i de nordiska länderna. I denna process bör Luftfartsverket söka lösningar som bidrar till att reducera kostnaderna genom ökat samarbete och på sikt integrering av de nordiska flygtrafiktjänsterna.

In general it can be seen that the Swedish policy for the long-term development for the provision of air traffic services is based on a Nordic cooperation within the future European SES.

8.2 The Danish policy

A similar policy has been expressed in the Danish Government document “Dansk Luftfart 2015”[33] (see insert overleaf) where it is stated that the Danish aviation policy supports the planning and implementation of the SES and that such an implementation should be made in cooperation with Sweden.

[32] Moderna transporter”, Näringsdepartementet, 2006.
[33] Dansk Luftfart 2015 – muligheder og udfordringer”, Transport- og Energiministeriet, 2005

I dansk luftrum er der fortsat tilstrækkelig kapacitet, men der er betydelige kapacitetsproblemer i luftrummet over andre EU-lande. Dermed bliver mangel på kapacitet også et stigende problem for luftfartsselskaber, som flyver mellem Danmark og andre lande. Transport- og Energiministeriet vil derfor arbejde for, at "et fælles europæisk luftrum" så hurtigt som muligt kan realiseres i praksis.

"Et fælles europæisk luftrum" indeholder en række forskellige elementer, herunder blandt andet fælles krav til udøvelse af luftfartstjenester. Fælles krav vedrørende sikkerheds- og kvalitetsstyringssystemer mv. vil fremme mulighederne for samarbejde på tværs af landegrænserne.

Et andet element er etablering af såkaldte funktionelle luftrumsblokke, hvor eksisterende historisk og geografisk betingede luftrumsinddelinger lægges sammen. Sådanne sammenlægninger vil gøre det muligt for flyene at flyve mere direkte. Et tredje element er sikring af interoperabilitet gennem standardisering og harmonisering af udstyr og procedurer for flytrafikafvikling.

I øjeblikket arbejder tekniske eksperter fra de forskellige EU-lande på at udarbejde de specifikke implementeringsregler, der skal til for at få "et fælles europæisk luftrum" til at blive en realitet.

Naviair og Luftfartsverket i Sverige er ved at udarbejde et beslutningsgrundlag vedrørende etablering af en funktionel luftrumsblok, som dækker det øvre luftrum over både Danmark og Sverige samt at samle flyvekontroltjenesten i det nedre luftrum over Danmark og det sydlige Sverige.

8.3 Compliance with the national policies

As it can be seen both the Swedish and the Danish governments clearly state that the future cooperation between Sweden and Denmark should be in line with the EU SES policy and in both Government proposals it is stated that the structure for the future cooperation should allow for the introduction of the FAB concept.

With reference to the analysis in Chapter 7 both the Merger, the Operational Alliance and the Alliance concepts can be implemented within this overall Danish-Swedish political framework.

8.4 Military issues

8.4.1 Generally about the military issues

The Danish and Swedish airspace in not only used by the civil sector but also by the Danish and Swedish armed forces for policing of the national airspace and for different types of military operations and training. It is therefore important that the interfaces between the civil and military requirements are taken into consideration when changes in the civil airspace structure and management are considered.

8.4.2 Danish military issues

Based on meetings with the military authorities[34] and based on a specific memo "Det danske Forsvars krav i relation til NUAC Programme, 2006" from the Danish Armed Forces there are no objections to the NUAC Programme and the proposed scenarios provided that the interface with the military remains unchanged and provided that the military can continue to carry out its duties and keep its operational freedom as of today.

The memo lists a set of operational issues, which can be integrated in all the analysed scenarios without problems.

The Armed Forces has stated that it is a precondition that a possible change in the civil ATC will be at a minimum cost neutral for the Military.

8.4.3 Swedish military issues

The Swedish Armed Forces (Försvarsmakten or FM) shares the Danish points of view[35] with respect to the implementation of the NUAC programme. The requirements from FM are presented in a document from the FM "FM krav och inriktning på flygtrafiktjänst i svenskt luftrum, HKV 02805:62286".

The general concept is a flexible cooperation between FM and LFV, which will allow FM to carry out its obligatory duties in the Swedish airspace. Different technical and operational requirements are specified in the document, which do not contradict the implementation of the NUAC programme.

[34] Meeting with the Danish Armed Forces, Steen Ulrich, Autumn 2006
[35] E-mail to the NUAC programme dated 14.12.2006

9 Contribution to the regional development

The regional effects include the direct effects to the Danish-Swedish aviation sector and the indirect effects to the many suppliers of products and services to the aviation industry in the two countries.

Copenhagen Airport, Kastrup and the Stockholm-Arlanda Airport are today major hubs and gateways to and from the Nordic and Baltic regions on the one side and European and overseas destinations on the other. The status as future hub and gateway airports requires sufficient capacity in the entire traffic system especially in peak hours as transit passengers wish to spend as little time as possible waiting for their connection.

Therefore, it is essential for the development of the two airports, Kastrup and Stockholm/Arlanda as well as for other airports in the region to be served by an efficient and strong ANSP and that as much capacity and efficiency as possible can be provided by the ANSPs.

Today, the boundary between Denmark and Sweden is close to Kastrup and hence the airspace is controlled from air traffic control positions in units on both sides of Oresund. A possible establishment of a common organisation for the provision of Air Navigation Services in the Oresund region ensures that this complex airspace can be controlled from only one operational centre. Furthermore the airspace structure can be enhanced, ensuring seamless operations in the airspace with limited need for co-ordination between units and integration of the operations to and from Kastrup, Malmoe-Sturup and Roskilde Airports.

A future possible development of NUAC to include Finland, Norway and the Baltic countries would give opportunity to further promote the efficiency in the Functional Airspace Block of the Nordic Region. Such a development will give a higher efficiency regarding flights in and out to the major airports in southern Norway, the Stockholm area, the southern Finland as well as to the major airports in the Baltic states without constraints like national boundaries.

The regional effects will not only be related to the ANSP sector itself but will also include a contribution to the technological R&D in the Danish-Swedish region in a broader sense. Both the Danish[36] and Swedish[37] government focus on the importance of technological development as a mean to continued economic growth and welfare in the two countries.

The services from the ANSPs are based on very advanced technologies and systems. The technological systems, hardware and software will to some extent be purchased from the few international specialised suppliers of such systems but there is no doubt that the strengthening of the Danish-Swedish ANSPs will also mean more orders and jobs to local suppliers of technological development and maintenance services.

In this respect it should be mentioned that both Denmark and Sweden have a good and solid basis of companies and suppliers already involved in R&D and maintenance of systems and equipment in the aviation sector. Thus there is a good basis for further development based on new market opportunities coming from a stronger ANSP sector.

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[36] Helge Sander: Regeringens IT politik http://videnskabsministeriet.dk/site/forside/ministeren/artikler/IT-politik%20for%20hele%20erhvervslivet%20-%20Af%20videnskabsminister%20He
[37] Politik för IT-samhället - Rekommendationer från Regeringens IT-politiska strategigrupp
http://www.regeringen.se/sb/d/108/a/71555

This contribution to development and maintenance of equipment and systems will take place in all three scenarios. However, it is the consultant's opinion that two of the scenarios, the Merger and the Operational Alliance, with a common headquarter and focus on the core business will in a more powerful way support local and regional technological development and it will allow for synergies with the aviation support industries. Thus a physically close and integrated R&D and maintenance environment will benefit both the customers (the ANSPs) and the supply sectors in Denmark and Sweden. The impact will depend on to which extent the R&D activities will be allocated to the common NUAC company or will remain in the parent organisations.

10 Final remarks

The socio-economic analysis has shown that the implementation of all three scenarios will provide a substantial benefit to the external stakeholders and to the society.

In addition to the internal savings within Naviair and LFV both airlines and passengers will benefit from reduced flying time, which means reduced operational costs for the airlines and reduced flying time for the passengers. Furthermore the reduced flying time means reduced emissions from aircraft.

All scenarios are in compliance with the EU SES policy and fulfil the Danish and Swedish aviation policy. Particularly the Merger and the Operational Alliance scenarios will take full advantage of the future EU SES framework and market opportunities.

No conflicts are identified with the military operations in the Danish and Swedish airspace.

The development of a closer and more efficient cooperation between Naviair and LFV will also contribute to the overall strength of the Danish-Swedish aviation industry. An efficient provision of Air Navigation Services is a precondition for maintaining and development of an efficient hub airport system particularly in Copenhagen Airport, Kastrup and in Stockholm-Arlanda Airport.

Furthermore such a technological strength will give spin-off effects to the many companies and industries working as suppliers to the Danish and Swedish aviation industry.

Annexes

Annex 1: Abbreviations

A 330-300	Airbus 330-300, long haul aircraft
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCC	Air Traffic Control centre
ATCO	Air Traffic Controller
ATM	Air Traffic Management
B 737-800	Boeing 737-800, medium haul aircraft
CFMU	Central Flow Management Unit
CVA	Charging Volume of Airspace
CO_2	Carbon Dioxide
DG-TREN	Directorate General, Energy and Transport
DK-S	Denmark-Sweden
DOC	Direct Operational Costs
FAB	Functional Airspace Blocks
FH	Flight hour
FOC	Fixed Operational Costs
H_2O	Water
HC	Hydrocarbon
LS	Luftfartsstyrelsen
NM	Nautical Mile
NOX	Nitrous Oxide
NPV	Net Present Value
PAX	Passenger
R&D	Research and Development
SAAM	System for Airspace Analysis at Macroscopic Level
SATSA	Swedish ATS Academy
SES	Single European Sky
SLV	Statens Luftfartsvæsen
SO_2	Sulfurdioxide
TERESA	Transport- og Energiministeriets Regnearksmodel til Samfunds-økonomisk Analyse

Annex 2: Environmental impact from the aviation sector

Utsläpp från flygtrafiken

Flyget bidrar till den globala växthuseffekten via förbränning av flygbränsle vilket främst bildar koldioxid och vattenånga. Koldioxid, CO2, är en växthusgas som har lång uppehållstid i atmosfären, minst 100 år. Flygplanens utsläpp av kolmonoxid, CO, och kolväten, HC, ger också upphov till lägre halter av marknära ozon. Globalt beräknas flyget svara för cirka 3,5 procent av människans samlade bidrag till växthuseffekten. Även om flygets negativa miljöpåverkan idag är relativt liten är flyget sannolikt en tillväxtbransch. Därmed riskerar flygets negativa klimatpåverkan att på sikt öka kraftigt i förhållande till annan mänsklig klimatpåverkan och det är därför angeläget att ta fram åtgärder som motverkar den negativa trenden.

Vattenånga, H2O, är en betydande växthusgas. Även om flyget släpper ut ganska stora mängder vattenånga är dessa utsläpp en mycket liten del av den totala mängden vatten som finns naturligt i atmosfären. Den största delen av vattenångan som släpps ut från flygplanen hamnar i troposfären och försvinner snabbt med nederbörden, men på högre höjder kan eventuellt små mängder vattenånga ackumuleras och bidra till uppvärmningen av jorden. Kondensstrimmor bildas när de varma avgaserna från flygplanet blandas med den omgivande kalla luften och bildar ispartiklar. I torr luft dunstar ispartiklarna i kondensstrimmorna snabbt och försvinner. I fuktigare luft kan kondensstrimmorna däremot bestå i flera timmar. De kan dessutom växa till genom att ispartiklarna tar upp vatten från den omgivande luften. Bildandet av kondensstrimmor är i hög grad beroende av de lokala atmosfäriska förhållandena och även en mindre förskjutning av flygvägen kan motverka att kondensstrimmor blir långvariga. Kondensstrimmor har samma effekt som tunna höga moln, och kan bidra till uppvärmningen av jordytan. Antalet kondensationsstrimmor som bildas från flygtrafik kan komma att öka med ökad flygtrafik och också om trafiken i högre grad sker i luft där det lättare bildas kondensationsstrimmor.

Dessutom kan flygets utsläpp orsaka en ökning av cirrusmoln. Det kan antingen vara kondensstrimmor som inte försvinner utan utvecklas till cirrusmoln vid vissa atmosfäriska förhållanden, dels kan partiklarna från flyget påverka bildandet av cirrusmoln om atmosfärens sammansättning ändras så att moln kan bildas. Dessutom kan aerosolerna från flyget påverka existerande cirrusmoln och förändra dess livslängd och sammansättning. Inom dessa områden behövs dock mer forskning för att öka kunskapen.
På hög höjd i stratosfären orsakar utsläpp av kväveoxider, NOx, en nedbrytning av ozon. På lägre höjd kan däremot flygets utsläpp av kväveoxider bidra till bildandet av ozon vilket minskar UV-strålningen men denna ökning bidrar samtidigt till uppvärmning. Kväveoxiderna bidrar även till att bryta ner växthusgasen metan, vilket motverkar uppvärmningen av atmosfären. Den totala effekten av kväveoxidutsläppen från flyget innebär dock ett bidrag till uppvärmningen. Utsläpp av kväveoxider som når marknivå, exempelvis från lokala utsläpp vid flygplatser, ger samma negativa effekt på hälsan och på försurning av miljön som utsläpp från exempelvis vägtrafiken.

Utsläpp av svaveldioxid, SO2, från flygbränsle orsakar ozonnedbrytning på hög höjd vilket till viss del motverkar den ozonbildning som orsakas av kväveoxidutsläppen. Dessutom bidrar svavel till försurning.

Kolmonoxid, CO, och ofullständigt förbrända kolväten, HC, bildas också vid förbränning av flygbränsle och deltar i processen där ozon bildas. Även partiklar släpps ut, vilka kan påverka molnbildningen så att fler cirrusmoln bildas som i sin tur har en värmande effekt.

På flygplatserna minskar spridningen av glykol från avisning av flygplan och av urea från halkbekämpning. Glykolen samlas upp medan urea ersätts av nya acetat- eller formiatbaserade medel mot halka. Glykolspill orsakar syrgasbrist i vatten medan kväve från urea bidrar till övergödning.

Flygets miljöpåverkan är idag relativt liten jämfört med andra transportslag. I Sverige svarar flyget för omkring tio procent av transportsektorns utsläpp av koldioxid, fyra procent av kväveoxidutsläppen och en procent av kolväte- och kolmonoxidutsläppen.

Emissionsberäkningar

På Luftfartsstyrelsens webbplats finns en miljödatabas som visar flygresenärerna vad en viss resa ger i form av utsläpp till luften. Det ger resenärer möjlighet att väga in miljöperspektivet i sitt val av färdsätt.
Även SAS har ett system för att beräkna utsläpp, SAS Emission Calculator.

Minskad miljöpåverkan - hur kan flyget minska sina utsläpp?

För att minska mängden bränsle pågår arbete med att utveckla och använda motorer och flygplan med bättre miljöegenskaper. Även effektivare flygvägar, utan väntetider i luften inför landning, ger mindre bränsleförbrukning. En effektivare förbränning i flygplansmotorerna har sedan 1970-talet minskat utsläppen av kolmonoxid med 80 procent och kolväten och partiklar med 60 procent. I de modernaste motorerna har även kväveoxidutsläppen sänkts med 30-40 procent. Flygplan har en relativt lång livslängd, 20-30 år. Därför måste man räkna med att det tar lång tid för den nya tekniken att få genomslag på marknaden.
För att effektivt minska de globala utsläppen fordras internationellt överenskomna gränsvärden, som kan driva på teknisk utveckling och kommersiell introduktion av miljöanpassade motorer och flygplan. Dagens flygplan är bränslesnålare, tystare och renare än äldre flygplan. Internationella normer för utsläpp och buller liksom miljöavgifter ger flygplanstillverkare och flygbolag kraftfulla signaler om de krav som ställs.

Forskning pågår för att ta fram nya miljövänligare flygbränslen, t.ex. biobränsle och vätgas, som inte bidrar till växthuseffekten. Effekterna av kondensationsstrimmor är bland annat beroende av var utsläppen sker, så flygvägar anpassade till de meteorologiska förhållandena skulle i vissa fall kunna minska dessa effekter.

Arbete pågår för att införliva flyget i EUs handelssystem med utsläppsrätter. Detta handelssystem gäller koldioxid och omfattar för närvarande större utsläppskällor och anläggningar inom energiintensiv industri och inom kraft- och värmeproduktion. En öppen handel med utsläppsrätter för koldioxid skulle vara mer kostnadseffektivt jämfört med alternativa åtgärder i form av skatter och avgifter som skulle kunna begränsa flygets klimatpåverkan i motsvarande grad. Kommissionen ska ta fram ett lagförslag under 2006, på begäran av ministerrådet. Det är inte uteslutet att flyget kan komma med i handelssystemet redan under perioden 2008-2012. Luftfartsstyrelsen deltar i arbetet inom EU-kommissionen och nationellt som behandlar frågan.

Miljöavgifter

Miljörelaterade avgifter syftar till att stimulera tillverkare och flygbolag att utveckla och använda flygplan med bättre miljöegenskaper. Vid de statliga svenska flygplatserna tillämpas sedan 1998 avgasrelaterade avgifter, som gör det dyrare att landa med flygplan med höga utsläpp av kväveoxider och kolväten. Sedan 1 mars 2004 används ett nytt system för detta baserat på ERLIG-modellen, en europeisk modell som används för miljörelaterade startavgifter. En klassificering av flygplan görs avseende kväveoxidutsläpp, där man beräknar hur många kilo kväveoxider en viss flygplanstyp släpper ut under en sk LTO-cykel (Landing- and Take-Off-cykel). Avgiften tas ut på samtliga av LFVs flygplatser. Andra länder som har infört miljörelaterade NOx-avgifter är Schweiz och Storbritannien. Även Tyskland har planer på att införa denna typ av avgift.

Luftfartsstyrelsens miljöarbete

Luftfartsstyrelsen har ett särskilt sektorsansvar för miljömålsarbetet inom flygets område. Luftfartsstyrelsen samarbetar också med övriga trafikverk och Naturvårdsverket, inom gemensamma projekt för konkreta miljöåtgärder. Samverkan mellan transportslagen är nödvändig för att miljöanpassa hela transportkedjan.
Luftfartsstyrelsen är aktiv inom luftfartsorganisationerna ICAO (International Civil Aviation Organization), ECAC (European Civil Aviation Conference) och EUROCONTROL (European Organisation for the Safety of Air Navigation), liksom inom EU och det nordiska samarbetet för att skärpa de internationella normerna för buller och avgasutsläpp samt att utveckla ekonomiska styrmedel för att minska utsläppen och flygets negativa klimatpåverkan. Luftfartsstyrelsen har också samarbete med de övriga nordiska länderna i en särskild arbetsgrupp för miljöfrågor, N-ALM.

Miljöledningssystem

Luftfartsstyrelsen har fått ett uppdrag från regeringen att införa ett miljöledningssystem vid myndigheten. En miljöutredning av Luftfartsstyrelsens verksamhet har genomförts och en miljöpolicy finns framtagen. För närvarande pågår arbete med att ta fram miljömål och handlingsplaner som ska implementeras i verksamheten. Målet är att det den 1 januari 2007 ska finnas ett fungerande miljöledningssystem för hela Luftfartsstyrelsens verksamhet.

Annex 3: Calculations

Overall savings in the Merger scenario

Savings		
Saving in minutes per day	911	
Flights per day	2,784	
Savings in minutes per flight	0.33	
Savings in hours per day	15.18	
Savings in hours per year (349 days per year)	5,296	
Number of pass. per year	101,048,064	
Value of time to pass.		
Total saved pax minutes	33,047,508	
Total saved pax hours	550,792	
Intentionally left blank	-	
Business pax share	0.45	
Leisure pax share	0.55	
Value of 1 hours for business-pax	21.3	
Value of 1 hour for leisure-pax	13.2	
Total value to passengers per year	**9,278,088**	
Value of savings to airlines		
DOC		
Saved hours per year	5,296	
Fuel		
Weighted fuel consumption in ltr. pr. FH in mixed p-to-p and cruise	4125	
Fuel price per liter in Euro (May 2008)	0.56	
Fuel saving in Euro	12,233,933	
Maintenance		
Maintenance reserve pr. FH, weighted	220	
Maintenance saving in Euro	1,165,137	
Total DOC	13,399,070	
FOC	7,756,986	
Total DOC and FOC savings	**21,156,056**	

Value of reduced emissions			
Reduced flight hours per year	5,296		
	Kg. per hour	Value pr. kg	Total value per hour
CO2	9412	0.056	527.08
H2O	3698	0.018	66.57
SO2	3	6.548	19.46
NOX	38	6.619	251.11
HC	4	0.569	2.07
CO	28	0.001	0.03
Total value of all emissions per hour			866
Total value per year			**4,588,079**

DK-S savings in the Merger scenario

Savings		
Saving in minutes per day	692	
Flights per day	2,135	
Savings in minutes per flight	0.32	
Savings in hours per day	11.54	
Savings in hours per year (349 days per year)	4,026	
Number of pass. per year	62,962,218	
Value of time to pass.		
Total saved pax minutes	20,410,375	
Total saved pax hours	340,173	
Share of DK-S pax	0.6	
Business pax andel	0.45	
Leisure pax andel	0.55	
Value of 1 hours for business-pax	21.3	
Value of 1 hour for leisure-pax	13.2	
Total value to passengers per year	**3,323,523**	
Value of savings to airlines		
DOC		
Saved hours per year	4,026	
Fuel		-
Fuel consumption in ltr. pr. FH , p-to-p	3438	
Fuel price per liter in Euro (May 2008)	0.56	
Fuel saving in Euro	7,749,501	
Maintenance		
Maintenance reserve pr. FH	200	
Maintenance saving in Euro	805,143	
Total DOC	8,554,644	
FOC	5,896,332	
Total DOC and FOC savings	**14,450,976**	

Value of reduced emissions for B 737-800			
Reduced flight hours per year for all flights	5,296		
	Kg. per hour	Value pr. kg	Total value per hour
CO_2	7048	0.056	394.69
H_2O	2769	0.018	49.84
SO_2	2	6.548	14.41
NOX	23	6.619	152.24
HC	5	0.569	2.56
CO	34	0.001	0.03
Total value of all emissions per hour			614
Total value per year			**3,250,557**

Overall savings in the Alliance scenario

Savings		
Saving in minutes per day	888	
Flights per day	2,784	
Savings in minutes per flight	0.32	
Savings in hours per day	14.79	
Savings in hours per year (349 days per year)	5,162	
Number of pass. per year	101,048,064	
Value of time to pass.		
Total saved pax minutes	32,212,700	
Total saved pax hours	536,878	
Intentionally left blank		
Business pax andel	0.45	
Leisure pax andel	0.55	
Value of 1 hours for business-pax	21.3	
Value of 1 hour for leisure-pax	13.2	
Total value to passengers per year	**9,043,716**	
Value of savings to airlines		
DOC		
Saved hours per year	5,162	
Fuel		
Weighted fuel consumption in ltr. pr. FH in mixed p-to-p and cruise	4125	
Fuel price per liter in Euro (May 2008)	0.56	
Fuel saving in Euro	11,924,894	
Maintenance		
Maintenance reserve pr. FH, weighted	225	
Maintenance saving in Euro	1,161,516	
Total DOC	13,086,409	
FOC	7,561,038	
Total DOC and FOC savings	**20,647,448**	

Value of reduced emissions, weighted B 737-800 and A330-300			
Reduced flight hours per year	5,162		
	Kg. per hour	Value pr. kg	Total value per hour
CO2	9412	0.056	527.08
H2O	3698	0.018	66.57
SO2	3	6.548	19.46
NOX	38	6.619	251.11
HC	4	0.569	2.07
CO	28	0.001	0.03
Total value of all emissions per hour			866
Total value per year			**4,472,180**

DK-S savings in the Alliance scenario

Savings		
Saving in minutes per day	674	
Flights per day	2,135	
Savings in minutes per flight	0.32	
Savings in hours per day	11.24	
Savings in hours per year (349 days per year)	3,921	
Number of pass. per year	62,962,218	
Value of time to pass.		
Total saved pax minutes	19,879,546	
Total saved pax hours	331,326	
Share of DK-S pax	0.58	
Business pax andel	0.45	
Leisure pax andel	0.55	
Value of 1 hours for business-pax	21.3	
Value of 1 hour for leisure-pax	13.2	
Total value to passengers per year	**3,237,086**	
Value of savings to airlines		
DOC		
Saved hours per year	3,921	
Fuel		
Fuel consumption in ltr. pr. FH , p-to-p	3438	
Fuel price per liter in Euro (May 2008)	0.56	
Fuel saving in Euro	7,547,954	
Maintenance		
Maintenance reserve pr. FH	200	
Maintenance saving in Euro	784,203	
Total DOC	8,332,157	
FOC	5,742,981	
Total DOC and FOC savings	**14,075,138**	

Value of reduced emissions for B 737-800			
Reduced flight hours per year for all flights	5,162		
	Kg. per hour	Value pr. kg	Total value per hour
CO_2	7048	0.056	394.69
H_2O	2769	0.018	49.84
SO_2	2	6.548	14.41
NOX	23	6.619	152.24
HC	5	0.569	2.56
CO	34	0.001	0.03
Total value of all emissions per hour			614
Total value per year			**3,168,445**

Annex 4: Meetings and interviews

Person	Organisation
Anders Janson	Svenske Forsvar
Henrik Jonshammer	SAS
Henrik Littorin	LFV
Jan-Olof Bergling	Skyways
Kim.Lindkvist	SAS
Lars Ahlm	LFV
Martin Porsgaard Nielsen	SAS
Olle Björk	SAS
Søren Byrjalsen	Cimber Air
Steen Ulrich	Forsvarskommandoen
Bo Gryckdal	Københavns Lufthavne A/S

Annex 5: Consultation statements from trade unions

Malmö-Sturup och Arlanda 080123

Till NPMT.

ST inom Flygledningens kommentarer och synpunkter på "Socioeconomic Report".

Generellt vill ST inom Flygledningen klargöra att vi ser positivt på att man även genomfört analyser som visar att det finns potentialer till gagn för framförallt miljön genom att förbättra och effektivisera luftrummet inom segmentet en-route.
Vad gäller de enskilda resultaten i rapporten för NUAC väljer ST att inte kommentera dessa i detalj, däremot har vi sedan tidigare redan påpekat att vi är skeptiska till vissa av de ekonomiska vinsterna som redovisas. Som exempel kan nämnas tidsvinster för slutkunden, d.v.s. för den enskilde passageraren. D.v.s. den lilla tidsvinst som redovisas per passagerare, tack vare ett effektivare luftrum inom NUAC, kan tyvärr riskera att ätas upp eller skulle till och med kunna resultera i en tidsförlust p.g.a. att andra segment inom flygtransportsektorn i dagsläget inte har tillräcklig kapacitet/resurser så att de tidsvinster som en-route skulle kunna åstadkomma, inte kan åtnjutas.

Med anledning av detta vill ST därför poängtera att det i rapporten, jämte analyserna, tydligt borde framgå att de resultat som den socioekonomiska rapporten visar gällande NUAC, oavsett om det bildas ett NUAC-bolag eller inte, visar på potentialer som först torde kunna uppnås till fullo under förutsättning att övriga segment av flygtransportkedjan, där vi i dagsläget har kända kapacitetsbrister, hittar och genomför, för dessa delar, nödvändiga effektiviseringar.

För ST inom Flygledningen

Ann-Marie Bredberg   Christer Karlsson

Fra: Leffler, Gunnar (ASD/SYS)
Sendt: 21. januar 2008 10:24
Til: Håkansson, Eva (ASD/DEV)
Cc: Hansson, Stefan (ANS/EMS)
Emne: Remissvar socioekonomiska rapporten

SACO/ANS remiss-svar på NUAC Programmets Socio-economic analys.

SACO/ANS anser att det är värdefullt för NUAC programmet att den Socio-ekonomiska analysen har genomförts. SACO/ANS har inga synpunkter på den analysmetod som använts och ifrågasätter inte heller de simuleringar som genomförts.

Däremot konstaterar SACO/ANS att analysresultatet har varit positivt ur flera aspekter bl.a. beroende på ett mer effektivt utnyttjat luftrum. Analysen visar på miljöförbättringar genom bl.a. minskade emmisioner.

Den allmänna miljödebatten blir allt intensivare och då särskilt flygets roll som miljöbov. SACO/ANS vill därför poängtera vikten av att NUAC programmet mycket tydligare än hittills visar att ett genomförande av NUAC är positivt för (flyget och) miljön.

SACO ANS genom Eva Häll och Gunnar Leffler

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DATCA høringssvar til Socio-economic analysis NUAC

DATCA kan ikke tilslutte sig beregningerne og konklusionerne som fremsættes i den Socio-økonomiske analyse af NUAC-projektet.
Det er der flere grunde til som vi vil liste herunder.

Rapportens beregnede besparelser og gevinster synes meget svært realiserbare og er, efter vores mening behæftet med stor usikkerhed, uanset det bliver beskrevet at det er sådan man gør.

Hele beregningsgrundlaget hviler på en beregnet besparelse ud fra en simulering som, efter vores overbevisning ikke nødvendigvis holder. Den foreløbige sektorisering og rutestruktur i Fast Time Simuleringen skal først verificeres og risikovurderes inden der vides om den rent faktisk kan implementeres. Desuden er der , os bekendt, ikke foretaget nogen realtime simulering som kan belyse at der rent faktisk er en besparelse at hente i forhold til hvordan trafikken afvikles i dag. Vi mener at trafikken i dag, i dansk luftrum, flyver direkte igennem luftrummet uden mulighed for yderligere besparelser. Det selvfølgelig være under hensyn til anden trafik og og aktive militære samt R og D-områder. Men det vil man også være nødt til at tage hensyn til i et NUAC-projekt ellers falder sammenligningsgrundlaget til jorden.

Luftfartsselskabernes udmelding om hvad de kan spare er svær at kommentere på, men det må gøres opmærksom på at deres beregninger må være baseret på de oplysninger de har fået stillet til rådighed. Og de oplysninger stiller vi gerne spørgsmålstegn ved.

Man har omregnet passagerernes sekund og minutbesparelse på en flyrejse til et, samlet set ret stort beløb. En besparelse, som det er svært at se reelt kan udmøntes til gavn for samfundet.

The main impacts of the current costs of Naviair and LFV include reduced staff and salaries as well as reduced operational costs, training costs, costs for procurement, maintenance and costs for R&D.

Vi savner belæg for ovenstående udpluk af rapporten. Hvad er det man forventer at kunne spare i en Alliance eller Mergermodel som ikke vil kunne spares i de nuværende scenarier. Vi tror ikke på at man vil kunne klare sig med færre flyveledere i et NUAC end man har brug for i dag.

DATCA er ikke imod NUAC ideen og støtter op om den operationelle alliance, men vil ikke være med til at tage beslutning om en etablering på et forkert økonomisk grundlag. Vi forventer ikke, at etableringen af NUAC vil give en stor økonomisk og miljømæssig gevinst. Det skyldes at vi i dag i Danmark er meget effektive og dermed er der stort set ikke plads til forbedringer.
Derimod kan vi se andre fordele som at vi lever op til kravene i SES og etableringen af FABs.

København 30 januar 2008.

DATCA

Til
NUAC – gruppen

Kastrup, den 21. januar 2007

HK og Kreds 2 har ingen bemærkninger til "Socio-economic analysis" November 2007.

Med venlig hilsen
HK klub 3952

Anette Toft Sørensen

Kreds 2

Bo L. Petersen