# REPORT
# SL REP 35/2005

# SAFETY IN NORWEGIAN AVIATION DURING THE PROCESS OF CHANGE

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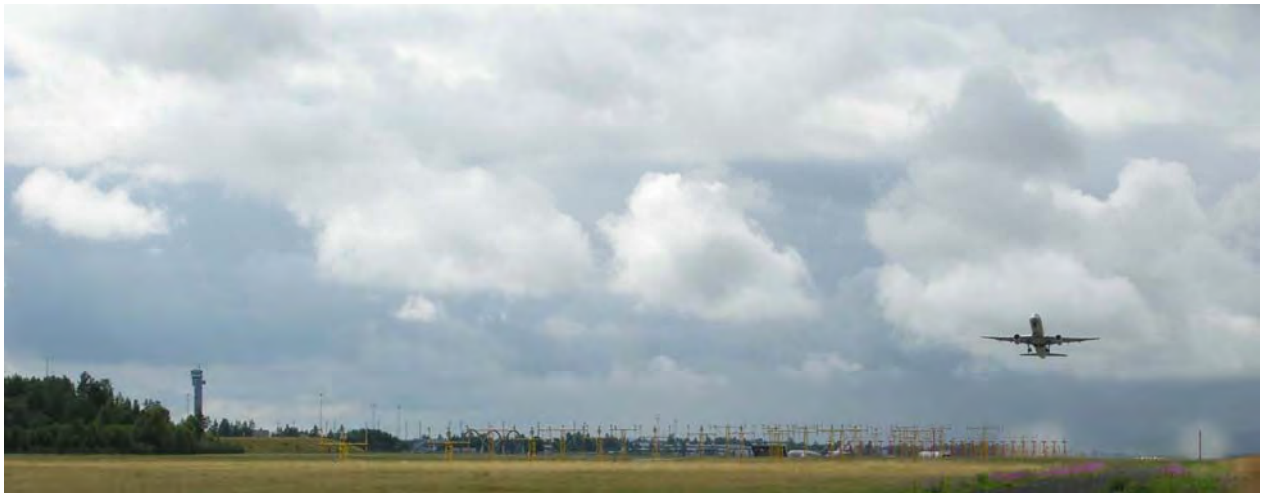
This report was commissioned by the Norwegian Ministry of Transport in a letter dated 7 October 2004, based on the provisions of Section 20 in the regulation dated 22 January 2002 no. 61 concerning investigation of aviation accidents and incidents in civil aviation.

The Accident Investigation Board, Norway has prepared this present report solely with the intention of improving flight safety. The intention of the investigation has been to identify errors or defects which may undermine flight safety, whether they are causal factors or not, and to promote safety recommendations. The Board is not supposed to divide blame and liability. This report should only be used in order to promote flight safety.

This report has been translated into English and published by the AIBN to facilitate access by international readers. As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

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# 1  SUMMARY WITH SAFETY RECOMMENDATIONS

The Accident Investigation Board/Norway (AIBN) has been commissioned by the Norwegian Ministry of Transport and Communications, to investigate how aviation safety will be maintained in the light of the major change processes taking place in the Norwegian civil aviation sector.

The AIBN has chosen to limit the investigation to the period from 1 January 2000 up to the current date (July 2005), because there have been especially comprehensive changes in this period. At the New Year 2000, The Aeronautical Inspection Department (Luftfartsinspeksjonen) was split from the then Civil Aviation Administration (Luftfartsverket), which is now Avinor AS, and was established as an independent supervisory authority named the Civil Aviation Authority, Civil Aviation Authorities (Luftfartstilsynet). In addition, in the same period, the major aviation players in the state sector, infrastructure operators, air traffic services and aircraft operators have also implemented comprehensive and demanding processes of change. These are changes that are unique in international aviation, especially because they are taking place concurrently and, in some cases, at very high speed. This means that maintenance of safety in the air must be given a high priority, and be documented at all levels in the affected organisations.

International, and particularly western aviation, has achieved high levels of safety, thanks to stringent and rigid supranational regulations, and application of them. Over the last few years, Norwegian civil commercial aviation has avoided serious accidents with many fatalities. There has been a decrease in the number of accidents and serious incidents, both in Norway and other industrialised countries during this period.

The authorities' and industry players' expressed, and partly written, overall guidelines and goals stating that:

- Levels of safety in the air must be continually improved
- Levels of safety in the air must, at least, be maintained during and after the period of change

This is the basis for AIBN's assessments in this study.

The generally high safety level, with its attendant low number of accidents and serious incidents, make it difficult, not to say impossible at national level, to apply accident statistics to measure or confirm that the level of aviation safety has become better or poorer as a result of the changes in the past few years. Research and experience from abroad shows that any negative air safety consequences rarely materialise in the form of accidents until several years after the implementation of the changes. It has, therefore, been necessary to use other types of indicator as a basis when assessing whether levels of aviation safety in the air are being maintained.

In this connection, the AIBN has emphazised investigating how the major players in the Norwegian aviation sector maintain aviation safety during the change processes. It also points out conditions, and makes recommendations, where there seems to be a potential for improvement.

The main conclusion is that a number of major and minor changes were not sufficiently assessed, individually or holistically, with regard to their impact on aviation safety. When such assessment has been carried out, there often seems to be a lack of follow-up and documentation of "closure" of the conditions and results/recommendations. All of the aviation players that we have investigated, including the authorities, have potential for improvement.

As its contribution to preventing the huge changes in the Norwegian aviation sector impacting on aviation safety, the AIBN is making the following safety recommendations, which will be justified later in this report and its annexes:

1. The Civil Aviation Authority should consider putting greater emphasis on system-oriented holistic and risk-based supervision and develop/recruit personnel with relevant expertise - not least in order to follow up and become aware of potentially negative safety consequences of the change measures at those they supervise.

2. The Civil Aviation Authority should consider extending the transitional phase with double staffing in Oslo/Bodø, in order to ensure that new employees receive the experience and acquire the competence they need. This is necessary for carrying out the supervision tasks in a satisfactory manner during the transition, thus maintaining market trust.

3. The Civil Aviation Authority, in collaboration with recreational organisations in general aviation and sporting aviation, should consider taking the initiative (on the basis of "Terms of reference" that govern PAL ("Project general and sporting aviation"), as well as findings in this report) to establish the necessary prerequisites for continuing PAL, so that the recreational organisations can carry out their aeroplane and air sports activities by means of an organisational, responsibility and sanction model in conjunction with the supervisory authority.

4. The Civil Aviation Authority should consider whether Avinor's interpretation of BSL E 4-4 meets the intention of the regulation, both in view of the fact that staff levels are not dimensioned for concurrent rescue and firefighting, and that the downward adjustment of airport category allows for a lack of personnel contingency for all available equipment.

5. The Civil Aviation Authority and Avinor itself should consider whether there have been enough aviation and/or safety specialist requirements imposed on central senior management positions with an overall responsibility for aviation safety at Avinor.

6. Avinor should consider to let the approved and planned safety-related "Take-Off-05" initiatives that have not yet been implemented rest until the safety consequences have been thoroughly studied and documented, compared with DNV's reservations and comments, and have been checked with the relevant safety and supervisory authorities.

7. Avinor should consider implementing a documented review of experience with the "Take-Off-05" initiatives that have already been implemented, seeing whether DNV's reservations and comments, and the relevant official requirements, have been met.

8.  Avinor should consider increasing its internal capacity in general, and the safety specialist expertise in particular, in order to be able to follow up the heavy increases in recommendations and initiatives generated by the safety management system (occurence reports, risk analyses, etc.).

9.  "The employer" Avinor AS and the labour organisations in the company should consider intensifying their efforts to improve coordination and employee involvement in internal decision processes, so that trust is increased between the parties. This is regarded as being necessary in the development of a positive culture of safety.

10. The airlines that have been studied should consider looking more holistically at their initiatives, and carrying out analyses to see how concurrent changes and use of dispensations, MEL and HIL lists affect safety. (The study has revealed that MEL is not regarded as a safety reduction as long as the regulations concerning type and time are adhered to.)

11. The airlines are advised to survey cultural differences before considering association/mergers and integrating courses from the original companies in such a way that a "new" corporate culture can be established in a clear way for everyone involved.

12. Overall follow-up and administrative routines at the supervisory authorities and the airline operators should be developed and integrated, which will include systematic and documented protection of air safety matters that are associated with the processes of change. This should form a supplement to the regulated and event-based quality systems that exist, and are mainly used, today. New recruitment/development of associated safety expertise should be considered in this connection.

13. The Ministry of Transport and Communications should ensure that the official duties that are still carried out by the state-owned company Avinor are transferred as soon as possible to the Civil Aviation Authority and/or other official bodies in which the responsibility would naturally reside.

14. The Ministry of Transport and Communication should, in a holistic social safety perspective, and in collaboration with other responsible/affected official bodies, and based on the report from the "Committee for securing Norway's critical infrastructure", which is expected to be published in the autumn of 2005, consider gaining experience from, and evaluate, the current model/solutions for state ownership/administration of air navigation services and airport operations.
    *(This safety recommendation is given with the authority of the commissioning document from the Ministry of Transport and Communications, in which the AIBN is also given the opportunity of "investigating in more detail other conditions that may be revealed in connection with the investigation".)*

15. The Ministry of Transport and Communications and/or other responsible ministries should consider including impact assessments of safety matters as part of the basis for their political decisions within the transport sector, when specialist sources indicate that safety levels may be at risk. Alternatively, broad-based consultation exercises should be held, in which relevant specialist agencies should be given the opportunity to submit their views/comments.

*(The AIBN is in the process of becoming the independent investigative authority for accidents/incidents within the entire transport sector, and therefore allows itself to promote this cross-sector safety recommendation.)*

## 2  FOREWORD

The Norwegian Accident Investigation Board (AIBN) has been commissioned by the Norwegian Ministry of Transport and Communications to investigate how aviation safety is protected by <u>both the government and private companies</u> in a period of major changes in the Norwegian aviation sector.

As far as the AIBN is aware, partly through this investigation, no such aviation study has been carried out in Norway or abroad, without having been triggered/initiated by serious accidents. The AIBN would like to thank the ministry for the confidence it has placed in us, by awarding us such a broad-based and ground-breaking accident prevention investigation.

The AIBN has carried out this important project in full knowledge that in a "normal situation" it is the responsibility of the Civil Aviation Authorities to evaluate how aviation safety is protected in the Norwegian aviation sector.

Within the extremely wide-ranging project description and the relatively short time frame, the AIBN has had to place a number of priorities, amongst them to "only" investigate the most "prestigious" players in the Norwegian aviation industry. Some people, including the many small and medium-sized commercial aircraft and helicopter companies, will therefore feel that the challenges that they, in particular, face have not been (sufficiently) discussed, while the "major" companies may well feel that there has perhaps been more than enough focus on them.
In our opinion, however, both the main conclusions and large parts of the background material will also prove to be useful reading for others than the "investigated" players. The same also applies, in principle, for other transport sectors/industries.

The AIBN, therefore, hopes and believes that the report and its associated annexes will be actively used in work on preventive measures in the field of aviation safety, and that time and energy shall not be used to cast doubt on, and argue against, the findings of this report. Factual information has been checked with the involved parties as far as has been possible.

We have received indications/feedback that the investigation in itself has already led to measures being implemented that are in line with several recommendations from this report.

The AIBN wishes to express its thanks for the generosity and openness that we have been met with by players/sources of information we have been in contact with through this investigation.

We would also like to thank our external consultants and research institutions for their excellent cooperation, as well as solid and valuable contributions to the investigation.

Two meetings have been held during the investigation, in which all of the contributing research institutions and the AIBN have participated.

Finally, the AIBN would like to remind you that commercial civilian aviation is an especially safe form of transport, especially in our "western" part of the world, and that the assessments and safety recommendations that appear in this report, are intended to contribute to ensuring

that the major changes occurring in the Norwegian aviation sector do not take place at the expense of safety in the air.

# 3  INTRODUCTION

## 3.1 Background to the special project/investigation

*The National Transport Plan for 2002-2011, chap. 4.3 states: "In its long-term work on safety within all transport sectors, the government will base its efforts on a vision that no fatal accidents, or accidents leading to permanent disability, will occur".*

*This zero vision is repeated explicitly for scheduled commercial aviation in chap.4.3.8: Accident investigation shall be used in the prevention of new accidents. The aviation industry is regarded as having high levels of safety. The main challenge to be faced is the maintenance and continual improvement of safety.*

In the autumn of 2004, the Norwegian media speculated greatly whether safety in the air could be threatened as a result of the many changes taking place in the Norwegian aviation sector. In addition to this, the AIBN also published several reports pointing out that changes in the sector could be one contributory factor to certain incidents. Based on this, the Minister for Transport and Communications requested the AIBN in October 2004 to carry out a general investigation/analysis of how aviation safety would be protected during the comprehensive changes that were taking place in Norwegian aviation. (Ref. commissioning letter from the Ministry of Transport and Communications, dated 07.10.2004.)

The AIBN is an administrative body, subordinate to the Ministry of Transport and Communications, which has responsibility for investigation of accidents and incidents within civil aviation and railways. The AIBN studies root causes of accidents and makes recommendations for improved transport safety. The law also states that "*The Ministry of Transport and Communications, following advice from the investigating authority and the Norwegian Civil Aviation Authority, may order the investigating authority to perform special duties that concern general aviation safety*". In all aviation questions, the AIBN is independent, and does not apportion blame, or liability under civil law in its investigations.

From 1993-06-11 no. 101: The Act relating to Aviation (Aviation Act):

**Section 12-1.** *The duties and independence of the investigating authority*

Investigation of aviation accidents and incidents must be carried out by an authority appointed by the Ministry. The object of the investigation is to improve safety and prevent aviation accidents.

The investigating authority shall clarify the sequence of events and root causes, study matters that are significant in the prevention of aviation accidents and submit a report from the investigation, as stated in Section 12-21.

The investigating authority shall not assume a position on blame and liability according to civil or penal law. The investigation must take place independently of other investigation that has wholly or partly such aims.

**Section 12-16.** *Duty to provide information to an investigating authority etc.*

If requested to do so, any person has the duty to provide the investigating authority with any information they have about matters that may be of significance to the investigation. This overrides any duty not to disclose confidential information under which the person

concerned may be. Any person making a statement has the right to have a legal representative or other person present while making the statement.

Addition to the Act of 3 June 2005 no 35.


**Section 12-27.** *Reports concerning safety levels in civil aviation*

The aviation authority may publish general reports that have the goal of informing the general public of the levels of safety in civil aviation. Such reports shall not contain reference to individual's name or address.

Addition to the Act of 3 June 2005 no 35.


From the regulation relating to official investigation of aviation accidents and incidents within civil aviation, BSL A 1-4:

**Section 2.** *The purpose of the investigation*

The investigation has as its goal clarification of the sequence of events and causes, as well as discussing other significant conditions that could prevent accidents and incidents in order to improve aviation safety. The purpose of the investigation is not to apportion blame and liability.


**Section 20.** *Other tasks*

The Ministry of Transport and Communications, following advice from the investigating authority and the Norwegian Civil Aviation Authority, may order the investigating authority to perform special duties that concern general aviation safety.


### 3.2 Protection of aviation safety from a historical perspective

Aviation has stood out as being a very safe form of transport. It can refer to unique accident statistics, compared with other forms of transport. This is not coincidental, but is a result of the history of aviation and the very special manner in which organised air operations are carried out.

The International Standards and Recommended Practices, drawn up by the International Civil Aviation Organization (ICAO) became, in the post-war period, a comprehensive common set of regulations for all of the member countries of the ICAO, governing operational and technical administration and control of the aviation sector. The standards were published as so-called Annexes, one for each of the defined specialist areas. Members were encouraged to include the annexes as part of their national aviation legislation. In this way, there was early achievement, to a great extent, of international standardisation and cooperation.

The aircraft manufacturers produce aircraft concepts, in which standardised and systematic safety efforts are emphasised during development and manufacture in a way that lacks comparison with other industries. Aircraft are sold throughout the world as complete means of transport, in which all safety analyses and safety technology are integral, and with operation and maintenance manuals that make it possible for them to work around the world within the limits that the manufacturer and the certification authority have specified. The various countries' aviation authorities issue type certificates, in which national special requirements arising from geography, infrastructure, weather conditions, etc. are laid out.

In addition, the international requirements governing investigation of accidents (ICAO Annex 13) and incidents have contributed to experience interchange as "previous faults" have been noted and the notes built into aviation's "standardised" transport system.

The result is an aviation industry that has a special relationship to everything being standardised and to prevention of deviations. This is the main reason that aviation can boast the high levels of safety that it has. In addition, there is the fact that those carriers who have had major accidents have often not survived them and have become bankrupt, or have had to cease operations, soon after the accident. With this background, as well as the companies having enjoyed good times, with good profits, many of the companies have created their own in-house standards, in addition to the laws and regulations, which have contributed to increasing safety margins even further.

Both commercial aviation operators and the authorities have considered for quite some time that this standardised fine-meshed safety net has been sufficient for the maintenance of aviation safety - which has been confirmed by the good accident statistics over the last decades.

Liberalisation of the aviation sector, with increased competition and increasing pressure on profitability, has in recent years led to great structural changes and changes in the form of reorganisation, downsizing and changes in company structure, sometimes with subsequent unclear areas of responsibility and interfaces. Such changes may impact on the predictable and standardised solutions upon which the aviation sector has been built.


### 3.3 Major, and parallel, changes in Norwegian aviation since 2000

In addition to the changes that have taken place, and are taking place in connection with the movement of the Civil Aviation Authoritiy from Oslo to Bodø, several major changes have taken place in parallel in Norwegian aviation since 2000.

In 2003, Luftfartsverket, at that time The Civil Aviation Administration was reorganised into a separate public limited company (PLC), Avinor AS which both has carried out, and is in the process of carrying out, major organisational changes and staff reductions, some through the programme Take-Off-05. Air Traffic Control has been reorganised with the closure of the Trondheim ATCC and transfer of its area of responsibility to the newly created ATCC North at Bodø. The decision has been made to close the ATCC at Røyken and air traffic control in southern Norway will be unified in one ATCC South at Stavanger (Sola).

There have also been major changes in the company structure in Norwegian airlines. SAS acquired Braathens in 2001. In both SAS and Braathens the technical services have been demerged and organised as separate companies - SAS Technical Service (STS) and Braathens Technical Service (BTS) (a subsidiary of STS). Similar restructuring has taken place at CHC (formerly "Helikopterservice"), which has new Canadian owners and where technical maintenance has also been demerged into a separate company - Astec. The ground staff at Braathens were absorbed into SAS Ground Service (SGS), a subsidiary of SAS – which was also created in the period. In the spring of 2004, the airlines SAS and Braathens were merged into one – SASBraathens.

In addition to such changes in the domineering airlines in Norway, new players have also entered the market recently, primarily Norwegian Air Shuttle, which competes against SAS and Braathens on both domestic and foreign routes. Air miles programmes on domestic flights have been terminated, and the prices of domestic flights have been heavily reduced as a result of increased competition, both national and international.

The increase in competition, with its increased focus on costs, has led to changes in the jobs of central groups in Norwegian aviation. Pilots now have more active flight service duty, in other words they have increased their air borne time when they are on duty. Time on the ground between flights has been reduced, and a number of technical maintenance routines have been transferred from aircraft technicians to other groups. The number of airports having technical maintenance staff has been reduced, etc.

These changes affect virtually all groups working in the aviation sector. The changes have led to loss of jobs, transfer to other work, relocalisation and redundancies in the companies. Many employee groups have had to change their working practices, and especially the decisions concerning movement of the ATCCs and the Civil Aviation Authorityhave led to strong protests from employee groups.

It is entirely possible that such comprehensive and concurrent changes to private and public players do have an impact on the Norwegian aviation sector. Unlike road traffic, aviation safety can only be investigated to a limited extent using statistics, quite simply because relatively few accidents happen. In this way, it is better to compare aviation with advanced production facilities that also have stringent safety and reliability requirements, such as atomic power stations and oil production.

In general, it is accepted that as the degree of change in all company types increases, it is no longer sufficient to establish good safety management solely through routines and regulation (Hale & Baram 1998). When circumstances are predictable and fixed such safety management is adequate, but when circumstances are in the process of continual changes, efforts must be made to internalise employees' safety awareness. Safety cultures and safety climates, which can be seen as latent and manifest expressions of organisations' degree of focus on safety have, therefore, come steadily more in focus in modern safety management.

In addition to the surroundings for all organisations becoming more dynamic, surveys indicate that major organisational changes may have negative impact on levels of security. Ytrehus and Østerbø (2002) state that they can document organisational changes as indirect contributory factors in several major accidents, including the Åsta rail accident in 2000. In general, "disturbance" in organisations, which often occurs during organisational changes, will be an expression of employees' impression that they are not listened to and taken into account. Larsson (2005) has recently documented the connection between such conditions in the working environment and the risk of accidents.

Rasmussen (1997) points out that modern changes to a great extent concern deregulation and exposure to competition, and that this may lead to reductions in attention to safety and the barriers that have been erected. Research around the so-called "High Reliability Organisations" (HRO) emphasise *organisational redundancy* as an important safety factor. Put simply, it means that the organisation contains "slack", and that this forms a barrier against accidents. Modern processes of change often involve downsizing, leading to the extent of such barriers shrinking. This may lead to a higher risk of accidents.

The results of research around the impact of change on safety are not unambiguous. No increase in accidents has been documented following the deregulation and privatisation of British Rail in the mid 1990s (Evans 2004). One possible reason may be that the changes and deregulation lead to clearer divisions of responsibility and that such changes lead to some inappropriate safety cultures and practices being weeded out. Basically, therefore, it is an open question as to what consequences the major changes on so large parts of the Norwegian aviation sector have on safety.

## 3.4 Procedure and investigative methods

### 3.4.1    The expressions "safety" and "risk"

The word "safe" in the expression "safe aviation operations" is an abstract expression for a result, goal or vision that is understood in different ways, according to the user's point of view and safety needs. If the safety of a state, condition, transport activity or a transport system is to be expressed in an understandable way, it is completely necessary to be able to understand what in these elements could potentially be unsafe or a threat. It is the understanding of unsafe that expresses the level of safety. Safety or level of safety is often stated quantitatively as how probable it is that an unsafe situation can arise, or qualitatively with e.g. what would be the consequence of a state or condition.

As a basis for this investigation, we will define (aviation) safety as a state in which

(1) the significant sources of danger linked to a system, or an activity, are under control
(2) the level of risk is acceptable and/or as low as practically possible.

By risk, **we understand the danger that undesirable incidents represents for human beings, the environment or material property**. In this study, we will only consider the danger of acute, unintended events. The risk of terrorist incidents will, for example, not be considered. Risk concerns the possibility of unwanted incidents. Incidents that have been experienced, possibly quantified in accident frequencies are, therefore, not a direct expression of risk. In principle, one or more sources of hazard may be out of control, even if accidents have not occurred in connection with these sources.

### 3.4.2    Systems/methods

The task of this investigation is to consider both how the largest individual players, and the aviation sector as a whole, maintain safety during the many parallel processes of change that are taking place. The organisations that we have been looking in to must be considered as open systems, in other words systems that interact with the world around them. We must, therefore, be aware of what is happening in the interaction between the organisations in connection with the processes of change.

Measurement of the impact on safety is very difficult. Ideally, we could wish for indicators that can show us directly the expected impacts on safety, such as accidents and near accidents. The availability of such information is, however, very limited, and it is even more difficult to relate this information to organisational changes.

Nor are we aware of any single theory that encompasses the safety impact of processes of change, as defined here, in a holistic way. On the other hand, there are many theories and models which may be relevant in the understanding and analysis of various aspects of the processes of change. In this situation, we have chosen to use an open method of approach, in which we emphasise our information sources' own assessments and interpretations of the link between actual processes of change and aviation safety. We have, as far as resources and access to data have allowed, used methods based on triangulation between various data sources and methods of approach. This means that we have retrieved and analysed both qualitative and quantitative data. In addition to studying existing documents and analyses, we have interviewed persons in various positions (e.g. management, operative personnel, supervisory personnel and union representatives). In all, we have been in direct contact with several hundred sources. We have also investigated result indicators (for example numbers of accidents and incidents), and activity indicators (for example numbers of inspections carried out, system audits, inspection visits, corrective orders and initiatives implemented).

The AIBN has also chosen to base this study on an approach that assesses proactive measurement indicators of the impact on safety of the changes:

*The players' safety assessment of the changes before they took place (proactive)*

The following elements, which partially interact, form the basis of this study as indicators that give an indication of content, depth and extent of the aviation safety assessment against which the changes are measured:

- whether impact assessments of the changes have been carried out
- whether the accumulated impact of previously implemented changes has been taken into account
- whether the players have identified and based their assessment on safety margins when considering whether change can impact on them
- whether, and in which way, compensatory safety measures have been introduced

The AIBN considers adherence to these elements as decisive when assessing whether the original margins for aviation safety have been altered during introduction of the changes.

An anonymous questionnaire has also been sent to a majority of employees who, directly or indirectly are engaged in safety-related work in the Norwegian aviation sector. The questionnaires that have been used in this study contain a large number of questions. It is not possible to present or comment on all of the responses and results in this report. We have chosen to place the main emphasis on questions that concern changes in the Norwegian aviation sector over the last five years, and to present and comment on the questions that all or several groups have been asked. This makes it possible to compare the assessments made by different groups and has provided useful background information to the study and its analyses.

### 3.4.3    Use of resources and division of labour

In order to be able to carry out this special commission within a reasonable timeframe, with the best possible quality, AIBN associated itself with four consultancy companies/research institutions.

Scandpower has reviewed the maintenance programmes of the above airlines. SINTEF and SEROS (the Centre for Risk Management and Societal Safety) has examined similar changes in other countries with which it is natural to compare Norway. They have primarily assessed the result indicators (potential changes in the number of incidents and accidents) and such activity indicators as the number of inspections, system audits, supervisory visits and corrective orders that have been implemented. SEROS has also looked at safety conditions related to political decision processes. The Norwegian Institute for Transport Economics (TØI) has carried out a survey that has focused on safety experience and matters that obstruct/benefit aviation safety among personnel working in the Norwegian aviation sector.

The AIBN's own personnel have carried out in-depth investigation of the situation within the Civil Aviation Authority (including PAL) and Avinor AS and has held discussions with a large number of employees at various levels in the Norwegian aviation sector, as well as assessing/describing the study as a whole and presenting conclusions.

# 4  EXPERIENCE WITH CHANGES IN FOREIGN AVIATION SECTORS

## 4.1  The Swedish aviation sector

Over the past 30 years, the Swedish aviation sector has been through many, partly sector-wide changes relating to its airlines, supervisory body, airport operations and control service. In our interviews, we have especially investigated the deregulation of the Swedish aviation sector in the 1990s, the relocation of the CAA/S from Stockholm to Norrköping in 1976, and the merger of SAS/Linjeflyg in 1993.

SAS acquired Linjeflyg in 1993. Linjeflyg was the then market leader for domestic flights, but was struggling financially. In general there was a great deal of unrest among the pilots and, to a certain extent, among technicians, after the merger. Downgrading from the title of commander, loss of seniority and a surplus of labour leading to redundancies caused stress among the employees. Our sources of information also pointed out that many of the employees of Linjeflyg expected the two companies to be equal partners in the merger process, while SAS employees understood SAS to be saving Linjeflyg from bankruptcy.

There was broad agreement among the sources we interviewed in connection with this project that it took from five to ten years to arrive at a "normal" situation after the integration began. Several sources pointed out that some of the people who took personal offence at the merger process will never get over it. It could be that the long duration is particular to merger processes, or for processes that experience high levels of conflict. The unstable phase may be shorter in duration in other processes of change and/or in processes where those who feel most strongly about it leave the organisation.

The results of our interviews and the documentation that we have collected show that SAS did a lot to maintain safety in the air, both during and after the merger with Linjeflyg. Several of our sources do, however, claim that neither the senior management at SAS nor the supervising authorities were prepared for the situations they might encounter during the merger processes. The speed of a process of change should be set so that senior management do not have to carry out firefighting after the process has been introduced. It was said that good inspectors can sense the tension in connection with changes. Experience indicates that emphasis should be placed on monitoring quality of coordination in turbulent periods, e.g. adherence to the organisation's CRM (crew resource management) concept.

The deregulation of the Swedish aviation sector took place in three phases, and had major ripple effects at community level, company level and for individual users. The following topics were central in the wake of the deregulation:

- Changed market situation and increased traffic volumes
- The arrival of new low-cost airlines
- Increased price pressure
- New organisation of large and established airlines
- New approaches to the topic of aviation safety
- New and increased needs for supervision.

The analyses indicate that the change in the supervisory function in the Swedish aviation sector has, taken as a whole, experienced few problems. This also applies to the relocation of

the CAA/S from Stockholm to Norrköping in 1976. The changes have mainly been characterised by the ample time allowed them, and well-planned implementation, as well as good access to resources. The authority has not undergone significant change at periods in which there was turbulence in other parts of the aviation sector. The airlines do not think that the authority has changed with respect to the number of inspections, etc. in periods in which they, themselves, were in a process of change. Our sources maintain that a strong and competent authority is important when other parts of the sector are experiencing turbulence. It was pointed out that the new framework conditions place new requirements on the supervisory function. The inspectors should also focus on the organisational aspects, in addition to the technical aspects.

The CAA/S has undergone a number of changes and restructuring over the last few years, and several of these have been driven by a need to reduce cost levels. Over the last 20 years, for example, the number of ATCCs has been reduced from four to two, by closing the ATCCs at Gothenburg and Sundsvall. Despite the number of changes, the levels of conflict were significantly lower thatn those Avinor is currently facing. All of our Swedish sources emphasised that time was taken for the changes in the Swedish Civil Aviation Authority/Administration, and the emphasis was placed on finding good solutions for those employees who were made redundant or had to relocate.

## 4.2 The British aviation sector

The examples from the United Kingdom concern the changes in the regulatory and supervisory activity, as well as to the air traffic control service. These took place at low speed.

In 1971, the Civil Aviation Authority (CAA) in the UK was established as an independent organisation. The CAA is a public corporation, i.e. a state-owned company, run as an independent financial and administrative unit. Its income arises from the services it provides to its users in the aviation sector, mainly in the form of charges in connection with certification and other approvals. Today, the CAA acts as the regulatory and approval authority and carries out supervision on behalf of the Department for Transport (DfT). The Department for Transport has undergone four changes since 1983, the latest in 2002 when the DfT arose in its current form. In 1986, airport operations were demerged from the CAA to the British Airport Authority (BAA).
BAA owns and operates the seven major airports in the UK. From 1996, ownership of the airports, operations (BAA), and air traffic control (NATS – National Air Traffic Services) were separated out. In 2001, NATS was established as a public private partnership. Currently, NATS operates ATC services in British airspace. In addition, it acts as an advisory body for the CAA in ATC-related matters. One interesting aspect of NATS is that it has regulations that require safety evaluations of organisational change.

Even if the situation in the UK differs from Norway, study of the process of change in the UK makes interesting reading for the Norwegian aviation sector. We can gain the following experience from it:
- If conflict is to be avoided, continual information flow is important, as is a strong focus on maintaining the interests of the workforce during the change process.
- A long process of change is the most favourable. This provides the involved parties with time to adapt.

- Concurrent processes of change do not need to have a negative impact on risk levels in the aviation sector. Whom the change in question affects and the content of the change seem to be more important.
- Changes and restructuring that are planned in organisations which are mainly found in the "blunt" end should be considered in relation to the impact on the operative players before new procedures are implemented.
- Consideration of potential safety consequences has played a significant part in the separation of the CAA and NATS and the final privatisation.
- Lack of holistic planning of the ATCCs has created traffic problems at times in the UK's overburdened airspace.
- The supranational regulations by which the operative companies are governed cushion the impact of the changes.
- The CAA did not impose absolute demands on the involved parties to introduce a system for safety management. This may have provided good protection for the smaller players.
- Raising wage levels in the CAA for personnel who are in demand in the industry has led to improvements in the workforce situation in those positions that have virtually always been understaffed.
- Supervision of the helicopter sector has, because of a lack of skilled staff, been unsatisfactory. This is not reflected in accident statistics, but is regarded as being unfortunate because helicopter operations are more at risk of incidents than the rest of the aviation sector.
- A well functioning supervisory authority seems to have been a stabilising factor for other players, e.g. NATS during its process of change.
- The CAA has wished to appear as stricter in its supervision of NATS than of other ATC players, in order to mark the distance following the separation and to avoid speculation of special treatment.

## 4.3 The Swiss aviation sector

Following several serious accidents in Swiss aviation, an independent study was carried out: "Aviation safety management in Switzerland" (Ref. NLR-CR-2003-316. See www.nlr.nl).

This proved a clear relation between the accidents that occurred and the lack of safety management related to change processes in Swiss aviation. It was also possible to "read" a direct negative trend into the accident statistics.

## 4.4 Dutch aviation

The Dutch CAA is going to go through a process of change similar to that at Avinor. The plans for the process have not yet been drawn up, and nothing has yet been implemented. We have not been able to get an answer as to how far advanced the planning is. There are no special plans for change to the Air Traffic Control services (ATC). These services have been split off into a separate ATC organisation.

## 4.5 German aviation

The German aviation authorities have a very different organisation from Norway. There are aviation administrations in each individual federal state, called the Landesluftfahrtbehörden,

which carry out some certification and approvals within their own states, and a central unit, Luftfahrt-Bundesamt, which is responsible for regulations, type approvals and certificates in major commercial aviation. Air Navigation Services were reorganised in 1993, and are now provided by DFS Deutsche Flugsicherung GmbH, which is a government-owned company, operated according to non profit principles. The airports are operated by separate private companies, often with the republic, the federal states and local authorities as part owners.

## 4.6 Belgian aviation

Following review by a safety audit company, the Belgian CAA (BCAA) reorganised its organisation two years ago. A representative of the BCAA characterised it as a total restructuring, based on the recommendations of the safety review. The recommendations can be found in a confidential report, "Belgian Business Process Reengineering", which is not publicly available. The current organisation of the Belgian CAA and inspectorate is similar to the structure we had in Norway before the split into Avinor and the Civil Aviation Authorities in 2000.

## 4.7 Irish aviation

The Irish CAA (IAA) was established as a unit equivalent to a government corporation in 1994. The IAA took over the role of the former Air Navigation Services Office (ANSO), which was subordinate to the Department of Transport, Energy and Communications. The Shannon ATCC has undergone a complete technical renovation (equivalent to moving an ATCC). Shannon is responsible for all traffic in the eastern Atlantic, which borders onto US airspace. The Irish authorities are in the process of adapting their safety management to a function-oriented risk-based regime. In May 2002, the Air Navigation Services Department started the process of introducing a Safety Management System (SMS) in accordance with Eurocontrol requirements. The same requirements have recently been introduced into the Norwegian BSL work. One quote from the IAA website concerning this project states:

*"The new Safety Management System (SMS) is designed to ensure that ANS formalised procedures adopt a proactive approach to preventing accidents and incidents. Founded on a risk-based approach, the SMS provides a formal framework within which ANS can identify risks to the safety of our operation and determine, in a justified and traceable manner, if those risks are acceptable, tolerable or unacceptable."*

## 4.8 Canadian aviation

The National Transportation Act deregulated Canadian civil aviation in 1988. This led to great change in the role of the Ministry of Transport, as well as considerable changes at a number of players in the sector. In 1994, responsibility for all of Canada's airports was decentralised and transferred to local authorities. In 1996, the responsibility for the national air traffic services was privatised and transferred to NAV CANADA. At the same time as the changes in the sector, the authorities changed the regulatory structure, which included a new security policy in 1999.

There are many points of similarity between the Canadian and Norwegian aviation sectors. The concurrent changes in major parts of the Canadian sector are very interesting for Norwegian aviation. Between 1998 and 2000 the regulatory structure, the ministry function, airports, air traffic services and the airlines have undergone change.

## 4.9 Australian aviation

The Australian CAA split in 1995. A supervisory body (the Civil Air Safety Authority) was created and made subordinate to the Australian government. A state-owned company was created in order to operate air traffic control, technical services and fire & rescue services (Air Services Australia). The new sector structure may be regarded as the result of the deregulation and privatisation processes that started at the end of the 1980s. Its low accident statistics have led to Australian aviation being regarded by many as among the safest in the world. The aviation sector has, however, not been completely free of accidents. The investigation of the Monarch Airways accident at Young and Seaview found root causes between the incident and underlying organisational conditions, cultural factors and supervisory activities.

## 4.10  New Zealand aviation

In general, there are many similarities between New Zealand and Norway and Norwegian aviation. The size of the population (3.5 million), the topography and weather conditions can be regarded as relatively similar to Norwegian conditions. The country has a "western" culture and a relatively high standard of living.

New Zealand has also undergone rapid broad-based changes in its aviation sector. Aviation in New Zealand has been through great changes since the mid 1980s. In 1987, a necessary process of change was implemented because the sector had grown significantly, among other things because of the change in the system for issuing aviation licences. This led to high pressure on the Civil Aviation Division's (CAD) inspection-based regulation. At the same time, most of the air traffic services and other services were transferred from the CAD to private user-financed parties. This included the formation of a new state-owned corporation with responsibility for tower and air traffic services (the Airways Corporation of New Zealand) and privatisation of airports.

In the period 1987-88, the situation in the sector was investigated by the Swedavia-McGregor Group. This group was given the commission of reviewing all parts of the civil aviation system. One main area of focus was to illuminate the safety challenges posed by the rapid change from a detail regulated system with a government operated infrastructure, to an aviation system based on an open commercial market, regulated by systematic supervision and with an infrastructure operated by commercial companies.
The report led to great changes in the aviation industry:

- The regulation philosophy based on the internal check model, in which detailed inspections were replaced by audits of the parties' own safety management systems
- Introduction of a new Civil Aviation Act
- Establishment of a new framework for preparation and implementation of legislation, including a total review of existing legislation
- A significant downsizing and restructuring of CAD
- Establishment of a new, independent CAA (Civil Aviation Authority) in 1992
- New relationships between the parties.

Summing up of observations/experience from the changes in New Zealand's aviation sector:

- Rapid change and concurrent changes in the sector do not necessarily need to have a negative impact on risk levels, if they are based on a thorough overall independent safety review
- It would seem that only minor impact analyses of the split of the airport and air traffic services in 1987 were made. The split model seems to lead to a significant need for coordination between the airports and Airways because of their interlocking areas of responsibility
- Changes and restructuring that are planned in organisations which are mainly found in the "blunt" end should be considered in relation to the impact on the operative players before they are implemented.
- Commercialisation may have positive impacts on safety and productivity
- New Zealand has an internal check routine-based system of regulations, which is liberal and requires the parties to "keep their own house in order".
- The regulations and supervisory practice have less positive impact on GA (extended use) and small commercial airlines.
- Finances in the aviation sector, despite user financing of a number of services, are based on passenger charges. There is still disagreement here as to how the financing key should look in the future.
- A small Ministry of Transport seems to function well as the link between politics and the administration.

## 4.11  US aviation/space

Newly established companies in US aviation proved to have a period of lower safety for 1-2 years in their start-up phase. Poor financial situations were associated with poorer safety levels. Deregulation and the processes of change in general have led to a need for increase in supervision and follow-up on the part of the authorities. Newly-established companies in particular are followed up carefully and systematically. The number of serious near-accidents increased in the US in connection with a heavy reduction of numbers of air traffic controllers following the strike in 1981, in combination with the changes made by deregulation. This may indicate that several concurrent changes within a sector can lead to increased risk.

When the analyses following the Challenger-accident were reviewed, four different mechanisms or explanatory models that described the relationship between organisational framework conditions and actual accidents were identified. Filtration of information meant that the engineers' concerns about launching Challenger under extremely low temperatures were not communicated at the highest levels in the project's decision chain. Normalisation of deviations meant that engineers and managers, through a repetitive decision sequence, established a vision of reality in which ever more serious danger signals were interpreted as acceptable risk. This led to the reliability structure of the decision process being changed, so that the probability of postponing a launch decreased even if it was safe to launch, while the probability of carrying out a launch increased even if it was not safe to launch. It was also possible to identify a mutual dependence between the supervisory body and the supervised, which, experience shows, reduces the impartiality of the supervisory function.

The Challenger accident can be seen in the light of three different changes to the organisation:

- The combination of NASA's adaptations to reduced budgets following the ending of the moon flights and unrealistic ambitions for the space shuttle programme led to extreme pressure on production, at the same time as resources invested in the safety and quality function were drastically reduced.
- The increased use of sub-contractors in connection with the space shuttle programme led to a "pathological" growth in bureaucratic functions related to contract administration. At the same time, it became difficult to follow up safety.
- When the space shuttle programme was declared operative, workloads increased in the organisation, at the same time as resources for safety functions were cut further, and one of the two internal supervisory bodies was removed.

These organisational changes also impacted on safety even after the turbulent phase during and immediately after the implementation of the changes.

# 5   NATIONAL SUPERVISORY AUTHORITY (THE NORWEGIAN CIVIL AVIATION AUTHORITY)

## 5.1  The Aeronautical Inspection Department is separated from the Norwegian Civil Aviation Administration[1] and becomes an independent supervisory authority

In the Norwegian Aviation Plan (1998-2007), the incorporation of the Norwegian Civil Aviation Administration was handled parallel with the splitting off of the Norwegian Civil Aviation Authority in the political system. In Report No. 1 to the Parliament (1994-1995), "the National Budget," reference was made to the assessment by an internal Norwegian Civil Aviation Administration committee as to the nature of the Aeronautical Inspection Department's relationship with the Administration. It was pointed out that, on 1 March 1995, the Norwegian Civil Aviation Administration's Board of Directors decided that the Aeronautical Inspection Department should be separarted from the Norwegian Civil Aviation Administration. Moreover, Report no. 32 (1995-1996), "The Basis for Transport Policy", section 6.4.4 states:

*"The Aeronautical Inspection Department, which is organised as a part of the Norwegian Civil Aviation Administration, shall exercise oversight with respect to the organisation of which it is a part. The Aeronautical Inspection Department is responsible for operative and technical regulations and provisions, as well as for the monitoring and supervision of airlines and aircraft. The placement and organisation of the Department are being assessed."*

In the Norwegian Aviation Plan 1998-2007, the establishment of a separate aviation authority was spelt out in greater detail. This report dealt with issues such as financing and prognosis for anticipated traffic development. Air safety was discussed under a separate point (4.6) in the report. It was emphasised that *the regulatory governing authorities, the service provider and the individual company in the aviation industry all share responsibility for aviation safety*. It was pointedly made clear what responsibility for aviation safety rests with the aviation authority and how this should be realised through its control function. In assessing the need for establishing a separate aviation authority, much importance was attached to the need for solid, broad-based expertise among supervisory personnel, which would ensure top-quality supervisory and other work. There was no elaboration on what was meant by solid, broad-based experience and top-quality supervision. Trust was considered an important aspect, as it was felt that such a supervisory authority should appear to be as impartial as possible.

In the Transportation Committee's handling of the Norwegian Aviation Plan (1998-2007), the point about the importance of human factors in air safety operations was repeated, and it was felt that measures needed to be devised for mapping such factors with a view to preventing accidents. Importance was also attached to improving technical and operational standards, as this could help mitigate potential human error. It was also pointed out that, in connection with efforts to prevent accidents, no cost-benefit analyses had been carried out, and that there was an acute need to develop criteria for such analyses in the aviation sector. The report did not set forth detailed requirements for improvements, nor did it provide guidelines for

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[1] Prior to the year 2000, *Luftfartsverket* was called "the Norwegian Civil Aviation Administration"; in 2000 it changed its name to "the Norwegian Air Traffic and Airport Management," The English name for *Luftfartstilsynet* is Civil Aviation Authority. To avoid confusion, all references to *Luftfartsverket* – before and after the year 2000 – will use the current name only: "the Norwegian Civil Aviation Administration."

implementing the points in question. The proposed changes were not assessed in terms of the plan's description of safety.

The transportation committee proposed that the Directorate of Flight Inspection should be split off and established as a separate entity called the Norwegian Civil Aviation Authority. It would be the Norwegian Civil Aviation Administration's responsibility to consider what powers should be transferred to this new supervisory body, and to distinguish between the responsibilities of the two organisations, as well as make an assessment of the administrative and financial frameworks. The Norwegian Conservatives, Høyre, (a part of the minority) proposed that the new agency should not be a part of the Ministry of Transport and Communications, because much of the trust that the new body would need would depend in large measure on its independence vis-à-vis the Ministry. Since the Ministry held ownership interests in SAS, this could in some cases lead to a blurring of roles between the Ministry and the new aviation authority. Consequently, it was suggested that the new agency should organisationally come under the Ministry of Planning and Coordination [often referred to in Norway by the acronym AAD]. The Conservatives also proposed that the Norwegian Civil Aviation Administration should be incorporated. This proposal was voted down. The majority voted to place the new aviation authority under the Ministry of Transport and Communications.

Proposition to the Parliament no. 1 (1999-2000), "the National Budget," stated that the Government, through the Ministry of Transport and Communications, was preparing a proposition in which the splitting off of a separate aviation authority would be among the proposals to be submitted to Parliament. In Proposition to the Parliament no. 66 (1998-1999), *"Supervision and authority in the aviation sector and forms of association for the Civil Aviation Administration",* it was specifically proposed that a separate aviation authority should be established and that the Norwegian Civil Aviation Administration should become a joint-stock company owned by the state. The justification for establishing a separate aviation agency was the need to avoid conflicts of interest and prevent irrelevant considerations from interfering with the due exercise of authority. No further description of the conflict of interest issue was given. The part chapter on the establishment of the Norwegian Civil Aviation Authority described personnel matters, finances and the organisation of the new supervisory authority. The new agency's responsibility for safety was duly noted, but not elaborated on.

In connection with this study, a respondent from the Ministry of Transport and Communications claimed that efforts were ongoing to transfer those official responsibilities that still resided with Avinor to the Norwegian Civil Aviation Authority.

In Recommendation S. no. 226 (1998-1999) the Transportation Committee's recommendation concerning aviation and the nature of association of the Norwegian Civil Aviation Administration, the Committee basically repeated the points outlined in the proposition. The case for greater integrity and freedom from conflict of interest for the new agency was argued, and it was made clear that the new supervisory authority should have access to qualified personnel. A majority on the Committee also noted that it was important to determine whether it was expedient to allow the Norwegian Civil Aviation Authority to assume responsibility for security clearances of personnel in the Norwegian Civil Aviation Administration.

During a parliamentary debate (Parliamentary session of 17 July 1999, Case no. 10) concerning the report, there was broad agreement that the Norwegian Civil Aviation Authority should be established as an independent administrative body. And this view was

subsequently adopted by unanimous vote. The factors that were stressed during the parliamentary debate were, once again, a regard for the integrity and freedom from conflict of interest. Further, it was felt that the new agency had to have access to qualified personnel. The establishment of the Norwegian Civil Aviation Authority was passed by unanimous vote.


### 5.2 Setting the terms internationally

ICAO [International Civil Aviation Organisation] is a part of the UN system. Since ratifying the Chicago Convention of 1947, Norway has participated in binding international aviation schemes. ICAO's joint standards enable member countries to collaborate on international aviation projects while maintaining a high degree of security. One of the requirements that ICAO asks of its member countries is that they monitor and supervise national operators and businesses in terms of prevailing national laws and regulations.

During the 1970s, a European collaborative effort was initiated of which the goal was to ensure that the construction regulations for aircraft would be harmonised so as to make it easier for manufacturers to deliver the same product regardless of which country was doing the importing. This joint effort later laid the groundwork for the Joint Aviation Authorities (JAA), whose areas of responsibility include the following:

- Commercial requirements for companies that operate aircraft
- Commercial requirements for manufacturers that construct and manufacture complete aircraft and aircraft equipment
- Commercial requirements for the maintenance of aircraft and aircraft equipment
- Requirements for aviation personnel holding various types of certification, and for institutions that train such personnel.

All JAA regulations are based on the ICAO's annexes. There are currently 25 member states in JAA and 11 candidate countries (Eastern Europe). JAA works closely with the EU, which is why most of the EU regulations concerning air safety derive from the JAA. As the EU gradually establishes the EASA (European Aviation Safety Agency), both

JAA and ICAO will help establish the level of air safety standards. Norway will participate in EASA by virtue of the EEA treaty. As for the strategic initiatives during the period 2000-2003, it was hoped that all JAR (Joint Aviation Requirements) would be introduced on an ongoing basis as Norwegian regulations, and that the regulatory framework would be updated in whole in an accessible body of regulations. There was also the hope that regulations would be formulated for airports, aviation installations and air navigation services. All this was to be followed up with new supervisory routines. And last, but not least, the environmental regulations (BSL B 2-2) were to be revised.

EASA has taken over key parts of JAA's tasks and responsibilities. Since 2002, JAA has participated actively in the transference of tasks and responsibilities to EASA. In collaboration with the EU Commission, JAA has come up with a development plan linked to the transference of tasks and responsibilities by, among other things, assisting in the preparation of "Essential Requirements and Implementing Rules."

On 25 November 2003, EASA signed JAA's basic document, the so-called Cyprus Arrangements. In practical terms, this resulted in EASA's becoming a member of JAA.

JAA is expected to be discontinued sometime during 2007-2008, and will be replaced by a smaller organisation which, in collaboration with EASA, will safeguard the interests of countries that are members of neither the EU nor EASA. This is crucial for maintaining a high level of air safety throughout Europe.

The European Civil Aviation Conference (ECAC) is the key organisation in Europe for aviation policy; it works with similar organisations in other parts of the world. Decisions that arise from this forum are taken note of by the EU, where they are shaped into a binding regulatory framework.

The FAA (Federal Aviation Administration), which is the national aviation authority in the United States, plays an important role in how the Norwegian Civil Aviation Authority carries out many of its operations. The Norwegian Civil Aviation Authority must constantly abide by international regulations. One important task, therefore, involves harmonising Norwegian rules with international regulations. The hope is that this process can be carried out while maintaining a satisfactory dialogue with users.

EUROCONTROL is one of several European aviation organisations that help ensure that national aviation authorities abide by a common set of rules and regulations developed for international aviation. Such audits are carried out on a regular basis in every field of aviation in order to ensure that air safety is constantly held at the high possible level.

On 22 and 23 October 2004, the Norwegian Civil Aviation Authority was paid a visit by EUROCONTROL. The aim was to see how far the Norwegian Civil Aviation Authority had come in introducing EUROCONTROL's regulations. The conclusions after this supervisory visit were very favourable to the Norwegian Civil Aviation Authority. The auditing/supervisory team concluded in its tentative report that:

- Since 1999, the Norwegian Civil Aviation Authority appears to be a robust, modern organisation which, thanks to close cooperation internally among its various departments, has come much farther than corresponding organisations/functions in other countries.
- The Norwegian Civil Aviation Authority can be justly proud of its achievements, particularly its implementation of the ESARRs.
- In 2004, the Norwegian Civil Aviation Authority must decide how to go about its work and determine the impact that the ESARR regulations will have on the supervisory objects "in the field." (ESARR: EUROCONTROL Safety Regulatory Requirements)
- The relocation of the Norwegian Civil Aviation Authority to Bodø should be subjected to a risk analysis, in order to demonstrate that the move would not lower the level of performance or destroy the supervision system.

The implementation of the ESARRs is a prerequisite for realising Single European Sky, which is a major reorganisation of air traffic within Europe.

## 5.3   The Norwegian Civil Aviation Authority's responsibilities and primary tasks

The Norwegian Civil Aviation Authority was founded on 1 January 2000, with the Aeronautical Inspection Department as a point of departure. The Aeronautical Inspection Department was previously a part of the Norwegian Civil Aviation Administration (now

Avinor). The Authority encompasses all operations in Norway related to air safety in terms of material, organisation, techniques, procedures or individual skills – regardless of whether these operations are carried out in the air or on the ground.

The main task of the Norwegian Civil Aviation Authority is to help ensure the maintenance and continued development of safety in Norwegian commercial aviation. In order to achieve ever-improving levels of safety, the pertinent regulations are updated on a continuing basis. Initial surveillance and operator surveillance are carried out and service is provided for the users while keeping open lines of communication with users and public alike. Tasks are carried out in accordance with sound administrative principles, consistent with the demands of national and international aviation legislation, and in accordance with the stated needs of the users in the air transport market.

The Norwegian Civil Aviation Authority represents Norway in international supervisory-related organisations in the field of aviation, and it has an independent responsibility for safeguarding all aspects of air safety on Norway's behalf.

As the government's duly appointed civilian aviation authority, the Norwegian Civil Aviation Authority is responsible for promoting air safety in accordance with general goals set forth in the government's transportation policies. To accomplish this, the Authority must ensure that the various players in the aviation industry always comply with the safety requirements through the development of new regulations. In this connection it must be emphasised that new or modified regulations should be subject to environmental impact assessments. To perform its tasks responsibly, the Norwegian Civil Aviation Authority will need to possess a high degree of administrative and aviation expertise.

The Norwegian Civil Aviation Authority is the supervisory agency for Norwegian aviation, under the auspices of the Ministry of Transport and Communications. The Authority's supervision objects encompass, among others, Avinor and the aircraft operator companies in Norway. The authority, on behalf of the Ministry of Transport and Communications, is the official government agency in Norwegian aviation and, as such, is responsible for ensuring that civil aviation in Norway is conducted in a safe and effective manner. This goal is to be achieved by keeping the rules and regulations updated and by monitoring to ensure that the regulations are complied with.

The authority's mandate is from 1999. The strategic plan for the Norwegian Civil Aviation Authority dates from 2000. The idea is that the supervision methodology will develop in the direction of a risk-based supervision system. This will free the government from detailed involvement. Risk-based supervision means that the Norwegian Civil Aviation Authority will undertake initial surveillance and operator surveillance primarily as a superior supervision system. Initial surveillance is always carried out before the Norwegian Civil Aviation Authority issues or expands compulsory endorsements and rights. Monitoring ensures that all current requirements are met before organisations and personnel are accepted into the aviation system.

Operator surveillance is conducted in order to verify that the conditions for endorsements are met on a daily basis in accordance with standards defined in the rules and regulations. In supervision, certain subjects are selected and highlighted. Within each subject, spot checks are carried out. Such spot checks involve monitoring/supervision involving details. If it is

found that the selected details within a given subject are in order, it is assumed that all the other specific circumstances within this subject area are also in order.

The mandate from 1999 states that the Norwegian Civil Aviation Authority shall strive to ensure that air traffic in Norway is carried out in a safe and expedient manner. Section 3 of the mandate sets the stage for a detailed supervision in which specific work tasks with respect to the supervision objects are spelt out. It is clearly stated, however, that the Norwegian Civil Aviation Authority does not have responsibility for safety; this lies with the individual aviation company. However, the Norwegian Civil Aviation Authority assumes responsibility for its own operations in fulfilling of international requirements.

The authority spends a lot of its time dealing with small operator companies, and supervision of the "old-fashioned" kind is still provided in the case of smaller companies (smaller than Widerøe). The results of its inspections show no "manifest" risk increase. In the case of small operators, much of the expertise lies with individuals, which makes these very companies particularly vulnerable when reorganisation schemes go into effect and new rules and regulations are introduced.

The regulatory framework still gives the Norwegian Civil Aviation Authority the opportunity to grant excemptions for shorter or longer periods of time, on the basis of professional assessments. This right is exercised as needed.


**5.4 Relocating the Norwegian Civil Aviation Authority from Oslo to Bodø**

In 2002, Prime Minister Bondevik's second government examined the various government supervisory agencies' dependency relationship with their respective Ministries. The goal was to minimise the blurring of roles with the respective ministries, with those who make the laws and regulations, and with those who exercise supervision. A proposal for wide-ranging independence for the supervisory agencies was submitted in Report to the Parliament no.17 (2002 – 2003)), Supervision report doc.2, where it was proposed that the Norwegian Civil Aviation Authority should be relocated to Bodø. The result of this new supervisory arrangement was intended to help make the various supervisory agencies more independent, clarify their roles and enhance their professional expertise. It was pointed out that such relocation would also make for a greater independence and creates a healthy distance from the objects of supervision. The Government stressed in particular that such relocations would lead to better regional development in those outlying districts that were designated as headquarters for the new authorities.

The decision-making process that led to the relocation of the authorities was not the kind of lengthy political process that occurred when the Norwegian Civil Aviation Authority split off and the Norwegian Civil Aviation Administration was restructured. It took six months from the time the Report to the Parliament "Concerning government supervision" was submitted until it was approved by Parliament.

Renewal of government administration was a stated goal for the Bondevik II government. When Victor Norman joined the Government, he brought with him ideas from new public management. Some of these notions were put into practice specifically through the proposal to relocate government supervisory agencies.

Traditionally, there has been agreement across party lines that it is desirable to move government jobs out of Oslo to other parts of the country (Sætren 1983). Previous attempts to do so, however, had met with strong resistance among employees and Members of Parliament from the greater Oslo area.

Report to the Parliament "Concerning government supervision" was made public on 24 January 2003. The report (Report to the Parliament no. 17 (2002-2003) encompassed all government supervisory agencies and directorates with respect to organisation and localisation. It was recommended that the Norwegian Civil Aviation Authority be moved to Bodø. This relocation became a major bone of contention with respect to the report. Important fundamental proposals for modification contained in the report – e.g. the proposal to eliminate the government's instruction prerogative in individual cases, as well as the establishment of an independent appeal board (the point being that the Ministry should not function like an appeal board) – were completely overshadowed by the relocation issue.

The report described a number of factors that justified the relocating and restructuring of the supervisory authorities. It was pointed out that the current organisation of these bodies was unclear and complicated, and that there was a need to clear things up in order to enhance these agencies' legitimacy with the population. It was stressed that what the Government wanted was simplification and deregulation of the public sector. Inherent in this wish was also a desire for increased decentralisation. The most important challenges for the agencies were these: clearly defined roles, legitimacy vis-à-vis citizens and those being monitored, and the impact of the organisational structure of the agencies on economic life.

The Government stressed its fear of a confusion of roles, such as an agency being part of the very system it was created to monitor and supervise. Legitimacy was to be secured through a high degree of professional expertise in the agencies, and by being independent of the political authorities. This meant that the Government was to have less opportunity to overrule the supervisory agencies' decisions. The expression "high degree of professional expertise" and the reason this was necessary were not elaborated upon.

The report, in its discussion of the supervisory authorities' role in the transportation and traffic safety sectors, proposed the following changes:

1. The Ministry of Transport and Communication should be legally precluded from dictating to the Norwegian Civil Aviation Authority when specific decisions are made.
2. The establishment of independent appeal boards for the transportation and traffic safety supervisory authorities (instead of each Ministry functioning as an appeal board).
3. In matters of fundamental importance, or when social considerations dictate, the King in the Council of State should be empowered to abrogate any decisions reached by the supervisory authorities' or appeal boards.
4. The Norwegian Civil Aviation Authority should be relocated to Bodø.

It is worth noting that these four points were meant to be adopted in whole by the Government in order to enable the supervisory agencies to meet the main challenges described in the foregoing paragraph. It was felt consideration for regional development was an important argument for relocating the supervisory agencies. In this connection, the need was stressed for close proximity to professional environments and bigger labour markets. The report is somewhat unclear on this point where it concerns the Norwegian Civil Aviation

Authority. On the one hand, the current aviation environment in Bodø is described as one of the strongest in the country outside the Oslo-Gardermoen area (Report to the Parliament no. 17 (2002-2003) p. 74). On the other hand, it was pointed out that relocating the organisation to an outlying district would tend to strengthen the labour market base and the skills base and thus contribute to a more balanced regional development. Another formulation that recurs both in the Report to the Parliament and in a number of the Ministers' replies to questions about the aeronautical environment in Bodø is as follows:

*The Government's assessment is that a relocation of the Norwegian Civil Aviation Authority should help bolster the professional environment in Bodø* (Report to the Parliament no. 17 (2002-2003), p. 76).

In other words, no unambiguous answer was given as to whether the current expertise in Bodø was sufficient for meeting future recruitment needs. Access to skilled workers was discussed in general terms in a separate part chapter. New recruitment had not been a problem for the supervisory agencies in the Oslo area in the past. The Norwegian Ministry of Labour and Government Administration felt, however, that it might prove harder to retain a pool of experience and expertise in the supervisory agencies due to competition with other industries. A loss of experience and expertise was considered unfortunate for three reasons:

1. In the first place, it might prove difficult to establish the agencies' legitimacy with relatively young co-workers, because these people will encounter experience and a high degree of expertise among those they will be supervising.
2. In the second place, it was thought that the supervisory agencies would prove more vulnerable to the loss of key personnel.
3. Finally, it was felt that relatively frequent rounds of recruitment might push up costs.

Safety was not assessed in particular in this context.

It was also felt that greater independence from the Ministry would lead to less need for contact, so that geographical proximity to the Ministry in charge would no longer be necessary. Close proximity to those being supervised was mentioned as a factor in the issue of localisation. The report did not shed much light on this with respect to the Norwegian Civil Aviation Authority, however. Further, it was felt that in the long run it would prove cheaper to run the supervisory agencies away from the centralised high-impact area in and around Oslo. It was stressed that the relocation processes should be carried out as quickly as possible out of consideration for the employees. The supervision report also assumed that some would not be willing to move; this, in turn, would mean a loss of expertise. This loss of expertise was to be compensated for through a gradual downsizing at the current location, and by having highly skilled employees at the new location. It was also felt important that management in each supervisory agency should actively support the relocation process and not allow the decision to be overturned or to give scope for changes in the relocation plans along the way.

The word "move" is avoided at all times. Instead, the move is characterised as a relocation.

Safety considerations are not explicitly mentioned or dealt with in the report. In its description of the various supervisory agencies, the goal of the Norwegian Civil Aviation Authority is described as helping to promote safety in the aviation industry.

The Report to the Parliament "Concerning Government Supervision" was not sent out on a broad-based round of consultative hearings while it was being prepared by the Ministry. Instead, it was sent out on a consultative round *within* the Ministry. Such a round is meant to serve as a kind of quality assurance of the technical and professional content. Each Ministry was thus given an opportunity to submit proposals for change or to point out errors. Exactly which changes or corrections were proposed or carried out as a result of these ministry rounds was not examined in detail here. Sending reports out on broad consultative rounds is not prescribed, but there is reason to believe that the comments and suggestions thus elicited would have been more plentiful and more nuanced.

In the proposal from the Standing Committee on Family, Cultural Affairs and Government Administration (Recommendation S. no.222 (2002-2003) "Concerning Government Supervision"), the majority (all the parties except the Progress Party, FrP) viewed the relocation plans favourably. It was emphasised that the employees had to be taken into consideration. The majority (all the parties except the Progress Party) also viewed favourably the proposed changes designed to increase the supervisory agencies' independence. In that regard, reference was made to the preclusion of the Ministers' instruction prerogative in individual cases and to the establishment of independent appeal boards. The importance of continuity in each supervisory agency with respect to technical knowledge, and the need for the tempo of the relocation process to reflect this fact, was emphasised. The majority of the Committee also stated that each supervisory agency did not have the ultimate responsibility for safety and quality within the various companies, but that this responsibility resided with the companies themselves.

The Progress Party's members stressed that relocating the agencies had to be professionally justifiable. Access to expertise and consideration for the employees were cited as important factors in this regard. As for the Norwegian Civil Aviation Authority in particular, the Progress Party pointed to experience gained from previous relocations of government bodies, and to a report prepared for the Bodø municipal authority. Here there were doubts about the recruitment base in the Bodø region.

Higher travel expenses as a result of the move to Bodø were also cited as an objection to the proposed relocation.

Another majority on the Committee (everyone except the Conservatives, Høyre, the Christian People's Party, Kristelig Folkeparti and the Centre Party, Senterpartiet) cited the importance of retaining the Norwegian Civil Aviation Authority's professional and technical know-how during the relocation process. This was especially important because the Authority could risk losing its international accreditation on account of a lack of specialist knowledge. This, in turn, might cause major players in Norway to lose market shares while they waited for approval by the Norwegian Civil Aviation Authority.

The Standing Committee on Family, Cultural Affairs and Government Administration recommended that Parliament approve the Government's plans to relocate the Authority. As for the points concerning greater independence for the supervisory agencies:

1) The Ministry of Transport and Communications was to be legally precluded from instructing the Norwegian Civil Aviation Authority when specific decisions were being arrived at.

2) Independent appeal boards were to be created for the transportation and traffic safety supervisory agencies (instead of each Ministry functioning as an appeal board).

3) In important matters of principle, or when social considerations dictate, the King in the Council of State should be empowered to abrogate any decisions reached by the supervisory authorities or appeal boards.

The Committee recommended that no changes should be made in the way appeals are handled.

A fairly unusual aspect of the recommendation regarding the supervisory authorities was the inclusion of many questions from the Standing Committee on Family, Cultural Affairs and Government Administration, along with replies from the Minister. A certain Member of Parliament stated that the intention was to highlight special problem areas which the Committee felt had not been satisfactorily elucidated or answered. This was true in particular of the existing aviation environment in Bodø and the opportunities for recruitment in this environment.

In the parliamentary debate (session of Parliament, 6 June 2003, Case no. 1) no new factors were introduced with respect to the Committee's recommendation. It was not proposed that the changes intended to lead to greater independence should be adopted. Apart from this, a single Member of Parliament raised the issue of taking air safety into consideration. The same issue was also raised by the Minister himself. The Minister mentioned safety in terms of the significance of the supervisory agencies to society in general. Another Member of Parliament who, as a matter of fact, voted against relocating the Norwegian Civil Aviation Authority, made the following comment (session of Parliament, 6 June 2003, Case no. 1, p. 39):

*"I should like to make it perfectly clear, also to the majority in this chamber, that if there should be any impairment of air safety or in air traffic safety due to the relocation of the Norwegian Civil Aviation Authority and we find ourselves unable to get those professionals to move to Bodø that we had hoped to, or if some accident or other should occur, this chamber shoulders a major share of the blame."*

The Progress Party's proposal not to relocate the Norwegian Civil Aviation Authority failed by a vote of 72 to 25. One Member of Parliament stated that the professional environments – i.e. the supervisory agencies themselves – were eager to present their views on the move to the Standing Committee on Family, Cultural Affairs and Government Administration. As for the Norwegian Civil Aviation Authoritiy, it was primarily the employees and their trade unions that contacted the Standing Committee. The Norwegian Civil Aviation Authority's management was far more reserved. The argument presented by the employees' representatives was two-pronged. One aspect had to do with expertise and technical and professional know-how. Many employees simply didn't wish to move, which meant that some expertise would be lost. The other aspect of the argument had to do with social circumstances, e.g. established families would have to move and that, in practice, a move would have to be viewed as tantamount to making them redundant.

One member of Parliament stated that the Norwegian Civil Service Union [often referred to in Norway by the acronym NTL] did not show up for the latest hearing in connection with the Report to the Parliament no. 27 (2004-2005), "Concerning the relocation of the Norwegian Civil Aviation Authority to Bodø." The MP interpreted this as an expression of resignation on the part of employees that the relocation would proceed no matter what, and that the

controversy surrounding the issue (within the Norwegian Civil Aviation Authority as well), had begun to die down.

A respondent from The Ministry of Transport and Communications claimed that an important condition for the move was that the Authority should function normally during the relocation process and that the pace of the move should be adjusted accordingly. Plans were made for double staffing for a transition period, so as to maintain stable levels of expertise. The Report to the Parliament no. 32 (2004-2005) "Concerning the relocation of the Norwegian Civil Aviation Authority to Bodø" indicates that extra expenses in connection with the move expected to accrue for 2005 would amount to approx. NOK 20 million.

The supervisory report mentions that in the short term it might be difficult to replace the specialised knowledge that had been gained in the respective supervisory agencies; it also states that until a new network has been established and the employees' skills have been developed, the agency's efficiency is bound to suffer. These factors may also affect people's trust in the agency.

As for the Norwegian Civil Aviation Authority, the supervisory report points out that, apart from the Oslo area, the aviation environment in Bodø is among the strongest in the country, and points to Widerøe's head office, Avinor Nordland, the Air Force, Defence Command North Norway and the Joint Rescue Coordination Centre. The question remains, however, whether it was determined just how much of this professional aeronautical expertise satisfied the Norwegian Civil Aviation Authority's needs. The supervisory report assumes that 10-25% of the supervisory agencies' employees are expected to make the move in the event of relocation, and that it will take many years to reap the full benefit of an employee in terms of advanced, knowledge-based work. The awareness that it takes time to train new colleagues could complicate matters for the Norwegian Civil Aviation Authority in a transitional period, because many of its tasks involve the approval of pilots and the issuing of operating permits to workshops and airlines on a continuing basis. All this is governed, in large measure, by international treaties and obligations. The Norwegian Civil Aviation Authority is reviewed on a regular basis by international agencies whose task is to ensure that the Norwegian aviation industry complies with accepted norms and practices. Deviation from these norms and requirements can disqualify a country from engaging in aviation outside its own airspace. All this has to do with tasks that cannot be put off or left to others.

In the paragraph that specifically mentions the Norwegian Civil Aviation Authority in the supervisory report, the subjects of safeguarding air safety and the opportunities for recruiting technical personnel are not elaborated on. The report to the Parliament does not discuss considerations of, or the potential consequences to, air safety and relocation. Nor was the supervisory report sent out on a consultation round to the affected agencies before it was made public. The Director of Aviation at the time was, however, informed at orientation meetings with the Ministry of Transport and Communications and AAD of the forthcoming relocation plans. Because of this, the Norwegian Civil Aviation Authority was able to prepare an environmental impact assessment with the help of a consultancy firm. This assessment was then submitted to the Minister of Transportation and Communication four days before the supervisory report was made public. The Director of Aviation was puzzled by the AAD's handling of the matter. No-one at the Norwegian Civil Aviation Authority had been asked their opinions when the report was being prepared, which pointed out that there was enough professional aviation expertise in Bodø to establish a new aviation authority, which is also the

conclusion that had been reached by *Bedriftskompetanse A/S* in a report prepared on behalf of the Bodø municipal authority.

The relocation report created quite a stir in the media, and led to many technical discussions and contributions with respect to the affected agencies. For the Norwegian Civil Aviation Authority, the result of all this input was that the opposition parties in Parliament requested an open hearing, which was held before the Parliament's Standing Committee on Family, Cultural Affairs and Government Administration (the so-called FKA Committee) on 24 February 2003. The Norwegian Civil Aviation Authority claimed that air safety could not be safeguarded by relocating to Bodø, because at that point only nine out of 145 of its employees had agreed to move. One of the questions posed by the FKA Committee was as follows:

> *"In this hearing, and in public opinion in general, fairly serious charges have been levelled, suggesting that there is a risk of breakdown in air safety if the Norwegian Civil Aviation Authority is relocated in Bodø. How does the Ministry assess these claims, and how does the Government intend to maintain air safety during and after any relocation process?"*

The assumption was, as was pointed out, that air safety would be maintained during and after the relocation process and that extensive political measures would be taken with respect to personnel, with a view to making the project a success. After this hearing, it appears that the Norwegian Civil Aviation Authority resigned to the inevitability of a move.

The results from the questionnaires prepared and processed by the Institute of Transport Economics [known commonly by the acronym TØI] (see the attached part report) show that a large majority of employees at the Norwegian Civil Aviation Authority feel that safety trends in Norwegian aviation are not auspicious. In dealing with a question of such a general nature, most people have probably been thinking in terms of the latest changes, and about the move to Bodø in particular. The fact that the Norwegian Civil Aviation Authority's employees are the group within Norwegian aviation that is most sceptical to developments supports the assumption that the question has in fact been viewed in this light. As to the matter of the Norwegian Civil Aviation Authority's supervision of Norwegian aviation compared with that of five years ago, the responses are not as negative. Opinion is divided as to whether the Authority's operations are better or worse than they were five years ago.

As for the decision to relocate the Norwegian Civil Aviation Authority to Bodø, opinions are all clearly negative. The Authority's employees – not surprisingly – are the most outspoken in their view that this will have a negative impact on air safety. Nearly 60% feel that this is very negative, and a further 26% feel that it is somewhat negative. Only about one out of ten feels that the move will have a favourable impact on safety.

As for organising the Norwegian Civil Aviation Authority as a distinct entity (split off from the Norwegian Civil Aviation Administration/Avinor), opinion is predominantly favourable for all the employee groups within Norwegian aviation. Practically all the Norwegian Civil Aviation Authority's employees feel that this has represented a boost for air safety.

## 5.5 The Norwegian Civil Aviation Authority's goals and priorities

The Norwegian Civil Aviation Authority's task is to help promote safety in aviation. This agency has the main responsibility for preparing a body of regulations, for carrying out initial

surveillance, conducting quality control of material, relevant organisations and all infrastructure, as well as issuing certificates to airlines, workshops, pilots and cabin crew. In addition, the Norwegian Civil Aviation Authority is supposed to ensure that laws and regulations are complied with. The Authority is an independent administrative agency.

In 1946, when the SAS collaboration commenced, the government authorities in the three Scandinavian countries had to coordinate their supervisory operations with respect to the new company. In line with this, in 1948, a special forum was formed for the SAS collaboration, called the OPS Committee. This Committee is composed of senior managers from the aviation authorities in the three countries. The Committee's primary goal is to make rapid and cost-saving joint decisions on the safety-related supervision of SAS.

After technical maintenance in SAS was divided among the three Scandinavian countries in 1967-1968, the Scandinavian Supervision Office (known by the acronym STK) was established. STK's original task was to establish a factual basis for the OPS Committee's decisions through actual supervision. In time, the technical supervision of SAS has increased in scope to the point where the chief manager at STK currently has the authority to make binding decisions affecting SAS. Today, STK conducts supervision on businesses and flight simulators in Denmark, Norway and Sweden.

The Ministry of Transport and Communications feels that STK today has the authority to make binding decisions in areas of such importance that a more clear-cut legal basis is needed for delegating authority to the agency. At the same time, the SAS collaboration is developing rapidly, which makes it hard to get a clear picture of what the need for the transference of authority to STK will be in 2-3 years. Perhaps we will see a clearer distribution of tasks, which would reduce the need for supranational or transnational supervision authorities. In any case, the regulations demand that the three Scandinavian countries take a joint stand – and on a broader foundation – on what legal status STK should have.

During 2000-2003, the Norwegian Civil Aviation Authority endeavoured to further improve safety in commercial aviation. It also attempted to develop a supervision scheme for the air navigation services.

In the Strategic Plan for the Norwegian Civil Aviation Authority from 2000-2002, we read the following:

*"Aviation safety can be linked to safety in relation to the regular operations of aviation enterprises, and to safety in relation to irregular incidences. Risks and weaknesses in the aviation industry are to be identified through an increase in analyses and assessments. As for the Norwegian Civil Aviation Authority's primary goal, it is stated that the statistical basis for gauging air safety shall be improved and methods of analysis as a basis for safety-enhancing measures shall be developed."*

With this primary emphasis, the Norwegian Civil Aviation Authority chose, when it was created, to divide its operations into five main areas:

1) **Initial surveillance:**
   This work is intended to ensure that aircraft equipment, aerodromes and personnel in civil aviation all satisfy current regulations before certificates of approval are issued. The most common forms of control are document searches, testing and inspections.

Initial surveillance takes place in relation to organisations, aircraft, material and people who are employed or are seeking employment in the

Norwegian aviation industry. Initial surveillance is initiated by applications from players in the aviation industry, or as a result of demands for periodic renewal of existing rights.

2) **Operator surveillance:**
   In principle, this involves planned inspections of various groups to be monitored. The national and international requirements for air safety form the basis of operator surveillance. With these regulations as a basis, the Norwegian Civil Aviation Authority defined a policy governing how often inspections are to be carried out for the different groups being monitored.

The Norwegian Civil Aviation Authority undertakes initial surveillance and operator surveillance primarily as a superior system supervisory authority. Initial surveillance is always conducted before the Authority issues or extends compulsory certificates of approval and grants rights. Its control function ensures that all current regulations are met before organisations and personnel are allowed to serve in the aviation system.

This kind of supervision is conducted in order to verify that the prerequisites for approval and certification are being met in day-to-day operations in keeping with the standards that are defined in the body of regulations. For supervision, certain subject areas are chosen. Within each area spot checks are made. Such spot checks involve the monitoring/supervision of specific details. If it is found that the selected details in a given subject area are in order, it is assumed that all the other individual details within that same subject area are in order as well.

3) **Developing new regulations**:
   New regulations take shape through international collaboration, in which the Norwegian Civil Aviation Authority plays an active role. In Norway, national regulations are updated on a continuing basis in tandem with the implementation of international rules and regulations.

4) **Registration of aircraft**:
   The Norwegian Civil Aviation Authority is responsible for the Norwegian Register of Civil Aircraft. Registration is meant to protect the interests of owners and rights holders from violation by third parties.

5) **Providing the market with information:**
   The Norwegian Civil Aviation Authority is responsible for ensuring that those who use its services are always provided with correct and sufficient information. This is done in the form of announcements, general information work and statistics on incidents and accidents. The Norwegian Civil Aviation Authority's safety philosophy is in constant renewal and should be communicated in an effective manner.

## 5.6 Special provisions and tasks assigned by the Ministry of Transport and Communications etc

In the allotment letters for 2003 and 2004, the Ministry suggests the desirability of a more risk-based supervision, with the establishment of criteria for acceptable risks for different

categories of air traffic. The Ministry also recommends that new or modified regulations be subject to an environmental impact assessment. This applies in particular to Take-Off-05, Avinor's restructuring plan. In early January 2004 (letter dated 9 January 2004), the Norwegian Civil Aviation Authority points out that Avinor has not requested a safety-related approval of the Take-Off-05 project. Since the organisational change at Avinor is so extensive, approval of the new organisation by the Norwegian Civil Aviation Authority must have been granted before the organisational change could be introduced. The Authority is concerned about whether safety will be maintained at an acceptable level during the introduction of Take-Off-05, and requests that an independent auditing firm looks into the matter. In a reply to the Norwegian Civil Aviation Authority at the end of January (30 January 2004), Avinor states that *Det Norske Veritas* [better known both in Norwegian and English by its acronym DNV] has already analysed the Take-Off-05 project. This report concludes, however, that DNV feels that this project is so complex that it was not possible at that time to arrive at an overall assessment concerning changes in the level of safety stemming from the proposed modifications. In its letter, Avinor replies that it will choose which planning areas in Take-Off-05 should be assessed and accepted by the Norwegian Civil Aviation Authority prior to an approval.

In April 2004, however, a Report to the Parliament (no. 36 2003-2004) was issued, which states that approval of operations and infrastructure is delegated to the Norwegian Civil Aviation Authority. In this Report to the Parliament, the safety-related aspects are described and assessed before the financial aspects. Nevertheless, the financial aspects are given the wider berth. Avinor outlines its emphasis on safety-based management, which is to be accomplished by developing reporting systems that bolster the statistical justification for working pro-actively, and by basing safety-related priorities on cost-benefit analyses.

An agreement is lacking between the Norwegian Civil Aviation Authority and the Norwegian Civil Aviation Administration/Avinor for the splitting off process, in terms of who is responsible for what. This obscurity means that not all tasks are dealt with in an optimal fashion. When Avinor lays plans, it does so with a minimum of collaboration with the Norwegian Civil Aviation Authority. In other words, the Authority is not involved in the process of determining and approving the number of air traffic controllers at the control centres. Avinor feels it can decide such things on its own.

At present, communication between the Norwegian Civil Aviation Authority and Avinor on how to handle the Accident Investigation Board Norway's (AIBN's) recommendations is problematical, since Avinor feels it can/should be the one to consider which measures will suffice for compliance.

The Norwegian Civil Aviation Authority hopes that the new Aviation Act, chapter 12, which introduces modifications to the reporting system, will lead to an improvement in this matter.

In an allotment letter from 2004 from the Ministry of Transport and Communications, it is emphasised once again that the Norwegian Civil Aviation Authority is to prioritise safety guidelines and regulations in its work.

In 2000, a government committee was appointed with a mandate to assess how the government was involved organisationally and to devise specific goals for promoting air safety in Norwegian offshore helicopter operations. Since then, a lot of effort has gone into studying and formulating initiatives for improving safety in this industry.

The Norwegian Civil Aviation Authority has been assigned a major responsibility for continuing this work. For example, a number of safety recommendations, made after the Norne disaster in 1997, are still pending – that is, measures for promoting better safety have yet to be implemented. The situation as it stands is worrying. Initiatives need to be taken, so that the Norwegian Civil Aviation Authority's expertise, resources and capacity can quickly be brought up to a level that is in keeping with the tasks and the risk that helicopter operations in general and offshore operations in particular represent. This aspect of helicopter traffic is different from other commercial aviation in that it is part of a whole when assessing risk in the extraction of oil and gas. The infrastructure and services involved in helicopter operations are also answerable to several government agencies, which is why the distribution of responsibility can tend to become blurred in this field. The Norwegian Civil Aviation Authority wants to survey all the studies involving infrastructure and services in helicopter operations so that it can set prioritised initiatives and various means of support for the industry.

### 5.7 The PAL project
Another important challenge for the Norwegian Civil Aviation Authority has been to improve safety in general and sporting aviation.

The frequency of accidents with this type of flying has been excessive, so steps were taken to do something about the situation. The Norwegian Civil Aviation Authority, in collaboration with the recreational organisations that were organised through the Norwegian Air Sports Association (NLF/NAK), the Aircraft Owner and Pilot Association (AOPA) and the Experimental Aircraft Association (EAA), established "Project general aviation and sporting aviation" (the PAL project). The goal of this project was to improve safety in general aviation and in sporting aviation activities – for example by a special arrangement for supervision of this type of flying in close cooperation with those engaged in it.

The goal of the project was to get the Government to transfer certain tasks to the recreational organisations so that the Norwegian Civil Aviation Authority's activities could be streamlined and its taxes and fees model could be reassessed. The recreational organisations were to be organised on a model of "operating permits under system supervision." Work was carried out for four years with 16 part projects with a view to improving safety in gliding, ballooning, hang gliding and paragliding, flying with ultra-light aircraft, parachute jumping, model airplane flying and motor gliding. The umbrella groups carried out thorough, comprehensive work.

The project was supported by the Norwegian Civil Aviation Authority, which contributed nearly NOK 5 million during this period – for example, by hiring two special consultants, as well as by providing operating expenses for implementing the 16 part projects.

The various projects had just begun to put the theoretical safety-related work to practical use, both centrally and out among the clubs, in the form of new procedures, handbooks, reports and training when the Norwegian Civil Aviation Authority decided, on 23 April 2004, to terminate the project.

When the PAL project started up, the Norwegian Civil Aviation Authority prepared a project directive that was to constitute the framework/agreement between the principal (manager and

management group) and the project manager. The management group was formed with the Director for the Norwegian Civil Aviation Authority as its leader, with terms of reference which stated that the necessary agreements should be worked out between the Authority and the organisations based on operating permission under system supervision. A new responsibility and organisational structure was to be established for adapting NLF/NAK to a new role model by giving NLF/NAK government tasks and operating permission under system supervision. The aviation laws were changed in order to make it possible to delegate government tasks to private organisations. NLF/NAK is a private legal subject and as such cannot have government tasks imposed upon it without prior agreement by special warrant. AIBN has discovered that the Norwegian Civil Aviation Authority, during its work on the PAL project in 2003, began to change its opinion concerning NLF/NAK's ability to fulfil its new operational model. AIBN's study of documents and conversations with the parties directly involved paints a picture of the Norwegian Civil Aviation Authority moving away from a model involving the delegation of government tasks and the application of operating permission under system supervision and returning to a model involving detailed supervision. In 2004, after three years of activity, the collaboration between the project management at the Norwegian Civil Aviation Authority and NLF/NAK collapsed.

What, then, are the consequences of shutting down the PAL project? They involve a change that will put the active players in NLF/NAK, AOPA and EAA in a real bind. The recreational organisations are now left without an approved organisational model that was meant to reflect the regulations' new PAL requirements, without system management and the requisite procedures, manuals, training and auditing system that should have been channelled to the clubs via NLF/NAK's organisation. This could have serious repercussions for whatever safety work has already been done – work on which ongoing operations in general aviation and sporting aviation are completely dependent.

The AIBN feels it is vital to safety in general and sporting aviation in particular that these circumstances should be speedily resolved through a constructive collaboration between the Norwegian Civil Aviation Authority and NLF/NAK.

### 5.8 Skills requirements for technical operational jobs in the Norwegian aviation industry

To ensure that air safety in the Norwegian aviation industry is maintained – and preferably enhanced – there have been efforts to develop the skills of the various players in the aviation industry. There is general agreement that a high level of expertise on the part of the players can best be ensured by maintaining set levels of skills standards and by developing new skills requirements and needs for today. In this connection, a closer look has been taken at the form of education for all involved players. Here too, the requirements must be adapted to national and international standards.

### 5.9 Risk-based supervision

The allotment letters from the Ministry of Transport and Communications for both 2003 and 2004 state explicitly that a more risk/system-based type of supervision is desirable, involving the establishment of criteria for acceptable risks for different aviation categories. This task is hard to follow through today on account of reduced manpower levels that stem from the relocation. As a result, the work must primarily be based on statistics gathered by others. In the allotment letter of 2004, it is pointed out that safety requirements and regulations should

focus primarily within the scope of the supervisory agency's sphere of work. AIBN confirms that at present, the Norwegian Civil Aviation Authority does not have the professional expertise to conduct risk-based supervision as planned but must make do with thematic monitoring. Still, a handbook has been prepared that specifies how risk-based supervision should be carried out; however, it cannot be put into effect because of the lack of qualified personnel. At the time of writing, two persons in Bodø have been hired with this as their area of work. But it should also be pointed out that, with their limited aeronautical skills, they will have to undergo a lengthy period of training before they are fully functional. The department's managerial position is currently in the hiring phase.

In order to conduct risk-based supervision – that is, prioritise the development of new regulations and supervision activities such as inspections and system audits with a view to reaping optimal safety benefits – it is essential that data on incidents and accidents is collected, processed, made available and analysed in a professional and expedient manner. A new EU directive on reporting from market to government authorities due to take effect sometime in 2005 will help make this possible on a large scale within the EU and the EEA. In this connection, the Norwegian Civil Aviation Authority has been given responsibility for entering data on Norwegian accidents and incidents into a joint European database for use in promoting air safety. For some time, now, the Authority has not been able to do this work, with its associated analysis and coordination internally and externally, due to a lack of personnel.

Expertise in risk analysis is also important in assessing safety recommendations in reports from AIBN. The Norwegian Civil Aviation Authority is responsible for implementing initiatives designed to prevent new accidents, and it must be able to assess the various initiatives' anticipated effect on air safety. The pace of case management linked to the follow-up of such recommendations appears to have slackened, which is also due, no doubt, to a lack of technical aeronautical resources in other units.

Many parallel restructuring processes require adaptations of risk-based supervision to aeronautical circumstances and practical use. The Norwegian Civil Aviation Authority started up courses in risk-based supervision and in the preparation of related quality handbooks, but by its own admission it has not followed up in practice after the decision to relocate to Bodø.

## 5.10  Skills requirements for technical and operational aviation positions in the Norwegian Civil Aviation Authority

The Norwegian Civil Aviation Authority was well underway with most of its targeted activities when the relocation decision became known. It is no secret that this decision occasioned unrest and insecurity, because a "don't move" spirit prevailed in the Authority. It soon became clear that few employees in the Norwegian Civil Aviation Authority wanted to move to Bodø.

When it became known that the recruitment of new, qualified personnel in Bodø was going slowly, SINTEF was asked by The Ministry of Transport and Communications to examine the process in connection with the first round of announcements (19 April 2004). It was determined that the requirements for the candidates were consistent with current international guidelines (Report STF38F04424). But it was also pointed out that these positions could be advertised more broadly internationally, that one could also restrict/improve the specified requirements in the ad text and consider offering better salaries. This was accepted by the

Norwegian Civil Aviation Authority and utilised in the second round of announcements (30 September 2004).

AIBN, like SINTEF, is of the general opinion that no unreasonable demands were being made on those who were to fill the various technical and professional positions in the Norwegian Civil Aviation Authority. Corresponding and updated skills requirements would apply to all new hiring anyway, regardless of geographical location. The Norwegian Civil Aviation Authority, through its former Director of Aviation, has commented on why certain positions were previously filled by people who did not meet all the requirements. His point was basically this: alternative but relevant experience can compensate, as long as we are dealing with a single individual who is being brought into a strong, existing professional environment. AIBN feels that this is/was an astute observation, provided the existing environment is able to absorb and train personnel to the required level of expertise.

There has been much talk about the demands on those who will be hired in Bodø, particularly with respect to flight operations. None the less, there has been no easing up on the requirements for the air operations positions. A greater number of applicants with military backgrounds and experience, however, are being considered. This is similar to procedures followed in other countries.

The decision to relocate the Norwegian Civil Aviation Authority has led to several key persons resigning their positions. One department that noticed problems with the moving process early on is Supervision Department 3, particularly with respect to flight navigation, which suffers from employees who have resigned and turned to recruiting companies. Those who are left have been negatively impacted and suffer from poor motivation.

This has created unrest in the Norwegian Civil Aviation Authority. Our informants claim that the Authority's relocation process has made considerable demands on resources and that the move makes extra demands on future employees. Quoting from the interview: *The move is demanding in terms of maintaining the correct level of expertise; it has led to a great deal of stress and unrest.*

Even if new personnel can be recruited for Bodø by the established deadline, it is clear that the Authority will be vulnerable for some time to come, because it lacks some employees with the old Norwegian Civil Aviation Authority's history as part of their ballast. This means that inspections will probably take longer, as will case management, until security – which is a product of experience and knowledge – is once again in place. It is important that this development is not forced; the process must be given whatever time it needs.

### 5.11  Conclusion

After the establishment of the Norwegian Civil Aviation Authority in 2000, developments up to 2003 were marked by adaptations and organisational consolidation. 2003 was the year the Authority had established a competent, effective organisation, both technically and administratively.

In 2004, an internal restructuring of the Norwegian Civil Aviation Authority took place. After the restructuring, the Authority is to supervise and monitor operator companies, workshops, airports, air traffic services, environmental demands, safety and security and initial surveillance (approval of new operators/workshops and access to airports, security).

After all this, the organisation has increasingly borne the hallmark of Parliament's decision to relocate the Norwegian Civil Aviation Authority to Bodø.


### 5.11.1    Parliament's decision to relocate The Norwegian Civil Aviation Authority to Bodø

This study has considered the extent to which safety has been assessed and the extent to which it has been an essential factor in arriving at a political decision to relocate the Authority.

The impression one is left with, based on information from the interviews, is that the political environment is genuinely concerned about safety. However, there is some question as to how big a role safety should play in the political process. And, in the event, in what detail should these issues be elucidated and assessed by the political system? Theoretically, every change can influence safety in some way or another. Is it not natural, therefore, to make safety a more important criterion than it is today?

The principles in "Zero Vision" are laid down in the Report to the Parliament no. 46 (1999-2000), "The National Transport Plan 2002-2011", and involve major initiatives for reducing the number of life-long injuries or mortalities due to accidents. Zero Vision virtually requires that the underlying basis for political decisions should include environmental impact assessments when safety is at issue. Alternatively, it can be assumed that "independent" supervisory agencies – functioning as consultative bodies and/or as ordinary supervisory bodies – will ensure that any changes do not have an adverse effect on safety.

In this relocation matter, it would appear that financial, legal and regional considerations carry the most weight. Safety was mentioned, but in our opinion it has not played an active enough role in the assessments. Nor does safety appear to be one of the key concepts in the final decision.

By insisting, as in this case, that changes must not affect safety, the politicians have freed themselves from specific assessments. So it is assumed, indirectly, that it is the supervisory authority's duty to sound the alarm when it detects an inauspicious trend stemming from some political decision. This is/was in this case particularly problematical, since the professional agency itself, through political guidance and decision-making, has been saddled with changes that could adversely affect safety. How, then, should the Ministry weigh the professional arguments and technical contributions from the very agency that to which change in question applies?

Therefore, AIBN feels that an independent aeronautical environmental impact assessment in terms of safety should have been performed before the political decision to relocate the Norwegian Civil Aviation Authority was taken.


### 5.11.2    Consequences of the decision to relocate

Since the Norwegian Civil Aviation Authority was not a consultative body, and since no professional environmental impact assessment was carried out in connection with the decision to relocate, a vacuum of sorts arose, in terms of safety. Because of the philosophy of safety that has guided the Norwegian aviation industry for decades, a way of thinking that permeates the company culture and the individual employee in the Norwegian Civil Aviation Authority,

the Authority as an organisation felt obliged to fill this vacuum. This was an expression of loyalty towards an existing culture of safety. The loyalty that the Authority has towards its overall responsibility for safety created a need to make the decision-making agencies aware of the consequences of a move in terms of safety. These objections, which can be detected in the report from Hartmark Consulting AS and the Norwegian Civil Aviation Authority, along with correspondence between the Authority and agencies above it in rank, were regarded, at the political level (which was only natural), as one-sided pleas and thus went unheeded. In time, the ramifications became manifest and are part of the reason why major recruitment problems arose and it became difficult to carry out safety work in the Norwegian Civil Aviation Authority after the decision to relocate was final.

Another consequence of the move is the fact that the Norwegian Civil Aviation Authority loses what one might call an unwritten air safety expertise. This expertise is part and parcel of the overall wealth of experience gained through air safety operations and handed down from employee to new recruit when personnel changes occurred naturally. Since so few who possess this unwritten safety expertise are making the move to Bodø, much of it's expertise will be lost. This unwritten expertise must be regained all over again, and that is going to take time.

Supervision Department 1 in the Norwegian Civil Aviation Authority is responsible, among other things, for type approval for aircraft not listed in the Norwegian Register of Civil Aircraft, as well as for granting approval for major repairs and modifications. Over the years, this section has had a lot of vacancies, and operators have therefore been granted permission to conduct business with temporary approval while waiting for their applications to be handled; or, in some cases, they have to change their plans while their applications are being processed.

It is financially critical, especially for minor operators, when their applications are not dealt with in a timely fashion. So the AIBN is concerned that there must be enough capacity that no-one will be "tempted/forced" to abandon the formal government approval of planned and implemented repairs or modifications. Carrying on business operations with temporary permits while work already performed is being studied by the Norwegian Civil Aviation Authority, and carrying out repairs and modifications without the required permits can both have a negative impact on air safety. One possible consequence is that an operator might choose to register abroad in order to speed up the processing of his application. This will only water down the national professional aviation environment and again, in time, impair air safety.

The decision to relocate has resulted in a marked turnover of personnel; but those who have chosen to stay with the company remain loyal. The Norwegian Civil Aviation Authority has spent a lot of time making changes; however, in spite of this, in 2004 the frequency of inspections was maintained at 2003 levels. There is still an annual inspection of 30% of all aircraft flown commercially.

1153 out of 1160 inspections, initial surveillance and document checks were carried out in 2004. As for the SAFA/SANA area, the Norwegian Civil Aviation Authority performs 30 inspections per month, whereas Denmark and Sweden, by comparison, perform fewer than 10.

Despite the lower numbers of employees and the allocation of resources to the moving process, supervisory operations have remained fairly stable. It has been necessary, however, to give this work a higher priority, which in turn has led to delays in developing new regulations and in introducing risk-based supervisory methodology. All told, however, operations have gone as planned, and the cost structure has not changed noticeably. There has been a 2% drop in inspections from 2003 to 2004.

### 5.11.3    New Aviation Director and Action Plan

After AIBN submitted its part report on the situation concerning the Norwegian Civil Aviation Authority in January this year, in which the main conclusion was that the Ministry of Transport and Communications, in consultation with the Norwegian Civil Aviation Authority, should submit an action plan that outlined corrective measures, the Minister of Transport and Communications accepted that the Director of Aviation resigned his position, followed by the hiring of a new director on a limited contract.

The impasse, which had led to a refusal to move, was analysed, and attitudes towards relocating were gradually changed. It was made clear that in the time ahead, the Norwegian Civil Aviation Authority had two tasks:

- Safeguarding daily operations
- The recruitment process and relocation to Bodø

The various job categories were examined and classified as either professional or non-professional (in terms of aviation). Professional positions are traditionally described by the ICAO, the Joint Aviation Authorities (JAA), in the Joint Aviation Requirements (JAR), and more recently by the European Aviation Safety Agency (EASA – operative from 28 September 2003). This applies to operative, technical aeronautical proficiency and air traffic services, as well as positions related to the issuing of certification. Jobs in these areas have traditionally been held by people who have technical/operative training and work experience in the Norwegian aviation industry. If the majority of employees in the professional aviation departments have a professional background, then specific individuals with no professional aviation background can legally (and sometimes even expediently) be employed when it benefits the company. Examples of non-professional aviation areas are legal dept., personnel, finances and archives.

With this definition of professional, the number of job positions in this category was reduced from 116 to 63. This was expected to be reflected in the wording of employment ads and in the hiring process. Furthermore, it was considered important to hire a manager who resided permanently in Bodø, as well as a Director of Human Resources and an Administrative Manager. It was also clear that between mid-2005 to the end of 2006 there would be a need for double staffing – a need for as many as 200 employees – whereas a normal staff level would be 145. This arrangement is expected to ensure the transfer of skills that is needed and provide enough time for handling applications. Massive training programs, both domestic and foreign, have been set in motion, with the aim of qualifying new workers.

One result of this new attitude is that a number of employees who originally did not want to relocate, have begun to rethink the situation, because there is greater scope than before for financial incentives.

After the decision to relocate had been made, a new strategy for the Norwegian Civil Aviation Authority began to take shape; the Authority shall:

- work towards a safe, socially beneficial aviation industry
- ensure that the rules and regulations are kept up-to-date
- be an efficient, open agency
- ensure that the players in the aviation industry comply with current requirements
- be a strong international player

It was emphasised in particular that the Norwegian Civil Aviation Authority, during a demanding restructuring phase, had to maintain normal supervision and supervisory functions. The Authority is to fulfil its guiding philosophy by meeting its goals. And to reach these goals, clear lines of communication are essential. People had to agree that all talk of "not moving" was taboo, and that Parliament's decision had to be respected. The Norwegian Civil Aviation Authority had to be capable of maintaining day-to-day operations while at the same time preparing for and carrying out the move to Bodø.

During this process it is important to make it clear that Bodø can be a fine headquarter for the Norwegian Civil Aviation Authority in Norway. It is important to visualise and profile the "new Norwegian Civil Aviation Authority" and drum up PR for a good, attractive workplace. During this process, it will be necessary to confront the issue of recruitment and qualification requirements, as well as encourage discussion. There must be a constant focus on air safety. And meetings, speeches, presentations and the like must constantly confront issues relevant to this area. There is also a desire to speed up the move itself. As a step in this direction, recruitment of new employees to all position categories is being done concurrently.

A process has been set in motion, its aim being to boost motivation for getting as many people to move to Bodø as possible. In this regard, it is crucial to see the potential, and not the drawbacks of the situation. It is important to win over key personnel, people who are willing to commit themselves for shorter or longer stretches of time. To help achieve this, transitional schemes should be offered, and some should be allowed to commute, within limits. Relocation packages should also be offered in the form of pay rises and grants. In addition, mobile solutions should also be emphasised (e.g. wireless offices).

Tools and incentives such as these calls for complete openness; when implemented, they should provide important information about all ongoing processes to all employees, wherever they are stationed.

The Norwegian Civil Aviation Authority is totally dependent on trust, both nationally and internationally, for carrying out its tasks. For this reason, great emphasis is placed on a high degree of integrity and expertise at the agency, on its being clear and visible in its professional environment, and on its being accessible, attentive and capable of providing service.

The strategy plan for this particular period focuses in particular on resources allocated for safety measures at airports, with special attention to clearing runways, snow removal, salting, sanding, ensuring friction, as well as providing pilots with frequent and updated readings.

After a new Director of Aviation was hired, steps were taken that should enable the Norwegian Civil Aviation Authority to follow up in these areas.

5.11.4    The need for increased supervision of an aviation industry in Norway that is
          undergoing major restructuring

The commercial players in Norwegian aviation are all facing stiff competition, financial
constraints and greater demands for profitability. Partly as a consequence, major and potential
restructuring processes that are critical to safety are under way, such as rationalisation,
downsizing, mergers, organisational changes and a dividing up of responsibility. This is
exactly the kind of situation that calls for a strong, alert supervisory authority, one that is
capable of monitoring and ensuring that air safety is safeguarded in an acceptable manner.
Experience from Sweden and other countries confirm that there is a need for strong
supervision when many changes and restructuring efforts are going on simultaneously in a
given line of business. AIBN feels that this need is not currently being satisfactorily met. The
informants in the airline companies have been impressed that the Norwegian Civil Aviation
Authority has been able to maintain a high level of service in the wake of the decision to
relocate. As for Avinor, AIBN has the impression that the Norwegian Civil Aviation
Authority has not been able to satisfactorily follow up on changes and plans. In a number of
key areas (see chapter 6), the Norwegian Civil Aviation Authority accepted solutions which,
in hindsight, they are not comfortable with (the training of personnel when ATCC North was
established, the splitting off of AFIS and air traffic controllers into their own divisions, and
much else). The main reason for this, as AIBN sees it, is that major challenges have grown
out of the decision to relocate and the move itself.

Nevertheless, the action plan that has now been presented for the new Norwegian Civil
Aviation Authority appears credible and realistic enough to ensure that the Authority's
expertise, resources and capacity will – in time –reach a level consistent with the challenges
and tasks the agency will face.

**5.12  Safety recommendations**

In addition to the need to work in tandem with the recommendations concerning expertise and
resources in the part report on the Norwegian Civil Aviation Authority, which was submitted
to the Ministry of Transport and Communications in January of this year, the AIBN submits
the following recommendations:

- The Civil Aviation Authority should consider putting greater emphasis on system-
  oriented holistic and risk-based supervision and develop/recruit personnel with the
  relevant expertise – not least in order to follow up and become aware of potentially
  negative safety consecuensces of the change measures at those they supervice.

- The Civil Aviation Authority should consider extending the transitional phase with
  double staffing in Oslo/Bodø, in order to ensure that new employees receive the
  experience and acquire the competence they need. This is necessary for carrying out
  the supervision tasks in a satisfactory manner during the transition, thus maintaining
  market trust.

- The Civil Aviation Authority, in collaboration with recreational organisations in
  general aviation and sporting aviation, should consider taking the initiative (on the
  basis of "Terms of reference" that govern PAL ("Project general and sporting
  aviation"), as well as findings in this report) to establish the necessary prerequisites for

continuing PAL, so that the recreational organisations can carry out their aeroplane and air sports activities by means of an organisational, responsibility and sanction model in conjunction with the supervisory authority.

- The Ministry of Transport and Communications and/or other responsible ministries should consider including impact assessments of safety matters as part of the basis for their political decisions within the transport sector, when specialist sources indicate that safety levels may be at risk. Alternatively, broad-based consultation exercises should be held, in which relevant specialist agencies should be given the opportunity to submit their views/comments.
  *(The AIBN is in the process of becoming the independent investigative authority for accidents/incidents within the entire transport sector, and therefore allows itself to promote this cross-sector safety recommendation.)*

# 6   AIRPORT OPERATION AND AIR NAVIGATION SERVICES (AVINOR AS)

### 6.1 Introduction

Avinor is one of the central players in a Norwegian aviation sector that has undergone major changes in the period from 2000 until the present day. The major changes are:

1. 01.01.2000: The current Norwegian Civil Aviation Authority was separated from the former Civil Aviation Administration, which changed its name to the Norwegian Air Traffic and Aerodrome Management (the Norwegian name "Luftfartsverket" was kept), becoming a government corporation under the Ministry of Transport and Communications.
2. 01.01.2003: The Norwegian Air Traffic and Aerodrome Management becomes a limited company owned 100% by the state, changing its name to Avinor AS.
3. 04.12.2003: Avinor AS decided to implement the project Take-Off-05 (the project had, however, been in preparation since the autumn of 2002).

(See chapter 6.4 for the timeline with more detailed presentation of the various changes during the period)

In addition to these changes, there have been other major and minor changes, including a major change in 2001 when 11 regions were reduced to 5. In this report, we would like to focus on the most comprehensive process of change, Project Take-Off-05. The Air Navigation Services Division is the unit in Avinor which affects safety to the greatest extent, although all of the divisions must function optimally and in coordination if Avinor's contribution to total air safety is to be ensured. Air Navigation Services will, therefore be subject to more detailed review than airport services.

The Ministry of Transport and Communications requested AIBN to undertake this study because of the concern that had been communicated from parts of the Norwegian aviation community, as well as three, then fresh, reports from serious incidents, in which a significant contributory factor was distraction caused by someone's "psychological state". One of these reports, SL rep 42/2004, as well as two earlier reports, 05/94 and 49/2000 concerns incidents associated with the air traffic service.

Avinor is responsible for the total range of air navigation services in Norway, and owns/operates 46 airports, including one heliport. At the end of 2004, the Avinor Group had a total of 2,732 full-time employees, compared with 3,072 the previous year (according to the 2004 annual report). In addition to its directly aviation-related activities, the company also has commercial interests in the form of property, rental, hotels, parking, etc. OSL is a separate limited company, owned by Avinor, and is therefore a part of the Avinor Group.

In this Avinor investigation we have studied written documentation, conducted interviews with its customers (the airlines), the aviation authority (the Norwegian Civil Aviation Authority), met central employees of Avinor and conducted a survey of workers in the Norwegian aviation industry. Large amounts of formal and informal documentation have been made available to AIBN, including a number of documents/studies in connection with

Take-Off-05. The challenge for AIBN has been that several of these documents/studies have been produced by persons or groups with vested interests, and thereby have required appropriate treatment. The various groups often come to differing conclusions concerning the same issue. In such cases, AIBN has chosen to illuminate the different points of view, so that the issues discussed should be subject to greater consideration in order for a choice to be made that will achieve the highest possible level of safety in aviation.

Avinor's design phase document for the various subprojects and the DNV report, ordered by Avinor to review the project, looking at aviation safety, and health and the occupational environment aspects, have formed core documents for the AIBN study. Subsequently, Avinor has produced evaluation reports from the subprojects, which confirm the findings of the AIBN, and lay open the areas that the DNV report stated that Avinor was not taking care of. There is no overview of the total level of safety levels at Avinor, either at 1 January 2000 or today. This is, however, a difficult area and other similar organisations are in the same situation. To date, there has been no regulatory requirement compelling Avinor to have such an overview. As Avinor does not have historical parameters that quantify the level of safety, it is not possible for AIBN in this report to make a quantitative assessment of changes in safety levels from 1 January 2000 to the present day. For that reason, this report only makes qualitative assessments.

The starting point for the AIBN is not that changes equivalent to those taking place at Avinor are ipso facto a threat to security. The study attempts to point out the necessity of holistic thinking and use of thorough safety analyses in order to reveal which weaknesses the change(s) can lead to in safety levels. Such analyses will normally say something about compensatory measures that should be put in place before the change takes place. If this is done, there is high likelihood that safety levels are maintained and could even be improved through the process(es) of change.

## 6.2 Fact section

### 6.2.1     The expectations of the Ministry of Transport and Communications of Avinor

Avinor's duties have been laid out in the Proposition to the Parliament no. 1 (2002-2003) and Report to the Parliament 36 (2003-2004):

1. Protect air safety
2. Provide good aviation services to travellers
3. Administer the infrastructure
4. Maintain contingency measures
5. Yield a financial dividend

#### 6.2.1.1     *Protect air safety*

The Board of Avinor has an independent responsibility for organisation of the company's activity and for considering measures that are necessary to ensure the company's competitive edge and finances, *at the same time as protecting safety in the air and other overall goals*.

The ministry is concerned that Avinor carries out the change that is necessary to achieve the goals, set as a basis for operations when the company was established, are to be achieved. "*At the same time, it is crucial that overall requirements relating to factors such as aviation safety*

*and contingency against acts of terror and sabotage are met. The ministry is especially concerned that the Board of Avinor considers closely any consequences for aviation safety from the restructuring of air navigation services. The ministry has noted that Avinor's Board assumes that safety levels are, at least, maintained during the ongoing process of change."*

From the National Budget 2005 – Allocation letter concerning safety:

*The Ministry of Transport and Communications emphasises the importance of having a strategy that will maintain contingency preparedness within separate sectors.* One of the bases for the Parliament's work on the 2005 budget was that priority was to be placed on development of contingency schemes appropriate to the current threat scenario. In this connection, we refer to courses and exercises for contingency personnel, *as well as use of such important instruments as studies, and risk and vulnerability analyses.*

It is important for Avinor to carry on its work on exercises. The ministry also requests that an *overall risk and vulnerability analysis for aviation contingency be prepared according to detailed guidelines.* This must form part of the planned work of the ministry on an overall risk and vulnerability analysis for transport, which will identify vulnerability in its own systems, critical infrastructure and functions and dependency on other systems, etc. The ministry will return to this as a separate matter.

Avinor informs AIBN that it has prepared new contingency and crisis management systems, as well as participating in the Ministry of Transport's SAMROS project (risk and vulnerability in the transport sector).

### 6.2.1.2      *Provide good aviation services to travellers*

The company (Avinor) will contribute to giving the travelling public safe, environmentally sound and good travel to all parts of Norway,

The current restructuring of Avinor is expected to yield more efficient operations and lower costs. Change is, therefore, expected in the future that will provide reduced travel costs for commercial and private passengers.

The ministry bases its considerations on the changes maintaining or strengthening regularity and punctuality in air traffic.

### 6.2.1.3      *Administer the infrastructure*

Avinor distinguishes itself from "normal" commercial aviation interests by being an administrator of the infrastructure, and virtually alone in the market, which is carrying out important tasks imposed by society. This indicates a stronger political management of Avinor than is usual for government-owned corporations.
*Focus on cost-efficiency must, however, not impinge on the company's opportunity to maintain high safety levels, provide good quality services and carry out investment that is necessary to maintain and develop the infrastructure in the long-term.*
*At the same time, it is crucial that overall requirements relating to, amongst other things, air safety and contingency against acts of terrorism and sabotage, are met.*

### 6.2.1.4     *Maintain contingency measures*

The ministry will follow the current changes closely, particularly the aviation security requirement and the contingency against terrorism and sabotage. The EU has adopted common regulations for contingency against terrorism and sabotage in the aviation sector. These regulations also apply for Norway through the EEA.

In addition, the Ministry of Transport and Communications issued on 24 March 1998 "Guidelines for protection of electronic installations in the "Total Defence" against electromagnetic pulses (EMP)", which place requirements on protection of the infrastructure. Excerpts from this:

*Technical installations, as well as significant networks for Norway's total contingency (communication, computing, warnings, power supply, broadcasting, navigation, etc.) must be given the greatest possible protection against electromagnetic influence both in "standard conditions" in peacetime and against hostile attack, including sabotage. Protection against "electromagnetic pulses" (EMP) is important in this connection. It matters little to end users whether system failures are resulting from EMP, lightning or vandalism.*

*In the civilian contingency sector it is up to the individual agency, operator and company (private/public) to decide which installations should be protected. Relevant facilities/installations for which EMP protection should be considered, include (abbreviated list):*

- *Telecommunication facilities and networks.*
  *- Navigation installations.*
  *- Communication installations for Totalforsvaret (Civil Defence and civilian*
- *administration)*
  *- Power supply networks.*
  *- Meteorological communication installations.*
  *- Computer installations.*

According to Avinor, Norway's National Security Authority (NSM) has not required Air Traffic Control Centres (ATCCs) to be located in underground facilities.
We quote from NSM's written response: "*AVINOR AS informs us in the documentation it has sent that the alternatives have been reviewed from a security aspect, and any necessary security measures have been identified in the various alternatives. AVINOR AS therefore considers that all of the alternatives are equal from a security point of view. Given this assumption, including the implementation of all necessary compensatory security measures, NSM has no comments to the localisation of ATCC South. NSM, however, assumes that we are consulted before an establishment takes place at Sola near Stavanger.*"

### 6.2.1.5     *Yield a financial dividend*

Over time, the government, as owner, has invested huge amounts in state-owned corporations like Avinor in the form of paid-in capital, and has retained any profits. In principle, the state could have used this capital for other purposes. The capital has, therefore, a cost that is equivalent to the capital's alternative value for the owner. The requirement for return on the capital is defined as the expected alternative return that could have been achieved in another way at the same risk. In this connection, there will be industry-specific return requirements. In

addition to being a goal for value development in the company, the return requirement plays an important role as a driving force for efficient operations.

The ministry maintains its requirement for a return on capital of 10.3%. Between 2004 and 2006, the Ministry of Transport and Communications suggests that the dividend from Avinor will be calculated as the state loan interest, multiplied by the equity, limited to a maximum of 40% of the post-tax profit. In the opinion of the ministry, the dividend calculated in relation to equity provides a good incentive for efficient operations. Avinor's financial results in 2003 and the outlook for the 2004-2006 period shows that the company still has a considerable need to reduce operating costs and develop new profitable business areas within the baseline business.

In 2004, its post-tax profit amounted to NOK 463 million.

The ministry points out that there is considerable uncertainty linked to, among other things, air traffic developments and how quickly Avinor manages to implement cost savings through its programme of change (note that this is a comment from 2003).

(AIBN note traffic growth through OSL in 2004 was 9% and in the first six months of 2005 was 5.7%).

### 6.2.2      The Civil Aviation Authority's requirement for EMP protection and contingency
                (from letter to Avinor, dated 6 January 2005)

#### 6.2.2.1      *Protection of facilities against electromagnetic pulses (EMP)*

Avinor is in the process of reducing the number of ATCCs from four to two. This means that the requirements for, and design of, infrastructure, technical installations and operation of future ATCCs must, to a great extent, concentrate on its ability to maintain an air traffic control service (full or reduced), as well as the possibility of establishing an air traffic control service at an alternative locality in a reasonable amount of time if one unit should be taken out of service.

*Protection of facilities against electromagnetic pulses (EMP).* In our (Civil Aviation Authority's) opinion, Norway's air traffic control centres are facilities that must be planned with the emphasis on special protection against electromagnetic pulses (EMP). The extent of such protection must be appropriate to the importance that the control centres have in society. Ref. the Ministry of Transport's "Guidelines" of 24 March 1998.

#### 6.2.2.2      *Protection of supply lines*

All supply lines to the control centres shall be duplicated and physically protected against unauthorised attack. Duplicated communication lines externally as well as internally in the building must not follow the same cable route. The consequences of not protecting the facilities could be that the equipment could be inoperable for long periods.

The AIBN has previously published reports concerning such outages at both Røyken and Værnes.

### 6.2.2.3    *Contingency plans*

The letter from the Civil Aviation Authority also discusses the further requirement to prepare contingency plans. It points out the importance of the plans for the control centres being in place at the start of the projects, so that lack of infrastructure, physical protection and technical/operative measures seen in the light of the contingency plans do not suddenly appear in the final phase and obstruct approval.

### 6.2.3    Government tasks that are still the responsibility of Avinor

Avinor still administers the Aeronautical Information Publication (AIP) and the Instructions for execution of air traffic service (RFL 1) [Norwegian translation of ICAO Doc. 4444 PANS-ATM].

*AIP:*
Under the Chicago Convention, Norway is responsible for publication of an AIP, although nothing is said about who should issue it. The Civil Aviation Authority thinks that the Ministry of Transport and Communications should be responsible, that the service can be provided by an approved supplier and that the Civil Aviation Authority should supervise the activity. Because of its supervisory role, the Civil Aviation Authority should not publish AIP Norway.

In order to prepare the way for this, the Civil Aviation Authority is the process of writing the regulation that will govern the aeronautical information service.
Through the Single European Sky programme, the EAIP (European AIP) will be adopted as a Norwegian regulation; the mandate for the regulation will be evaluated by Eurocontrol and will be discussed in the July meeting of the Single Sky Committee (SSC).

*RFL I:*
RFL I is built on the former BSL G, which in its turn was built on/translated from Doc 4444 PANS-RAC. It has always been the opinion of the Civil Aviation Authority that Doc 4444 PANS-RAC, now PANS-ATM, shall be the responsibility of the Civil Aviation Authority, but not as a direct transfer of RFL I. The progress of the Civil Aviation Authority in this matter depends on the development of the move to Bodø. Without this regulation, the Civil Aviation Authority lacks an important instruction instrument, and for this reason the Civil Aviation Authority wishes to assume responsibility for the task.

The Civil Aviation Authority does not have the impression that Avinor has deliberately attempted to retain governing responsibilities. Since it was established as a government corporation, Avinor has attempted to transfer government tasks to the Civil Aviation Authority, and the Civil Aviation Authority, on its part, has been unwilling. Its staffing situation has made it unable to take over these tasks.

### 6.2.4    Avinor's relationship with the Civil Aviation Authority.

There are areas where there is an unclear division of roles between the Civil Aviation Authority and Avinor, where Avinor still is the aviation authority. This applies for the area RFL 1 (Instructions for execution of air traffic service) and AIP.
Both the Civil Aviation Authority and Avinor agree that this situation must be clarified, see 6.2.3.

Avinor mainly regards the Civil Aviation Authority as the aviation authority, and applies for approval for most of the changes that it wishes to introduce, but admits that it has probably "exerted time pressure on the Civil Aviation Authority" in connection with the result improvement project Take-Off -05 (cf. the conversation with the Managing Director).

6.2.5    Requirements set by the Civil Aviation Authority for key personnel at Avinor and
          their approval.

The Civil Aviation Authority requires that the organisation (Avinor) must appoint a responsible Manager and an Operative Manager, who must be acceptable to the Civil Aviation Authority. The organisation reports on the person to be appointed, and the Civil Aviation Authority considers whether this person is suitable for the job, although without any other requirements being set than relevant background. This requirement is based on the provisions of **§** 17 of BSL G 2-1 *Management requirements*
*(1) A service provider must have an administrative and operative organisation that ensures that operations take place in accordance with current legislation and regulations for the activity.*
*(2) The service provider must appoint a responsible manager who shall be acceptable to the Civil Aviation Authority. This person shall have the total responsibility for ensuring that operations are financed and implemented according to the standard required by the Civil Aviation Authority.*
*(3) The organisation must appoint an operative manager who has the relevant background. The operative manager must be acceptable to the Civil Aviation Authority.*
*(4) Functions stated in sections 2 and 3 can be carried out by the same person.*

In principle, the approval procedures are the same for the operators and the airport operator Avinor. The procedures for approval of airports have been developed/adapted, based on the approval procedures for airlines.

The Safety and Security Director has been accepted by the Civil Aviation Authority, in accordance with Section 4.11 of A1-1.

6.2.6    The Civil Aviation Authority's relationship with Avinor.
The following has emerged during discussions with persons central in the Civil Aviation Authority:

- In the experience of the Civil Aviation Authority, Avinor does not always accept that it is no longer an authority, and therefore argues to a greater extent than others that the regulations do not apply to it. Avinor is experienced as being slower than other operators to close (accept) non-conformances that supervision reveals. This has, however, improved recently.
- The Civil Aviation Authority has requested access to the non-conformance reporting system MESYS, to no avail. MESYS also contains "operational occurrences" (e.g. loss of navigational aids). The airlines, however, report their operational interruptions (e.g. loss of an engine on a multi-engine aircraft) to the Civil Aviation Authority. (Avinor has, to the AIBN, defended its decision by saying that "These are important air safety matters, which require more detailed dialogue and clarification between the service provider and the supervisory authority." It has also informed us that the amendments to the Aviation Act now make it easier, as this protects the reporting

party against legal penalty, which is important for the maintenance of the will to
report.)
- The Civil Aviation Authority has committed itself to a case processing time of one
  month, and experiences that Avinor has exploited this in the Take-Off-05 process.


### 6.2.7    The operators' (airlines') relationship with Avinor

Surveying this depends highly on how the questions are asked and to whom. Avinor carries
out customer satisfaction surveys, but the AIBN understands these to be more of a "financial"
nature than concerned with safety. Interviews/discussions that the AIBN has had with leading
figures in the companies that are included in this survey (Widerøe, SAS Braathens,
Norwegian, CHC and Norsk Helikopter) reveal that there is a high degree of satisfaction with
service levels at Avinor, but they are decidedly sceptical to the process behind the current
restructuring at Avinor. They are also sceptical to the restructuring of the weather service and
about whether maintenance of technical equipment (esp. Gates) will be carried out in the
restructuring period.

Pilots employed by the user's state the following about today's Avinor:
- Winter maintenance has become poorer and the minimum figure for snow-cleared
  runway (30 m) has become more and more common.
- OSL is stated to have good snow clearance and de-icing.
- Several sources say that reporting of runway conditions in the winter has improved.
- Work on bird strikes is neglected by Avinor.
- The introduction of M-ADS in the North Sea is positive, although full radar coverage
  is desired.
- The aircraft knowledge of the air traffic controllers has improved, although the regular
  conflict between senior management of Avinor and the air traffic controllers is
  unfortunate.
- The introduction of Cat III at Gardermoen is emphasised as a positive measure.
- The taxiways seem to have become more poorly maintained.
- Pilots feel harassed in security controls and 50 % of the pilots asked think that the
  increased focus on security distracts attention from air safety.
- Around 75% of the pilots asked think that the unrest in Avinor has a negative impact
  on safety and security.
- 80% of the pilots asked experience the changes in Avinor as negative.

Other users (licensed aircraft technicians, cabin and ground personnel)
- Between 60 and 70% of those asked regard the unrest at Avinor as a negative impact
  on safety and security.
- Around 70% regard the changes in Avinor as negative.
- A large majority regard introduction of new technology at the airports as positive for
  air safety and security.
- A large majority regard the use of tenders for contracts for operations and maintenance
  as negative.

### 6.2.8    Understanding of roles

The AIBN has studied the understanding that parts of Avinor's management have of their responsibility for safety and security, related to the roles and legislation in the Norwegian aviation sector - seen from the perspective of air safety and security.

Examples of understanding of roles include:

Avinor chose not to plan for regulation BSL G 2-1 in the Take-Off- 05 project. The regulation had been sent out for consultation and Avinor disagreed in the content and submitted responses to the consultation exercise to that effect. Avinor chose, therefore, to base its plans on its own disagreement with a regulation that had been sent for consultation by the aviation authorities, the Civil Aviation Authority. BSL G 2-1 limited use of overtime, in relation to former regulations and the baseline air traffic control workforce (number of full-time equivalent jobs) was set without taking into consideration the limitations that soon would follow. The regulation came into force on 1 January 2004, without having allowed for Avinor's objections.

Avinor thought that the Civil Aviation Authority interpreted BSL G 2-1 ("the operations regulation") in such a way as to make the employer's management role more difficult, and in April 2005 ordered a legal consideration of whether the Civil Aviation Authority has the authority to place conditions upon the use of overtime by air traffic controllers. Legal considerations were made both before and after the appeal was rejected by the Ministry of Transport and Communications. Avinor has, as an interested party, the complete right to appeal the decision and to have a legal consideration of the matter.

Avinor has refused to hand over information for this study (Board meeting minutes) and Avinor previously refused to hand over RaADS, in-house developed software, to the investigating authority (AIBN).

Excerpt from the Aviation Act: § 12-16**.** *Duty to provide information to an investigating authority etc.*

        If requested to do so, any person has the duty to provide the investigating authority with any information they have about matters that may be of significance to the investigation. This overrides any duty not to disclose confidential information that the person concerned may be under. Any person making a statement has the right to have a legal representative or other person present while making the statement.

RFL II was cited as a ground for not providing access to the software. RFL II is a set of internal procedures and regulations for ATS units, not a law or regulation.

In connection with the "RaADS matter" Avinor stated: *"…When a serious incident or accident is investigated, it is important for consideration of responsibility or guilt that the investigating person is permitted to know clearly……"* (extracted from an interview with the Director of Air Navigation Services in the air traffic control magazine "Flygelederen" no. 4 2004). From the regulation relating to official investigation into aircraft accidents and aircraft incidents within civil aviation, BSL A 1-4: § 2. *The purpose of the investigation.*

The investigation has as its goal clarification of the sequence of events and causes, as well as discussing other significant conditions that could prevent accidents and incidents in order to improve aviation safety. The purpose of the investigation is not to apportion blame and liability. .. or from

1993-06-11 no. 101: The Act relating to Aviation (Aviation Act).:

The investigating authority shall not assume a position on blame and liability according to civil or penal law. The investigation must take place independently of other investigation that has wholly or partly such aims.


Equipment for automatic weather observation was taken into use in the "old Avinor organisation" without it having been approved by the Civil Aviation Authority. BSL G 6-1, Section 23, forms the legal basis for the requirement for approval of technical equipment by the Civil Aviation Authority. Such approval must have been given before the equipment is taken into use. ICAO, annex 3 obliges weather observations. The equipment was later taken out of operation, after Avinor's new organisation was established.


### 6.2.9    Regulations governing safety

The Civil Aviation Authority has commenced a comprehensive process for adjustment and amendment of the regulations under the Aviation Act that concern airports and air navigation services.

The safety process has been influenced by efforts in the EU (through the EEA) and Norway's membership of ICAO. For this reason, the Norwegian regulations have undergone significant change over the last five years. Among the most important are Safety Management, BSL A 1-9 (ESARR3) and use of Risk Assessments that are in the process of implementation through BSL A 1-10 (ESARR4). In addition to these, design requirements for large airfields have been made more stringent (BSL E 3-2, obstruction analyses), as have the security requirements. BSL A 1-1, the regulation governing quality systems in commercial aviation has also come into force, as has BSL G 2-1, which is based on ESARR5 ("the operation regulation").


### 6.2.10    Avinor's safety philosophy and safety goals, as Avinor has informed the Ministry of Transport and Communications

**The content of the chapter has totally been retrieved from Avinor.**

«The management pyramid» below illustrates the connection between vision, values and goals.

| Vision | | | | |
|---|---|---|---|---|
| *Values* | | | | |
| *Reputation values* | | | *Conduct values* | |
| Safe/secure and punctual | | | Open | |
| A driving force in Norwegian aviation | | | Responsible | |
| Value-added services | | | Active | |
| *Management demands* | | | | |
| Role models | Result creator | Developer | Co-ordinator | |
| *Strategic target areas* | | | | |
| Safety/security | Finance | Customer | Organisation | External |
| Environment | | | | |

*Management pyramid*          *Avinor – a leader in safety/security and punctuality in European aviation*

Avinor regards safety/security as the most important area of investment, and will contribute actively to measures being implemented within the civil aviation area in Norway.

If the number of incidents and accidents are not to increase when traffic volumes increase, safety levels must be continuously improved. The implementation of a safety management system has led Avinor to work on aviation safety in a more focused and systematic manner. One of the requirements is that all new systems and changes to existing systems must be assessed for their safety. This makes it possible for Avinor to place priority on initiatives that yield the highest safety benefit in relation to investment (cost-benefit). Development of the safety management system and implementation of the system throughout the company was an area of investment in 2004.

One of the most important aviation safety improvement measures is to correct identified unsafe conditions before they can develop into dangerous situations. The routines for notification and reporting of undesirable incidents were changed in connection with Avinor's

introduction of a safety management system in the air navigation services. This has led to a considerable increase in reports of undesirable incidents. Previously, only serious incidents were reported, but now less serious incidents are also reported. This makes it possible for Avinor to correct unsafe conditions at an even earlier point in time. Experience in other industries shows such systems increase the degree of reporting, at the same time as they decrease the number of accidents. Despite the increase in the number of reported incidents, this does not mean that safety levels have dropped. On the contrary, it provides an excellent basis for further pro-active work and higher levels of safety.

The increase in reports also plays its part in making it easier for Avinor to produce statistics and analyse trends in aviation safety. It will also make it easier to identify which measures contribute the most to increased safety. Further development in this area will be an area of investment.

Other areas of investment:

*Helicopter safety in the Norwegian Continental Shelf*
*Satellite-based approach systems to regional airports*
*Replacement of the air traffic control system (NATCON)*
*European action plan for prevention of aviation accidents (AGAS)*
*Establishment of a project for estimation of braking action (Safe Winter Operation Project, SWOP)*
*Risk-based safety management*

### 6.2.11    How safety was assessed in the political processes

#### 6.2.11.1    *Introduction*

This part of the report assesses to what degree aviation safety has been taken into account in the political decision processes, and to what degree the political decision processes have discussed changes in aviation risk levels. We have particularly considered the process around the conversion of the Norwegian Civil Aviation Administration [Luftfartsverket] into the state-owned limited company, Avinor AS.

#### 6.2.11.2    *Conversion of the Civil Aviation Administration into the state-owned limited company, Avinor*

The idea of privatising the Civil Aviation Administration in some form or another was first promoted in the Norsk Luftfartsplan 1998-2007. It was not stated explicitly in the plan, but a proposal from the Norwegian Conservative Party, Høyre, was put forward during the Norwegian parliament's Transport Committee's discussion of the matter. The proposal was voted down. We cannot find any direct reasoning by Høyre's committee members as to why this proposal was put forward. In the committee notes, Høyre states the position that airport operations should be privatised.

In the proposition to the Parliament no. 66 (1998-1999) Supervision and authority in the aviation sector and forms of association for the Civil Aviation Administration, assessment was also made of various forms of association for the Civil Aviation Administration. By forms of association is meant various organisation models for government agencies, i.e. a government corporation or state-owned limited company. *The assessments mainly examined*

*the advantages and disadvantages in a financial perspective. The advice from the Ministry of Transport and Communications was also only based on financial considerations. The impact on, and potential implications for, aviation safety were not stated.* The proposition put forward the concept of creating the Civil Aviation Authority [Luftfartstilsynet] as the administering authority from 01.01.2000, and that the old authority, Luftfartsverket, should be reorganised as a state-owned limited company from the same date. The government proposed that all supervisory activities and other forms of authority should be delegated to the new Civil Aviation Authority. This was also confirmed in the 2000 National Budget. In the proposition, the facility for political management was assumed as being sufficiently protected in the so-called Section 10 provision. The Section 10 plan is an annual plan for the company, which the state-owned company is obliged to present to the owner (in this case the Ministry of Transport and Communications) each year. Every second year, the Ministry of Transport and Communications draws up a report to the Parliament concerning Avinor's activities, with the relevant year's Section 10 plan enclosed. The Ministry of Transport and Communications thought, therefore, that this gave politicians the necessary influence. In practice, however, the majority of members of the Parliament have not shown any interest in making changes to Avinor's activities. Only one report has been submitted concerning Avinor's activities thus far.

The government's new draft for change to the form of association of the Civil Aviation Administration was presented in the 2002 National Budget. In the proposition to the Parliament no. 1 (2001-2002) National Budget, it was stated the *renewal and modernisation of the public sector was an important area of investment for the government.* Several government corporations within the rail and postal sectors have previously changed their organisation or form of association. The Ministry of Transport and Communications wanted, through this *type of company, to remove itself from detailed regulation, at the same time as it wanted to emphasise regulation and market supervision more. It was emphasised that safety had been awarded more attention. It was also noted that the Civil Aviation* Administration *would review its organisation with the intention of increasing its efficiency. The Ministry of Transport and Communications emphasised strongly that this should not be at the expense of safe traffic management. This has not been developed further. Work on safety is discussed specially in connection with the Civil Aviation* Administration*. The Zero Vision and use of safety management systems are described as important principles. Future areas of investment noted were risk assessments, a system for reporting non-conformances and safety audits*.

In the Budget Recommendation no. 1 (2001-2002), the majority of the Transport Committee put forward a *proposal to change the Civil Aviation* Administration *into a limited company. This proposal was made for financial reasons.* Advice no. VIII from the Committee was for Parliament to request the government to start the process of changing the Civil Aviation Administration into a limited company. This motion was passed.

Proposal to the Parliament no. 1, Annex no. 2 (2002-2003) contained an actual government proposal to form the Civil Aviation Administration into a limited company. This referred to proposition to the Parliament no. 60 (2001-2002). This proposition emphasised that the Civil Aviation Administration should still play a role in society and that the aviation sector should still be an important instrument in regional policy.

*The interface between the Civil Aviation Administration and the Civil Aviation Authority was also commented on in the same Proposition to the Parliament, no.1, Supplement no. 2 (2002-2003): Concerning the change of the Civil Aviation* Administration *into a limited company, etc. Transfer of official duties, such as issue of access cards and right of arrest of aircraft*

*which have not paid their charges was not proposed, but will be considered on an ongoing basis. A respondent from the Ministry of Transport and Communications claims that transfer of Avinor's remaining authority duties is still under consideration.*

The same proposition also assessed the need for social management and the Ministry of Transport and Communications emphasised that the opportunities for this would not be undermined by conversion to a state-owned limited company. One member of the Parliament informed us that the resistance to conversion into a limited company mainly concerned social responsibility, and the argument was that an organisation with responsibility for operation of airports and air traffic control services should not be, in principle, established as a limited company because it would reduce the opportunity for continual official management and control. The member also noted that the Board of the Civil Aviation Administration had resisted the conversion into a limited company because of the uncertain financial base that such a change would involve. *It came as a surprise to those who supported the change to a limited company that cuts in the Civil Aviation* Administration *were as great as they proved to be when the Take-Off-05 plan was rolled out. The member also stated that politicians' opportunity to influence the management of Avinor was heavily reduced in relation to when the Civil Aviation* Administration *existed as a government agency. The impression retained by this member was that politicians' role in this connection was reduced to only stating that none of the changes should impact on safety.*

*There were, therefore, clear political divisions in the assessment of the organisation form of the Civil Aviation* Administration. *On the one side, the government and FrP [The Progress Party] wanted an organisation that would ensure greater autonomy and more efficient administration of this sector. On the other side, the opposition wanted primarily to continue its opportunity for direct political control, especially in matters that concerned other societal goals.*

One member of the Parliament informed us that the Ministry of Transport and Communications had wide-ranging contacts with all professional communities and leaders of the individual organisations. The purpose of this was to gain sufficient information about the matter. *The member also indicated that the high level of conflict between employees and management of Avinor was partly provoked by the actions of the management.* This member also expressed a wish for more open working methods at Avinor that would include the employees to a greater degree. The member was also *concerned that the financial focus could impact on safety because of the risk of cutting existing margins. Based on this, the possibility of separating air navigation services from Avinor was considered, since this part of the activity concerned safety directly.*

Separation of the Air Navigation Services Division from Avinor, response to question 8 to the National Budget for 2005 the Parliament:  Avinor's Air Navigation Services Division provides air traffic services (air traffic control) from three air traffic control centres and 20 control towers, as well as communication, navigation and surveillance (technical support services). The services are financed by Route Charges, take-off charges and commercial income from Avinor's airport activities. *Avinor thinks that the costs of air navigation services will increase if the service is demerged from Avinor and established as a separate agency.* The primary grounds for this are stated to be the loss of synergy with the rest of Avinor in connection with administration and management of payroll and accounting, human resources, financial management, safety/security, ICT, etc. The current integrated model allows individual investments to benefit both the air navigation services and other parts of Avinor. Such a

separation will, therefore, possibly increase investment needs. The Ministry of Transport and Communications does not currently have any grounds for assessing the concrete financial consequences of establishing Avinor's Air Navigation Services Division as a separate agency or company. Nor has the Ministry any grounds for assessing the opportunity for short and long-term efficiency measures in such an organisation solution. With reference to the above information from Avinor it should be assumed that this will involve increased administrative costs that will be passed on to airline passengers.

### 6.2.12   Take-Off-05

#### 6.2.12.1   *Introduction*

Shortly after it became a state-owned limited company, the management of Avinor commenced the process of restructuring the company. The greatest change project was given the name Take-Off -05, a project that was formerly known as a "result improvement project", but which central management members now partly call a safety project and partly a reform of responsibilities (cf. discussions between central members of Avinor's management and the AIBN). The expression "safety project" seems to be of recent date. Since its inception, this project has consisted of 11 subprojects and several of these projects have been completely or partly implemented. Avinor, among other things, has been reorganised according to a Group model (subproject 01 first stage) and looks like this today (cf. report to the Parliament 36 (2003-2004)). Oslo Airport, Gardermoen, (OSL) is a wholly owned subsidiary of Avinor and, in principle, is organised in the same way as the Regional Airports Division.

The figure below shows the main structure
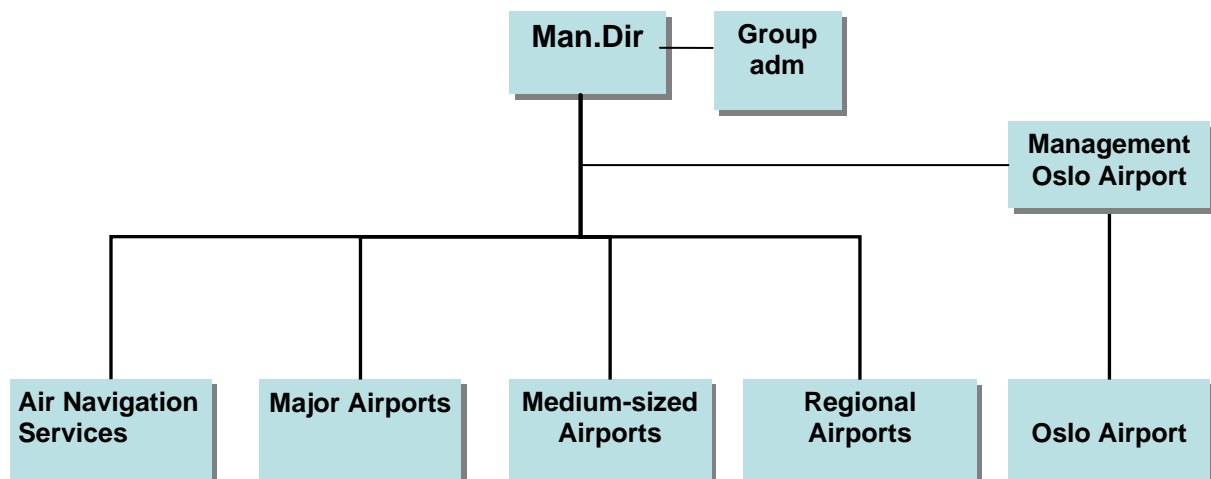


The new structure has been welcomed by the majority of the workforce, who had long been eager to see such a solution. The reorganisation provides the opportunity for stricter reporting lines than previously.

In connection with the reorganisation from 11 to 5 regions, senior management was expanded by the appointment of a Safety and Security Director, who also appointed a safety and security team. Each of the divisional directors (with the exception of the Regional Airports Division) has appointed a safety, security and quality manager, with an associated team of safety and security advisers. Each of the regional airports also has its own safety, security and

quality manager. OSL has, as at the regional airports, its own safety, security and quality manager.

At its creation, the Group safety and security team contained positions covering the following areas:
Quality, risk assessments, safety management, security and contingency, contact with the authorities, internal audits and health and working environment. The risk assessment position was removed in the Take-Off-05 project, but was recreated at a later time.

The Civil Aviation Authority has accepted the Avinor organisation model, in which AFIS is not part of air navigation services, after an SLA has been established for instructions and transfer of experience. The Civil Aviation Authority stated that they would probably not have made the same choices today.

### 6.2.12.2    *Take-Off-05 as it has been presented to the employees in newsletters*

We present below an abbreviated version of the information given to employees in newsletters from the project managers and the managing director. Employee representatives were provided with further information and employees were also given information by their line managers.

Newsletter no. 3 from June 2003 stated that the costs analysis had commenced and that 250 employees would be interviewed about use of resources. It was made clear that Take-Off-05 is a financial programme, but that changes in organisation would be considered if they would yield a financial gain.
The final decisions would be made in November/December 2003.
Newsletter no. 4, June 2003, stated that impact assessments would be made of 11 projects/initiatives during the autumn of 2003. The following projects/initiatives were presented:

1. **Management model,** including the proposal to establish a small senior management team and establish airports as the smallest financial profit centre. An air navigation services division would be established, which includes the minimum air navigation service, the ATCCs. Future organisation would be considered in the autumn. (AIBN note: on 1 March the change was made from the Group model to a division model).
2. **Joint tasks**, including organisation of payroll, accounting, decentralisation of marketing to the profit centres, relationships with the property units, consideration of development and legal services and consideration of purchasing services. In this project efficiency measures in purchasing also have an impact, through increased loyalty to framework contracts, realisation of economies of scale and reduction in the number of invoices. The establishment of a Document Centre is proposed, to manage services within mapping, drawings, document archives and basic data for administration, operation and maintenance of buildings, property and rolling material. A centre for roster planning will also be established, which will offer expertise in planning, agreements and optimalisation of resources. The centre shall prepare staffing models and plans for all of Avinor's units. The roster planning centre is one of the most important standardisation proposals from the project.
3. **Management and control of ICT**, establish uniform management and cost control through strategic management of ICT and establish a new organisation to gain control over total use of ICT resources.

4. **Service definition and pricing**, including establishment of correct pricing of services by establishing a price strategy according to business principles. These can form the basis of Avinor's proposal for revision of the traffic charge system. Existing agreements must be revised and evaluated.

5. **Adaptation of standards to requirements**, review of current regulations, etc. with the intention of adapting Avinor's levels of ambition to current regulations. Inherent in this is an assumption that Avinor's operational level is higher than current regulations permit.

6. **Training,** including the proposal for optimalisation of training activities (ASSR) according to the future needs of the ATS, cf. the proposals in project 7 air navigation services and project 8 landing/take-off/approach. Adaptation of CNS training to test-based certification using electronic methods. Close down ASST for airport services, LHT, in their current form and establish the theoretical part of the courses as e-training and allow external sources to provide the practical part of the courses. Also remove the training supplement (NOK 210 per hour) throughout Avinor.

7. **En-route Services,** including the proposal to change the sectorisation of the airspace, reduce the number of air traffic control centres, transfer the responsibility for TMA to control towers, optimise staffing and sector opening according to traffic levels, automate tasks that are currently the responsibility of the ATS operators, achieve better use of resources through improvement and standardisation of operation models (cf., among others, the proposal for a roster planning office).

8. **Take-off/Landing/Approach**, including the proposal to optimise opening hours in accordance with traffic patterns, automate tasks that are currently the responsibility of the ATS operators, one-person manning where traffic levels permit, self-relief where this is possible, improved staff planning and more detailed follow-up of resource use, reduction of the number of certification units.

9. **The CNS operation concept**, including the establishment of an overall strategy for function and service levels, the change from time-based to state-based supervision, centralisation and remote operation, as well as the introduction of a uniform management, operation and maintenance system for documentation and management.

10. **Efficiency improvement at airports**, adapt staffing levels to the official requirements for fire and rescue, adapt services to local needs, the introduction of individual work rosters, closure at night and flexible seasonal staffing (winter). Cooperation with municipal fire services.

11. **Rolling equipment**, including implementation of critical needs assessments and cost/benefit analyses for acquired material, the standard of the equipment is adapted to its tasks, making the users responsible by making total costs visible and focus on preventive maintenance.

The potential savings have been calculated as being between NOK 506 and 678 million and between 648 and 865 full-time equivalent positions (gross figures, i.e. without costs of investment and change). Based on this, it should be possible to achieve the profit improvement goal of NOK 400 mill. in 2006, compared with the 2002 result.

The various projects/initiatives (subprojects in the Take-Off-05 project) must be analysed in the following way (cf. previous newsletters)

- Cost/benefit analyses – all projects
- Assessment of the initiative's impact on safety - projects 1, 3, 7, 8, 9 and 10

- Assessment of the initiative's impact on health and working environment for employees - all projects, except 5 and 11
- Detailed implementation plan
- Communication plan for each initiative, based on who is affected.

Newsletter no.16 from December 2004 states that the en-route services will be operated from 2 air traffic control centres, reducing the number from the current 4. Quote "This assumes that NATCON has been implemented". Later simulations will distribute sectors and extend sector boundaries. Agreement was reached, stopping the previous NATCON implementation in Trondheim and training.

In May 2004, the employees were informed about the status of the 11 subprojects with their "sub-projects". Among other things, a NATCON review project, which does not report to Take-Off-05, has been established.

In August 2003, following advice from the safety team, the project management decided to engage Det Norske Veritas (DNV) to carry out an impact assessment of safety and security and health/working environment. Their work resulted in the report: *DNV Report 2003-1232*.


6.2.12.3    *DNV Report 2003-1232, Impact assessment of safety and security, and health/working environment*

The evaluation took place in the period August to December 2003, in parallel with Avinor's own production of Take-Off-05. DNV was asked to assess the impact of this initiative on projects 1, 3, 7, 8, 9 and 10. In addition, the impact of the initiative on health and working environment for the employees is measured in all of the subprojects, except for 5 and 11. The report concludes with suggestions for compensatory measures for the maintenance of safety and security, and occupational health and safe working environment for each of the subprojects.

Excerpts from the DNV report follow below. (Numbers refer to the numbers of the sub-projects)

1. **Management model,** New organisation structure, new profit centres and units and the staffing of teams in Group senior management and in the new main units.

   On 18 September 2003, the Board approved the changes we have previously described, by reorganising Avinor into a division model (the DNV report is dated 15 October 2003)

   DNV thinks that the current management model has unclear divisions of responsibility and tasks between the regions and specialist teams in head office. DNV thinks that the division model will be able to provide greater overall administration and clearer management responsibility, less local variation and, therefore, a greater degree of system security. Avinor is recommended to carry out further assessment of functions and tasks, with the associated requirements for staff and skills for safety and security professional teams. The safety and security function in the Group senior management must be given sufficient resources to fix and follow up preconditions, and also have the authority to influence central decisions that impact on occupational health and safe working environment. The Director for Safety and Security should also meet in the Group Management Assembly.

The new organisational form changes interfaces in the organisation that are significant for safety and security. The particularly important of these include Airport-TWR, TWR-APP-ACC and CNS-TWR/APP/ACC and airport.

In the new organisation, <u>TWR and airport</u> will be subordinated to different profit centres, with the responsible hub only at senior management level. Admittedly, the proximity between TWR and airport is important for the optimisation of safety, but it is emphasised that the organisation must clarify certain points, so that there is no conflict of goals between punctuality and financial priorities on the one hand, and aviation safety priorities on the other hand. Local means should be employed to optimise the process of cooperation.

<u>TWR-APP-ACC</u> all belong in the air navigation profit centre. The organisation makes optimisation of the interfaces possible.

Communication, navigation and surveillance [FNT] is a support function for the operative functions, TWR/APP/ACC and the airport service (LHT). CNS also provides services directly to aircraft in the form of navigational aids. As with TWR-APP-ACC, ANS belongs in the air navigation services profit centre. DNV thinks that this is favourable, as the CNS is organised together with the most important users, allowing good coordination with the airlines. It is a precondition that a good process of cooperation is created between airport services, LHT, and the CNS, and that this part is emphasised in the detail planning process.

Staffing and skills for the non-operative functions are assigned to this subproject. DNV thinks that there is a risk of omitting functions and tasks, or underestimating staffing and skills needs when describing the new organisation. If this assumption is correct, there is a risk that safety may be compromised in the long term, because important skills have been lost. It will also become an occupational health and safe working environment problem if employees experience overload and find that they cannot manage all of their work.

2. **Joint tasks**, the safety aspect has not been considered by DNV. Occupational health and safe working environment has, however, been considered and DNV points out that it may be favourable to place personnel carrying out the same type of work under the same roof, although it warns against monotonous work. Roster planning is considered placed in joint tasks. The risk inherent in centralisation is the distance between individuals, with the individual's opportunity to influence the roster, based on personal wishes and needs.

3. **Management and control of ICT**. (Administrative system, CNS, ATM, as well as Telephony and data communication). The project aims at optimising ICT in Avinor across the specialist areas, providing efficient exploitation of technology and resources. The quality of the deliveries impacts indirectly on safety and security. DNV thinks that the choice of organisation model (centralised or decentralised) will be about finding the balance in awareness of potential compensatory measures for weaknesses in the chosen solution.

4. **Service definition and pricing**, not assessed in safety terms by DNV.

5. **Adaptation of standards to requirements**, not assessed in safety terms by DNV.

6. **Training**, the subproject's main areas are linked to reduced training of new air traffic controllers, reduced training for air traffic controllers, an amended training system for the air navigation service, reduced training for airport services. I.e. "optimisation" of the training courses (ASSR) according to the future needs for the ATS, cf. the proposals in project 7 air navigation services and project 8 landing/take-off/approach. Adaptation of CNS training to test-based certification using electronic methods. Close down ASST for airport services, LHT, in their current form and establish the theoretical part of the courses as e-training and allow external sources to provide the practical part of the courses. Also remove the training supplement (NOK 210 per hour) throughout Avinor.

*Trainee air traffic controllers and air traffic controllers*
DNV points out that the safety and occupational health and safe working environment aspects of terminating ongoing courses for air traffic controllers, as well as halving the number of trainees in the future, stands or falls on reliable analyses of the future requirements for air traffic controllers. A possible future shortage of personnel and subsequent insufficiency of resources for air navigation services will have obvious consequences both for the working environment and safety and security. The uncertainty linked to traffic trends and political decisions must be factored into the analysis. It is also important to look at the demographic conditions (age structures).

DNV places emphasis on wide margins in relation to the calculated minimum level that is necessary to handle unforeseen conditions associated with air traffic control staffing. Reductions in on the job training (OJT) for trainees must take into account safety and the demands on the training must be evaluated and adjusted. Periodic specialist refresher courses are recommended to be changed from 3-year central gatherings to annual local/regional CRM (crew resource management) training. DNV warns that achievement of good quality training at the smaller locations may prove difficult.

*CNS*
The project suggests the change from "classroom teaching" to a combination of self study (e-learning) and the planned joint ANS course centre. DNV warns against PC-based training being introduced as a replacement for classroom teaching and practical training. CRM training can only be carried out to a limited degree using e- learning. DNV also thinks that local training would not be able to replace centralised training to the full extent.

*Airport services*
It is proposed that ASST be cancelled, and practical training be outsourced. Local/regional training should also be considered. DNV thinks that use of internal Avinor instructors should be considered even on external courses, but is otherwise positive to the proposal. There is the same concern in relation to e-learning as for CNS.

7. **En-route Services,** including the proposal to change the airspace sectors, reduce the number of ATCCs, move TMA responsibility to the control tower, optimise staffing/new staffing concept and opening sectors in relation to traffic loads, automating tasks that currently are the responsibility of ATS operators, improved exploitation of resources through improvement and standardisation of the operations model. A new staffing concept, with introduction of a Radar Controller/Planning Controller (RC/PC) as standard sector staffing. DNV thinks that this will provide increased safety by the introduction of redundancy, as long as the sectorisation requires such staffing. DNV thinks that the

physical design of the workstations has not been emphasised strongly enough in connection with this staffing concept.

The intention is for the gains to be achieved by a new sectorisation, in which the number of sectors is reduced, and the remaining sectors are made larger. DNV assumes that the evaluation project that has begun in collaboration with Eurocontrol supports DNV's recommendations. DNV points out the simulations must take place under relevant conditions.

DNV thinks that safety levels will be reduced if one-man sectors are introduced without other tasks being removed at the same time. This is not the case as NATCON is constructed at the moment.

If safety is to be maintained while splitting and merging the sectors, there must be clear rules and criteria for when the splitting/merging can be established. The status for the criteria must be monitored by the supervisor.

The splitting or merging of the sectors will mean that air traffic controllers will need time to acquire understanding of the situation; good routines for this must be prepared.

DNV considers discussions as to whether 2 ATCCs are safer than 1 or the current 4 to be irrelevant, as none can take over for the others at short notice. Having 2 instead of 1 would seem to reduce vulnerability. DNV points out that when the number of ATCCs changes, occupational health and safe working environment will become relevant to safety. It also points out that there is a problem because the existing system must be in operation at the same time as personnel must be trained in the new system (staffing, sectors). Downsizing the CNS department in parallel with these changes is warned against.

DNV cannot find any reason to declare that the subproject's proposal to change the ratio between active service and rest at the ACC positions from the current 2 hours on and 1 hour off to 0.5 hour off is unjustifiable, seen from an H&/WE perspective. It does, however, emphasise the importance of having at least one long break which can allow real relaxation in an appropriate setting.

DNV regards the order in which the initiatives are implemented during the change to the ATCCs as essential. Implementation of a new sector structure and new staffing concepts imposes safety-critical challenges, related to the order in which the changes are carried out. DNV considers the following to be appropriate:
    1)    Move into the "newly established" ATCC(s).
    2)    Carry out training in:
        1)  The systems
        2)  Roles in the new staffing concept
        3)  New sectors.
    3)    Change sectorisation
    4)    "Go live"

In general, the opinion of DNV is that the sub-project has approached its work well and methodically. The project has started with the functions that must be in place in an ATCC, and then drawn up a list of the tasks that these functions generate, before deciding on

which staffing concept is most suitable to carry out these tasks. The staffing concept is compared with alternative ways of sectorising Norwegian airspace, followed by consideration of the number and locations of the ATCCs.

8. **Take-off/Landing/Approach**, including the proposal to optimise opening hours in accordance with traffic patterns, automate tasks that are currently the responsibility of the ATS operator, one-person manning where traffic levels permit, self-relief where this is possible, extension of TMA and centralisation of APP.

   It is proposed that the ATS operator be removed. This removal will be compensated for by automating his or her duties. In the opinion of DNV, the automation will always be semi-automatic, because it will concern residual duties, and the automatic system will have to be monitored. DNV also thinks that it will be difficult to use the ATS operator's formal job description on which to base automation, because the actual duties are often more comprehensive and the current system often leads in reality to redundancy (listening watch, controlling ground traffic, etc.). Based on experience gained from automation at OSL, these tasks will be transferred to other specialist groups, although there are also proposals to downsize these.

   DNV thinks that an expansion of TMA must be carefully considered in the light of sector loading. A simulation has not been considered, either by DNV or the project. (AIBN note: An evaluation was carried out ref. 6.2.16.4)

   DNV is critical of the introduction of partial one-man tower operation (with combined TWR/APP functions) and thinks that this reduces safety in all situations, despite the proposed compensatory measures. It suggests the immediate termination of the system of one-man towers (in opening hours) where this is currently in practice. In addition to impacting on safety, it also points out that one-man operation also affects health and working environment. They base this on reduced stress management, resulting from lack of social support, and the fact that it is difficult to arrange breaks.
   (note: Avinor points out that DNV goes into more detail in its report than that which appears above and that DNV does not regard it as impossible in principle to impose compensatory measures)
   DNV recommends that job descriptions are clarified, so that safety-related duties that are currently performed can be formalised and trained for and/or that individuals' understandings of their own safety-related duties are brought into agreement with the employer's intentions and interpretation of official requirements/recommendations.

9. **The CNS operating concept**, the purpose of the project is to identify savings in operations and maintenance of the air navigation equipment. The project has focused on operation and maintenance of CNS equipment (COM, NAV and SUR), less so on other ATM equipment.

   This involves fixing the overall strategy for function and service levels, transfer from time-based to state-based supervision, centralisation and remote operation, as well as the introduction of holistic administration (creation of CNS operation with maintenance pools for each area of operations), operation and maintenance system for documentation and management.

DNV is critical of the reduction in the number of inspections of NAV approach equipment as this may increase the risk of CFIT. External factors such as grass, snow, etc. may affect the equipment. DNV thinks that this measure may negatively affect accessibility of equipment, thereby reducing safety. It should also be remembered that subprojects 08 and 10 also are favourable to reduction of airport personnel. Centralisation will probably improve the occupational health and safe working environment for CNS employees.

10. **Efficiency improvement at airports**, adapt staffing levels to the official requirements for fire and rescue, adapt services to local needs, introduce individual work rosters, night closure and flexible seasonal staffing (winter) and cooperation with the local municipal fire service.

Based on current practice and use of over-staffing, DNV considers that the proposed solution, which uses minimum staffing does not reduce safety, compared with the current situation. (Based on the fact that it is currently highly coincidental as to whether the "correct" personnel for the task are present.)
(Minimum staffing in accordance with BSL E 4-4 allows for sequential working, i.e. first fighting the fire, then damping down, then rescue. Another interpretation is that breathing apparatus specialists (smoke divers) must be present, in addition to those fighting the fire.)

On the other hand, DNV recommends that fire and rescue be regarded as parallel activities, and this means that the minimum staffing is too small. The regulation also allows for changed categories in relation to planned traffic. DNV thinks that a reduction in categories may lead to actual decreases in safety levels, because all available equipment will not be used in the case of accident. Whether or not this is in accordance with the regulations, DNV has difficulty in seeing that this does not involve an actual reduction in safety from the current level.

Individual rosters may provide increased safety, but will, in the transition phase, place a burden on the working environment. Individual rosters place great demands on CRM training. DNV does not disagree that safe and efficient execution of safety-related tasks in an accident situation requires a significant degree of trust, and that an individual can experience a decreased level of mutual trust because of the removal of the old shift patterns. This may present a serious safety problem in a transition phase. We should be aware of the logistical challenge as this is linked to individual employees' status for training and exercise when individual rosters are used.

When using a combined solution with Fire and Rescue (F&R) and airport duties, the boundaries between tasks must be clarified and airport duties must not reduce the general contingency level (the time requirement for firefighting material to reach the accident site is 120 seconds). DNV has seen several examples where execution of airport duties, at the same time as general contingency has been implemented, has been at the expense of the fire and rescue service. It is important that there is no competition between airport duties and maintenance of general contingency. The requirement for a readiness time of 30 seconds must be regarded as an absolute maximum. DNV thinks that the great opposition to individual rosters may, in itself, present an occupational health and safe working environment problem. We recommend that Avinor document and clarify the financial savings from this measure.

Use of temporary staff for winter maintenance presents high demands for training and maintenance if it is not to take place at the expense of safety.

**11. Rolling equipment**, safety assessments have not been made by DNV.

In its report, DNV has recommended a number of measures that shall compensate for decreased safety levels, and possibly also strengthen the safety measures already in place. Some of these recommendations have been taken up, others not. The AIBN has requested, but not been given, any official list from Avinor that shows which recommendations were accepted, and which alternative compensatory measures have been adopted.

6.2.12.3.1   General comments about overall safety and occupational health and safe working environment from DNV:

"DNV has the impression that Avinor, as it is today, places too little emphasis on *real* behaviour in its safety assessments, but seems to focus on the *formal* aspect of regulations and routines".

And also:

"It is the opinion of DNV that there is too much focus on sub-elements and too little assessment of the total safety aspects of the aviation sector, both within Take-Off-05, and in Avinor in general. DNV disagrees with, e.g., the claim that accessibility of the various services is not safety-related, but is only related to regularity. This is an example of a lack of a holistic assessment of total safety in the system".

And also:

"DNV has been given the impression that the various subprojects of Take-Off-05 propose to a certain degree to retrieve financial gains by moving tasks to other parts of the organisation without having clarified sufficiently whether they have the capacity to perform them. In illustration, both subprojects 8 and 9 assume transfer of duties to other employees at the airports, while subproject 10 rationalises staffing at the same airports".

And also:

"The Take-Off-05 project has worked within very limited time constraints. Given the pressure of time, there is reason to question whether all of the measures have been sufficiently considered and their impact assessed. The extent and reach of the planned measures as laid out in Take-Off-05 may lead to unpredictable consequences both in regard to safety and occupational health and safe working environment. This applies to measures within each of the subprojects, but is primarily related to cumulative effects, i.e. the consequences of major changes to systems that are closely interlocked".

And also:

"It is important that those who are told that they are leaving Avinor do not carry out tasks that are critical to safety immediately after being given notice. For this reason, Avinor must incorporate short-term overcapacity into its staffing plans. Avinor should also expect more long-term effects, such as increased absence through illness for a certain period after the plans have been published. Staffing plans must allow for this.

DNV points out that the implementation phase may create unexpected and unpredictable consequences for which a contingency must be in place. It also points out that the existing reporting system does not provide sufficient contingency.

It also points out that the same safety-related tasks at Avinor are performed differently by different employees, and that this is a safety problem. Individual practices must be brought

into accordance with the intentions of the employer and interpretation of official regulations and recommendations. Based on the fact that both people and machines make errors, error-tolerant systems must be created so that these errors do not have consequences for safety.

### 6.2.12.4    Report to the Parliament 36 (2003-2004), The company's development plan for 2004-2006 concerning Take-Off-05 and DNV

Avinor states it will actively help redundant employees to find new work outside the company. Avinor is also working towards systems that will offer redundant employees opportunities linked to the comprehensive safety and security work at airports.
*Det Norske Veritas (DNV) has assessed the various proposed efficiency measures from the point of view of safety and security, and health and working environment. It has concluded that the measures do not have a negative impact on safety and security, and that certain measures do pave the way for an improvement. This applies particularly to the new administration model, which clearly defines responsibility. DNV emphasises that the extent and complexity of the proposed changes may lead to unforeseen consequences during the period of change, for which Avinor must have contingency plans.*
In the opinion of Avinor, the new administration model will provide clearer division of responsibility and clearer order lines. At the same time, the structure will pave the way for development of an improved culture of safety at Avinor.
The downsizing of the central administration, removal of regional administrations and engagement of local airport managers will provide a decentralisation of the organisation. The airport managers will be local managers at the airports and will have responsibility for profits. The administration model, which makes airport managers wholly responsible for their airports, with air navigation services as an internal provider, is a model that has been tried out, according to Avinor, successfully at Sandefjord airport, Torp, and many other European airports.
Avinor points out that great emphasis has been placed on ensuring an independent assessment of the various proposals from DNV. Measures which may be significant for air safety will be subjected to further analysis before they are implemented. The implementation of the operative changes will not take place before the Norwegian Civil Aviation Authority has processed the changes which require approval.
The change process also contains elements that are intended to improve customer satisfaction. Avinor informs AIBN that the airlines are positive to the changes taking place in the company, and that they point out that change in the industry require all players to make changes and provide more cost-effective services.

### 6.2.12.5    The Ministry of Transport and Communications on Take-Off-05

The Ministry of Transport and Communications points out that the Board has started comprehensive processes to reduce cost levels in the company and exploit potential sources of revenue. *This process of change is very demanding for the company and its employees, and the ministry is aware that the employee organisations have expressed concern about the speed of implementation of the measures. The ministry expects the management of the company to cooperate with the employee organisation in the work of design and implementation of the change measures.*

6.2.12.6    *Special areas significant to aviation safety that are influenced by, or are part of,*
             *Take-Off-05*

The areas that are covered in this chapter have not been directly described previously in this report.


6.2.12.6.1   *Norwegian Air Traffic Control System, NATCON*

An early version of NATCON is currently in use at Røyken (ENOS) and the system became operational in 1996 when service was moved from Fornebu to Røyken. An upgrade to NATCON has been intended for ENOS. NATCON is a technically intricate, and therefore, complicated system. Avinor chose to train and use special personnel for third-line maintenance (modification and maintenance of software and hardware) and the supplier no longer has a full overview of the current system. Currently, NATCON is only in use at Stavanger/Sola.
Its complexity may be illustrated by the fact that NATCON for ATCC North is planned to have around 130 operative computers in a network, with 30 distributed units. In this system, one computer runs the flight plan display and the radar display (formerly 2 computers). The software contains 800,000 lines of code. Software development and testing is currently carried out at Røyken.

NATCON has been operative in the Stavanger Area of Responsibility (AoR) since the summer of 2004. Technicians at Røyken were responsible for delivery and initiation. Plans are in place for phasing out NARDS at Bodø and replacing it by NATCON. This decision has been deferred. The work of implementing NATCON at Værnes was very advanced when the decision was made to transfer duties from Værnes to Bodø, making Bodø into ATCC North. (There seems to be disagreement between management and employees (the technicians at Røyken and the air traffic controllers) about how far forward the project had advanced. The management points out that equipment had not been installed and the building had not been completed when the decision was made.)

Eurocontrol sets standardisation targets (often known as CIP requirements) for providers of ATC services. Providers must meet these requirements within stated deadlines and Eurocontrol demands that plans must be submitted showing when the implementation is proposed. In connection with the phasing out of NARDS and implementation of NATCON in Central Norway, 21 CIP requirements described in LCIP 2003-2007 NO Level 1+2 (Local Convergence and Implementation plan Norway) would be met.

| Note | CIP | Description | Notified as met by Avinor | Eurocontrol deadline |
|------|-----|-------------|----------------------------|----------------------|
|  | FCM01-ASP03 | Receive and process ATFM data from the CFMU | 05/2004 | 12/2001 |
| 1) | FCM03-ASP05 LA2 | Provide for AFP for missing flight plans, automatic processing | 05/2004 | 12/1999 |
| 2) | FCM03-ASP10 LA2 | Provide AFP message in ADEXP format | 05/2004 | 12/2005 |
|  | ATC02-ASP01 | Implement Short Term Conflict Alert (STCA) | 05/2004 |  |
|  | ATC02-ASP03 | Implement Minimum Safe Altitude Warning (MSAW) for ACCs and TMAs | 05/2004 |  |
|  | ATC02-ASP04 | Implement final approach path monitoring | 05/2004 |  |
|  | ATC03-ASP01 | Implement basic co-ordination support between ATC units | 05/2004 |  |
|  | ATC03-ASP02 | Implement communication support for flight data exchange | 05/2004 |  |
|  | ATC07-ASP04 | Prepare and adapt ATC systems to support Arrival Management functions | 05/2004 | 12/2003 |
|  | DPS01-ASP01 | Provide flight plan/track correlation | 01/2004 |  |
| 3) | DPS01-ASP02 | Automatic assignment and management of SSR codes according to ORCAM | 01/2004 | 12/1995 |
|  | DPS01-ASP03 | Flight data update | 01/2004 |  |
|  | DPS01-ASP04 | Flight data distribution | 01/2004 |  |
|  | DPS01-ASP06 | Route processing | 01/2004 | 12/2001 |
|  | DPS01-ASP07 | Flight profile calculation | 01/2004 |  |
|  | DPS01-ASP08 | Airspace data processing and distribution | 01/2004 |  |
|  | DPS01-ASP09 | Met data processing and distribution | 01/2004 |  |
|  | DPS01-ASP10 | Operational human machine interface | 01/2004 |  |
|  | DPS01-ASP12 | Recording and replay | 01/2004 |  |
|  | SUR01-ASP07 LA2 | Provide radar data processing | 05/2004 | 12/1998 |
|  | SUR01-ASP08 | Provide vertical tracking | 05/2004 | 12/1998 |

1) and 2) are currently covered by manual routines. 3) assumed to be covered after the introduction of ASCA.

Although NATCON is technically superior to NARDS, it is not modern in today's terms. Scandpower has stated that structure and architecture seems unstructured and without a clear vision from the start.

### 6.2.12.6.2   *Norwegian Air Traffic Control System, NATCON flex*

NATCONflex is a development of NATCON, launched by the technicians at Røyken. Centralised data processing with distribution over a common network means that all units are given access to the same data. Technical support functions are rationally thought through. It is possible to adapt sectorisation. It will be possible to locate the system at a safe and otherwise suitable site for the service of all units. The decision has been taken to use NATCON flex at Bodø AoR, although the question of a central FDS has not yet been decided.

### 6.2.12.6.3   *NARDS*

NARDS is used at the ATCC North today, and is based on a technical platform/radar equipment from the 1970s. The users describe it as unstable. Addition of new sectors, caused by the amalgamation of the Trondheim and Bodø ATCCs has stretched its performance to breaking point. The system lacks much in comparison with the more modern NATCON. NARDS was upgraded at Bodø when ATCC North was created. Avinor operates with 2006 as the expected lifetime of the system. The upgrade was approved by the Civil Aviation Authority.

### 6.2.12.6.4   *Significant differences between NARDS and NATCON*

NATCON operates with 12 radar inputs, in addition to ADS, and is superior to NARDS NATCON is able to cover a greater geographical area and possesses an improved mosaic which continually connects back-up radar, and is able to apply all radars, which NARDS cannot do.
NARDS has limitations in the map files, which NATCON does not have.
NATCON has greater messaging options (NAIS)
NATCON has short term conflict alert (STCA), in contrast to NARDS.
NATCON introduces automatic coordination, in contrast to NARDS.

### 6.2.12.6.5   *Technicians/Software development*

Much of the technical platform for the latest generation SW for control of Norwegian airspace (NATCON) has been developed by Avinor's own technicians at Røyken. Unease concerning the localisation and the relationship between central administration and the employees has led to several technicians leaving the company, with more on their way out. The management of Avinor do not regard this as a problem. They inform AIBN that the jobs have been announced and that several qualified applicants have shown an interest.

### 6.2.12.6.6   *Automatic weather reports*

Norway's extended coast, its deep fjords, high mountains and multiple climate zones pose great challenges for meteorologists. Its proximity to the Arctic exposes Norway to polar low pressure systems, which are often intense and occur suddenly. This results in very unstable weather with wind shear, icing and reduced visibility. The Norwegian Meteorological

Institute has prepared a climate scenario for the National Transport Plan 2002-2015 which outlines the main points up to 2050. The main characteristics are more extreme weather conditions, to which the Troms and Finnmark regions would seem to be especially exposed. The aviation meteorological service is a part of the air navigation service. The Civil Aviation Authority, as supervisory authority, is able to issue national regulations governing aviation meteorological services. A regulation, BSL G1-4, has been sent out for consultation, but has not yet come into force. Until 1946, there were separate civilian and military aviation meteorological services, until they were merged and came under the auspices of the Norwegian Meteorological Institute (DNMI). A formal agreement was not signed between the Civil Aviation Administration until 1995. Until lately, the aviation meteorological service has consisted of 11 offices (Gardermoen, Flesland, Sola, Værnes, Tromsø, Bodø, Svalbard, Bardufoss, Andøya, Rygge and Ørland). Two personnel groups have been associated with the service, meteorological consultants and meteorological officers. The primary task of the meteorological consultants has been to observe the weather conditions around the station, and issue landing warnings for their own airport for the next two hours (TREND). They brief flight personnel and issue draft terminal area forecasts (TAF) and cooperate with the aviation meteorologist and the weather forecasts that issue the TAF. The meteorological officers carry out continual monitoring of the weather situation on and around the airport, and communicate this information for local use, and as a basis for the forecast (METAR and SYNOP (orally given)). In the autumn of 2000 the Civil Aviation Authority started a collaborative project between the Joint Staff and DNMI with the intention of making the service more efficient, with the aim of financial savings. The collaboration resulted in a report about reorganisation of the aviation meteorological service, published in June 2002. The report outlined several potential options, in which the Civil Aviation Authority supported closing all of the offices and itself taking over all observational services, fully centralising the forecast, which is issued by meteorological personnel stationed at another geographical location (Oslo, Bergen and Tromsø), who issue the 2 hour forecasts - the so-called remote TREND. A compromise was reached with the Joint Staff, which made an exception for all of the weather offices in Svalbard, and at Bardufoss, Andøya, Bodø and Ørland. On the backbone network, the air traffic services operators (ATSOs) observe and issue METAR and SYNOP. SYNOP is no longer issued every 2nd hour, but every 3rd hour. At airports without ATSOs, air traffic controllers or AFIS duty officers perform the same task. Remote TREND is issued in Oslo, Bergen and Tromsø. Tests of remote TREND have been carried out. A good result depends on good training, good weather radar coverage of the airport, continual transfer of meteorological parameters from the airport, video/camera coverage with transfer of updated information and observers who place priority on the task. Tests proved that it was difficult to combine regular trending with daily tasks. The accuracy was, however, reasonably good. Certain weather types that are a result of local conditions are, however, difficult to forecast using this method. Establishment of remote TREND assumes introduction of AWOS (automatic weather observation system).

The automatic AWOS system generates a complete draft METAR report. All the air traffic controller has to do is to correct the visual parameters, if necessary, before METAR is sent. An early version was used at Tromsø, Alta, Banak and Kirkenes. This system has been discontinued, and the work of acquiring and approving a new system is in progress. The oldest system will also be upgraded for approval by the Civil Aviation Authority. Apart from the tests of remote TREND, no form of impact assessment was carried out. Various users have attempted to influence Avinor to retain the weather service, but these have only acted in unison to a limited extent. Both SAS and OFS' helicopter committee have expressed criticism of the choices made.

Statskonsult have prepared a report on behalf of the Ministry for Education and Research, concerning the organisation of the Meteorological Institute, which includes in chapter 2.3.2.1 discussion of the aviation weather service: "*As long as this is not exposed to competition, and is considered to be central for air safety reasons and therefore a service that society demands, it should be considered to be a core activity. There is still confusion as to the responsibility between met.no as the service provider, Avinor as the purchaser and the Civil Aviation Authority as the supervisory authority in all matters of air safety,.....*"

### 6.2.12.6.7   Automatic switchboard

Plans are in place to equip all telephones handling incoming calls in control towers with "automatic answering machines".

### 6.2.12.6.8   Traffic Management System SOL/NORSIM

SOL/NORSIM is a new planned traffic management system for southern Norway. The system has undergone simulation testing which revealed that little was needed prior to potential deployment. Time has passed, and in the meantime traffic loads in the area have increased. Oslo Approach currently handles a traffic load equivalent to Stockholm Arlanda with around half of the staff of S. Arlanda.

Figures at this and the following pages show equivalent figures from Oslo Gardermoen (ENGM), Stockholm Arlanda (ESSA) and Stockholm Bromma (ESSB), presented as graphics.

AD ENGM G Entry Counts (Hour/20)

Observed period: 00:00 - 24:00, Thu 17 Mar 2005

Entry (Hour/20 Min)

( TL )



AD ESSA G Entry Counts (Hour/20)

Observed period: 00:00 - 24:00, Tue 26 Jul 2005

Entry (Hour/20 Min)

( TL )



AD ENGM G Entry Counts (Hour/20)

AD ENGM G Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Tue 26 Jul 2005

Entry (Hour/20 Min)                                                                                ( TL )___



AD ESSA G Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Fri 24 Sep 2004

Entry (Hour/20 Min)                                                                                ( TL )___

AD ENGM G Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Fri 24 Sep 2004

Entry (Hour/20 Min)                                                    ( TL )____



AD ESSB G Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Fri 18 Jun 2004

Entry (Hour/20 Min)                                                    ( TL )____

TV ENOSFAR Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Fri 18 Jun 2004

Entry (Hour/20 Min)                                                        ( TL )____



AD ESSB G Entry Counts (Hour/20)

Observed period:  00:00 - 24:00,  Fri 18 Jun 2004

Entry (Hour/20 Min)                                                        ( TL )____



TV ENOSFAR Entry Counts (Hour/20)

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                         TV ENOSFAR Entry Counts (Hour/20)

                 Observed period:  00:00 - 24:00,  Fri 18 Jun 2004

   Entry (Hour/20 Min)                                                      ( TL )____
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The target date for deployment has been 2006, but the Take-Off-05 process has meant that it seems as though the resources needed for deployment are not in place and deployment has been postponed. The management of Avinor point out that no staffing reductions have taken place at Oslo APP or at Oslo ATCC. AIBN has previously in this report referred to the growth in air traffic at Gardermoen over the last few years. Despite the growth, it can be seen that current traffic is at a level equivalent to when Gardermoen opened. It is considered that air safety has been maintained at Oslo TMA by introducing limits to the number of aircraft per hour (60 aircraft per hour, apart from one hour of 65 aircraft in the morning) (cf. e-mail from Avinor, dated 25.07.05)

Eurocontrol has defined Oslo Approach sector West and East as "Severe Overload" in its design. The mixture of concurrent incoming and outgoing traffic, transit flights and VFR traffic on the same APP frequency is virtually unique in Europe at so busy an airport as Gardermoen.

The Planner position is still occupied and operated on a manual basis, and does not have automatic sequencing equipment (AMAN). AMAN was a demand/strict requirement from the project group behind the Luftrom 98 airspace project before the introduction of the current traffic management system "Luftrom 98". (Luftrom 98 was a review of all Norwegian airspace, the transfer to B-RNAV, ATS routes and new names for the former Airways. This change took place at the same time as the opening of Gardermoen.)

New traffic restrictions around Gardermoen are being put into place by the Civil Aviation Authority as part of noise abatement measures. This will lead to changed approach patterns in comparison to today. The Civil Aviation Authority considers (letter from the Civil Aviation Authority to the Ministry of Transport and Communications, dated 7 July 2005) that

flexibility for ATS will be as great as before the introduction of the noise abatement measures.

Traffic growth in Norway has been great over the last two years, and greatest at Oslo Gardermoen (ENGM). At ENGM, growth in 2004 reached 9% and up to June 2005 it has reached 5.7%.

Based on the proposal for reduction in the number of sectors, leading to larger remaining sectors, Eurocontrol was asked to carry out a simulation, which took place at the University of Beograd. The simulation built on the SOL/NORSIM results and was in several phases. The result of the simulation showed that the sector central could be set to operative, but pointed out that several of the sectors appeared impossible to handle/too large and that air safety would be reduced with a deployment as described. The proposal for a heavy reduction in the sectors was sent back in modified form. (The project did not change the expected need for air traffic controllers.)

In its report 4/2001 the AIBN made the following recommendation (4/2001):"The AAIBN recommend that the Civil Aviation Authority consider a revision of all aspects concerning the STAR and SID procedures at Oslo Airport Gardermoen in order to ensure adequate separation between arriving and departing aircraft."

This recommendation was closed by the Civil Aviation Authority on the grounds that introduction of SOL/NORSIM would solve the problem.

### 6.2.13    The process of creating ATCC North

Group 7, which studied the localisations of the ATCCs, asked for input from Oslo, Stavanger, Trondheim and Bodø ATCCs if they were able to maintain ATCCs South and North, respectively. The question did not contain a specification and the responses were, therefore, submitted on different bases. These responses formed part of the basis for choice of location. Subsequently, employees at the Trondheim ATCC have interpreted the responses from Bodø as disloyal and this has create a somewhat "tense atmosphere". Only 7 months elapsed from when the localisation decision was taken until ATCC North was deployed. Training for a new sector normally requires 6 months.

#### 6.2.13.1    *Background description / Sequence of events ENTR/ENBD*

4 December 2003        :Board decision to reduce ATCCs from four
                                    to two
18 February 2004       :Board decision to locate ATCC North at
                                    Bodø
15 April 2004              :Sector Central comes into operation
                                    (merger of ENTR sector North and ENBD
                                    sector South).
12 September 2004    :(ENTR) sector South at Bodø comes into
                                    operation.

Deployment of sector Central was achieved without transfer of personnel from Trondheim to Bodø. The process was approved by the Civil Aviation Authority.

Training and preparation before deployment were carried out using resources from Bodø (there were no personnel from Trondheim in ATCC North's project organisation)

Training and authorisation in the new sector Central was carried out in a simulator. Excemption was given from the OJT requirement and "self checks" were carried out without any form of transfer of experience.
Sector Central was deployed with a new staffing concept on the NARDS platform (EC (executive controller)/PC (planning controller) plus ATS-operator)

Deployment of Trondheim sector South in Bodø was, in its entirety, carried out using authorised personnel transferred from ENTR.

Administratively, the 16 air traffic controllers with the least experience and 6 ATS operators were transferred and made subordinate to the local management in Bodø (two of these controllers were granted leave of absence until mid-2005). None of the 16 air traffic controllers was made supervisor.
The report from DP 07 indicated transfer of 11 air traffic controllers (5 of these to the NATCON reception project).
The report from DP 07 did not describe transfer of ATS operators from TR to BD to run sector South.

In order to have sufficient capacity to implement PFO and cross authorisation training (authorisation in other sectors in order to achieve more efficient operation) of air traffic controllers, two controllers and two ATS operators have been engaged at the simulator at Værnes. Despite these measures, it seems to be difficult to implement PFO within the time constraints (October). (Cf. lack of voluntary instructors)

The increased workload following the change has meant that use of overtime and absence due to illness, compared with the figures at the Trondheim and Bodø ATCCs, are high at ATCC North (cf. also Tenebø report 6.2.22).

6.2.14    Experience so far from the localisation of ATCC South

Oslo APP and Oslo ACC both work in the same OPS room at Røyken. Following the decision to locate ATCC South at Sola, the organisations of APP and ACC were divided into two separate units (01.03.2004). APP is subordinate to Gardermoen TWR/APP. Until this date, the allocation of air traffic controllers to ACC and APP was carried out on a more or less random basis, based on the current existing needs, regardless of whether it was new trainees who were taken in, or whether it was controllers from other units who were being converted. This random nature has created unrest, as those who belong to Oslo ATCC have to move to Stavanger, while those who belong to APP may continue in eastern Norway. Some of those associated with ACC are also checked out on Farris APP, a sector that is expected to accompany Oslo APP to Gardermoen. Employees who were allocated to the Oslo ATCC on 1 March, feel it to be extremely unfair that the seniority principle has not been followed. The management have based their decision so far on APP service meaning Gardermoen, with ACC (possibly also Farris APP) meaning Stavanger.
The situation in the OPS room now has become an unfavourable working environment in which to handle steadily increasing traffic volumes in eastern Norway over a period of several years.

From the evaluation report from subproject 07:

- In November 2003 the subproject made no recommendation concerning the location of ATCC South. It was recommended that the project for the localisation of ATCC South should submit the localisation decision basis on 1 June 2004, and the Board should decide the localisation in July / August 2004. This created an atmosphere of resignation among many of the employees, and there were at times numerous and heated discussions in the operations room. Because this could easily affect air safety the management attempted to limit such discussion in the operations room.
- The management assumed later that a recommendation would be submitted in early August, so that it could be discussed in a Board meeting at the end of August / beginning of September. Before publication of the localisation recommendation, measures were set in place to take care of any employees who needed attention at both units. This included both support from colleagues and increased staffing.
- The Board chose to postpone its discussion of the localisation until its meeting on 6 October. Based on this, the management chose to postpone its publication of the recommended localisation until 27 September 2004. This provided fertile ground for a lot of speculation and hopes. Many employees had the feeling that they had been "taken for a ride", a feeling that was further supported by the fact that the explanation for the postponement was regarded by many as not being genuine.
- Regularity was maintained in the period until the recommendation to the Board was published, but the working environment at Røyken was characterised by many as rather poor. Publication of the recommendation created strong reactions among the employees of Oslo ATCC, which led to a complete interruption of operations for almost 24 hours. There was a lot of speculation about a hidden agenda and whether the figures were correct. Most people were in a state of disbelief and revolt, and thought that they weren't given answers to the questions that were asked.

### 6.2.15    Training air traffic controllers

Before the result improvement programme, Take-Off-05 was started, the number of air traffic controllers at the Civil Aviation Administration was marginal, even with the use of virtually unlimited overtime. In 1993, training of a group of trainees was cancelled, which led to ripple effects for a long time. The lack of this group was especially noticeable during the major changes in the period 1995-1999, which featured the openings of the Røyken facility and Oslo airport at Gardermoen.

Around 20 trainees were recruited in 2003, and they should have started training in August of the same year. Their training was cancelled at a week's notice. The reason given for the cancellation was a surplus of air traffic controllers in Norway. This decision was made after 5 of the 8 booked (and paid) courses had been completed at UNDAF in USA. Normally, two groups of prospective air traffic controllers have been trained each year, but until now (July 2005) Avinor has chosen not to train 4 groups of prospective air traffic controllers.

Avinor wants a new training concept with pan-Nordic training in Malmö. Avinor has indicated a need for 7 trainee air traffic controllers per group. Plans have been made to send a group of trainees to Sweden for training in August 2005. Avinor points out that it will be possible for it to send larger groups than 7 if needed. It is also emphasised that the groups in

2000 -2003 were "abnormally" large, in order to take up the slack that resulted from the previously cancelled courses.

### 6.2.15.1 *The pan-Nordic Academy for training and further training of air traffic controllers in Malmö*

(Below follows an excerpt from the project group's report,
dated 10-05-2004)

The Academy's area of activity:
The Academy's main tasks in accordance with the above
are as follows:
  * Initial Training
  * Further training
  * Recruitment and selection

Apart from this it is proposed that the academy is given the opportunity to carry out commercial training activities within one of the areas specified in more detail by the academy's Board.

Initial Training
The need for Initial Training has, in the short term (2005 – 2008) been estimated at 2 courses per year, with a maximum of 18 students on each course. These dimensions are based on an anticipated annual requirement from AVINOR, LFV and NAVIAIR of approximately 7, 16 and 12 trainees, respectively. Joint training for the three owners must be developed in accordance with ESARR-5 (Initial Training) and Eurocontrol Common Core Content (CCC) as basis. A student licence may be issued on this basis (in accordance with ESARR 5). The documentary material must, before it can also be used for commercial sales of training, be produced in English, but the owners propose that the Scandinavian languages be used for teaching.

PFO has been introduced in the period and will be carried out annually.

### 6.2.16 Staffing and use of overtime for air traffic controllers

### 6.2.16.1 *Use of overtime*

Use of overtime is regulated from 1 January 2004 by BSL G 2-1 "The Regulation concerning establishment, organisation and operation of air traffic services". Annex 8 concerns working hour regulations for operative personnel:

1. The duration of normal working hours

   Normal working hours must not exceed 9 hours per day. Normal working hours shall not exceed 36 hours per week, when taken on average, not more than 48 hours per week.

2.  Work schedule

    A work schedule shall be prepared, showing the individual employee's working and leisure hours. When preparing and changing the work schedule, special emphasis shall be placed on air safety and the health of the employee.

3.  Overtime work

    The provisions of the Worker Protection and Working Environment Act apply to overtime working, with the following additions;
    (1)     The employee shall be given a break of a minimum of 1 hour after 12 hours at the latest.
    (2)     No employee may work more than 12 consecutive days.
    (3)     Permission shall not be given for overtime working exceeding 25 hours in a 4-week period, and exceeding 200 hours in the calendar year for an individual employee.
    Working hours at the workstation and breaks are not regulated in BSL G 2-1, except for the generality that the individual unit must have a system in place that regulates staffing, service, position and break times. (Section 20).

    Until BSL G 2-1 came into force, working hours were regulated by the "productivity agreement for air traffic controllers". This limited overtime in the following way:
    1)  The length of a working day should not exceed 16 hours
    2)  Max. 40 hours overtime in a 4-week period
    3)  Max. 300 hours overtime per year.

Avinor has stated that planned overtime is not used. The company disagrees, however, with the conditions that the Civil Aviation Authority and the Ministry of Transport and Communications impose in their interpretation of the legislation, (BSL G 2-1), and thinks these impose restriction on its management right to use of overtime.

The introduction of the "operations regulation" has led to a reduction of the total use of overtime in the period. Historically, some units have had high levels of overtime (Bodø) while others have had low levels (OSL Gardermoen). Air traffic controllers at OSL boast of their good working environment.

Avinor's main principle for ATCC staffing is a minimum concept, in which tasks are covered according to the minimum requirements of legislation and regulations, where these exist, and otherwise according to internal analyses (cf. also DNV). There has been a great deal of conflict around staffing in the Air Navigation Services Division, with a large gap between the union's and management's analyses. The management thinks that it has provided the spare capacity that DNV recommended in its report, while the air traffic controllers disagree.

An analysis of current and future requirements for air traffic controllers, ATS and AFIS duty officers in subproject 07, en-route services and in subproject 08, take-off/landing/approach provided input that was used in subproject 06, training. Based on estimates in subprojects 7 and 8, the then Director for Airports and Air Navigation Services therefore recommended no recruitment of trainees in 2004. The recommendation for the pan-Nordic air traffic controller training was for training of 7 students per annum, half of those trained in previous years. As at

July 2005, the pan-Nordic training has still not begun. Much indicates that it will be difficult to carry out a pan-Nordic training programme again this autumn.

### 6.2.16.2    *Air traffic controller staffing from the evaluation report, subproject 07, Take-Off 05*

The evaluation was carried out in the period after the deployment of ATCC North. The need for air traffic controllers has proved to be greater than predicted in subproject 07. The needs analysis builds on Avinor's wish to halve the number of sectors. A reduction in the number of sectors with fewer and far larger sectors proved to be impossible to implement without a reduction in air safety. The evaluation report sums up "*As the preconditions of phase 1 have to be changed, the report is actually built on an unrealistic foundation. This means that the savings and staffing calculations later in the report will also have to be changed. This will lead to an increase in staffing requirements.*"

### 6.2.16.3    *NATS (The British National Air Traffic Services) report*

NATS was commissioned to review the sector loadings at ATCC North. This area was scarcely discussed in the report, but it described a potential staffing, based on the principle NATS itself uses. We quote from the report:

> *Using the team system with a sub roster shows some slight improvements in efficiency due mainly to the rostering of nights in pairs. The average attendance rate is very similar to the present one (212 attendances per year). The total number rostered is 50 (45 rostered and an additional 5 for leave).*
> *This gives 5 teams of 10 although some would be floated off from time to time for the subrosters. This is based on the existing number of duties employed. A detailed analysis of workload could produce a different figure.*
> *There is additional leave and spare capacity on the roster. The spare capacity equates to between 5 and 6 additional staff – two rostered Monday to Friday and approximately 4 from shifts not used after leave. Some of this spare capacity is at weekends where its use may not be so easy to extract for other purposes.*

The report otherwise shows that employees at NATS work 0.5 to one hour less per week, have fewer days at work and more days off than the employees at ATCC North. The comparison may be somewhat over-simplified, and Avinor's management thinks that the figures are not necessarily correct.

### 6.2.16.4    *Air traffic controller staffing from the evaluation report, subproject 08, Take-Off 05*

As in the evaluation report after subproject 07, the evaluation report after subproject 08 also shows that it was based on incorrect conditions and that the practicality of a number of proposed savings measures is now in considerable doubt. The assumed reductions in the numbers of air traffic controllers at the Bodø, Ørland, Værnes, Flesland, Sola and Gardermoen control towers, as well as at Oslo APP, down to the levels proposed in the project (which were adopted and, as in subproject 07, contributed to the dimensioning of air traffic control training) cannot be achieved without a serious impact on air safety. The report shows that several units operate with minimum staff levels.

### 6.2.16.5    *Applications for excemption to the Civil Aviation Authority in 2004*

In the autumn of 2004 several units were forced to apply to the Civil Aviation Authority for excemption to use overtime working. This is mainly due to understaffing following the introduction of a maximum of 25 hours overtime in a 4-week period.
The following units were granted exemption from the regulation.
Kirkenes TWR/APP, Tromsø TWR/APP, Bodø ATCC, Vigra TWR/APP, Stavanger ATCC, Sola TWR/APP, Oslo ATCC and Andøya TWR/APP.
In addition, several units reported understaffing for reasons that included expected retirements in the near future.

### 6.2.16.6    *Age structure of the air traffic controllers*

The AIBN has used Avinor's 2001 list showing age groups of air traffic controllers to see when the expected retirements will come. This shows that while there have been relatively few leavers who have reached retirement age over the last 5 years, there are large groups who will reach the 60 year-old retirement age in the next few years.

### 6.2.17    Staffing fire and rescue

Avinor has interpreted the regulations in such a way that there is no requirement for concurrent firefighting and rescue. Variations have also been introduced in the categories, according to planned air activity (the number of air movements and types of aircraft). This means that if few flights are planned in periods of the day, the category that requires the least possible fire and rescue staffing is chosen. By not arranging for concurrent fire and rescue, there is no need for smoke diver personnel in addition to those engaged in firefighting.

### 6.2.18    Employment of air traffic service operators (ATSOs)

After management notified that the ATSOs will be surplus to requirements, many of them looked for new jobs. Several of them have left, although the work they did is still required. Avinor is now planning for these positions to be replaced in the long term by automated solutions/new technology. Where this does not take place, air traffic controllers will take over their tasks. In this phase, where ATSOs have left, their tasks have been shouldered by others (air traffic controllers, temporary staff or employment of surplus ATSOs)

### 6.2.19    Staffing in group administration/regions and joint services

Take-Off-05 started with splits into divisions, according to the Group model. An important driving force in this process was to "slim down" the organisation and many of the staff at head office left the company. These included many important functions, which may be vital during reorganisation. Those who remain, therefore, have high workloads. By November 2004, these groups had lost 143 full-time equivalent jobs. (ref newsletter no. 20. Nov. 2004)

### 6.2.20    Results of a survey accomplished in Avinor

In connection with this survey, the Norwegian Institute for Transport Economics (TØI) collaborated with the AIBN in March and April 2005 in a questionnaire sent to employees of Avinor (and to the Civil Aviation Authority and other operators in the Norwegian aviation industry). The report (TØI report 782/2005) that resulted from this questionnaire is attached (See annex 1).

### 6.2.20.1    *Safety culture among various employee groups*

From annex 1, TØI report:

A number of common questions have been addressed to all employee groups. These include a set of 25 questions taken from GAIN (2001), aimed at measuring the "safety culture" at Avinor.

A number of groups have found it difficult, or impossible, to provide a meaningful response to some of these questions, because they refer to "managers" in the organisation, without stating precisely which management level they should have an opinion about. This has been a problem for many employees, and we have chosen to ignore questions from managers in this part. A number of concrete questions concerning the management's focus on safety are asked later in the questionnaires, so that the data set will still contain much information about this.

The original GAIN index has a maximum value of 125 (everyone agrees with all 25 statements). According to GAIN (2001), organisations with 93-125 points are characterised by a "positive safety culture", organisations with 59-92 have a "bureaucratic safety culture", while organisations with 25-58 points have a "poor safety culture".

To calculate an index for safety culture, we have totalled all of the questions that are equivalent to those in GAIN, while omitting the eight questions that concern managers. This also has the advantage of allowing better comparison of managers' responses with responses from non-managers.

The modified index that we have constructed has a maximum value of 85 ((25-8) x 5), and a three-way split of the scale provides the following divisions: 17-39 points = poor safety culture, 40-62 points = moderate safety culture and 63-85 points = good safety culture.

### 6.2.20.2    *Best safety culture among managers and cabin crew – poorest among air traffic controllers and AFIS duty officers*

From annex 1, TØI report:

*AIBN comment: Note that the questions are directed at conditions at Avinor and that safety culture, therefore, relates to how air traffic controllers and AFIS duty officers experience that Avinor, as a company, handles safety, and the same for cabin crew and managers in relation to their respective companies. The next section provides more information about the questions and responses.*

Figure 6-1 shows the various groups' average score on the safety culture index, as measured by the questionnaire.
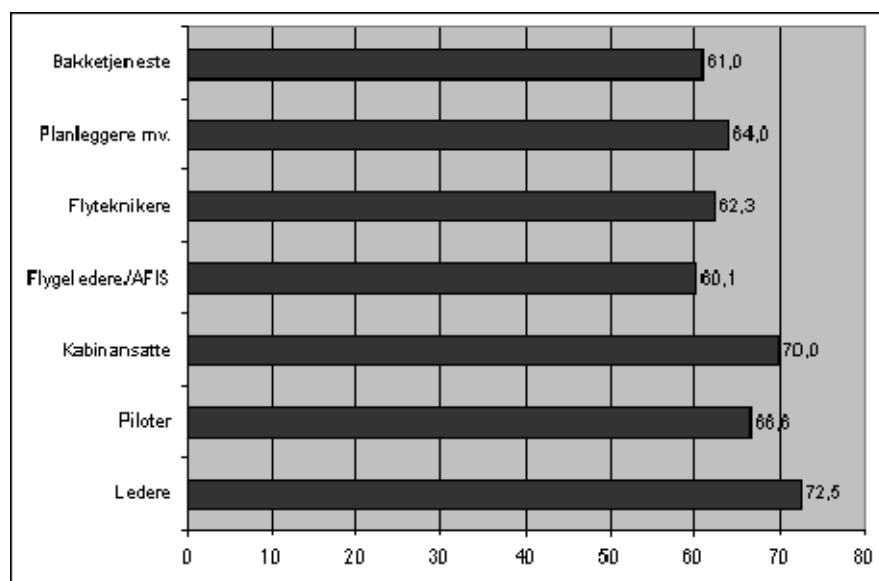
*Groups (top to bottom):*
*Ground services*
*Planners, engineers (BSC/MSC) etc.*
*Aviation technicans, (engineers)*
*Air traffic controllers/AFIS*
*Cabin crew*
*Pilots*
*Managers*

*Figure 6-1: Average score on the safety culture index among managers and various employee groups. (Source: TØI report 782/2005)*

None of the groups have an average score that indicates that they are in organisations with "poor" safety cultures (< 40 points). Four of the groups have an average score of more than 63 points, which indicates that they belong to organisations with good safety cultures, as measured here.
There are fairly large differences among the various groups. Cabin crews have an average score on the index of 70, while air traffic controllers and AFIS officers have an average of 60. These differences are significant, measured with traditional T-tests, apart from the difference between ground services and aircraft technicians, and ground services and air traffic controllers.
Among air traffic controllers, the greatest differences are driven by where they are stationed; those who are stationed at regional airports (AFIS) regard the safety culture as far better than those stationed at the ATCCs at Bodø and Oslo.

6.2.20.3    *A rough review of the responses from air traffic controllers and AFIS officers*
The responses from air traffic controllers and AFIS officers that provided the results/indexes shown above can be summarised as follows:

- The survey shows that the management's safety attitudes are not good enough, and the employees feel that they are not consulted enough. Nor is information about safety matters good enough. Work is commenced without analysis of potential risks being carried out. It takes time before procedural errors are corrected, so that theory agrees

with practice. Safety is not a topic in all meetings. Some few people at Avinor think that safety is the first priority.

- There is little confidence in the professional ability of the management, with subsequent ability to make the correct safety decisions.
- The results show less influence over the rosters at the ATCCs than at the other units (where influence is great). A majority think that Avinor places unrealistic demands on the work of the air traffic controllers.
- Most are aware of the reporting system that Avinor's management has encouraged them to use. Few are afraid of reprisals based on their own reports. Most of the employees (apart from Bodø ATCC) are satisfied with how local management handles incident reporting, but few are satisfied with how the air navigation services division handles and analyses these reports.
- Praise is seldom given (while the management thinks that it praises often).
- Communication with the management is not good.
- A majority thinks that automated weather services are less reliable that the manual service.
- The social working environment imposes challenges to safety at the Oslo and Bodø ATCCs, but is otherwise satisfactory.
- There is not abnormally great opposition to the merger of ATCCs from a safety aspect.
- A majority think that personal problems disturb their work, and that they are not efficient when they are tired.

### 6.2.20.3.1   *Changes over the last 5 years (responses that have been given by many):*
- Focus on safety has been significantly reduced among management, has increased among employees.
- Reporting is much better (MESYS)
- Adherence to the regulations is better.
- There are slightly more who think the Civil Aviation Authority's supervision is better than before
- The use of double shifts has increased at the ATCCs, although there is an improvement at the other units.
- Courses and OJT seems to have improved (with the exception of the Bodø ATCC).
- Job loyalty is far poorer - as is the cooperation between managers and employees.
- Loyalty between colleagues seems to be relatively unchanged (apart from Bodø ATCC).
- The physical working environment has become somewhat poorer for some units, and has improved for others.
- Awareness by air traffic controllers has become poorer at Oslo and Bodø ATCCs.
- ATS staffing has worsened in the period, as have shift plans.
- Better communication between the tower and pilots.

### 6.2.20.3.2   *A list of the most important changes and the significance they have had for aviation safety; the majority view is shown (Avinor-related):*
- Change from the Norwegian Civil Aviation Administration to Avinor, negative
- Moving the Civil Aviation Authority, negative
- New technology in aircraft, very positive

- New technology at airports, positive
- New technology in towers, positive
- Changes in use of staff, negative
- Increased use of tender process, negative
- Take-Off-05, ATS reorg, very negative
- Increased focus on security, positive
- Reduction in number of employees, more positive to reduction centrally than in regions.
- Separation of Civil Aviation Administration and Authority, very positive
- Increased use of PC-based information, positive
- Removal of assistant air traffic controllers, negative.
- Access to and presentation of meteorological data, negative
- 2 ATCCs, negative
- Cancellation of academy uptake, very negative.

### 6.2.20.3.3  *Safety-related claims:*

- Many routines provide a false sense of security, agree pretty much
- The Civil Aviation Authority is important for safety
- The graded reduction in safety margins will lead to more accidents
- Norwegian airports are as safe as others in western Europe.
- Do not agree that long breaks lessen safety.
- Few people are worried about losing their jobs in the near future.
- Personnel who have been given notice are a safety risk.
- Security has been achieved at the cost of safety
- A majority think that air traffic control services can be performed from one single ATCC
- The shift plan makes shearing of experience/social contact more difficult.

Air traffic controllers and other employees respond similarly, but the management often has a diametrically opposite viewpoint (with the exception of the claims).

### 6.2.21  Avinor's internal questionnaire sent to employees of Bodø ATCC

In May/June 2005, virtually all of the staff (90 employees) at Bodø ATCC were interviewed by Tennebø & Partner, on behalf of Avinor.
We quote from the report:
*A great lack of resources is experienced - both in management/administration and in operations.*
*All in all, everyone has the impression that there is a great lack of personnel. This leads to stagnation and lack of time for administrative tasks, trial of ideas in the simulator to find new ways of handling air traffic, sufficient updates of routines and regulations, etc. Lack of resources - takes resources away from daily operations. Change projects - a heavy extra burden.*
*This is a weary organisation, I hear that absence through illness is increasing, and meet a lot of employees who seen tired and demotivated. Employees are marked by the changes, uncertainty and wearing-down, both in connection with the Take-Off process and the merger with Trondheim. There seem to be different cultures in Trondheim and Bodø, which collide. Many express little confidence in local senior management.*

*An overall impression is that they wish for a clearer and more visible local leadership: management that provides much more information, even if nothing special is happening, and a management that is more forceful in its communication with central management at Avinor, especially concerning needs and lack of resources with the central administration in Oslo. Strong traces of a wish for a greater degree of proximity to the senior manager. Several employees look for management that shows itself more in the corridors; that pops its head round the door and says "Hi, how 's it going?". Both young employees and the "old guard" emphasise especially the lack of openness around processes, information and organisation of the workplace with shifts, reporting routines and duty rosters that allow them to plan their lives more than a week in advance. It is unfortunate that the CRM process has not been followed up, and everyone pointed out that the small subsidy for fitness training has been withdrawn. Not based on the symbolic amount, but precisely because it was seen as a welcome pat on the back. When a pat on the back is withdrawn it creates irritation and amazement. Bodø is managed in detail from above, and questions are asked about the local management's ability to work on behalf of Bodø within Avinor. Small matters have great weight, both positively and negatively, and this should be appreciated in the choice of future initiatives.*

### 6.2.22   Internal occupational health and safe working environment surveys

The various divisions have carried out occupational health and safe working environment surveys. The distinctive feature of these is the lack of confidence in senior management.

### 6.2.23   Safety vs security

The Ministry of Transport and Communications has issued regulations governing the Prevention of attacks on security in the aviation sector, which came into force on 5 May 2004, implementing Regulation (EC) no. 2320/2002 with underlying regulations in Norwegian legislation. Norway has requested excemption from the requirements in the above regulations, with the exception of the implementation date for the regional airports, which was set at 1 January 2005. Avinor has accepted the regulations as such, but the implementation of the regulations at the individual airports is still taking place. Local practical schemes are accepted, but the requirements of the regulations are adhered to.

The EU Commission holds meetings every 6th week with security experts from all of the member countries, as well as the EFTA states. The intention of these meetings is to evaluate and develop the regulations. In this connection, major changes to, and increased stringency of, security requirements are expected in the near future. 28 European states now share common regulations.

The EU Regulations have led to a far more comprehensive security regime in the period. A great deal of resources has been used on equipment, and personnel have been employed to carry out the checks.
Engineers, pilots and others with ID cards who work "airside" must pass through security control one or more times in the course of their working day. Several of those asked think that the new regime does not improve aviation security, as it takes resources from other aviation security work which would have provided a greater benefit. In particular, those who have to pass the security control several times per day find it unnecessary, and think that several of the security guards have the wrong focus. The practical solutions are thought to have not been thought through sufficiently.

## 6.3 Analysis

### 6.3.1    Take-Off-05

The project was initially intended to be a "result improvement project", which could, if all of the preconditions were correct, also yield safety benefits. Professionals and employee groups attempted to provide input stating that not all of the preconditions were correct, and the project would not, therefore, achieve the planned result. Much important input was not acted on.

This included:

- The time aspect - such a comprehensive change in a safety organisation would require more time.
- New regulations governing training were not taken into account, and use of overtime that would consume larger resources than was the case when the project started.
- Most of the staffing proposals were based on minimum requirements, and did not sufficiently take into account the fact that such a process places demands on the organisation, and must therefore be motivated and maintained until the project has found its feet.
- A number of personnel at head office left Avinor early in the process. In hindsight it seems that this has depleted the organisation to such a large extent that many safety-critical tasks have not been carried out, including the introduction of SOL/NORSIM, follow-up of non-conformance reports in MESYS etc.
- The composition of the project groups was questioned, and with hindsight it is not difficult to agree that the groups had benefited from greater "professional expertise".

Several safety assessments have been carried out at present as part of the evaluation process, following the changes that have been implemented. These analyses should have been carried out in the design phase, and several of the projects would then have been different.

### 6.3.2    The AIBNs assessment of the DNV report

Seen with hindsight, it is easy to see that if the DNV report had been taken more into account, and the compensatory measures and other impact assessments had been put in place, it is highly probable that the Take-Off-05 project would have had a better result.

AIBN has no major reservations to any of the conclusions and recommendations that DNV has made in relation to the Take-Off-05 project, with one small exception. The DNV opinion of the relationship between breaks and active time for air traffic controllers (DP07, en-route services, chap. 10.6) in which AIBN, based on a safety survey, made recommendation 49/2004 from report 42/2004: "Avinor AS assesses whether the operational service period for air traffic controllers in especially demanding working positions should be limited to a maximum of one hour without break".

Although the DNV report has highlighted many important points, it could have had a greater impact by being clearer about what should absolutely not be recommended.

Among the especially important notes and observations, we emphasise:

DNV points out the safety and occupational health and safe working environment aspects of terminating ongoing courses for air traffic controllers, as well as reducing the number of trainees in the future stands or falls on reliable analyses of the future requirements for air traffic controllers. A possible future shortage of personnel and subsequent insufficiency of resources for air navigation services will have obvious consequences both for the working environment and safety and security. The uncertainty linked to traffic trends and political decisions must be factored into the analysis. It is also important to look at demographics (age groups). This point has been one of those about which the management and air traffic control union has had most difficulty in agreeing, and is a cornerstone of a number of choices in the Take-Off-05 project. It now proves that the preconditions were not correct, which means that a number of other preconditions then also fall. Several factors led to the staffing estimates not being correct, the most important of which was the wish to "halve" the number of sectors. A simulation carried out under the auspices of Eurocontrol showed that it was not possible to make the sectors as comprehensive as wished by Avinor centrally.

It still seems today that the general observations that DNV made at Avinor continue to apply. The most important are repeated here:

The AIBN observes that parts of the current Avinor still seem to emphasise to only a small degree actual behaviour in their consideration of safety, and seem to focus on the formal aspect of regulations and routines. This is supported by the choice of minimum solutions, discussions of legislation and regulations and focus on audits. (ref. Avinor's safety report for 2004)

It is the impression of the AIBN that there is generally at Avinor too great a focus on part elements in the Take-Off-05 project, with too little assessment of the total safety aspects in the aviation system. Reference is made to the fact that the various subprojects of Take-Off-05 achieve financial gains by moving tasks to other parts of the organisation without clarifying sufficiently whether there is capacity in those parts to perform these tasks. In illustration, both subprojects 8 and 9 assume transfer of duties to other employees at the airports, while subproject 10 rationalises staffing at the same airports.

The AIBN has problems in understanding the background reason for implementing the Take-Off-05 project in such a short time. This leaves an impression that the project management did not appreciate the benefit of thorough impact assessments, and that the project was implemented without sufficient analysis. The extent and reach of the planned measures as laid out in Take-Off-05 may lead to unpredictable consequences both in regard to safety and occupational health and safe working environment. This applies to measures within each of the subprojects, but is primarily related to cumulative effects, i.e. the consequences of major changes to systems that are closely interlocked.

DNV said "It is important that those who are told that they are leaving Avinor do not carry out tasks that are critical to safety immediately after being given notice. For this reason, Avinor must build in a short-term overcapacity in its staffing plans. Avinor should also expect more long-term effects, such as increased absence through illness for a certain period after the plans have been published. The staffing plans must allow for this". The AIBN can state that this was not acted on. Air traffic in eastern Norway stopped when the location of ATCC

South was published. In certain parts of Avinor there is now a weary organisation, which suffers from quite high absence through sickness.

DNV points out that the implementation phase may create unexpected and unpredictable consequences for which a contingency must be in place. It also points out that the existing reporting system does not provide sufficient contingency. It is not possible for the AIBN to see that a contingency plan has been drawn up that has worked. A number of reports have been submitted in MESYS identifying areas in which safety has been reduced, where necessary action does not seem to have been taken, and where the person making the report has not been given feedback.

Most of the areas that have later become "problem areas", and therefore a potential safety risk, were highlighted by DNV. The AIBN finds it surprising that, despite DNV pointing out these matters in an early phase of the Take-Off-05 project, they do not seem to have been attended to in the following process of change.

The previous safety director left a memo to the managment when he left the company, which pointed out several areas that it should focus upon and implement, including the significance of following up recommendations from safety assessments such as the DNV analysis.


### 6.3.3    The process of establishing ATCC North

Experience/consequences in connection with the merger of Trondheim (ENTR) and Bodø (ENBD) ATCCs into ATCC North (KS N).  (Taken from the evaluation report following subproject 07).

- Different perceptions of reality and understanding of the decision base for the location of ATCC North, which created a lack of acceptance of the decisions among the personnel at TR. (Trondheim)
- The short timeframe for the implementation of the decision led to great stress for employees who have family in TR, allowing only a short time to move, find housing, work for spouses, schools, etc.
- A great deal of public attention and focus from the media, led to increased levels of tension between the two units. Despite this, the units managed to maintain a professional relationship.
- The staff at BD showed a high level of commitment and energy in the realisation of ATCC North, while most of the personnel from TR were little motivated, and wished to refrain from participation in the project.
- Personnel who have previously worked at TR ATCC expressed great dissatisfaction with the placement process, which has resulted in increased absence through illness, capacity problems, work tribunals and a poor working environment.
- Employees of TR thought that their commuting would be subsidised by Avinor, in accordance with the initiative package, but this has not taken place.
- The Civil Aviation Authority approval process was exceptionally demanding and the original commencement date for sector South had to be postponed for 10 days.
- Personnel at both BD and TR expressed dissatisfaction with the information given in the process.
- Focus on the negative aspects of the merger also led to tension in the collaboration process between management and employees.
- There were cultural differences between the TR and BD staff groups.

- Take-Off-05 was discussed at working positions and in ops-rooms, despite the local management and employees trying to avoid doing so. This was unfortunate for maintaining focus on operations.

As the evaluation report did not achieve consensus, there may be points on which one of the "parties" does not agree. The AIBN assumes that one of these with be point 4. As the Trondheim personnel had been excluded from this, the wording seems somewhat odd. The above points are otherwise well in accordance with the information given to the AIBN during this study. The picture drawn is not one of a good place of employment that motivates concentration on a job that is critical to safety.

Newsletter no.16 from December 2004 states that the en-route services will be operated from two air traffic control centres, reducing the number from the current four. Quote "This assumes that NATCON has been implemented".

The way in which the process has been implemented has created a great deal of frustration. Both Avinor centrally and the air traffic controllers have stated that NARDS is no longer a satisfactory instrument and that NATCON would provide a quantum leap for air safety. For this reason, the haste with which Trondheim was closed, and its work transferred to Bodø, and an extended period with NARDS seem impossible to explain for workers at Værnes. The employees did not form part of the project phase for subproject 07 and felt that they were not listened to.

The process is described by Avinor as a merger, and we quote from Annex 2, SINTEF STF 50 A05102:

> *Mergers seem to be especially demanding processes of change, with great potential for conflict and a long phase of instability. The SAS/Linjeflyg merger in 1993 was, for example, marked by a high level of conflict and led to psychological problems, problems with cooperation and lack of adherence to the CRM concept. It was stated that this unstable phase lasted between 5 and 10 years.*

AIBN thinks that this should be generally known and that this demanding process was not handled adequately by Avinor.

AIBN finds it very unsatisfactory that operations were commenced without the necessary training, in which those taking over were not given OJT (on the job training) with experienced instructors, and therefore in reality took a self-check in new sectors. It is true that this took place in agreement with the Civil Aviation Authority, and that dispensation was given from normal training routines - routines that have been drawn up to protect air safety. The AIBN is not aware that the decision was based on analyses that included implemented compensatory measures.

### 6.3.4    The process of establishing ATCC South

Oslo APP and Oslo ACC both work in the same OPS room at Røyken. When the choice of location was published, and ATCC South was to be sited at Stavanger, the APP and ACC organisations became two separate units. The process of "selecting" those who were to remain in eastern Norway has created an unfavourable working environment in an organisation that must handle steadily increasing traffic volumes in the east of Norway for several years.

From Avinor's evaluation report for subproject 07:

- When a situation occurs in which so serious and emotional a discussion becomes a feature in an operative sector it becomes a safety hazard. The personnel have different thresholds for what is and is not good to talk about in an operative working situation.
- Collegial support workers also have problems with finding the part they have to play because they are affected to the same extent. In other words, there is an arena in which those employers who are most critical and who have the strongest opinions dominate. The situation is difficult, employees experience great psychological pressure. Many are loath to turn up for work, and this contributes to disproportionably high absence through illness.

The AIBN is of the opinion that intensive efforts must be made to improve this situation. There should be a lot to learn from the process around ATCC North. In the opinion of the AIBN, the process should be stopped and re-analysed, so that it is quite certain that the choices that have been made benefit air safety. This study has not looked at the financial aspect, but has understood that lack of clarity around the financial presentation between management and the employees is also a source of frustration.


6.3.5    Political processes related to the Civil Aviation Administration/Avinor (based on Annex 4)

The main question in this study is to what extent safety has been considered, and whether safety has been a factor in the decision process of the political decision. Our impression, based on the information gleaned in interviews, is that the political community is genuinely concerned about safety.

Information relevant to safety is said to appear in the ministries' and Parliament's contact with the professional communities, although the written documentation does not reflect this to any extent. One of the reasons for this may be that safety is difficult to quantify, and therefore becomes a subjective assessment that individuals make on the basis of their own experience. On the other hand, finance and financial considerations can be quantified in pecuniary terms and are therefore easier to take into account in a decision situation. Both civil servants and members of parliament assume that the Civil Aviation Authority maintains continual supervision of aviation developments.

It is assumed that the responsibility for notifying about undesirable developments lies with the Civil Aviation Authority.
This may mean that confidence in the authority is reflected in the decisions, and explains why the decision is mainly based on financial considerations. At the same time, it reveals a limited ability/will to look at the situation as a whole, because the authority is in an unstable position at the same time as Avinor is allowed to carry out extensive changes.

Selection of information as part of the political process does not mean that information relevant to safety is not made available. However, we cannot see that safety considerations have been made in individual cases.

By assuming that the changes will not impact on safety, politicians have liberated themselves from specific considerations. The Civil Aviation Authority's duty to notify is also implicit, if they are aware of unfortunate developments that follow from political decisions as, for

example, the decision to turn the former Civil Aviation Administration into a state-owned limited company.

### 6.3.6    Organisation of air traffic control services and airports, experience from other countries

There are a number of variants in countries that we have examined in this study, and none are completely identical to the Norwegian situation. It is difficult to draw any unambiguous conclusion as to whether one or the other form of organisation is preferable in safety terms. Several sources, however, point out the importance of having an aware agency when other players in the aviation sector are privatised or reorganised. It is interesting to note that the US has not chosen to privatise or split air traffic services into a separate company. There are several other countries that have chosen to split airports and air traffic services (England, New Zealand, Canada, the Netherlands, Germany, Denmark, etc.). This question has also been raised in Norway, but there does not seem to have been any real debate around the question. It was last raised at a political level in question 8 of the annual national budget. Avinor responded that the *costs* of air navigation services will increase if the service is split from Avinor and established as a separate agency. The AIBN does not wish to state an opinion about the cost aspect, but requests an evaluation of how safety aspects of society are protected in the current model/solution for ownership/administration of the air navigation services and airport operation.

### 6.3.7    Avinor's safety philosophy and areas of investment in safety:

Avinor's vision is to have the greatest level of air safety/security in Europe. The management considers safety to be protected through an increase in reporting, improved chains of command in the new organisation and by statistics proving that the amount of serious incidents is not increasing.
The areas of investment that have been listed by Avinor are important areas in the aviation sector, but the AIBN does raise questions about what is meant by investment and whether these are the company's own choices or whether they are "imposed". Several of the initiatives associated with the areas have been implemented, although several of them are very familiar from previous annual reports, which have indicated that these should have been implemented several years ago. (For example SCAT). Nor do the choices made in the Take-Off-05 project in relation to NATCON seem to involve any investment in NATCON.

### 6.3.8    Avinor's administrative system for protection of safety.

Avinor has carried out excellent and systematic work to create a documentable system that protects aviation safety. A quality system is in place and approved by the Civil Aviation Authority and the reporting system MESYS has contributed to the number of reported occurrences and deviations having risen from virtually zero to more than 1,200 per year over 3 years.

Internal audits are carried out before Civil Aviation Authority supervision, consequence analyses are carried out according to the ESSAR4 standard, and obstruction analyses are carried out in connection with Civil Aviation Authority approval of airports, etc.

Despite a system that in many ways is at the forefront of the aviation sector, there is still a lack of follow-up. Questionnaires and discussions agree that MESYS and the reporting lead to

an environment that incites reporting of your own mistakes and other deviations. The AIBN is left with the impression that the apparatus which should be following up has not been given sufficient resources to process and implement initiatives. This will be extremely unfortunate if one wants to maintain the willingness to report. Also, the lack of trust between major employee groups and senior management is contributing to breaking down trust in the systems that have been created, so that no actual organisation safety gains are achieved.

### 6.3.9    Avinor's management

Skills' requirements

The Civil Aviation Authority carries out acceptance/approval interviews and/or review of CVs for several types of position with responsibility for safety at Avinor. For key personnel in divisional management the approval is given on the basis that the "support network" around the senior manager in the division is competent. If such an approval process is to have any mission, it is important that the organisation is tolerant, so that the support network is allowed to provide support. If this is the case, the approval process would have difficulty in revealing anything. The AIBN is of the opinion that both quality and ownership of/loyalty to decisions, and the safety culture in the company would have been reinforced if the management had had a more varied aviation background. In this we think especially of a general reinforcement of the technical, operational and safety-related expertise/experience for positions concerned with overall aviation safety responsibility.

Understanding of roles

A legal interpretation of how the Civil Aviation Authority has limited overtime, whether Section 20 in BSL A 1-4 is in accordance with the Aviation Act, the extended obligation to provide information, etc., has not been made here. But we assume that an organisation which has the vision of being the European leader in safety will not allow itself to be distracted by this, but will look for the best solution for air safety.

Much of Avinor's management has not worked very long for the company, and several of them lack an aviation background. This may be one reason for the interaction between the various players not functioning at its best. The AIBN is primarily thinking of the interaction between Avinor and the Civil Aviation Authority when Avinor did not give the Civil Aviation Authority the opportunity to provide input to Take-Off-05, so that sufficient time for analysis and approval of the changes could be agreed. Equipment has also been taken into operation without the Civil Aviation Authority having approved it (AWOS). The question of why the Civil Aviation Authority has not been clearer and put its foot down when it has been under pressure can also be raised in this connection. AIBN has no unambiguous answer to this, other than that the "moving process" could have been a contributory factor.

In addition, there seems to be little awareness of the role of the investigative authority (AIBN). Information/documentation in connection with investigation should be provided without hesitation. The goal of the AIBN in contributing to increased air safety should harmonise with Avinor's. It is difficult to understand the purpose of interpreting legislation to find out whether Avinor is legally obliged to provide information in this context.

The result improvement programme Take-Off-05

The result improvement programme was initially led by a consultant who had been hired for the project, and who had a financial background. This person has subsequently been engaged as the director of air navigation services. The director, who had no aviation or safety-related

experience before coming to Avinor, refers to the result improvement programme as a safety project. The managing director refers to the programme as a reform of responsibilities, and it was presented to the staff as a result improvement programme. The AIBN agrees that some of the initiatives, as such, contain the potential for increasing safety (i.e. the reorganisation into the Group model), but thinks that the goal of rapid improvement of results has led to several projects that impact on safety being started at the same time, without the necessary analysis and safety management.

The AIBN has requested, but not received, an overview of how the various concerns of the DNV report were treated. In summary, therefore, this report will conclude that if more attention had been paid to the DNV report, several of the subprojects and sub-projects would not have been launched/implemented, or would have had other results. If the summary of the DNV report through report to the Parliament 36 (2003-2004) indicates the management's understanding of its content, it is understandable that the report was not given the attention it deserved – From *Report. to the Parliament no. 36 (2003-2004): "Det Norske Veritas (DNV) has assessed the various proposed efficiency measures from the point of view of safety and security, and health and working environment. It has concluded that the measures do not have a negative impact on safety and security, and that certain measures do pave the way for an improvement. This applies particularly to the new administration model, which clearly defines responsibility. DNV emphasises that the extent and complexity of the proposed changes may lead to unforeseen consequences during the period of change, for which Avinor must have contingency plans."*

The management has created a "purer" organisational structure with result-oriented divisions with clearer lines of responsibility and reporting. Routines are in place for increased reporting of deviations, incidents and accidents, with an improved and simplified reporting system (MESYS). The problem seems, however, to be that thanks to the high speed of implementation, and increasing shortage of personnel (in relation to workload), the organisation is lagging in analysis and follow-up.

Management has said that it wishes for a greater degree of openness during the project and has publicised a lot of material during the process through newsletters and information on the intranet. It would seem, however, that the employees have always been presented with a "cut-down" version, which has omitted fundamental information. The information, which was regular to begin with, has become more sporadic over time. This reduction seems to coincide with an increase in resistance. The opposite development would, perhaps, have been expected for the management to present the required information.

A growth in aviation activity is said to have been included as a precondition during the project's planning period. There is much to indicate that the project has not allowed for the sort of traffic growth that we have seen over the last two years. The AIBN regards it as natural that a change in preconditions in the form of increased revenues and increased workload would have led to a restructuring of the project, but cannot see that this has been the case.

The Chairman of the Board of Avinor sits on the boards of more that 30 other Norwegian companies. During the Take-Off-05 period, the chairman has been rarely available for the employees and union leaders. Avinor administers the infrastructure in Norwegian aviation, and therefore plays a very central part in the provision of safe traffic in the air. Take-Off-05 is a very comprehensive process of change, which requires high awareness and follow-up if

aviation safety is not to be threatened. As the Ministry of Transport and Communications has delegated follow-up of Avinor to a board of directors, the AIBN finds it questionable that the Chairman sits on so many other boards, with their associated duties.

### 6.3.10    The relationship between Avinor and the Civil Aviation Authority.

The relationship between Avinor and the Civil Aviation Authority seems to have been strained since the Civil Aviation Authority was separated from the then Civil Aviation Administration. There may be many reasons for this, and they will not be discussed in any detail in this report. The fact that Avinor still has authoritative responsibility in some areas (RFL I and AIP), meaning that it still performs as an aviation authority in these areas, has not helped the situation. The Civil Aviation Authority finds that it receives little information from Avinor and Avinor finds that the Civil Aviation Authority does not have any understanding of the changes that Avinor finds to be necessary. As an example, the Civil Aviation Authority was not consulted by Avinor prior to the implementation of Take-Off-05, but was eventually given an implementation plan that assumed (if the plan was adhered to) Civil Aviation Authority approval of initiatives as they arose and with short deadlines. Avinor looks for a more risk-based supervisory authority, but refuses to grant the Civil Aviation Authority access to MESYS, on the grounds that the Civil Aviation Authority only needs reports from the system. Risk-based supervision requires good background material, which MESYS could well provide. The Civil Aviation Authority has approved the new organisation structure at Avinor without reservation. The statement from the Civil Aviation Authority that it "reluctantly approved the organisation model, in which AFIS did not form part of air navigation services" can be interpreted in several ways. In the report to the Parliament no. 36 (2003-2004) Avinor stated that it is a precondition that the Civil Aviation Authority approves operational changes. There is a lot that indicates that a somewhat reduced Civil Aviation Authority has been used to indicate approval to the processes of change at Avinor.

### 6.3.11    Training air traffic controllers

From the point of view of safety, it would seem to be difficult to understand that a choice is made to terminate a system that undoubtedly gives a good result, and produces high quality air traffic controllers, without having a new and quality-assured training procedure in place. Nor is the initiative in line with DNV's recommendations to avoid reductions before it was quite certain that the coverage was present. DNV recommended having an excess that could tackle the period that would follow the changes.

The evaluation reports (produced jointly by management and employees) following subprojects 07 and 08 now show that the basis for not training air traffic controllers in 2004, and for halving the number to be qualified in the future, was incorrect. The AIBN is surprised that nothing has yet been done about this.

In the case of Bodø ATCC, NATS concludes that the number of air traffic controllers working there is, at present, sufficient, given the workload on which the review is based. NATS did not evaluate the sector loadings and the result of the survey is, therefore, not as useful as it could have been. The workload at the ATCC was "normal" at the time of the NATS survey and the air traffic controllers' union and the employees at Bodø think that the extra burden imposed by military exercises, introduction of NATCON, OJT and PFO, would most probably indicate that the NATS calculation only provides a minimum. Even based on the NATS figures, there is a gap between this and the management estimation in Take-Off-05. There is also the same gap in estimation of air traffic controller requirements for other units. There is a lot that

indicates that aviation may experience problems equivalent those experienced after the termination of **one** group of trainee air traffic controllers in 1993.


6.3.12   Infrastructure

The closing of Røyken and Trondheim in favour of strengthening Bodø and Stavanger poses a challenge with regard to EMP protection. EMP protection may be highly important when there is high level of lightning activity (and in the case of enemy activity in time of unrest). One such example was in 1993 when Fornebu was rendered inoperable as a result of a lightning strike. EMP protection was pointed out as important in the Vulnerability Commission's report and the protection requirements are laid out in "The guidelines for protection of electronic installation in the total defence realm against electromagnetic pulses (EMP)" (Ministry of Transport and Communications 24 March 1998). In addition, the Civil Aviation Authority has obliged Avinor to carry out a survey. Given that there is a systemic redundancy, this problem area is in the borderland of the mandate for this survey. If this redundancy is not present, it will definitely have an impact on air safety.  Of the four original ATCCs, Bodø has the poorest protection, and questions can be raised whether the evaluation and initiatives around the establishment of ATCC North satisfy the intentions of the Ministry of Transport and Communications' circular.


6.3.12.1   *CNS*

As most air accidents happen during take-off and landing, the approach aids at airports are vital, and a reduction in supervision and maintenance of this equipment would not seem favourable for safety. Sudden drop-out of approach aids on an otherwise unfavourable day could prove critical. The AIBN is aware of the sound statistics on which the decision is based, but points out that this, taken in conjunction with other reductions, could have a negative impact on safety.


6.3.12.2   *The traffic management system SOL/NORSIM and Oslo APP*

The "new" traffic management system seems to be highly necessary if capacity is to increase, and safety is to be increased in the airspace around Norway's main airport. Postponement of implementation beyond the current goal of 2006 would prove unfavourable for Avinor's ability and potential to respond to further increases in traffic in eastern Norway. The current traffic system is, at times, under great pressure.

The fact that Eurocontrol has defined Oslo Approach sector West and East as having "Severe Overload" in its design should indicate that something should be done to protect air safety in the best way.
The Planner position is occupied and operated on a manual basis, and does not have automatic sequencing equipment (AMAN). Any change apart from the current air space solutions without SOL/NORSIM (or equivalent) system, would create unforeseen problems and, therefore, the possibility of incidents and accidents.

Snow and other unfavourable weather conditions indicate greater minima on final approach at Gardermoen, and therefore less capacity in the airspace. Under such conditions, the burden on the traffic system would increase even further. When the Civil Aviation Authority introduces new noise limits around Gardermoen, the take-off routes will change. The Civil Aviation Authority thinks that this will not deteriorate the meeting situations, but at the same time

points out in its letter to the Ministry of Transport and Communications, dated 7 July this year, "nor will it improve". The Civil Aviation Authority also writes "we know that Avinor has carried out simulations of a new air space structure around OSL (AIBN note: SOL/NORSIM), but for some reason the project has been terminated. If this is to be recommended it will probably take some time. In the meantime other initiatives must be implemented immediately."

The Civil Aviation Authority closed, in its time, recommendation 4/2001 from the AIBN report 4/2001 on the grounds that SOL/NORSIM was to be introduced. This shows that the Civil Aviation Authority, at that time (2001), also regarded SOL/NORSIM as decisive in the regulation of the traffic around Gardermoen.

This trend towards increased traffic will force the adoption of a better system for increasing capacity, without reducing safety. The introduction of new systems requires psychological energy and staff surpluses, as well as motivated employees. If any of these conditions are lacking, the implementation of a new system may be delayed. Oslo Approach is now a unit that is suffering very heavy workloads in many areas. The closure on 27 September 2004 that has been decided (together with the rest of Oslo ATCC) has inflicted even greater burdens on all of the employees.

In its report, DNV recommended a need for a "surplus" in staffing terms, as well as the necessity of contingencies for unpredictable consequences. SOL/NORSIM is an aviation safety initiative that has obviously been the victim of reduced priorities because there are not sufficient resources in the system.

One of the goals in Avinor's annual safety report for 2004 is "There must not be an increase in the numbers of serious aircraft incidents, in which Avinor has been a participant, even if traffic volumes increase." Based on this, SOL/NORSIM should be a task on which priority is placed. The AIBN is not aware that any risk analysis has been carried out concerning a delayed implementation of SOL/NORSIM (cf. Avinor's annual safety report, case 57/2005), nor concerning the downsizing of Røyken and the CRM/staffing problems linked to this.

### 6.3.13    Automated weather reports

The Civil Aviation Authority has been given the task of approving the introduction of automatic weather reporting equipment before it is brought into use.  In this case the introduction of the equipment was planned and a condition for the staffing concept before the Civil Aviation Authority was contacted about the matter (cf. discussion with central personnel at the Civil Aviation Authority). Users find the system more difficult to use, and miss the "personal" service and local knowledge. Statskonsult think that as long as correct and detailed weather forecasting is essential for aviation safety, its maintenance is a social responsibility. The weather in Norway can be difficult to predict, especially without local knowledge. As the weather has contributed to the causes of several aviation accidents (e.g. Mehamn, Værøy, several at Hammerfest and others) there are good reasons to emphasise the importance of correct meteorological data - and it is especially important on the STOL landing fields. The AIBN finds that Avinor does not act in accordance with the regulations and introduces equipment without it being approved and risk-assessed. Several user groups have said that they are sceptical to the introduction of automated weather reports. The users of offshore helicopters, in particular, are anxious about the effects. The AIBN assumes that the current process of evaluation and, potentially, approval by the Civil Aviation Authority includes a thorough risk analysis. The automated weather reports, in which the pilots must leave airside, with the increased security checks and shorter turnaround times for the aircraft, may lead to

meteorological data not being collected. Such a situation would not promote safety. Whether safety would be significantly reduced by the introduction of automated weather forecasting is difficult to adjudge but it will not, in any case, lead to an improvement of aviation safety. If one or more of the conditions were to be absent, safety would deteriorate.


### 6.3.14   Staffing

Rasmussen (1997) points out that modern changes largely concern deregulation and exposure to competition, and that this may lead to reductions in attention to safety and the barriers that have been erected. Research around the so-called "High Reliability Organisations" (HRO) emphasises *organisational redundancy* as an important safety factor. Put simply, it means that the organisation contains "slack", and that this forms a barrier against accidents. Modern processes of change often involve downsizing, leading to the extent of such barriers shrinking. This may lead to a higher risk of accidents.
Staffing has almost been reduced to the level proposed in Take-Off-05. Even so, the workloads for certain groups have been very large. The workloads of intermediate managers have seemed especially large. In many units, absence through illness is higher than the target, and it is highly probable that this is a sign of heavy workloads.


#### 6.3.14.1    *Administrative positions*

This survey has revealed that high pressure has been exerted on intermediate managers/managers in connection with the changes. This is both because they have been given more tasks and the level of conflict has affected them psychologically. To a certain extent, the result has been that work has been left on the desk, and that the relevant people have become unavailable to those who for whom they are supposed to be managers. The motto of clear leadership has, therefore, become difficult to live up to. Weary and absent managers will also, most probably, have problems in focusing on safety-critical tasks.


#### 6.3.14.2    *Technicians/engineers at Røyken*

NATCON is complex, and as NATCON is significantly different from the system that was, in its time, acquired from Raytheon, it is difficult for Raytheon to take over at short notice. Based on this, it would be critical if the expertise left before it were replaced. Currently, the organisation is built up with 1st, 2nd and 3rd line maintenance and follow-up, in which the 3rd line (at Røyken) trains the 2nd, who in their turn train the 1st line. If the technical platform should break down, and Avinor no longer possessed the necessary capacity and expertise to resolve the situation, aviation safety would be reduced.
Avinor has stated that its requirements relating to aviation control systems, specialist expertise, etc. does not depend on location. Much of the technical expertise is located at Røyken. Several of the technicians have already given notice, and others have indicated that they will do so. Loss of key personnel can affect safety, both in the long and short term.
Of those people with whom the AIBN has been in contact, there are very few (apart from senior management) who think that the situation is acceptable. Optimum function of the technical aids is a precondition for the new staffing concept, in which the use of ATS operators is reduced. Any deviation from this will place unnecessary burdens on the system, reducing levels of safety.

### 6.3.14.3    *Fire and rescue*

The AIBN is of the opinion that the current training concept now provides improved safety, as those who are trained are better suited to the job. The commission does, however, raise questions about whether its interpretation of required concurrence of firefighting and rescue is in accordance with the intention of the regulations. There is, perhaps, no reduction in safety in relation to earlier, but it would be undoubtedly be a safety benefit if it was not necessary to wait for a fire to be extinguished and damped down before rescue commenced. In addition, the practice of changing category in relation "unplanned" flight, it would not be possible to provide full coverage. AIBN shares the opinion of DNV that this is a reduction in air safety.

### 6.3.14.4    *Airport services*

Norway has many special conditions linked to the various airports. The weather changes more quickly than in many countries with which we can be compared, we face challenging winter operations, our topography is shared with very few countries, and few have such short runways to land on under such conditions. All of this underlines the importance of operating airports at optimum safety levels. The AIBN points out the importance of having sufficient staffing to fulfil obligations, and that any temporarily engaged personnel are given adequate training that gives them sufficient understanding of the importance of their jobs. AIBN has received several indications that there can be a lack of understanding of braking distances, relationship between values and actual runway status, as well as how they are used by pilots. This has, among other things, resulted in the air traffic services doubting the values given by the airport services and telling pilots this. There are also indications that there is greater incidence of snow not being cleared from the entire width of runways than previously, which also can reduce safety margins.

### 6.3.14.5    *Air traffic controllers*

The assessments of necessary staffing needs at the various units in subprojects 07 and 08 indicated a surplus of air traffic controllers. This estimated surplus led to the cessation of recruitment and training of trainees.

"Final report – evaluation of Take-Off-05 – occupational health and safe working environment08, take-off, landing and approach" shows that it is not possible to reduce air traffic controller levels at the individual units to the minimum level envisaged in Take-Off-05, without having serious consequences for air safety. The evaluation report also shows that the administrative resource needs at the units have been significantly underestimated.

The final report for subproject 07 "en-route services" assumed a new ACC/area control sector division for Norway that virtually halved the number of sectors. The background for this included reducing the number of air traffic controllers. The simulation that was carried out by the University of Beograd on behalf of Eurocontrol showed that the division that was proposed could not be implemented in a safe way. The reduction in the number of air traffic controllers from this proposal (subproject 07) and from estimates in subproject 08 take-off, landing, approach formed the basis for determining the total staffing requirement for air traffic controllers and therefore the rate of training for air traffic controllers.

BSL G 2-1 regulates the use of overtime and sets requirements for periodic refresher courses. The previous interpretation of the "Royal Resolution", which allowed overtime connected with military activity to be rated separately from the overtime accounts, was removed by BSL

G 2-1. This, in addition to the extra workload in connection with Take-Off-05, etc. has meant that the staffing requirement has changed from an estimated surplus of around 80 air traffic controllers to an actual deficit. The lack of personnel means that units are creating rosters containing "holes" and operations are based on planned overtime. Avinor and the Civil Aviation Authority have both stated that planned overtime is undesirable. This lack of staff also threatens PFO. Periodic training provides a contribution to safety and the AIBN considers any depletion of this newly introduced concept as particularly unfortunate.

### 6.3.14.6    *Air traffic services operators (ATSO)*

As several air traffic services operators have left, or are in the process of leaving, without the work that has to be done diminishing, their work must be performed by air traffic controllers. In its turn, this can reduce safety by increasing the workload for air traffic controllers.

### 6.3.15    Experience from other general processes of change compared with the changes at Avinor

### 6.3.15.1    *Background and goal of the process of change*

Backgrounds and goals of processes of change are often multiple. In some cases, this can be explained by processes of change being decided by coalitions of players with differing interests. In other cases, decision-makers are subsequently accused of other motives than those that are stated in the official grounds. Several organisation theorists indicate that decisions in organisations are not always characterised by unambiguous goals-means rationality (cf. March and Olsen, 1976). In individual cases, the multiplicity of interests may cause problems. When the airlines SAS and Linjeflyg merged, many Linjeflyg employees had another understanding of the background to, and conditions of, the merger than SAS employees and the SAS management, and this may have contributed to the difficulties that arose following the merger.
This was absolutely the case for the Take-Off-05 project. The experience of many of the employees was that decisions were made on the wrong basis, and that those who possessed the "leading edge" skills were not necessarily involved in the design of the project. The project's motives were unilaterally financial, but it was communicated as improving safety, which frustrated many people.

### 6.3.15.2    *Accidents as parameters of measurement*

Individual accidents and statistics may provide contradictory impressions of the safety consequences of the processes of change. Individual accidents will illuminate areas in which safety has been reduced following the process of change, while they rarely say anything about which conditions have improved. Statistical goals, on the other hand, are not always sensitive to change in the risk of major accidents because of the low frequency of major civil aviation accidents. In connection with the changes at Avinor, there is now statistical material that can indicate whether safety has improved or deteriorated. The management refers to absence of accidents and the high reporting levels in MESYS as quantification for the protection of safety.

### 6.3.15.3    *Mergers*

Mergers seem to be especially demanding processes of change, with great potential for conflict and a long phase of instability. The SAS/Linjeflyg merger in 1993 was, for example, marked by a high level of conflict and led to psychological problems, problems with cooperation and lack of adherence to the CRM concept. It was stated that the unstable phase lasted between 5 and 10 years. There are several examples at Avinor in which this is currently a reality, and also areas where this may pose a problem (ATCC North and the APP/ACC situation at the Oslo ATCC).

### 6.3.15.4    *The instability phase*

Processes of change may affect safety both during and after the "instability" phase. The Challenger disaster and the Hatfield accident took place several years after the relevant processes of change had been completed. Their problems were linked to the conditions in the "new" organisation, as it settled down after the turbulent phase. In the merger between SAS/Linjeflyg, the problems were linked to an unstable phase of conflict, cooperation problems, psychological problems and lack of experience of ownership of the new organisation. This places stringent demands upon awareness and follow-up long after the changes have been introduced. Such a follow-up requires application of resources. The instability phase will last longer than it might have done because the process starts by downsizing group management at head office. The same applies to the order in which other subprojects are implemented, such as the ATCCs, cuts in training before requirements were known, etc.

### 6.3.15.5    *The impact of "insignificant" changes*

The processes of change and other changes may lead to unforeseen consequences in other areas. In this connection, parallels can be drawn with the lack of total assessment of Take-Off-05, in which individual projects have been assessed individually without any full analysis of the entire picture having taken place. The DNV report also points out the risk of "chain reactions", in which a small change at one place transfers the problem to another location that is not able to handle the extra workload this involves.

### 6.3.16    When can processes of change threaten aviation safety?

Both statistical studies and the viewpoints of the subjects interviewed by SINTEF indicate that not all processes of change threaten safety in the air. We should, therefore, ask ourselves under what conditions a process of change can threaten aviation safety. Our results, in addition to theoretical sources, indicate that there are grounds for questioning safety in the air if one or more of the following characteristics are present in connection with the processes of change:

### 6.3.16.1    *Parallel changes in supervisory body and the supervised body*

As the processes of change may threaten safety, it is crucial that there is an effective supervisory body which can follow up the processes of change. This is why there is reason for concern if the efficiency of the supervisory body has been heavily reduced through the processes of change, at the same time as one or more supervised bodies are going through dramatic processes of change. Such problems have been indicated in connection with both the Challenger disaster (Vaughan, 1990) and the Dryden accident (Helmreich, 1995). There may

also be grounds for concern if the supervisory body lacks the expertise to assess the organisational changes. In Norway, the change project Take-Off-05 has run in parallel with the reduction in the Civil Aviation Authority through the decision concerning its move.


### 6.3.16.2    *Weakening of an organisation's ability to be aware of warning signals*

Most organisations affected by major accidents have been confronted with danger signs repeatedly (Turner and Pidgeon, 1997; Vaughan, 1996). This indicates a weakening of the organisation's ability to discover and interpret danger signs and to place priority on and resolve the underlying safety problems, leading to a significant increase in risk. Such a weakening may, for example, occur if line managers cannot find time to pay sufficient attention to safety problems, if expertise that is necessary to discover and interpret symptoms of safety problems is lost, or if changes in lines of decision obstruct efficient resolution of problems. The phenomenon of normalisation of deviations, which is described in Vaughan's (1996) analysis of the Challenger disaster, may also lead to incorrect interpretation of danger signals.

As Avinor lost much expertise in its senior administration, and because many of those remaining do not have any "historic" ballast any longer, the risk of danger signals not being reacted to in time increases. The fronts between management and the employees, as well as the increasing lack of response to reported deviations, will weaken this ability further.


### 6.3.16.3    *Organisational split within a system of tightly interlocked activities/technology*

Applying Perrow's theory about normal accidents (Perrow, 1998), extreme organisational splits within a system of tightly interlocked activities/technology can create the potential for "system accidents". This situation is illustrated in the Hatfield accident, in which the organisational split of maintenance responsibility contributed to derailing a train, and the subsequent comprehensive operational disturbance on the British rail network. How strong an organisation split any given system can "withstand" will, among other things,  depend on how effective are the measures that are used to "reintegrate" the split organisation (Snook, 2000). There are several examples, in the changes at Avinor, where this is relevant: Greater distance between the operational environment and the "service provider", such as between tower and ground, ICT and ATM, etc.


### 6.3.16.4    *Too high speed in the process of change*

High speed may threaten safety in several ways. Necessary analyses of safety consequences may be omitted or be of unsatisfactory quality. There may be insufficient time to follow up findings from analyses. High speed may lead to a lack of ownership and high conflict levels, at the same time as local knowledge is not exploited when changes are planned. There may be insufficient time to evaluate and adjust the course of the change underway. Finally, high speed may lead to insufficient preparation and clarification of operation of the "new" organisation (cf. the expression Operational Readiness, Johnson, 1980). There is no easy answer to how high speed is justifiable, but several of our interview subjects indicated that it may take several years to carry out a profound process of change in an adequate way. The management of Avinor state that they regard high rate of change as decisive for a successful implementation, and act thereafter. There are probably varying opinions as to whether it is too high a rate, but the fact that evaluations and safety analyses are first made after several of the changes have been deployed and others are well underway, indicates that the planning and implementation phase has been too short.

### 6.3.16.5    *Loss of actual safety barriers*

Loss of actual safety barriers can, among other things, occur if rationalisation or staff reductions lead to loss of the opportunity to make critical decisions and monitor, overrule or have independent checks of working tasks. Loss of the safety barriers has been pointed out in connection with the Dryden accident (Helmreich, 1995) and in connection with the decision processes linked to the Challenger disaster (Heimann, 1993). The changes have removed key personnel who could have performed checks, and high pressure on personnel (working and psychological) reduces capacity and awareness.

### 6.3.16.6    *Uncontrolled reduction in safety margins*

Safety margins may, for example, be reduced when maintenance intervals are increased, by reducing operative minima, or by introducing new types of aircraft that need longer runways in the existing route network (such as the introduction of DHC -8 aircraft on Norwegian STOL fields). We do not claim that any reduction of safety margins leads to unacceptable increase in risk levels. Uncontrolled reduction in safety margins occurs if (1) the limit of acceptable risk is unknown, undefined, difficult to observe, or easy to exceed by an incorrect judgement, erroneous action, loss of attention, etc., or (2) several of the involved parties cut margins simultaneously without an overview of how their changes of practice interact, or (3) that there are no effective mechanisms to monitor how those involved relate to safety margins (cf. Rasmussen, 1997). At Avinor, the margins may be reduced because training is not carried out when it should be, and because winter maintenance and fire & rescue are carried out according to the minimum conditions. Other contributory factors include semi-automation of working tasks, while working days under pressure may lead to failure to perform checks and controls satisfactorily (e.g. AWOS), and the cutting of inspection intervals at CNS, etc.

### 6.3.16.7    *Coordination*

Problems connected to coordination may occur in connection with processes of change that have high levels of conflict. For example, adherence to a company's CRM concept may fail. This was pointed out by several informants in connection with the SAS/Linjeflyg merger. According to several sources, "sabotage" of procedures may be a major problem in processes of change involving high levels of conflict (Degani and Wiener, 1990). The phenomenon must be understood as an expression of frustration, rather than an instrument of power in a conflict of interests. The expression retaliation is used in American literature for this phenomenon.
Cooperation: A key to good implementation of changes is good cooperation between the management and unions. This is, perhaps, the most important reason for the changes at Avinor not going according to plan. The unions think that their input is not taken seriously and that decisions have been made on the wrong grounds. This creates frustration, resignation and little faith in management. The process has led to poor CRM, both at Oslo ATCC and ATCC North.
As the air traffic controllers and AFIS duty officers are placed in separate divisions, the professional interaction has become poorer.
Internal occupational health and safe working environment surveys carried out locally at Bodø in addition to the TØI survey, which have been carried out in this project all agree, to a certain extent, that large employee groups have little faith in the senior management. This lack of faith leads to poor coordination and is, therefore, a threat to aviation safety.

The fact that large groups of personnel, who have safety-critical jobs, have no faith in Avinor's senior management may, in itself, form a threat to aviation safety and something should be done to correct it.

**6.4 Time lines for events at Avinor AS**



Tidslinjer for hendelser i Avinor AS
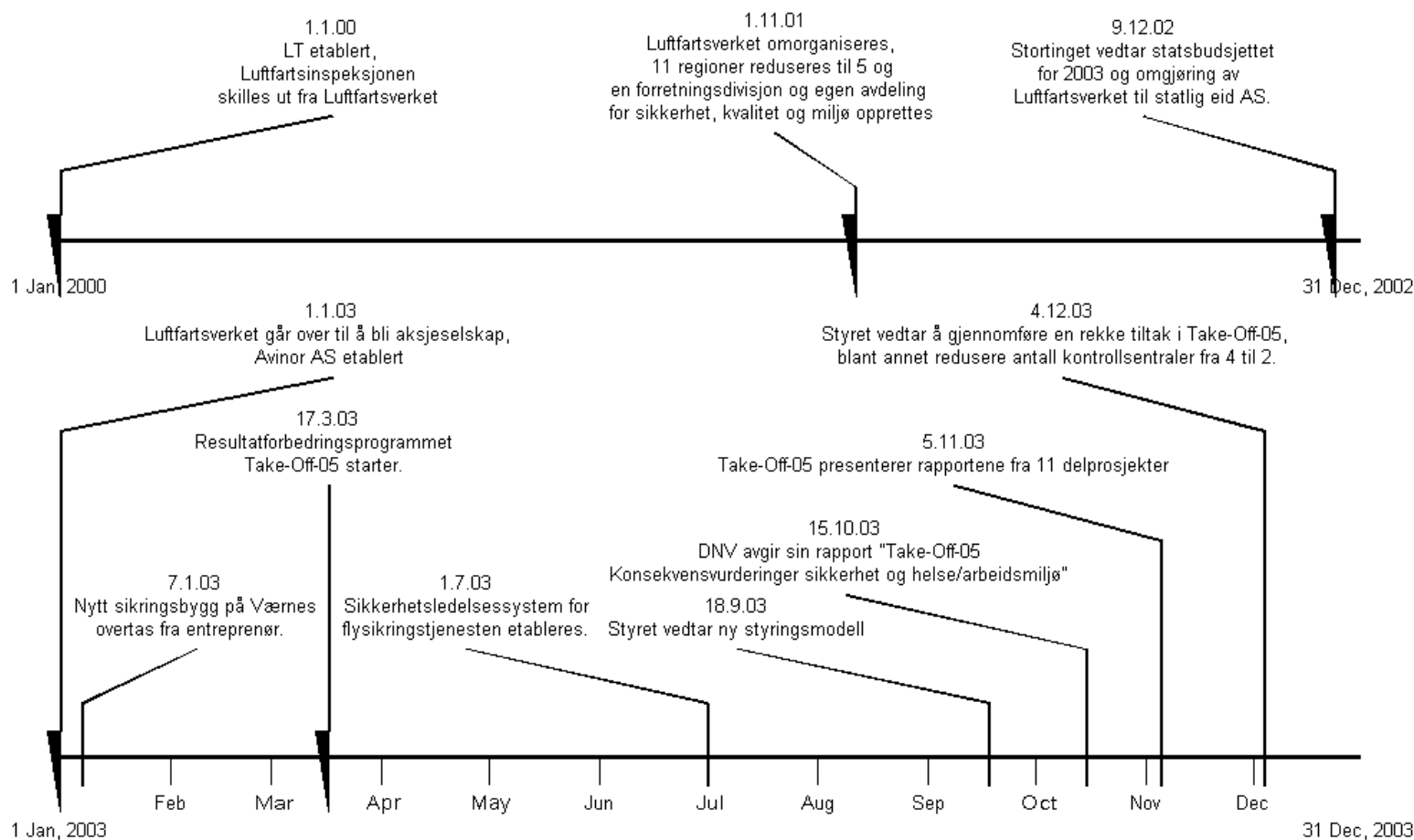
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| 1.1.00 Civil Aviation Authority is established as an independent organisation. The "Luftfartsverket" is no longer an authority, but provider of air traffic control/information and an owner and operator of airports. |
| 1.11.01 Luftfartsverket is reorganised, 11 regions are reduced to 5 and a commercial division and a separate department for safety and security, quality and the environment are created. |
| 9.12.02 The Parliament adopts the National Budget for 2003 and a reorganisation of the "Luftfartsverket" is implemented to a state-owned limited company |
| 1.1.03 The "Luftfartsverket" becomes a limited company, Avinor AS established |
| 7.1.03 Hand over of new air navigation services building at Trondheim airport, Værnes from contractor |
| 17.3.03 Result improvement programme Take-Off-05 starts |
| 1.7.03 Safety management system for air navigation services established |
| 18.9.03 The Avinor Board adopts new management model |
| 15.10.03 DNV submits report "Take-Off-05, assessment of safety and health/working environment" |
| 5.11.03 Take-Off-05 presents reports from 11 sub-projects |
| 4.12.03 The Avinor Board adopts the implementation of an number of initiatives from Take-Off-05, including reducing the number of ATCCs from 4 to 2 |

| |
|---|
| 1.1.04 New regulation regarding establishment, organisation and operation of air traffic service (BSL G 2-1) is effective. |
| 18.2.04 The Avinor Board decides that ATCC North will be in Bodø. |
| 1.3.04 Avinor is reorganised according to a divisional – modell. Gardermoen TWR is transferred from being an organisational entity belonging to OSL, to Avinor. The organisation Oslo ATCC is split and Oslo Approach get the same management as Gardermoen TWR |
| 15.4.04 Bodø ATCC makes Sector Central operational and takes command over the former Trondheim ATCC Sector North. |
| 15.6.04 Seven (7) different labor unions, representing 2250 employees at Avinor hand over a letter to the Board stating mistrust to the management. |
| 16.6.04 The Board hires the consultant, Considium, to clarify the different problems that excist between the management and the labor unions. |
| 3.7.04 NATCON is operational in Stavanger. |
| 7.9.04 Avinor og Widerøes sign an agreement on SCAT-1 (approach aid). |
| 12.9.04 Trondheim ATCC Sector South is transferred to Bodø ATCC. |
| 27.9.04 The Avinor management announces that ATCC South will be situated in Stavanger (ie Oslo ATCC becomes history). Following this announcement Oslo ATCC was unable to man the air traffic control positions and the Airspace over the eastern part of Norway is closed. |
| 30.9.04 Avinor met with the comitee of transportation in the Parlament regarding the restructuring. |
| 6.10.04 The Avinor Board decides that the new ATCC South will be in Stavanger. |
| 3.11.04 The director general sends an e- mail to the labor unions:"Consolidating the work of reorganisation – an invitation for cooperation" – none of the unions accept. |
| 12.11.04 The Avinor management makes public a note concerning the problems connected to the regularity at the air traffic control. At this date 2 classes of air traffic |

| controller students are cancelled |
| --- |
| 16.11.04 Considium deliveres the report on cooperation within Aviinor ordered on 16 th of June. |
| 17.11.04 The Board makes several decisions regarding management and the cooperation with labor unions. The decision "The Board support that the result improvement program is continued with full trust to the director general" was made 5 against 3 votes. |

| 2.3.05 The Board establishes a project aiming to establish controlled airspace offshore at Ekofisk and Haltenbanken. |
| --- |
| 20.5.05 Avinor is announcing that Avinor, the Swedish Luftfartsverket and the Danish Naviair will establish a joint Scandinavian school for educating air traffic controllers based in Malmø (Sweden). The first class is scheduled for a start in late 2005. |

## 6.5   Conclusions

1) The management's attitude to safety does not seem to be in relation to the vision of the company and overall safety goals. The results from the external reports that have been produced, for example the DNV report, do not seem to have been subjected to documented follow-up and implementation. The signs that indicate when a process of change can threaten air safety were all highlighted in the report. These are: Parallel changes of supervisory body and object of supervision, weakening of an organisation's ability to observe danger signals, organisational splits within a system of tightly interlocked activities/technology, high speed in the process of change, loss of actual safety barriers, uncontrolled reduction of safety margins and lack of coordination.

2) Over the last two years Avinor has put in place an approved quality systems and is working towards ISO 9000 registration. Such work systematizes and formalizes working methods, so that they are repeatable and traceable. This is regarded as making a positive contribution to air safety.

3) A safety management system has been introduced at Avinor. This provides a good starting point for improvement of safety in the air. A more systematic approach is used for mapping safety-critical areas and tasks (risk analyses). A basis for a positive contribution to aviation safety. (see point below). The creation of a safety team centrally and in the divisions (at the change from 11 to 5 regions) is a positive signal of the will to take safety seriously. The many tasks to be performed by this team have meant that it is lagging behind in relation to Take-Off-05. Similarly, the many deviation and incident reports are difficult to process as wished, with the attendant risk that the will to report also is lessened as a result.

4) Avinor's contribution to levels of aviation safety in Norway is unknown, but Avinor is in the process of a survey. (So far, this has not been a requirement by the authorities)

5) Hard cuts in administrative jobs early in the Take-Off-05 project have meant that the workloads have become very high for those who remain, and safety-related choices can be postponed or made on an erroneous basis.

6) The change from a regional model to a divisional model at Avinor has clarified routes of reporting and responsibility, and represents a contribution to improvement of air safety.

7)  A challenge is presented by having Airport services and Air traffic services under different management. Internationally, there is currently great focus on "runway incursions" and ground accidents and other incidents. An organisational split can make it more difficult to maintain focus on these safety areas, unless compensatory coordination measures are put in place. It seems that this is being taken seriously.

8) The decision to place air traffic controllers and AFIS officers in separate divisions seems somewhat strange to the AIBN and it is difficult to see it as a positive contribution to aviation safety. AFIS duty officers are now sidelined compared with air traffic controllers and did not, among other things, participate in CRM training together with the air traffic controllers. Compensatory measures should be initiated here.

9) The process linked to gathering reports from the four ATCCs, in which they assessed their own capacity to take over others jobs in a potential merger, was unsatisfactory.

The various parties returned different views and this have led to conflict in the relations between Stavanger and Røyken, and between Trondheim and Bodø. The questionnaire and discussions with air traffic controllers indicate that the working environment at Bodø is so poor that something should be done to correct it, so that air safety is not compromised. Better work should be carried out in relation to the creation of the ATCC South, so that a good working environment can be maintained.

10) The evaluation reports from subprojects 07 and 08 demonstrate that the estimate of necessary air traffic controller staff levels made by Avinor is not adequate. The need for air traffic controllers in the future seems to be far greater than the training is dimensioned for. Continued safe management of air traffic depends on a sufficient number of competent air traffic controllers.

11) The technical platform for control of Norwegian air space has, to a great extent, been developed by Avinor's own technicians at Røyken. Unease around the localisation and in the relationship between central administration and the employees has led to several skilled technicians leaving the company, with more on their way out. Management claims that new recruitment will correct this.

12) Training of air traffic controllers will be significantly weakened if it is not possible to carry out OJT and PFO at a time when there seems to be a discrepancy between tasks and the number of air traffic controllers. Training of personnel at Bodø following the merger of Trondheim ATCC and Bodø ATCC was not according to the regulations, and questions can be raised as to whether there was sufficient training. A repetition of this should be avoided in the creation of ATCC South.

13) Redundancy and the EMP situation, particularly associated with Bodø, seem to have been inadequately studied and there seem to be questions as to whether the intentions of the Ministry of Transport and Communications and the Civil Aviation Authority have been met.

14) The hasty creation of ATCC North meant that the decision was made to continue to control air traffic with outdated equipment, not choosing a solution that would have provided improved air safety.

15) The interpretation of BSL E 4-4 for staffing fire and rescue is based on an absolute minimum interpretation and the opportunity to allow for concurrent firefighting and rescue has not been taken. The opportunity to vary airport categories in relation to planned aircraft activity allows the non-participation of all available equipment in the contingency and will, therefore, lead to a reduction in air safety.

16) Training and testing of fire and rescue crews have improved, and those participating today are better prepared for their tasks. This has not always been the case.

17) Avinor did not allow sufficiently for the role of the Civil Aviation Authority in the Take-Off-05 project. However, the Civil Aviation Authority has kept to its self-imposed deadline of one month. There may be grounds to question whether this has affected the quality of the decisions made by the Civil Aviation Authority.

18) There is a conflict between the Civil Aviation Authority and Avinor, which has been present since the "divorce". Both need to improve. The Ministry of Transport and Communications has contributed to the maintenance of the conflict by allowing the creation of an Avinor which has retained some supervisory tasks. The supervisory activities that have been retained by Avinor (RFL I and AIP) should be transferred as soon as possible to the Civil Aviation Authority.

19) There is doubt as to whether the competence requirements set by the Civil Aviation Authority for acceptance/approval of key Avinor personnel are sufficient.

20) Follow-up and control of the company demand more of the owner now that Avinor has become a state-owned company. The "political management" of Avinor should focus just as highly on Avinor's societal/safety-related duties as on the financial return. The owner (the Ministry of Transport and Communications) seems to have assumed that the Civil Aviation Authority will cover any potential weakness associated with air safety.

21) There has been a limited focus on safety in the political processes when the Civil Aviation Authority was separated from the old Civil Aviation Administration, and the latter changed to a state-owned company. There has also been little focus on the fact that deregulation means increased demands on supervision and control. This became especially clear when the authority was moved at the same time as Avinor carried out/planned major changes to its organisation.

## 6.6    Safety recommendations

- Avinor should consider to let the approved and planned safety-related "Take-Off-05" initiatives that have not yet been implemented rest until the safety consequences have been thoroughly studied and documented, compared with DNV's reservations and comments, and have been checked with the relevant safety and supervisory authorities.

- Avinor should consider implementing a documented review of experience with the "Take-Off-05" initiatives that have already been implemented, seeing whether DNV's reservations and comments, and the relevant official requirements, have been met.

- Avinor should consider increasing its internal capacity in general, and the safety specialist expertise in particular, in order to be able to follow up the heavy increases in recommendations and initiatives generated by the safety management system (occurrence reports, risk analyses, etc.).

- The "employer" Avinor AS and the labour organisations in the company should consider intensifying their efforts to improve coordination and employee involvement in internal decision processes, so that trust is increased between the parties. This is regarded as being necessary in the development of a positive culture of safety.

- The Civil Aviation Authority and Avinor itself should consider whether there have been enough aviation and/or safety specialist requirements imposed on central senior management positions with an overall responsibility for aviation safety at Avinor.

- The Civil Aviation Authority should consider whether Avinor's interpretation of BSL E 4-4 meets the intention of the regulation, both in view of the fact that staff levels are not dimensioned for concurrent rescue and firefighting, and that the downward adjustment of airport category allows for a lack of personnel contingency for all available equipment.

- The Ministry of Transport and Communications should ensure that the official duties that are still carried out by the state-owned company Avinor are transferred as soon as possible to the Civil Aviation Authority and/or other official bodies in which the responsibility would naturally reside.

- The Ministry of Transport and Communications should, in a holistic social safety perspective, and in collaboration with other responsible/affected official bodies and based on the report from the "Committee for securing Norway's critical infrastructure" which is expected to be published in the autumn of 2005, consider gaining experience

from, and evaluate the current model/solutions for state ownership/administration of air navigation services and airport operations.

*(This safety recommendation is given with the authority of the commissioning document from the Ministry of Transport and Communications, in which the AIBN is also given the opportunity of "investigating in more detail other conditions that may be revealed in connection with the investigation".)*

# 7 AIRLINES

## 7.1 Widerøes Flyveselskap ASA

Widerøes Flyveselskap ASA was started by five enthusiastic friends in 1934. One of these was Viggo Widerøe. To begin with, the company was located at Ingierstrand outside Oslo, and its first activities involved taxi and ambulance flights, a flying school and air photography.

From the 1950s, its activities increased considerably, and the seaplane routes in northern Norway generated the greatest revenues, together with workshop operations at Fornebu Airport, Oslo. The seaplane routes were later replaced by land-based routes after the Norwegian government decided to establish the regional STOL airports. In 1968, the first four of these were opened on the Bodø - Trondheim route.

In 1970, Widerøe was reorganised, as the company wanted to play a leading part in the development of the regional air routes. Its business concept of only scheduled operations was achieved, among other ways, by injecting new capital, which gave the company strong growth. The subsequent continual development has made Widerøes Flyveselskap a significant carrier in Norway's outlying regions. The company's route network is currently twice as extensive (number of destinations) as Braathens' and SAS' total domestic routes.

At present, Widerøe has more than 300 daily departures to 41 destinations in Norway and abroad, and more than 1.5 million passengers each year.

In the period 2000 – 2004 there have been organisational changes in the company, at the same time as the external framework conditions have changed:

1. 2000 New manager technical division
2. 2001 Introduction of DHC-8-400
3. 2001 new base at Torp, carries out A-checks every night
4. 2004 Split into operations and maintenance sections
5. Introduction of CORM (Corporate Resource Management concept for the whole organisation).

The organisation up to the management level has changed little in the period 2000 – 2004.

During the entire period, there has been strong focus on making the work more efficient and cutting costs. It has been, and remains, a goal that the fixed costs of administration and support functions should end 2005 at the same level as at the end of 2003. The "Administration Project" which was implemented in 2004 reduced the administrative workforce somewhat, but resulted in the creation of an operations division. Focus has been on adapting tasks and resources to the needs of the organisation and the market.

Other projects of this type, which have taken place in the period, have been the "Widerøe mile" in which the goal was to save NOK 60 million, as well as the "Struggle for the hourly rate".

Before 2004, there was a distinction between line and basic maintenance in aircraft maintenance. The Board has focused on having the fewest possible technical bases - there is a goal in place for only having two, although this has never been possible to achieve. In this period, bases have been created and closed; there have been many changes. There have also been a number of tender processes. This applies especially to the 17 aircraft in the DHC-8 100-series.

Discussions have included merging workshops, possible closure and/or outsourcing of the workshop function, and whether the workforce should be organised according to components or aircraft types. At present both are done.

As an example of how cost-saving measures have impacted on aircraft maintenance, we take a story concerning what happened when it was decided to reduce aircraft cleaning. After a while, problems arose with the cabin temperatures, and a maintenance program was established for the temperature system. The reason for the temperature problems proved to be that the temperature measurement sensors were dirty, as a result of the lack of cleaning. This story is also an example of another reported challenge: that quality assurance takes place in vertical lines, and that there are too few audits of the "lateral" challenges or gains. We point out that the regulations do not allow for quality audits across organisations.

In 2003, the aircraft maintenance division was JAR 145 approved, and in 2004 Part 145 approved. In 2004, the workshop was again approved in accordance with JAR 145, with greater freedom of action than in Part 145.

In this period, technical training has been complicated by the changes in the regulations. The changes have taken place quickly, but the professional background of those who are to be trained lags, naturally enough, behind. It is thought that if the change to the new regulations had been made too quickly, people with the wrong basic education would have been recruited, so attempts have been made to retain as many as possible from the old system.

Widerøe emphasises having high levels of training among its technicians. The system is based on all technicians being able to taxi the aircraft. This is considered necessary as the aircraft are often parked far from terminal buildings. Simulators are used to train for this. This may require up to 20 hours' training in a simulator for a technician. This training programme has been possible because there was a simulator in Bodø until 2004; now technicians must travel to Gardermoen for the same training.

There was a challenge to the training for the DHC-8-400 series, as the course had been planned and started without being approved by the Norwegian Civil Aviation Authority. The Human Factors course in maintenance is developing slowly. For some time, Widerøe

has focused on Corporate Resource Management (CORM) in which they have tried to look at the organisation as a whole, training technicians with pilots and managers. The decision to downplay this programme to the benefit of more traditional Crew Resource Management (CRM) was taken before the requirement for the Human Factors training for maintenance was known.

The introduction of JAR/Part 66 has created a lot of work for the organisation. The special Norwegian requirements that supplement the EASA requirements have required initiatives and resources. In contrast to several other countries, Norway has a requirement that technicians are ICAO approved. The Civil Aviation Authority has an important task in ensuring the requirements are always updated, and that the approval of training and technician certification is carried out in such a way that the companies are not prevented from performing their work. At times, the aircraft maintenance division at Widerøe has felt that the Civil Aviation Authority can take a long time.

The conversion from ICAO to A, B1 and B2 has posed challenges because the technicians who are approved for sign-off do not necessarily have enough avionics expertise to know whether the job that they are signing off has been carried out satisfactorily. There is concern that some people may, as they are certified for the job, be given jobs they are not competent to do.

In 2000, there was a new requirement for continuation training. This was not followed up. This has been all about getting up to minimum requirements. There has been a focus on the fact that the transfer of simulator training to Gardermoen in 2004 has made it difficult to carry out continuation training for technicians.

There have not been major changes associated with safety-related management systems recently. The changes in the quality and reporting system were carried out in 1996 in connection with the employment of a new Quality Manager. The changes involve the creation of one address, one form and one system for all deviations. The Safety Board was created in 2002.

Widerøe established an air safety forum to follow up initiatives after the Namsos accident (around 300 initiatives were proposed after this accident). The task of the forum is to draw up an air safety programme for the next few years and follow it up. The programme will be submitted to the Safety Board for approval. It is based on trends, incidents, internal investigations, etc. Everyone can read the minutes of the Safety Board. The Safety Board also discusses matters of common safety concern.

The company has decided to implement LOSA (Line Operations Safety Audit), but this will require acceptance by the pilots' union (WFF), which has not yet been achieved.

The quality department has received fewer resources over the past few years, and has been through an efficiency process. In particular, much of the manual work has been removed. The organisation is now vulnerable if anyone becomes ill or takes leave of

absence. The quality organisation satisfies their internal and government requirements, but says that it would like to have had greater capacity.

There have been many changes in the organisation, as well as efficiency and cost cutting campaigns. At the same time, there have been a number of changes in the framework conditions for the entire industry with the introduction of EASA, JAR OPS 1, Subpart M/Part M, JAR/Part 145, JAR/Part 147 and JAR/Part 66.

Also at the same time, the company has had to relate to both external and internal changes. This has led to extra burdens on the workforce, and has affected levels of training and skills development. It must also be assumed that approval of the workshops has also required extra resources.

Widerøe has a good reactive system for following up deviations and incidents, but has fewer systems for proactive safety work, such as follow-up of dispensations and low risk deviations. There is no system in place for holistic risk assessment, although certain risk assessments have been made of major changes.

## 7.2 SAS Braathens

SAS is a complex organisation with maintenance activities in all of the three Scandinavian countries. This is why it can be difficult to separate out "Norwegian" data.

In 2000, SAS was highly profitable. This has changed dramatically over the last five years. The SAS Group's financial situation and framework conditions differ widely from those in 2000.

SAS Braathens is a new airline, which was established in the spring of 2004, based on Scandinavian Airlines in Norway and Braathens. SAS Braathens will operate on domestic routes in Norway, and between Norway and other European destinations. The company is the largest Norwegian airline, with 440 departures every day.

The airline has a route network that includes 41 destinations from Longyearbyen in the north to Las Palmas in the south. The network is served by Boeing 737 and Fokker 50 aircraft. The intention is to maintain all of the current destinations served by Braathens and Scandinavian Airlines' Norwegian company. The company wants to be acknowledged for its reliability. Only 1.3% of both SAS and Braathens departures in 2003 were cancelled. At the same time, 91.3% of SAS departures and 89.2% of Braathens departures left within 15 minutes of the scheduled time. The goal of the new company is for the merger to result in further improvements in punctuality and regularity.

"The Airline Service Commitment" is a voluntary commitment by an airline that it will provide service with a quality standard that applies before, during and after the journey. The service promises have been developed in a collaboration between the European aviation industry, the EU and representatives of various consumer groups. Scandinavian Airlines and Braathens signed such agreements as early as 2002, as did Widerøe.

In 2004, the SAS Group had a turnover of SEK 58 billion and has a 32,481-strong workforce. The Group is split into several business areas:

1. Scandinavian Airlines is the largest airline in northern Europe, carrying 23 million passengers each year (2004).
2. The sales organisation is integrated into the company and coordinates Group sales in Scandinavia.
3. The business area includes the Snowflake low price concept.
4. Following a recent reorganisation (March 2004), Scandinavian Airlines was split into four independent units: Scandinavian Airlines Sweden, Scandinavian Airlines Denmark, Intercontinental activities and SAS Braathens.
5. SAS Technical Services and SAS Ground Services offer baggage handling, ground services and technical maintenance of the aircraft. SAS Cargo also belongs to this business area with its air freight services.
6. SAS Trading, SAS Flight Academy, Jetpak, European Aeronautical Group, SAS Media and Travellink. These units are engaged in aviation-related activities,

including retail at airports, pilot and cabin crew training, express freight, production of aircraft planning systems and in-flight magazines.

The following major changes, which took place during 2000-2004, have impacted on maintenance in SAS Braathens:

- Braathens' engine works was sold to Pratt & Whitney in 2000/01
- Braathens was acquired by SAS 21/9/2001
- SAS Braathens was established as a separate PLC on 1/3/2004
- Braathens Technical Services (BTS) was created on 1/11/2004, and the engineering works sold to SAS Technical Services (STS) 1/11/2004
- Subpart M-organisation approved from 1/10/2004.

Braathens sold both its engineering works and maintenance works. Following the sale, activity-based contracts were entered into with these units. The company retained its maintenance engineering expertise after the sales, and this group is responsible for preparation of orders and follow-up of contractors' deliveries through monthly monitoring. As the company has retained its skills, the opinion is that safety aspects are maintained in the same way as before the sales. The sale of the workshops created a great deal of turbulence and uncertainty within the company.

Today, line personnel are not in physical contact with aircraft between 2400 and 0700 hrs, unless they are requested in connection with actual faults. This reduces the opportunity of finding faults that have not been reported by personnel. Formerly, the company had technical six-person groups with a range of skills at all external facilities over a certain size. These could generally solve most of the problems that occurred. During this period, pilots have also assumed responsibility for external checks of the aircraft before flights.

There was previously also direct contact between air crew and technical personnel at Braathens on frequency 131.500 MHz, while the aircraft was still in the air. Uncomplicated checks could be carried out directly, and there was time to prepare for fault finding before the aircraft landed. Today, there is mainly telephonic contact between traffic control and BTS (Braathens Technical Services) after the aircraft has landed. This allows shorter time for fault finding/repair, creating a stress factor. Formerly, there was also direct contact with the technical managers at Braathens when spare parts were requisitioned, and when "borrowing" parts from aircraft that were on the ground for service. Today, the Stores Manager at Scandinavian Technical Services (STS) must be contacted to find out whether spare parts can be "harvested" from aircraft undergoing service, if the necessary spare parts are not in stock. The Stores Manager is uncertain about his own authority, and which parts can be "harvested", and therefore must contact other personnel internally at STS, which has led to increased waiting times for parts.

Following the sale of BTS to STS, the lines of communication have become unclear. Uncertainty as to distribution of responsibility and authority has occurred at "Line" and "Heavy Maintenance". BTS is now a subcontractor of STS on an equal footing to other

subcontractors. All maintenance activities are governed by contracts and maintenance in excess of these contracts is not carried out unless specially agreed. There is uncertainty about which routines apply after the new organisation of STS/BTS – the old BTS routines or new STS routines.

Organisational change has led to more difficult lines of communication with SAS (the airline). There is only one contact person. This can lead to clear communication, but at the same time also a deficient organisational redundancy. Only having a single point of contact at SAS can lead to longer decision/clarification times for enquiries.

As the night shift's jobs are compressed, more and more maintenance tasks are only performed according to the maintenance programme. There is less time to use to uncover faults that do not have a direct link to the jobs described in the activity lists for that shift. Extra work that is performed must be invoiced and have, therefore, to be approved by representatives of the customer. These are few in number and they are not always easily accessible. In addition, in a number of cases, enquiries must be forwarded for approval before a job can be started.

Certain first line maintenance tasks have been transferred to personnel from SAS Ground Services (SGS), who have been trained for them. The technical personnel think that, in a potential non-conforming situation, these personnel categories do not have sufficient background to make correct decisions or use the correct lines of communication. This may lead to a minor event escalating and having greater consequences. The personnel are not trained for non-conforming situations, and would not necessarily see the whole picture. They also lack knowledge of other systems and do not have the background to interpret danger signals. Activities that have been transferred to SGS are not formally characterised as maintenance. No other companies allow SGS to carry out these types of activity.

A focus on finance has led to less time for maintenance. Faults found must be approved before maintenance can be carried out and there is ever increasing focus on finance and delays.

Post-Flight checks are no longer carried out which, it is claimed, has led to an increasing amount of faults being discovered by technicians before departure.

The sale of the engine workshop has led to less flexibility when assistance is required for engines. Engineers must be requisitioned from Pratt & Whitney for engine work. Following the sale, BTS has taken over boroscopy and personnel have been trained. This has not led to changes in finds in this activity.

Braathens does not carry out Line Operation Safety Audit (LOSA) for maintenance.

During this period mutual Task Release has been entered into with Widerøe for category A activities on Boeing 737 (Braathens) and Dash 8 (Widerøe).

Various campaigns have been implemented in order to reduce costs. At the same time, the *maintenance* interval for 737-705 NG aircraft has been extended from 18 to 24 months, in line with the supplier's recommendation.

After the decision was made to merge SAS and Braathens it was decided that STS should have JAR-147 approval and hold JAR-147 courses for the whole company. The course department at Braathens is still holding JAR-147 courses after the merger and applications are made to the Civil Aviation Authority for dispensation from the course organiser certification requirement on an ad hoc basis.

The transfer to the new set of regulations has led to fewer courses for Braathens personnel. This also applies to Continuous Training. When the change was made from ICAO M to JAR 66, B1 and B2, some of the personnel were awarded certificates within areas in which they were not sufficiently competent. This was a direct consequence of all holders of ICAO M certificates being automatically converted to JAR 66, B1 and B2 certificates.

145 approval requires employment of B1 and B2 support staff (specialist groups within both categories as support for management).

Personnel from Ground service are not given sufficient training in the new job tasks. Training is limited, for example, to: lubrication of components – demonstrating grease points.

Braathens' employees claim that, despite the bad times, the company maintained high levels of security between 1998 and 2004, largely thanks to its focus on aviation safety following an air accident in the US in 1997. This accident resulted in the FAA carrying out a comprehensive review of all FAA approved facilities. The result of the FAA review in 1998 was so unsatisfactory that the company (and many others) had to improve in a number of areas. The company received an interim dispensation for 6 months. The FAA review also led to the Civil Aviation Authority playing a greater part in connection with increased focus on maintenance. During this 6-month period, the company discovered many weaknesses in their own systems/processes, and this led to internal improvements and tightening up in a number of areas. These included a greater focus on follow-up of internal and external audit reports.

Maintenance Error Decision Aid (MEDA) is a reporting system which is used to learn from your own and others' faults. The system is intended to be used in such a way that focus is directed on the matter and not on the person. Incidents that are reported are used to solve problems and learn from them. MEDA is requested either by personnel/departments or by the quality department following incidents/observations. The system has, after a somewhat slow start, worked well for the company. It has been pointed out that the system is vulnerable if focus begins to be directed on the personnel who have been involved in the events that are reported. The Safety Management System is no longer used.

Quality engineers at Braathens carry out preventive work through direct contact with personnel/visits to departments in which they observe and have discussions with the personnel.

The industry is strongly governed by regulations and routines, with a lot of redundancy allowed for in the regulations and routines. The company thinks that this allows little chance of serious consequences from individual faults. Explicit risk assessments of internal changes to regulations at Braathens are not carried out. Nor did the company carry out explicit risk analyses when it sold the workshops. Risk assessments in connection with the merger process were entered into the "operative integration" project when SAS and Braathens were merged.

In the period the company has reduced its fleet by 6 aircraft. Despite this, the number of flying hours remains at around the same level. This means that the fleet has been better exploited. At the same time, the total workforce in the technical department has remained virtually the same. The split between internal/external costs has changed to more external purchasing of services. This can mainly be explained by the sale of the engine workshop in 2000. The total extent of maintenance seems unchanged, and total maintenance costs per flying hour have been steady.

The company has had a steady and positive development in most of the technical indicators during the period, with the exception of ASR and MEL departures category C. The organisation's ability to perform maintenance in accordance with the schedule also seems satisfactory. This gives grounds to assume that the technical condition of the fleet is good. Systems are in place for deviation processing, with regular structured reviews of reported faults. Changes in maintenance intervals are made in close cooperation with suppliers and the Civil Aviation Authority.

Heavy maintenance jobs have been transferred to the night shift. This has resulted in a tight schedule and ever less time for "extra work" (unplanned maintenance), such as the repair of new faults that are discovered when carrying out planned maintenance. At the same time as maintenance activities have been transferred, night staff levels have also been changed. In time, the scheme could lead to a reduction in technical condition, and possibly higher maintenance cost levels, resulting from an increased proportion of corrective maintenance.

The change from ICAO II to B1 and B2 made it easier to transfer lighter maintenance activities to other workshops. In this period, Braathens had an agreement with Widerøe for the companies to carry out maintenance for each other.

In the change from ICAO to JAR B1 and B2 certain specialist groups' certificates were automatically converted, and they could sign off maintenance tasks. They did not, however, possess sufficient qualifications to do so. Other personnel groups, such electronics and avionics personnel possessed certificates to carry out maintenance on components, but were not given certificates for signing off maintenance (CRS). These

specialist groups must find personnel holding B1 and B2 certificates for signing off. In principle, this will lead to poorer control and probably less respect for the rulebook.

Personnel who possess the former BSL approval must sit new examinations for JAR 66. This has created frustration in the relevant personnel groups, who regard this as a pure formality.

Between 2000 and 2004, the training department at BTS was reduced from 17 positions in 1997 to 4.5 positions in 2004. Following the downsizing, personnel are taken in from other departments to act as instructors. The current range of courses has been reduced, because all courses must be ordered and paid for as external courses. The strategy has changed in such a way that the personnel must be more specialised and receive training accordingly.

Braathens has been marked by the many changes in the period. Some of the changes have had a positive impact on aircraft maintenance (ASR except Cat. Low, MEL except Cat. C, Cancellation, PIREPS), while others may have had a negative impact (ASR Cat. Low, MEL Cat. C). Our analysis of the result indicators does not provide grounds to make any clear conclusions of the net effect on aircraft maintenance, and therefore aviation safety in the company. Our sources, however, have claimed that the reorganisation has led to increased pressure on time and uncertainty around employees' own situation and future. It has meant that technical personnel have reduced contact with the aircraft, and in some situations personnel have exceeded their mandates and their certificates. An example of this type of transgression is that non-technical personnel, i.e. personnel who do not possess formal approvals, have carried out inspections off site following undesirable incidents.

The merger of Braathens and SAS seems to be going according to schedule, but the process has created a great deal of frustration among flight personnel in the two companies. Both parties think that the other has gained from the merger. Some of the problem seems to be that the senior management have not emphasised the different corporate cultures in the two companies, and that the merger is taking place too quickly, with the changes and process not communicated to those concerned in a satisfactory way. It is felt that several matters that have not been resolved have only been swept under the carpet. The management has tried external measures to make the merger work, including the introduction of common crew rooms. It has also selected representatives from both of the companies who will try the "blending-in process" before it is run as a single company. This seems to work, but it is important to be aware that these representatives are taken from those who are positive, who wanted to join the project, and therefore have another starting point than the majority of the operational personnel.

The company's training department for operational personnel has taken on an important task when creating the new training routines, which must integrate courses from both companies in a uniform way. Personnel from both companies must be able to feel at home, at the same time as the new culture is implemented in a way that can be accepted by everyone.

The company seems to believe that a new, common culture will develop in time, instead of having worked on a corporate culture that is new to both parties, making it easier to accept. It is familiar ground that high levels of frustration divert attention away from tasks that should be concentrated on, leading to accidents and incidents caused by reduced awareness.

### 7.2.1    Qualification levels and training

Braathens' technical department started to introduce Human Factor courses in 2001/2002. A special concept was developed for Braathens, with customised courses for the various personnel categories ranging from senior management to operative Line personnel. They have also had courses for personnel at Norwegian Air Shuttle.

The new organisation that followed the creation of Braathens Technical Services (BTS) and sale of the unit to Scandinavian Technical Services (STS) has resulted in the current position of subcontractor to the operators, including SAS Braathens. This means that the company is now considered and treated in the same way as other external suppliers, including the course business. The company has leaned towards developing the leading edge skills of the personnel and reducing general multidiscipline skills, and multi aircraft skills.

Braathens reates 2-year plans for courses and training personnel. These are approved for only one year at a time by the Civil Aviation Authorities, as the regulations state that annual plans must be drawn up.

The processes of change in the period have led to a stricter internal company view of safety, but the Civil Aviation Authority has focused on type courses with certification, and has not shown interest in all of the other courses that Braathens has run for its employees.

Braathens has run its own training scheme, approved by the Civil Aviation Authority when regulations have been changed.

When the 737-700 series arrived, it was a great technological leap forward, compared with the 737-300, - 400 and -500 series. This imposed requirements for new skills, yet parts of the organisation lacked the motivation to develop their own skills for this aircraft type. At the same time, the company changed its philosophy of increasing specialisation, and its view that "all personnel shall not have expertise in all aircraft types". The current range of courses has been reduced, because all courses must be ordered and paid for as external courses. The strategy has been changed, so that the personnel are more specialised and receive courses and training according to their needs. The strategy of BTS is that expertise shall not be developed, or personnel certified for other aircraft types than those the company fly.

Courses/training that take place at Braathens can be divided into five different categories:
  a.  Apprentice training according to the "folder model"
  b.  Human Factor concept, basic training
  c.  Type course: Fokker 50 (finished in 2001)
              147-certified technicians on 737-700 take a
              9-week diff. course
              Annual full type course for the 300, 400 and 500 series
              JAR B1 and JAR B2 courses annually
              Conversion courses from ICAO M to JAR B1 and B2
  d.  145 training. Course that does not lead to type certificate
  e.  General technical training. (Documentation, IT, HSE etc.)

Broken down, there was focus on type courses until 2001, while there has been focus on HF and Continuous Training between 2001 and 2003. (Continuous Training cancelled in 2003). In 2003/04, the main emphasis has been on IT skills development.

1.  The transfer to the new set of regulations has led to fewer courses for Braathens personnel.

## 7.3  Norwegian Air Shuttle ASA

The company was established on 22 January 1993. The company carried on some of the activities of Busy Bee of Norway A/S. Busy Bee was part of the shipping line, Ludvig G. Braathens Rederi. In 1993, the company had a fleet consisting of three Fokker 50 aircraft. These three aircraft and approx. 50 employees formed the resources at start-up. Nine years later, the number of aircraft had increased to six and the workforce to 130. This was before the start of Norwegian Air Shuttle's new 737 operation, with low-price domestic flights in 2002.

The activity started in close cooperation with Braathens S.A.F.E. (South-American & Far East). In the subsequent years the company increased slowly, but surely, its production for Braathens. In the winter of 2002 the company began to fly its own route, Stavanger-Newcastle. This closed in December the same year, because it was not profitable. Until September 2002, Norwegian Air Shuttle was an airline that had specialised in being an operator for Braathens in western Norway, flying Fokker 50 aircraft.

In the autumn of 2002, Norwegian Air Shuttle began to compete against SAS and Braathens in domestic flights. The company acquired seven 148-seat Boeing 737-300 aircraft. From 1 September 2002, the company started the routes Oslo-Stavanger, Oslo-Bergen, Oslo-Trondheim and Oslo-Tromsø. The workforce increased to around 300. The route network was expanded in the spring of 2003 with flights to Faro, Malaga and Murcia (San Javier). In the course of that year, new domestic and foreign routes were started. In the autumn of 2003, the company was also given a licence to fly three northern Norwegian Air Shuttle routes. The three routes were Tromsø-Lakselv, Tromsø-Andenes and Andenes –Bodø.

The Fokker F-50 operations were terminated on 31.12.2003, and the aircraft sold in the 2nd quarter of 2004.

On 18 December 2003, Norwegian Air Shuttle was listed on the Oslo Stock Exchange. The listing was successful and was oversubscribed. The company gained new capital of NOK 250 million from the issue.

In the beginning of 2004 a further three aircraft joined the fleet, which in the summer of 2004 numbered 11 aircraft. The 12th aircraft joined the fleet in the late autumn of the same year. From May 2005, Norwegian Air Shuttle has a fleet of 13 aircraft. During 2004, Norwegian Air Shuttle carried 2.1 million passengers. The workforce at Norwegian Air Shuttle currently numbers 450.
The most significant changes in the company during this period have been:
- Change of operations from F50 in western Norway to B737 throughout Norway and abroad
- Phasing out the F50s and phasing in B737
- Strong expansion in the number of aircraft, routes and employees, as well as a new maintenance base at Gardermoen

In general, the situation at Norwegian Air Shuttle is very stable, especially considering the rate of growth of the company. Changes in levels of safety have not been registered in this period. The company has initiated new systems that will contribute to maintaining safety levels in the future.

A number of safety indicators have been reviewed. We recommend that Norwegian Air Shuttle follows up the number of incidents, as these are on the increase. This increase may be a result of improved reporting routines, but the trend may have other causes.

Norwegian Air Shuttle is, as are other Norwegian airlines, systematic in its follow-up of its reactive safety efforts. As far as proactive safety work is concerned, Norwegian Air Shuttle has carried out risk analyses for new destinations and analyses of safety culture in the company, but this lacks a system and a concept that encompasses the purpose of such safety work.
At 01.01.2000 Norwegian Air Shuttle operated 6 Fokker 50 aircraft on Braathens' route network in western Norway. After Braathens was acquired by SAS in 2002 the contract with Norwegian Air Shuttle was terminated, and this is when the company started its own routes. The decision was made on the basis that the financial basis for small aircraft traffic no longer existed. In this situation, no specific safety assessments of the decision to start operations with Boeing 737 aircraft were made, as the options were to begin with this aircraft or shut up shop.

This decision led to two major changes, the start of the B737 operations and termination of F50 operations. When B737 operations started, new aircraft were purchased and new routes were started. All Norwegian Air Shuttle personnel attended type courses for B737 and were transferred to this operation. The organisation's workforce increased heavily.

Personnel with experience of this sort of operation, in particular, were employed before the start of the B737 operations.

The maintenance programme was extended from only night work in Stavanger to also carrying our maintenance in Oslo on a 24-hour basis. Daily service checks were extended from 24 to 48 hours. As with the F50 operations, Norwegian Air Shuttle decided that the B737 operations should only involve line maintenance and all heavy maintenance services should be purchased externally.

Many of the technicians who have been recruited to Norwegian Air Shuttle have come from Braathens. This has required a period of change, as certain cultural differences have been revealed between the Norwegian Air Shuttle and Braathens personnel. This has included the Braathens technicians being used to getting what they need in the way of equipment quickly, and being several on duty at the same time so that they could support each other in difficult maintenance tasks and decisions. Even so, most of those who have come from Braathens have not had any difficulty in adapting to the working methods at Norwegian Air Shuttle.

There was a wish to rotate Norwegian Air Shuttle personnel between the bases in Stavanger and Oslo. This has proved to be difficult to implement, as the personnel have been against such rotation. The plans for the rotation are currently on ice.

Norwegian Air Shuttle employs primarily technicians with B1 certificates, relevant skills and training. All heavy maintenance services, and also to a certain extent avionics (B2 certificate), are outsourced.

Training at Norwegian Air Shuttle has changed between 2000 and 2004, as the operations have changed from F50 to B737 operations. All training material has been updated to take this into consideration, and training has also taken place in accordance with the documentation from the manufacturer. As far as those personnel who worked for Norwegian Air Shuttle in 2000 are concerned, all of the permanent employees have taken B737 courses and have updated their certificates. All of the technical personnel at Norwegian Air Shuttle possess B1 certificates, apart from one person, who is converting from F50 to B737 in the first quarter of 2005. Norwegian Air Shuttle's technical training is split into initial training, which takes place immediately a person starts work, and a refresher course which all technical personnel take within two years of the last course taken. This means that technical personnel will take a course at least every second year. After a new employee has been through the initial training, he or she will receive on-the-job training under the supervision of a superior. Following the refresher course, all employees must pass an examination.

Norwegian Air Shuttle's training consists of an introduction to the company, the routines, a type course if necessary, various courses that focus on special jobs that are relevant for various position courses and Human Factors training. Take-off checks at Norwegian Air Shuttle are carried out by the pilot (see routine in MMOE). This has been the situation since 2000. For this reason, technical personnel do not train in take-off checks. HF

training is initial for technicians, and is also carried out as part of the refresher course for all technical personnel. From 2000 to 2004, HF training has been a service provided by Braathens.

Historically, some of the training services have been purchased from Braathens and SAS. Norwegian Air Shuttle has purchased courses approved by the Civil Aviation Authority from Braathens, while courses that require a Part 147 approved school have been purchased from SAS. Part 145 courses are held by Norwegian Air Shuttle's personnel. Today they are considering making the further training/refresher courses for B2 available online.

The Maintenance Manager is responsible for documenting and following up all training for personnel in the technical department. The training is part of the Certifying Staff Record, which is filed by the Maintenance Manager.

As far as operative personnel are concerned, the aim is to achieve close coordination between the training department and the operative department. All of the operative personnel take an in-house CRM course which has been created by Norwegian Air Shuttle, using outsourced resources where they are not available in-house.

The chapter concerning safety and standards in the Norwegian Air Shuttle quality manual discusses a number of aviation safety goals and methods of achieving them. One of these methods is risk analysis; in other words, proactive safety work. Norwegian Air Shuttle carries out proactive safety work, but not risk analyses in the traditional understanding of them. Norwegian Air Shuttle carries out risk analyses of new destinations, i.e. risk analyses of relevant airports. The company does not carry out traditional risk analyses when acquiring new aircraft. When the company purchases new aircraft, it receives documentation for the aircraft, and this documentation forms the basis for the decision because it is reviewed in a systematic way to ensure that it gives all of the necessary information, and that this information is satisfactory. Two representatives from Norwegian Air Shuttle also travel to the supplier of the aircraft for a systematic, two-month inspection before taking it over.

Norwegian Air Shuttle carries out quality assurance of all of its maintenance providers before they may perform their services. This quality assurance involves, among other things, reviewing the service provider's quality and maintenance systems, to ensure that these are satisfactory. In addition, Norwegian Air Shuttle carries out audits of maintenance service providers as part of its reactive safety work.

The company has carried out safety culture analyses in order to feel the pulse of the personnel's attitudes and problems. The latest safety culture analysis was carried out in the spring of 2003, and the result was completed in early autumn 2003. A similar safety culture analysis was carried out in 2001. The 2003 safety culture analysis showed that Norwegian Air Shuttle had been through a major process of change, without it negatively affecting the company's general safety culture to any significant extent. Improvement was deemed necessary in clarification of responsibilities and implementation of these in the

quality manual. The analysis also pointed out the need for implementation and prioritisation of meeting forums, and better arranged courses in the technical department. It was also recommended that working routines and feedback following reports of incidents and general aviation safety information should also be improved. These recommendations had either been implemented or were still being worked on while this study was in progress.

Occupational health and safe working environment themes at Norwegian Air Shuttle is organised in its internal control system, which forms part of the company's quality system. Internal control includes quality assurance of health, safety and the environment, and builds on the same principles as other quality assurance: surveys, planning, documentation and follow-up. Norwegian Air Shuttle has issued regulations concerning health, safety and the environment to which the employees are required to adhere.

Until the autumn of 2004, the audit system at Norwegian Air Shuttle was manual. Norwegian Air Shuttle then introduced a new electronic system which will encompass all audits. This is the same system as used by Braathens. The audit system is constructed in such a way that each audit contains sub-directories that show which requirements are to be audited and what is required in order to meet the requirements. The audit plans are drawn up annually for internal and external audits. External audits follow the "Temporary Guidance Letter TGL-15" from the JAA regulations.

The audits are carried out by Norwegian Air Shuttle's own personnel from the Quality department. An annual physical check is carried out on virtually every aircraft. An experienced B737 pilot takes part in this check. There has been an increase in the number of audits carried out each year. This is because when Norwegian Air Shuttle only flew F50s the few audits were a result of a limited route network that was partially quality assured by Braathens. After starting its own B737 operations, it has proved necessary to increase the number of audits because of the increase in providers and destinations. The introduction of the computer-based audit system, and increase in routine which comes with experience, has also led to an increase in the number of audits.

As a company, Norwegian Air Shuttle is characterised by an organisation which is in the start-up phase, where systems are settling in as they go. As we have said, the audit system was first computerised in 2004, and incidents became reported electronically in 2005. Because Norwegian Air Shuttle has been a relatively small company, there were few problems related to the systems not being computerised. With the huge expansion currently taking place at Norwegian Air Shuttle it is, however, important to point out that implementation and improvement of such systems should be given high priority in the future. Norwegian Air Shuttle wants to improve its reliability follow-up system.

All in all, the safety level has not changed at Norwegian Air Shuttle from 2000 to 2004. In this period, a number of systems have been implemented that may contribute to maintaining safety in the future. Internal follow-up and focus on safety indicators, and proactive safety work will probably be highly significant in the maintenance of safety

levels at Norwegian Air Shuttle in the future, especially with regard to the company's expansion so far, and probable future expansion.

The company reports that the Civil Aviation Authority has carried out its audits according to plan, and the company has not yet registered any impact of the move to Bodø. It has, however, been noted that the certificate and training section is working hard because case processing in the area is taking relatively long time.

Norwegian Air Shuttle thinks that Avinor's services are expensive, and would also like greater stability in the service provided by air traffic controllers.

## 7.4    Offshore helicopter companies

### 7.4.1    CHC and Norsk Helikopter

These companies are the two main players in movement of personnel and offshore SAR on the Norwegian continental shelf. The companies work in a contract market, in which oil companies award contracts of 3-10 years' duration for flying from the individual bases, with the typical average contract length approx. 6 years. Each contract is awarded following a full tender competition, in which each of the two main companies, Norsk Helikopter and CHC HS, have so far acquired all of the contracts. At every tender competition there are also tenders from 2 to 3 other helicopter companies who want to enter this market. It is not unusual for one of the companies to win a contract for an operation that, at the time of award, is run by the competing company. This involves a reduction in business for the losing company, and an equivalent increase for the winner, with acquisition of helicopters, employment and training of pilots and technical personnel, acquisition of hangars and office facilities, official approvals, etc. This type of contract-driven business, with large, relatively long-term contracts, and the associated great change involved in winning or failing to win contracts, is peculiar to offshore, ambulance and state subsidised STOL aviation. The companies which have chosen to operate in these markets have also to a large degree established the flexible and adaptive culture that is necessary to maintain aviation safety through the actual processes of change.

### 7.4.2    CHC HS

CHC HS has had a stable ownership from 2000 to 2004, although there have been management changes in Managing Director/Accountable Manager (several changes), Technical Director and Chief Engineer. There have been no special changes in framework conditions for CHC HS in the study period, in relation to other aviation companies in the Norwegian sector. The changes in framework conditions on which the study is based have had little or no significance.

There have been several changes in senior management in the period. Regular turnover of key personnel is generally unfortunate in a company, but there are no indications in the

investigated material that the changes have had any negative impact on the technical level of safety.

The company split off heavy maintenance and logistics to a separate sister company, CHC Astec AS, on 1 January 2001. CHC Astec has played an important part in safety and regularity in the operations of CHC HS, as their duties include providing the company with necessary spare parts, based on a calculated and agreed need for each base. At times, there have been problems with both the ability to deliver and the quality of the spare parts and the work carried out by CHC Astec. Heavy maintenance is carried out under normal business conditions, and CHC HS monitors CHC Astec in quality audits and supplier meetings. CHC HS carries out all maintenance in the CHC Group (either itself or through CHC Astec), with the exception of some component maintenance.

In 2004, the CHC Group started a major reorganisation and coordination of its European activities. European units for technical and operative standardisation, and materials and personnel use were created. These functions will mainly be located in Aberdeen. The work of European standardisation and coordination will continue in the future.

The most important safety indicators, ASR, Technical dispensation and MEL, show a stable level throughout the period. Pireps and total technical faults show a stable or slightly decreasing tendency. The level of the study safety indicators is at the industry average or better.

Average maintenance costs per flying hour have increased by 9.4% over three years, which is equivalent to normal inflation.

There have been no significant personnel changes in technical maintenance, or within qualification levels and training, apart from splitting CHC Astec off as a separate company.

The company is in a transition phase between ICAO certificates and JAR/EASA Part 66 certificates for aviation technicians. We have been told that the company faces significant challenges linked to this transition, especially the authorisation linked to the B1 certificate.

CHC HS' safety management system is mainly based on the current official requirements from the aviation authority, with certain additions to meet the clients' (petroleum companies) contractual requirements. Such requirements include risk analysis of new activities (e.g. establishment of new bases) or significant change (e.g. acquisition of new types of aircraft) quality management that adheres to NS-EN ISO 9001, a documented system for environmental management (e.g. NS-EN ISO 14001) and reporting safety-related incidents to the client.

In response to requirements from the CHC Group and the clients, the company is developing its own Safety Management System (SMS). We have been informed that this is expected to be implemented in 2005/2006. The statistical development in the studied

safety-related indicators shows a stable, or improved, level throughout the period. The level of the indicators shows that there is good control over technical safety in the company. At times, there have been problems with both the ability to deliver and quality of the spare parts and quality of work carried out by CHC Astec. CHC HS has faced up to this, and has established closer monitoring of CHC Astec. The company's maintenance programme mainly follows the manufacturer's standard system, with some modification based on the company's operational pattern and the comprehensive experience base that CHC HS has built up.

The management of CHC has committed itself to creating a safe, healthy and accident-free workplace, while at the same time meeting all regulatory and procedural requirements. The company will work continually towards improving efficiency and increasing safety. The corporate culture is grounded on the principle of life-long training, awareness, preventive work and open communication. All employees are encouraged to work towards a safe workplace by adhering to correct routines, following up the training programme and ensuring open communication. All employees are obliged to familiarise themselves with the current health, safety and environmental regulations.

All employees participate in CRM training, which is customised for the company by CHC HS. The company did experience cultural problems when a Scottish director was employed who was not familiar with the Norwegian culture. In this period, the company became a closed company. This was corrected by a change of director.

The company enjoys a good dialogue with the Civil Aviation Authority but does find that this has been slowed by the move to Bodø. They hope that this will not introduce competitive bias through it taking longer to get approvals.


### 7.4.3    Norsk Helikopter AS

Norsk Helikopter AS started in 1993, and is an established helicopter operator on the Norwegian Continental Shelf. To date, Norsk Helikopter AS has specialised in transport of passengers to the fixed and floating installations in the North Sea.

The company currently has a 130-strong workforce in 5 bases; Stavanger, Bergen, Hammerfest, Heidrun and Brønnøysund (from 1 May 2002). 51% of the shares in Norsk Helikopter are owned by Andreas Ugland & Knut Axel Ugland Holding in Grimstad, whose interests include shipping, offshore engineering and construction. The remaining 49% of the shares are owned by Bristow Helicopter Ltd. This company was established in 1953, and is currently regarded as one of the world's leading helicopter companies, and its main base is at Aberdeen Airport.

There is a comprehensive and committed collaboration between Norsk Helikopter and Bristow Helicopter in several fields, from air operation services to personnel exchange, development of training programmes and maintenance routines, as well as a spare parts store. This is a collaboration that provides significant operational advantages to both companies. Bristow Helicopter is owned by the American company Offshore Logistics

with a 49% holding, Caledonian Investments with 49% and Andreas Ugland with 2%. The grouping Offshore Logistics, Bristow Helicopters and Norsk Helikopter have more than 420 helicopters at their disposal. Although Norsk Helikopter AS is a young company, its partners have several decades of experience in international helicopter traffic.

The company also has helicopters stationed offshore in fields in the North Sea. One is a Sikorsky S-76C+ stationed at Frigg QP, and the other, a Super Puma AS 332L1 AWSAR (All Weather Search and Rescue), is stationed on the Heidrun platform. This is a new service and the contract with Statoil started on 1 July 2001, with the helicopter used for search and rescue, ambulance services, shuttle traffic, surveillance and oil dispersal.

The company operates today with long-term contracts for Statoil, ExxonMobil and Total E & P A/S. Its fleet consists of 11 aircraft 5 x Super Puma L/L1, 2 x Super Puma L2, 2 x Sikorsky S-76C+ and 2 x S-92A.

Norsk Helikopter AS has enjoyed stable ownership, stable management and a high degree of stability in its key personnel in the period. External bases and routes have been created (and closed) as part of its commercial activities.

The company has an "integrated" JAR OPS Subpart M/JAR 145 organisation, within the framework conditions provided by the regulations. There have been no changes of a principle nature in the company's maintenance programme or MEL. Categorised MEL has been introduced for all types of helicopter.

Norsk Helikopter AS performs maintenance in its own organisation, with the exception of component maintenance and main inspection (7,500 hour inspections). There have been no significant changes in staffing levels linked to technical maintenance between 2000 and 2004, or in levels of qualifications and training of maintenance personnel in the period. The company has changed from ICAO certificates to JAR/EASA Part 66 certificates for aviation technicians. It has also introduced more stringent requirements with regard to "Human Factors" and "Continuation" training. Both technical and operative personnel carry out Human Factor training together. This is seen as very positive, as it provides a forum in which problems can be discussed across the specialist groups.

The company has developed simulator training in Florida, which is carried out with its own instructors.

The ASR and MEL indicators show a stable level throughout the period. Technical dispensations show an increase from 2003 to 2004, which is explained by the company as being due to problems in connection with changes to the supply service.

The company's accounting system does not show pure maintenance costs before 2004. There is, therefore, no basis for any exact consideration of the trend in maintenance costs. The level of average maintenance cost per flying hour in 2004 is at the industry average,

and absence through illness shows a relatively stable tendency throughout the period, with some increase from 2003 to 2004. Illness levels are, however, low, around 2%.

There is, therefore, nothing in the statistical material that we have studied to indicate any reduced technical standard in the aircraft, or reduced maintenance quality.

CHC HS' safety management system is mainly based on the current official requirements from the aviation authority, with certain additions to meet the clients' (petroleum companies) contractual requirements. Such requirements include risk analysis of new activities (e.g. bases) or significant change (e.g. acquisition of new types of aircraft), quality management that adheres to NS-EN ISO 9001, a documented system for environmental management (e.g. NS-EN ISO 14001) and reporting safety-related incidents to the client.

In response to client requirements, the company implemented its own Safety Management System (SMS) in 2004, which is documented in a Safety Management Manual. This is in advance of regulatory trends in European aviation, and it is harvesting experience and analysis methods from sources that include the offshore industry.

During the period in question, the company has increased its Quality and Safety staff. There have been no changes to the controller function or the extent of supplementary control (RII), in the period.
In general, the manufacturer's recommended maintenance programme is followed. There have been no changes in the maintenance programmes for AS 332 L/L1 or S-76C+, apart from what has been initiated by the manufacturer. The maintenance programme for AS 332 L2 was adjusted in the autumn of 2000, in collaboration with the manufacturer, and approved by the Civil Aviation Authority. The most significant changes are:

- 500-hour inspection was moved to 750 hours
- 1,000-hour inspection was moved to1,500 hours
- Other inspections have been "hacked up" and distributed.

In all, the inspection programme has been reduced by 271 hours per year, and the time laid off for the inspection reduced by 10.7 days.

The statistical development in the studied safety-related indicators shows a stable, or improved, level throughout the period. The level of the indicators shows that there is good control over technical safety in the company. It can also refer to high stability for key personnel in the period.

The company reports that it has cooperated well with Avinor at Sola. There is uncertainty about how the split of the former CAA [Luftfartsverket] into the current Civil Aviation Authority and Avinor will be in the long term. There is uncertainty about whether a risk assessment of the split has been carried out. The company wants a controlled airspace for offshore operations, as it is here the greatest safety benefit is assumed to lie.

Norsk Helikopter AS has begun to notice the move of the Civil Aviation Authority to Bodø, because case processing times have increased as a result of marginal staffing at the helicopter office. After the operator companies' operative organisation and maintenance organisation were split off, clearer division of roles and responsibility has been achieved. At the same time, the original routines have been retained. Some airlines have chosen to retain both functions within their companies, while others have separated operations and maintenance into separate companies.

Following the split into separate organisational units, the operator's operative organisation must itself assess whether the maintenance organisation satisfies the requirements for use of subcontractors. This applies both to main contractors and subcontractors. This has led to a simplification for the companies in relation to the requirements, but has, at the same time, led to a greater challenge for the inspectors.

The transition from JAA to EASA requires an adaptation of the organisation and revision of manuals.
Some of our sources expressed a wish to have a common manual, using the same terminology and definitions for the operative and maintenance organisations, and have taken this into account when revising manuals.

## 7.5 Maintenance review of the airline companies

### 7.5.1    Introduction

The main purpose of the maintenance review is to consider whether company has implemented changes of a technical, maintenance, operational, administrative and personnel/organisational nature, or a combination of these in such a way as to be significant to aviation safety.

The airline companies that have been investigated are SAS Braathens, Widerøes, Norwegian Air Shuttle, CHC HS and Norsk Helikopter. The review covers changes in a 5-year period from 31.12.1999 to 31.12.2004. The selection was made to include a representative basis for assessing the Norwegian aviation sector. There is a significant difference between ordinary airlines and offshore helicopter companies (CHC HS and Norsk Helikopter), so they are discussed independently – ordinary airlines (fixed wing) and offshore helicopter companies (rotor wing).

### 7.5.2    Method and approach

A triangulation approach has been chosen to cover a representative scope for the study. This means that it is based on several angles of approach in the investigation;

- Changes in the companies' activity levels in the period
- Safety indicators based on information collected and company data
- The companies' follow-up and risk control (aviation safety)
- The companies' risk management in processes of change.

The basis of the study is the changes in the external framework conditions laid down by aviation authorities, political authorities and the market. Description of the external framework conditions has been illustrated graphically using the Sequentially Timed Events Plot (STEP) method. The sub-reports for each company have plotted the processes of change that the individual companies have been through or are in.  The methods are described in the following chapters.
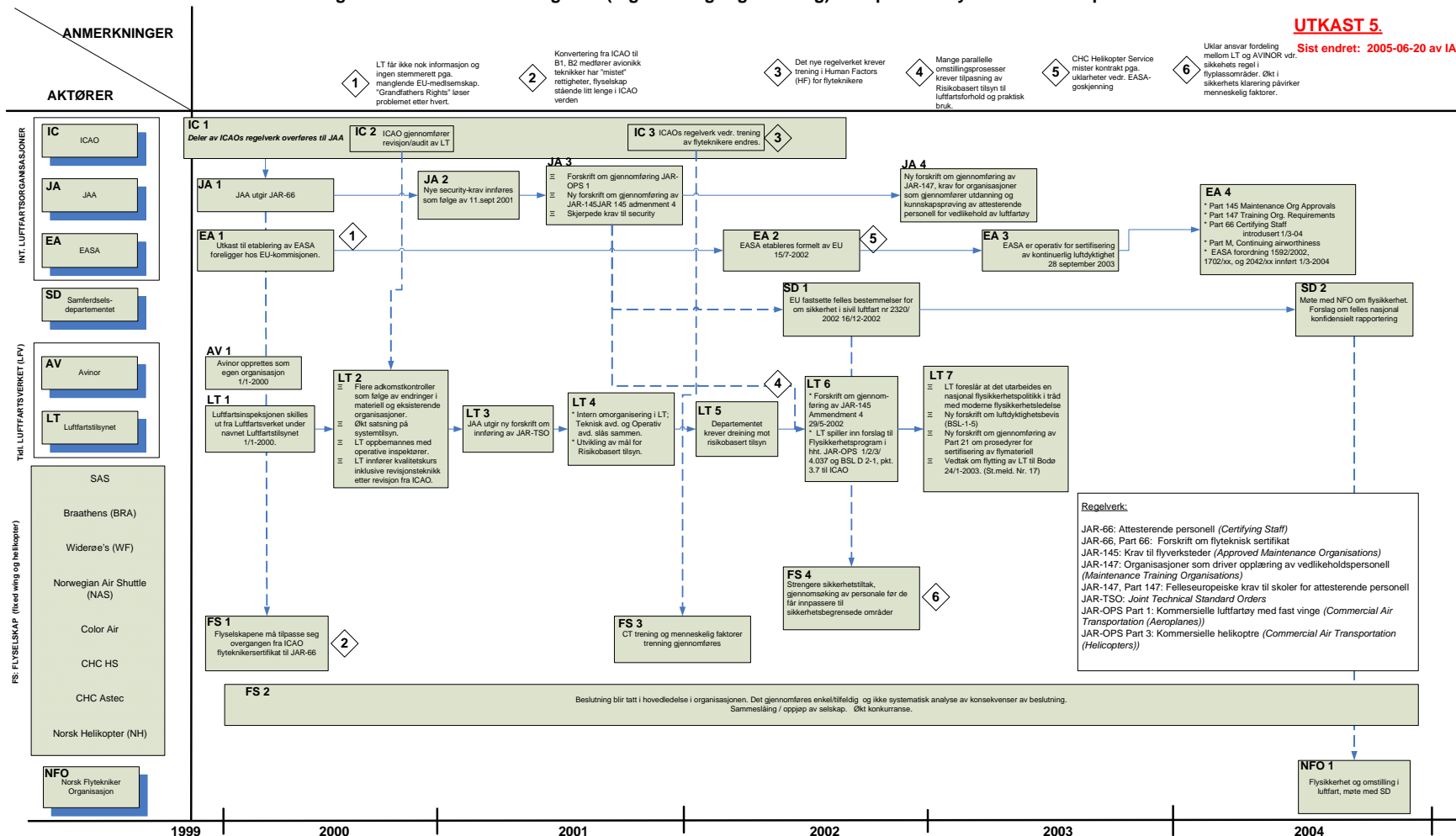
*Figure 7-1: External framework conditions that have impacted on aircraft maintenance in the period.*

### 7.5.3    Activity levels

Changes in the airline's activity levels can be affected by several factors, such as the recession in the market that followed 11 September 2001, awarding of contracts, government purchasing, etc. Changes in activity levels may be significant internally for some companies in the form of increased unit costs, reduced availability of aircraft, etc., which can spur internal processes of change in order to compensate for changes in external framework conditions.

Activity levels and changes in them have been surveyed for the whole period for each of the airlines, both to compare indicators and standardise them, in order to compare the companies and form an, as far as possible, objective picture of Norwegian aviation.

### 7.5.4    Safety indicators

Safety indicators have been defined for the investigation of the airlines that build on information gained from the companies' own internal reports and follow-up. The purpose of the indicators is to provide a baseline to assess any trends in aviation technical standards. The indicators are based on the "barrier" principle. That means that the indicators will say something about a company's ability to administer maintenance in such a way that the set barriers function as intended. For example, it may be an indication that the maintenance barriers (safety-related maintenance) are working poorly if techreps (fault reports found during maintenance) show a decreasing trend and pireps (faults reported by pilots) show an increasing trend.

(See Annex 6, "Scandpower report 23.490.014 R1, annex B" "conceptual barrier model" for a more detailed description of the background for the choice of safety-related indicators.)

The following safety-related indicators have been defined for the study:

- Reported incidents
- Technical dispensations
- MEL excesses
- Technical fault reports;
- Pireps (reported by flight personnel)
- Techreps (reported by maintenance)
- HIL/Backlog
- Cancellations/unscheduled downtime
- Absence through illness

### 7.5.5    Safety management model

In order to assess the companies' management and control of the processes of change, the project group has formed a basic model for safety management. This model is used to give a holistic and equal assessment of the respective companies.

The report "AIBN A model for safety management" (Tinmannsvik, 2005) provides an overview of the elements/activities that must be present if a company is to be able to achieve, and maintain, a desired level of safety, see the figure below. The arrows give an indication of interaction, including how the results of one activity may be the input to another activity.

External framework conditions, represented by requirements laid down in legislation and regulations, are shown in the two boxes at the top of the figure. In this context, we refer to the international aviation regulations (e.g. FAA, EASA/JAA, ICAO), as well as manufacturer's requirements for condition control and maintenance.

A satisfactory level of safety cannot be ensured solely by setting regulations, but by individual operators also having a system of safety management that allows the maintenance and development of a desired level of safety. The level of safety is determined at any time by the threats that are present, and what actions are taken to keep risk under control and develop safety. The model shows that a desired level of safety can be achieved by a structured process, in which safety goals are defined on the basis of a safety policy. A continual process of monitoring and control also takes place, in which the necessary actions (reactive approach; lower loop of the management model) are taken. Good safety management means that you do not exclusively invest in a reactive approach; new threats must be identified, and risk surveyed, in order for initiatives to be implemented before undesirable incidents take place (proactive approach; upper part of the figure). The emphasis on being proactive or reactive in safety work decides whether the company has a risk-based or an action-based approach to safety management. The process agrees with a general management model for achieving defined goals: "plan→perform→check→act", which we recognise from quality management.

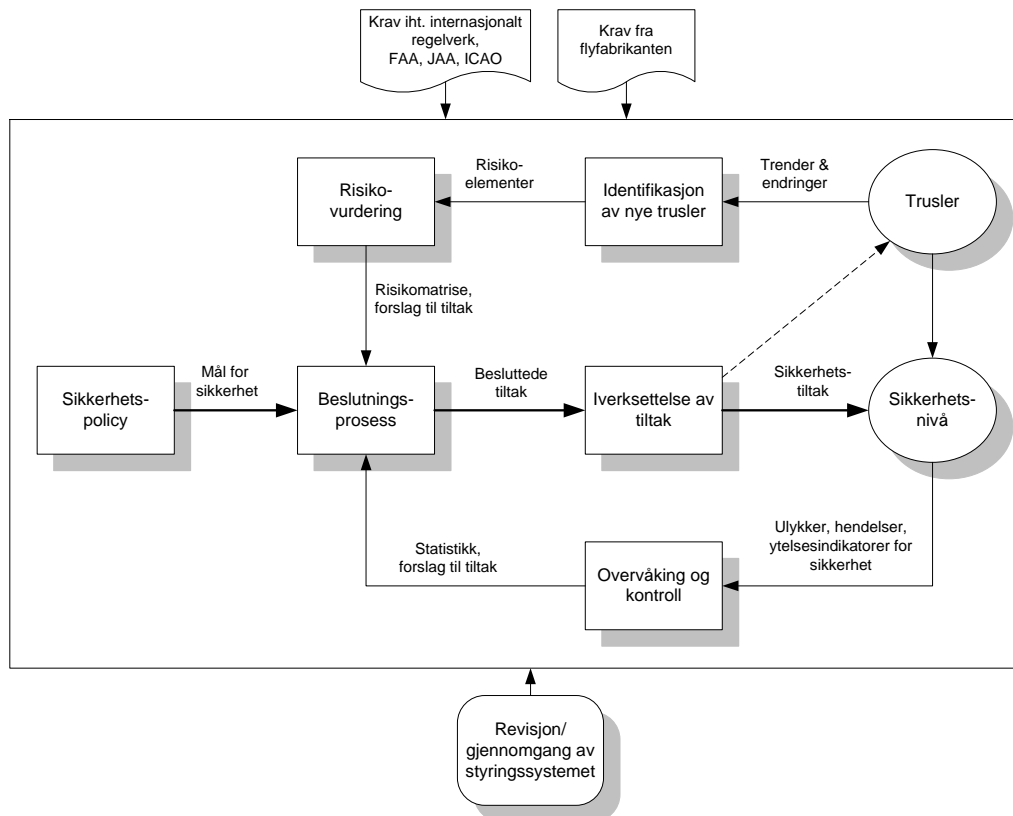The individual activities are briefly discussed in the following.

*Figure 7-2: A model for safety management (modified according to /1/ and /2/).*

### 7.5.5.1     *Safety policy*

Goals and acceptable risks are specified. The company's safety policy may make up part of an overall policy that integrates capacity, finance, the environment and social aspects. It is possible to create concrete safety goals from a safety policy. One example of a safety goal from US aviation is "to reduce the absolute number of air accidents by 80% in the period 1997 – 2007".

### 7.5.5.2     *Identification of new threats*

This activity identifies changes in states and conditions that can affect safety levels. Such potential threats can be linked to technology (e.g. new, complicated equipment), finance (e.g. staff reductions), environmental matters (e.g. introduction of new standards for noise reduction) or operational conditions (e.g. introduction of new control routines).

### 7.5.5.3    *Risk assessment*

Risk analyses are based on the identified threats that reveal which risk conditions are present. The risk is often expressed as a combination of probability and consequence of undesirable incidents. The result of the analysis can be presented as a risk matrix, and initiatives can be proposed when needed, which can bring the risk down to an acceptable level.

### 7.5.5.4    *Monitoring and control*

This represents the activities involved in reporting, investigation and follow up of undesirable incidents (technical faults, accidents/damage and near accidents) as well as follow up of performance indicators for aviation safety. They may be symptoms of weaknesses/deficiencies in existing technology, routines and organisation. Experience data is, however, also important input in risk analyses. Such data provides indications of what can go wrong, and will also provide a basis for estimating the probability and consequence of possible future incidents.

### 7.5.5.5    *Decision process:*

This process involves an assessment of the need for implementation of initiatives in relation to safety goals and risk acceptance criteria. It also involves choice of initiatives, based on efficiency, finance and other decision criteria. As the figure shows, this activity is built on the following input: 1) Overview of the risk picture, as it has appeared following a risk analysis/assessment, and 2) Overview of incident data, damage history and safety performance indicators.

### 7.5.5.6    *Implementation of initiatives:*

A central factor in safety management is implementation and follow up of initiatives. This part of safety management is crucial if continual improvement and commitment to safety work is to be achieved. As can be seen from the figure, the unforeseen effects/side effects that could form new threats to safety should be considered after each initiative, so that these can be handled before new incidents occur.

### 7.5.5.7    *Audit/review of the management system:*

In addition to the activities/elements that are involved in the central part of the management loop, there is an activity in the lower part of the figure that concerns audit/review of the management system. This involves a systematic and critical review of the organisation and the established procedures and routines in order to protect safety. There are many different instruments/check lists for such audits. Central content elements include:

- *Expertise:* Expertise in performing allotted functions and underlying tasks. This is dependent upon the employees having received satisfactory training and education, and being motivated for the tasks.
- *Commitment:* Ensuring that the required activities to protect safety are approved, supported and given the necessary status and priority by management.
- *Communication:* Ensuring that the communication and dissemination of safety-related information is clear and concise.
- *Documentation:* Ensuring that the management system, as well as the roles and responsibility, are satisfactorily documented.

### 7.5.5.8    *Changes in the airlines' framework conditions*

*Regulatory changes*

Adaptation of the activity to the requirements of JAR-OPS 1 Subpart M and JAR 145 and the training requirements, regulated through JAR 66/147. This change entails the authorities setting clearer requirements relating to technical and operative management, and management and control of active companies, especially within maintenance.

*Changes in the competition situation*

During the period, the political framework conditions have changed considerably. From being a relatively strictly regulated market, the political decision concerning deregulation has challenged existing companies to meet a new market situation. Within the companies, this has led to internal cost efficiency change processes, primarily to meet the competition posed by deregulation of the market.

*Other changes*

The processes of change in the companies has tended to split off operative and technical activities and purchase services from other companies. In many companies, splitting the operative and technical activities has led to technical activities being withdrawn from the operating companies and established as separate companies. Focus on "core business" has characterised the period.

*Other studies*

In international aviation, deficient aircraft maintenance is estimated to contribute to 12% of aviation accidents and to 50% of delays, as well as cancelled departures. This has given an increased focus on human factors in aircraft maintenance. A report from the JAA Human Factors in Maintenance Group in 2001 claims that many air accidents could be avoided if human factors were monitored better. NOU 2002:17 "Helicopter safety on the Norwegian continental shelf" recommends that the Crew Resource Management (CRM) concept be adapted and introduced in aircraft maintenance, and that necessary training be given in CRM/MRM and Human Factors.

### 7.5.6     Fixed wing

#### 7.5.6.1     *Statistical material*

##### 7.5.6.1.1     *Developments in activity levels*

Development of activity levels are split here into helicopter activities and the other airlines. It has not been possible for the airlines to separate out only scheduled flights in Norway. The reason for this is that SAS, which is one of the companies included in the study, does not separate its flights in Norway and the other Scandinavian countries. In the work with the individual airline, their activity levels have been primarily used to standardise the basic data for the safety indicators, so that these can provide better grounds for comparison. Developments are still given here as a total percentage in the period in order to provide a general overview.

Table 6.1 Trends in activity levels

|             | 2000   | 2001   | 2002   | 2003   | 2004   | Change 1999 → 2004 in % |
|-------------|--------|--------|--------|--------|--------|-------------------------|
| Number      | 171    | 175    | 175    | 171    | 169    | -1                      |
| FLH tot.    | 371233 | 373609 | 357792 | 339142 | 366788 | -1                      |
| FLH per A/C | 2171   | 2135   | 2046   | 1983   | 2170   | 0                       |

The overview includes the studied airlines' aircraft and flight time production, with the exception of SAS, for which only the total MD-80 and B737 production is included, with the remaining fleet and SAS Commuter excluded.

The overview shows that there is very little change at the end of the period in relation to the beginning, but that during the period it shows that aircraft use has had a periodically negative trend that can be interpreted as being an effect of the companies' processes of change. This varies somewhat in relation to the individual companies, as we can see from Figure 7-3. Production per individual aircraft was decreasing in the first part of the period, but is back at an equivalent level at the end of the period in relation to the beginning. Contributions to the decreasing trend have been stronger from certain companies. This is, in part, linked to new acquisition of aircraft and decommissioning of older aircraft.
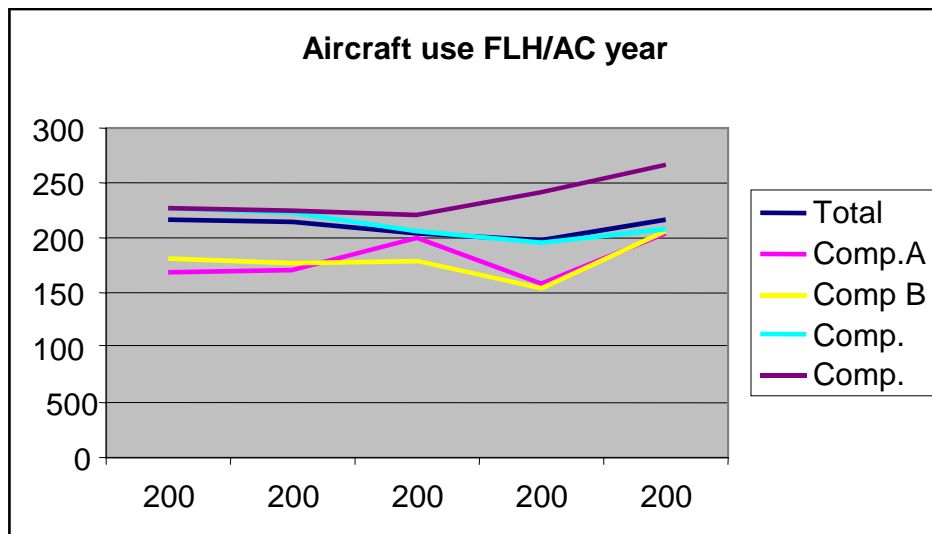
*Figure 7-3: Aircraft use*

### 7.5.6.2    *Trends in safety-related indicators*

#### 7.5.6.2.1    *Reported incidents*

During the period, the investigated companies showed an increased tendency to report. All of the companies attribute this increased reporting to a rising awareness of the importance of reporting. All of the companies have focused on incident reporting in the period and the increase is a result of this work.

#### 7.5.6.2.2    *Technical dispensations*

Dispensations are an indicator that says something about the companies' ability to perform maintenance. For all of the companies, use of dispensations is within the limits of the maintenance programme. These are only regarded as deviations if these limits are exceeded. The indicator is relatively rough and covers the organisation's ability to correct faults, carry out spare part dimensioning, personnel dimensioning, etc. It is, in other words an indicator that can be affected by processes of change. Follow up differs somewhat at the respective companies and is not directly comparable, but the changes through the period provide a certain indication.
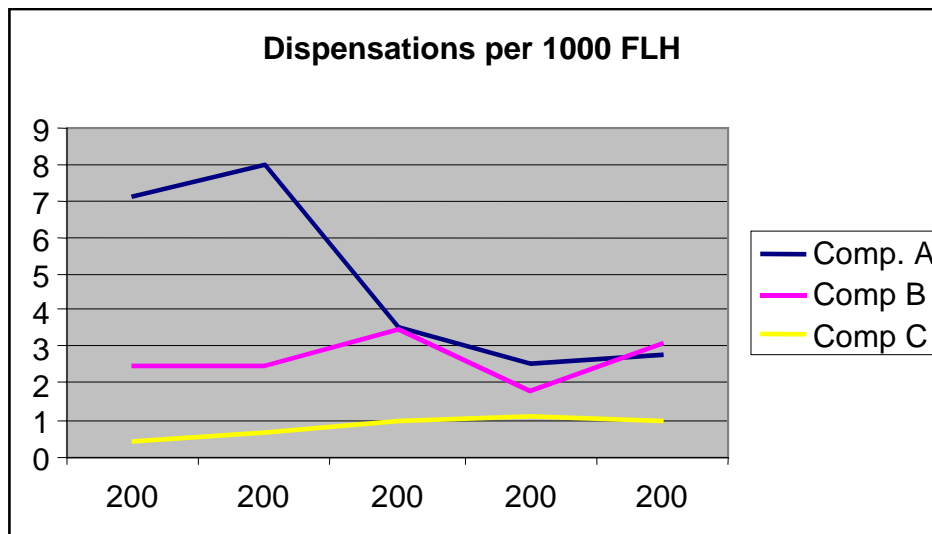
*Figure 7-4: Dispensations*

We can see from the overview that changes over the period are different for the different companies, which may indicate that some changes have been more comprehensive than others. Towards the end of the period, use of dispensations normalises.

### 7.5.6.2.3    *Flights with MEL remarks*

MEL as the indicator may say something about the aircrafts' technical condition in relation to safety-critical systems and the company's ability to carry out maintenance.

MEL contains criteria for the type of faults in systems that may be significant to safety. This is a strong safety indicator, as there is reduced redundancy in the aircraft's safety-critical technical systems. There is differing practice at the different companies in the way they report and analyse data. Some companies count the number of departures with MEL remarks and others count the number of remarks. Analysis is part of the reliability analysis per system or per MEL overrun.

MEL is a list of components or systems/subsystems that describes functional faults with which the aircraft can continue to fly (MEL departure), with the necessary limits described in the procedure. The list is based on Master MEL (MMEL), which is the manufacturer's requirement, noting the minimum number of functioning systems to operate an aircraft. This means that the functional faults in the components/systems defined in the list have been considered to give an acceptable level of safety, as long as the remaining operations are within the limits imposed by the procedure. Further flights on an MEL departure are, therefore, regarded as flight with an airworthy aircraft.

MEL is an indicator that shows both the incidence of faults in systems and the company's ability to correct the fault. MEL is registered as a pirep, as an MEL departure normally takes place while the aircraft is operational.

In relation to the risk, MEL is a list of components described by the manufacturer as being able to be compensated for by pilot action when they are out of function. The aircraft can operate normally until the fault has been corrected. Limits are imposed on operational hours before the fault must be corrected. As long as the aircraft is operating within MEL limits the risk is regarded as acceptable.

MEL follow-up's contribution to risk management:

- The number of MEL notations per 1,000 departures. This figure tells us the regularity of MEL departures. Individually, these departures represent an acceptable risk contribution, in which the pilot forms a compensatory barrier. The total of MEL departures provides a picture, in which the total risk for the company is affected more than each individual departure. It can, therefore, be an indicator of where an acceptance criterion can be set.

- MEL departures that fly past the time limit are a deviation in which the risk of an individual MEL departure is affected more than the total risk for the company. It can, therefore, be an indicator of where an acceptance criterion can be set.

Based on the number of MEL, airlines with the same aircraft show a slight increase in the number of MEL. The trend for the industry shows a negative development in numbers of MEL per flying hour/departures, but there are certain exceptions in the 2000-2004 period. The reason for this was given as lack of spare parts in stock, or reorganisation of the spare part supply for some operators.
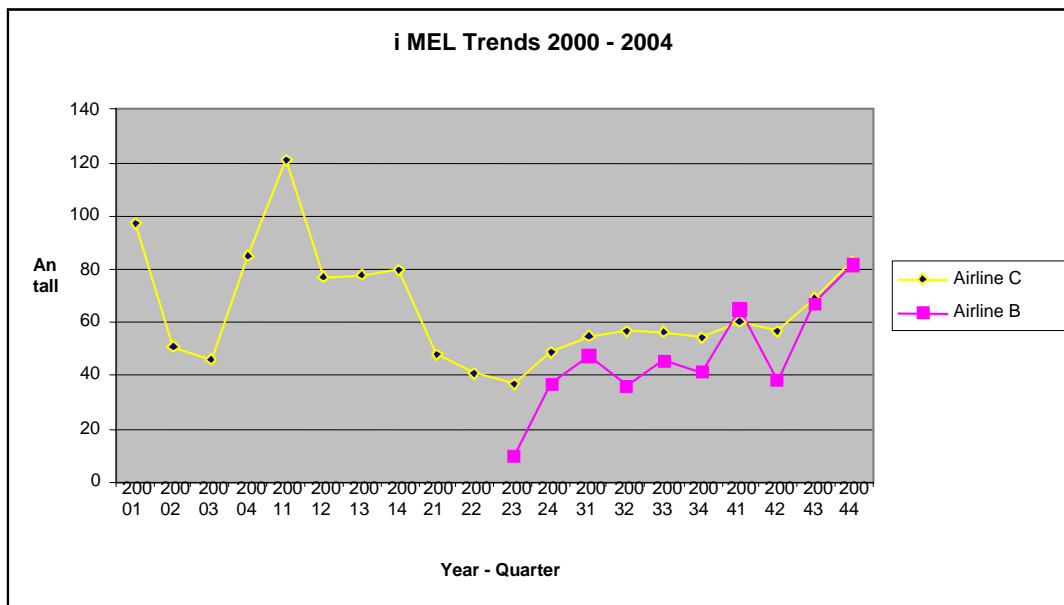


*Figure 7-5: Airlines flying the same aircraft type*

### 7.5.6.2.4    *Technical faults reported by pilots (Pireps)*
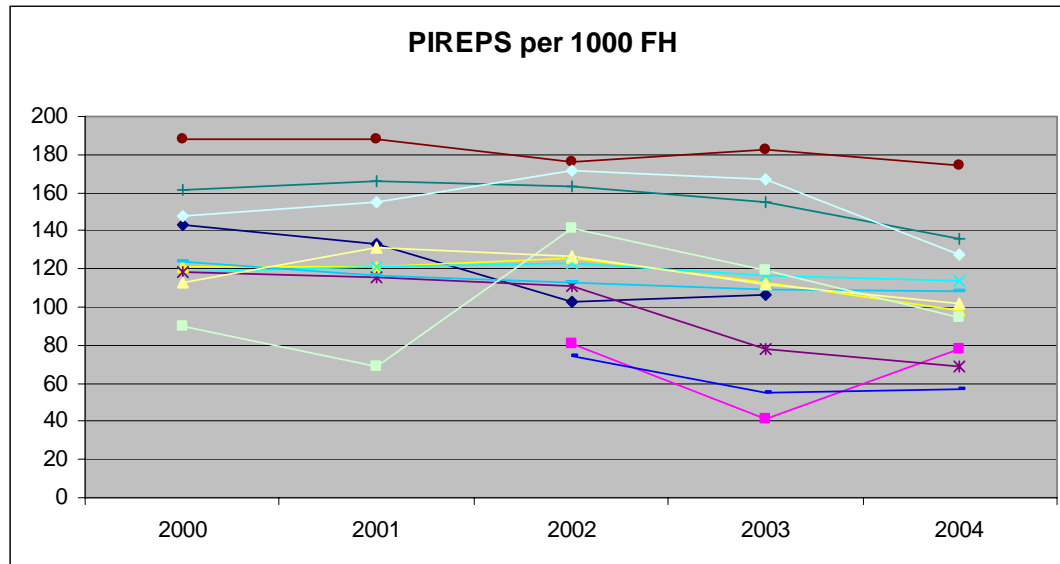
**PIREPS per 1000 FH**

*Figure 7-6: Pilot reports - changes in the period*

The figure above shows the number of PIREPS for a number of the companies in Norwegian aviation. As can be seen from the figure there is, despite some local variations, a steady number of PIREPS. There are variations between less than 60 and less than 180 PIREPS per 1000 flying hours. Some airlines record PIREPS per aircraft type, which is why there are 9 lines.

The number of PIREPS has been harvested from all of the companies included in the study. It is important to state that what is meant by the expression PIREPS varies from company to company. Some of the companies operate only with PIREPS, and not with TECHREPS. There are great variations in the definition of PIREPS, and this is the probable cause of the great variations in the number of PIREPS among the companies. Even so, there is in total no special trend in numbers of PIREPS in the period; the number is mainly stable.

One of the reasons that this study has examined the number of PIREPS and the number of TECHREPS is because these two together say something about where in the barrier chain the incidents are detected. If it happens that an increasing number of incidents are detected by PIREPS, and fewer by TECHREPS, this is a signal that the faults are detected at a later point in time. This is equivalent to a reduction in safety margins.

### 7.5.6.2.5    *Technical faults reported during maintenance*

As with PIREPS, the numbers of TECHREPS are mainly stable. As can be seen from the figures, one company that has a high initial number of TECHREPS also has a large

decrease. In 2004, the number of TECHREPS for this company is at the same level as the other companies. It is possible that the initial high number is a natural result of a higher level of reporting during the phasing-in period.

If the pink lines in the figures for PIREPS and TECHREPS are compared, it is possible to see that there is a change that represents more PIREPS, and fewer TECHREPS. As stated above, this may be a negative trend, as this indicates that more faults are being detected at a later point in time. On the other hand, the number of PIREPS and TECHREPS in 2004 on these curves is more "normal", compared with the figures from the other companies. It is, therefore, possible that this shift is only a natural variation.

### 7.5.6.2.6    *Open items on the Hold Item List (HIL)*

The indicator "Open HIL items" provides information about the company's ability to correct detected technical faults quickly. However, the Hold Item List contains all types of fault, including faults that have no significance for aviation safety.

There is different practice at the various companies in the study, both in the way they report as well as the starting time for collection of HIL. Trends are also different for helicopter companies in relation to the other companies involved in this study.

For fixed wing companies which have data on this indicator, all of the companies in this study show a mainly declining trend in the numbers of reported HIL. This means that the backlog at the various companies is being reduced.

For helicopters, the basic data shows an increasing HIL trend, showing that the backlog is increasing. Helicopter operations are discussed later in this document.

Reduction of the backlog shows a positive trend for maintenance not carried out according to plan.

A constant backlog is an indication that a company cannot make the necessary corrections to reduce the backlog, or a deliberate strategy, in which it considers that it has the correct amount of activities that are not carried out according to plan. If this is a strategic decision, analyses of the activities that the backlog contains must be carried out to avoid safety-critical activities being postponed in relation to the plans.

An increasing backlog may also be a strategic decision that can be followed up in the same way as a constant backlog, or an indication that the industry is not able to carry out planned maintenance activities within the framework of the maintenance programme to an increasing extent.

### 7.5.6.2.7    *Maintenance cost trends*

The data for the indicator is very limited because of lack of specification of these costs within the companies. At those companies which were able to provide these costs, there were no significant changes to the indicator in the period.

### 7.5.6.2.8    *Absence through illness within technical departments – for technical personnel*

*Absence through illness in the companies analysed between 2000 and 2004*
Absence through illness, which is often used as synonymous with work-related illness, even if this is not the case here, is a regularly used and concrete indicator. Even so, it is not always easy to read safety-related conditions from the figures without more information about what is happening in the companies and what could cause the illness. We can see both negative and positive trends in absence figures in the analysis of these companies. Certain initiatives that have been directed at reducing absence, such as becoming an inclusive working company (IA) has yielded the desired result in the form of a reduction in absence. At others we see an increase in absence towards the end of the period we have analysed. As it is too early to see whether this is a trend because of the short period, further analysis over time will be necessary to discover whether this is significant. As a whole, we can see absence as stable throughout the period.

*General links between processes of change and absence through illness*
It is normal for processes of change to be noticed in absence through illness figures. This is often linked to uncertainty in the work situation for the individual employee, if there is a risk of redundancy or changes in job content and/or level of the position. If conflict arises at work in connection with the processes of change, leading a psychological and/or physical reaction to the conditions, there may also be absence from work. The relationship between aviation safety and absence through sickness during processes of change is, however, difficult to interpret. In many ways it is possible to say that there can be just as many grounds for concern if there is a high level of conflict, with strong reactions from certain of those involved and you cannot see absence. The risk lies in the proximity to work and emotional or physical reactions on the part of the person carrying out that work. Examples of long-term effects of reactions following conflicts at work and the standard of work carried out can be seen in US research (Degani and Wiener, 1990), which mainly concerns the estrangement that can be created between an employee and the organisation he or she feels incorrectly treated by. This has been shown to affect the loyalty of the employee and lead to deviation from adherence to routines, etc. It is, however, not common to find large quantities of tacit deviations within aviation, as you also find in aviation a high degree of professional integrity and loyal adherence to regulations. Such loyalty often combats the consequences of disloyalty to the individual employer.
In their reports and other communication, companies are often concerned with the absence through sickness in the organisation measured in percentages and are less concerned with the actual condition of the employees. This has a natural background in the traditions of following up result indicators, such as absence through illness, and also the fact that it is a far more comprehensive job to measure actual conditions, as that

requires both efforts to be made by the organisation and enough openness to get true answers to such surveys. If a company wants to follow up safety-related indicators linked with this, the focus must be moved from absence through illness as the only indicator and over to the actually perceived situation for the employees and the degree of loyalty to decisions and regulations that is present in situations where this is safety-critical.

### 7.5.6.2.9    *Comments on the safety indicators*

The most important indicators, incidents, technical dispensations and MEL, show stable levels throughout the period. Pireps and Techreps show a stable or slightly decreasing tendency.

Average maintenance costs per flying hour are stable or slightly decreasing in the period.

Absence through illness shows a decreasing tendency and is mainly at a low level throughout the period.

There is, therefore, nothing in the statistical material we have studied that indicates any reduced technical standard in the aircraft, or reduced maintenance quality that has affected aviation safety in the period.

### 7.5.6.3    *Major changes in the companies in the period*

### 7.5.6.3.1    *Organisational changes*

During this period the companies have carried out organisational changes for adaptation to JAR-OPS 1 and JAR 145. The companies have carried out the changes to varying extents internally in existing organisations and by splitting the company into technical and operative independent companies. The challenge in relation to splitting the companies into operative and technical companies lies in the new interfaces for administration and checks of the activities. It seems, according to the indicators that this has been for certain companies a period of adaptation which has had an impact, but which has normalised after a short while.

### 7.5.6.3.2    *Staffing changes*

Reduction in line personnel
Movement of personnel between companies
Impact of mixing different cultures in an organisation

### 7.5.6.3.3    *Changes in levels of qualification and training*

In the period, technical training has been complicated by the changes in the regulations. The changes in the regulations have taken place quickly, which has led to a gap between skills and the requirements placed on the training departments. The following changes

which have taken place during the period have been significant for training technical personnel:

1.      The change from ICAO M to JAR/Part 66, B1 and B2 in 1999, which still poses a challenge. Personnel holding ICAO M certificates had them converted to JAR 66, B1 and B2 certificates. This is despite the fact that some of the personnel did not have skills in both the B1 and B2 areas. Our sources focus on the conversion from ICAO to A, B1 and B2 certification posing challenges, as maintenance personnel, who have approval to sign off, do not necessarily have the skills to know whether the job has been carried out satisfactorily. There is concern that certain employees can be given jobs they are not competent at.

2.      In connection with the requirement for Human Factors training in maintenance, there is differing practice at the Norwegian airlines. Some have only introduced mandatory training, while others follow international trends in the aviation industry and introduce the Crew Resource Management concept (CRM Concept) for the entire airline, both for technical and operative personnel.

3.      The requirement for school Part 147 Introduction of Part M, 145 and 147 has led to clearer requirements relating to the training curriculum and implementation of training and examination. A 145 approval requires employment of B1 and B2 support staff (specialist groups within both categories as support for management). There is also a more stringent documentation requirement. The large companies, which also sell training services to several of the smaller companies, report that the changes involved in adaptation to Part 147 have tidied up the training.

The training and competency requirements are, to a great extent, dependent on which role/certificate is to be achieved (A, B1, B2, C). The same applies to the requirement for practical training.  The increased degree of specialisation of skills has led to fewer possessing wide-ranging skills, which in both the short and long terms could affect safety, through the loss of the overall view of the technical condition of an aircraft among the technicians as a group.

New relationships have also occurred between the companies in the sale and purchase of training and training services in the period. Local training has been downgraded in relation to the larger companies taking over the training of more personnel. Our sources think that there is a reduction in courses offered because all courses must be offered and paid for as external courses. There are also tendencies for responsibility to be distributed for different courses, and for the company to intentionally purchase skills it does not possess. Training departments have been heavily downsized at certain companies and personnel possessing the relevant course skills have been fetched from the organisation. In many cases, specialist personnel from other companies participate in training new technicians in courses that are held by others.

### 7.5.6.3.4    *Changes in safety-related management systems*

During the period, no significant changes have been made to safety management systems, apart from adaptation to organisational changes in the companies in the study.


### 7.5.6.3.5    *Changes in management systems*

There have been continual changes in maintenance systems for all of the companies in the study. All of the companies have implemented these in accordance with the manufacturer's and authorities' recommendations, and within the frameworks or boundaries laid down in the maintenance programmes' approved regulations for change. Changes have been made at the service check level, without this having resulted in reduced technical standard.


### 7.5.6.4    *Analysis/conclusions*

The statistical material covers such a relatively short period that it is difficult to see long-term trends in how aviation safety develops as a result of processes of change through which the company has been in the study period. There are, however, indications in the material we have examined that show short-term effects in the periods in which the actual processes of change have taken place.

The statistical material for certain of the companies shows brief trends in:

Use of dispensations
Excesses in maintenance programmes and official requirements
Pireps, pilot reports
MEL
Technical cancellations of departures

It must be noted here that these are trends over a short time, and that the companies, through a number of initiatives in the last part of the study period (2002 – 2004), have had a positive trend in most of the statistics that are covered by this study, and that the level at the end of the period is equal to, or better than, the start of the period. One exception is where one company has had a slight regular increase in the Airline Risk Index (ARI) throughout the period, although within acceptable limits.

It can be seen from the data that has been collected, that the number of technical cancellations increased when pilot checks were introduced. This tells us that the pilot barrier works, as aircraft remain on the ground, rather than leave, when pilots are unsure about what they see. This trend decreased as they felt safer in the task.

The industry is traditionally reactively (event-based) oriented in its management and checks of activities. This normally is a characteristic of stable companies, which have been historically officially and market regulated. During the study period, certain companies have undergone major organisational changes and market adaptations that the company has not experienced to the same extent before. It is typical of such changes that

incident escalations have, to a greater extent, underlying causes related to the organisation and human error. Root causes can be less overt if direct or trigger causes form the basis for assessment of incidents. Human error may, for example, occur in different technical systems and aircraft types, but have the same underlying cause. The study shows that the companies, in this connection, have initiated a number of positive processes and shown, through clearer requirements for reporting and access to reporting systems that the degree of reporting has been improved.

### 7.5.7    Offshore helicopters

#### 7.5.7.1    *Summary*

One of the companies has had several changes in senior management in the period. Regular turnover of key personnel is generally unfortunate in a company, but there are no indications in the investigated material that the changes have had any negative impact on the technical level of safety.

The maintenance programmes mainly follow the manufacturer's standard system, with some modification based on the company's operational pattern and the comprehensive experience base that the companies have built up.

There is, therefore, nothing in the statistical material that we have studied that indicates any reduced technical standard in the aircraft, or reduced maintenance quality.

##### 7.5.7.1.1    *Significance of changes in the companies' framework conditions*

There have been no special changes in framework conditions for the helicopter companies in the study period, in relation to other aviation companies in the Norwegian sector. The changes in framework conditions on which the study is based have had little or no significance for the companies' technical aviation safety.

There are two main players in movement of personnel and offshore SAR on the Norwegian continental shelf. The helicopter companies work in a contract market, in which oil companies award contracts of 3 to10 years' duration for flights out from land and/or offshore bases. The typical average contract duration is approx. 6 years. Each contract is awarded under full competition conditions, in which the two main players, CHC Helikopterservice and Norsk Helikopter, so far have secured all of the contracts, although there are also tenders from 2-3 other helicopter companies wishing to enter this market.

It is not unusual for one of the companies to win a contract for an operation which, at time of award, is run by the competing company. This results in a reduction in its activities for the losing company, and an equivalent upswing for the winner, involving acquisition of helicopters, employment and training of pilots and technical personnel, acquisition of hangars and office facilities, official approvals, etc.

This type of contract-oriented activity, with large and relatively long-term contracts and associated major changes involved in gain or loss of tenders, is particular to the offshore, ambulance and state subsidised STOL aviation in Norway. However, the companies which have chosen to operate in these markets have also to a large degree established the flexible and adaptive culture that is necessary to maintain aviation safety through the actual processes of change.

### 7.5.7.2    *Statistical material*

*Activity level trends*

The activity level for the two companies, as well as the total market for this type of aviation on the Norwegian continental shelf, is illustrated in *Figure 7-7*.
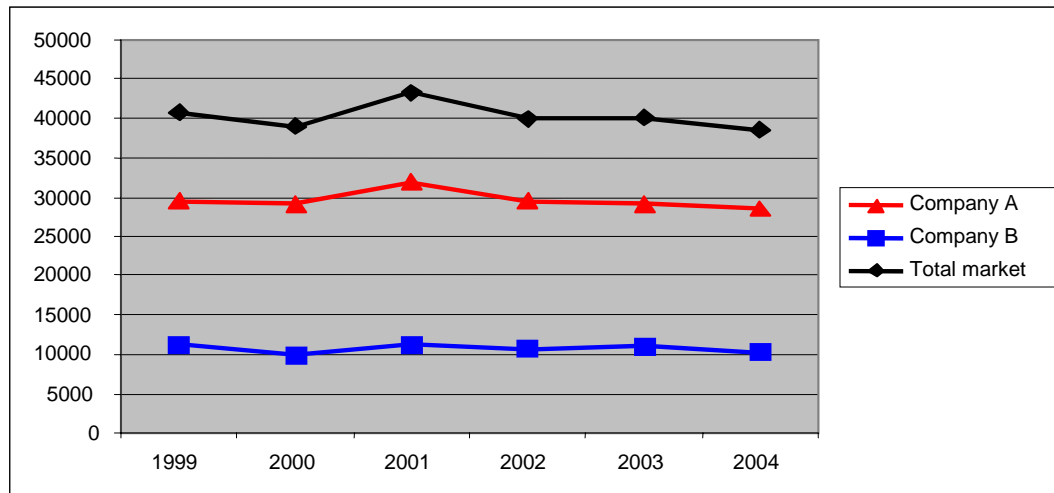


*Figure 7-7: Development in activity levels, measured in number of flying hours*

Both companies have shown a small decrease in number of flying hours in the period.

The total market for helicopter flights on the Norwegian continental shelf has decreased by around 2,100 flying hours (approx. 5%) in the period from 1999 to 2004, while the market share of the two players has been stable.

Although the number of flying hours does not paint a correct picture of the economy of the market, as offshore SAR has increased (and therefore employs helicopters, personnel and organisation, without producing many hours), the negative trends in the total market place major demands on both helicopter companies.

### 7.5.7.2.1    *Maintenance cost trends*

Both companies have seen a development in maintenance costs per flying hour, which is equivalent to general inflation levels.

This indicates that there have been no major changes in the companies' maintenance efforts in the period.

Nor are there any significant changes in external purchases of maintenance services, i.e. outside the groups to which the companies belong.

### 7.5.7.3 *Safety-related indicator trends*

Data has been collected in this chapter, split into curves and tables that show the trends for each type of safety-related indicator.

The final part of the chapter gives summarised comments on the trends in the safety indicators.

### 7.5.7.3.1 *Incidents reported as ASR (Air Safety Report)*

*Figure 7-8: Number of ASRs per 1,000 flying hours* shows the trends in the number of reported ASRs per 1,000 flying hours. Pilots (mainly commanders) submit ASRs. ASRs are used for operative, technical and other situations that are worth reporting, e.g. incidents on the helideck.
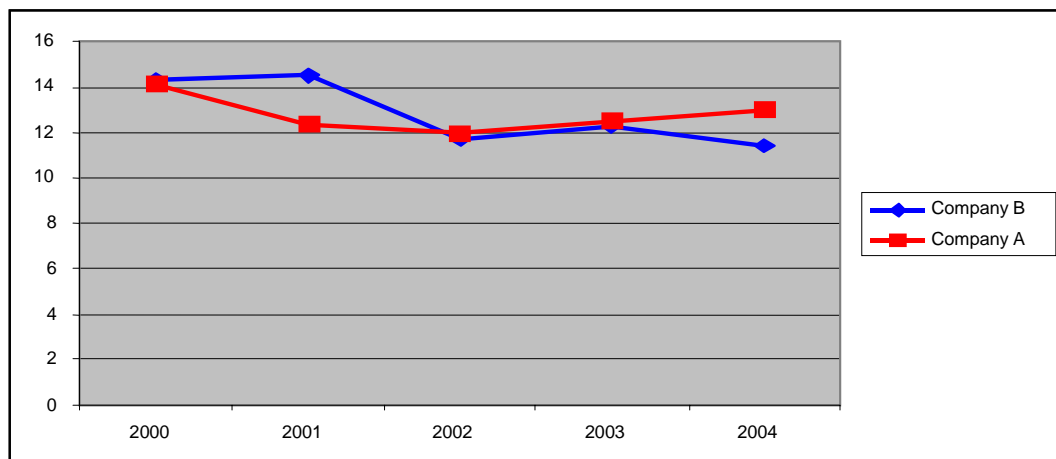
*Figure 7-8: Number of ASRs per 1,000 flying hours*

The figure shows a steady level throughout the period. The level in both companies lies at 10-15 ASR per 1,000 flying hours, which is regarded as normal.

### 7.5.7.3.2 *"Release to service" based on technical dispensations (MRD)*

The number of technical dispensations (MDR / TD) per 1,000 flying hours is shown in *Figure 7-9*. One of the companies did not begin systematic reporting of technical dispensations until 2003.
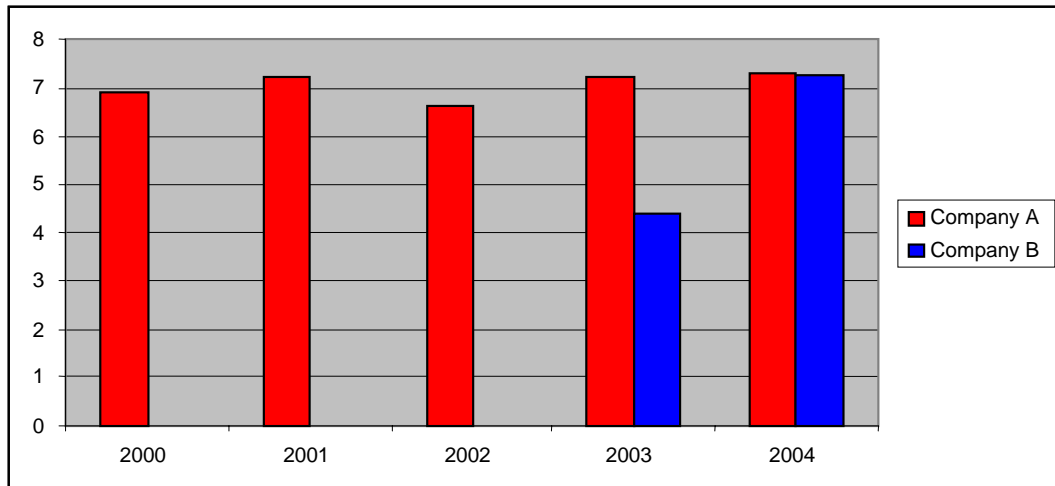


*Figure 7-9: Technical dispensations (MDR / TD) per 1,000 flying hours*

The figure shows steady trends for "Company A":

"Company B" has had a significant increase from 2003 to 2004. The company states that "reorganisation of the supply service" is the cause of this increase. If such reorganisation of the supply service has led to problems in getting spare parts out to the bases, it would be seen in the form of e.g. an increase in technical dispensations, increased use of MEL and increases in remarks on HIL.

The levels for both companies are low throughout, between approx. 4 and 7 technical dispensations per 1,000 flying hours. This indicates that the companies are careful in deviating from maintenance programmes and other defined technical limits.

*Figure 7-10* shows the number of MDR/TD in which the Civil Aviation Authority has been involved in the process, per 1,000 flying hours.
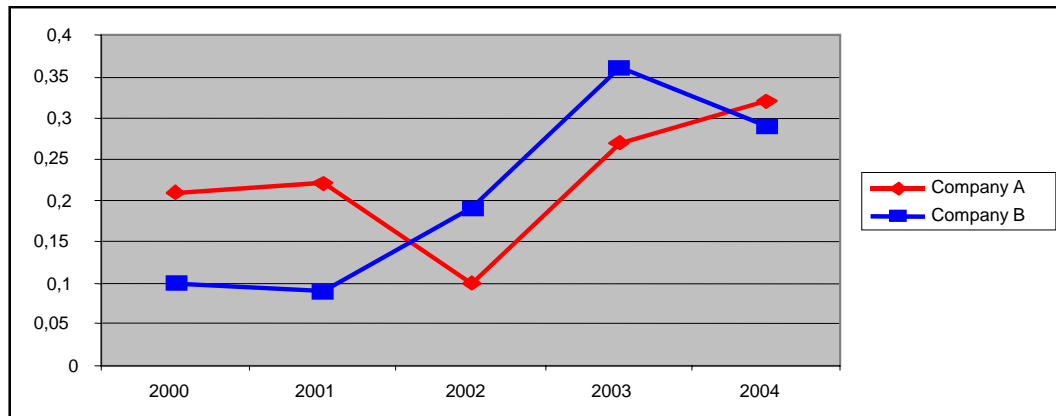


*Figure 7-10: Technical dispensations in which the Civil Aviation Authority has been involved*

This indicator also shows normal variations and is at a generally low level.

### 7.5.7.3.3    *Flights with MEL remarks*

The number of MEL remarks per 1,000 flying hours, as an average for all helicopter types, is shown in *Figure 7-11*. One of the companies has data from 2003.
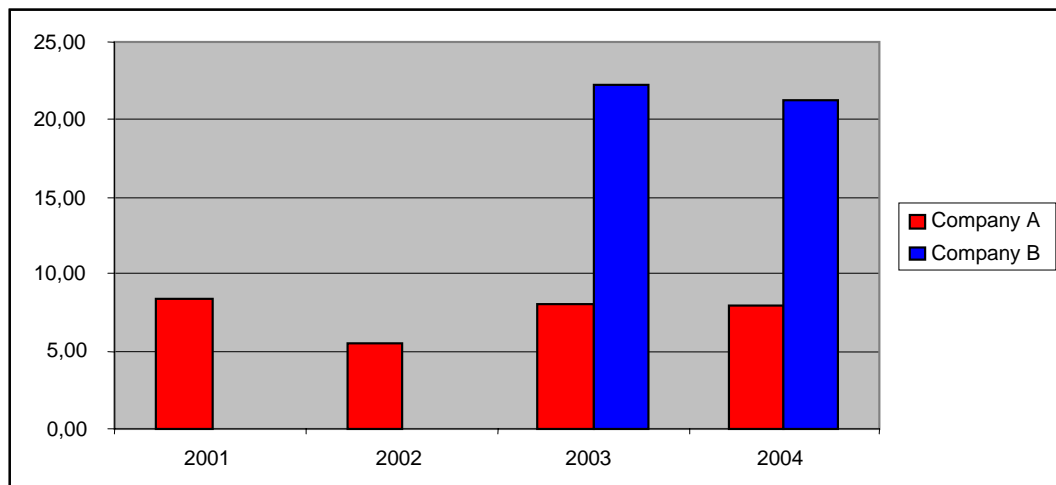


*Figure 7-11: Number of MEL remarks per 1,000 flying hours for AS 332*

In "Company A" the indicator shows a very stable and low level throughout the period, while the level is considerable higher for "Company B". Company-specific conditions associated with MEL, as well as the above-mentioned reorganisation of the supply service, may be significant.

### 7.5.7.3.4    Open items on the Hold Item List (HIL)

Only one of the companies keeps statistics of the HIL items and this is shown in *Figure 7-13*2.
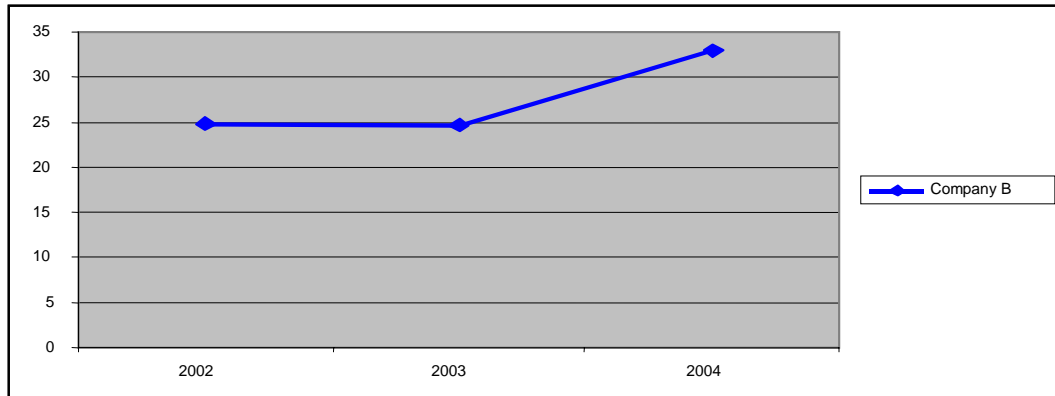


*Figure 7-12: Development of Hold Items (HIL) for company B*

HIL is a "collection" of technical faults that have not been corrected within a stated time, both minor and safety-related faults.

The curve shows a relatively stable trend throughout the period, with somewhat of an increase from 2003 to 2004. The above reorganisation of the supply service may be one reason for this increase.

### 7.5.7.3.5    Technical faults reported by pilots (Pireps)

*Figure 7-13* shows the trend in the number of Pireps per 1,000 flying hours as an average for AS 332 helicopters.
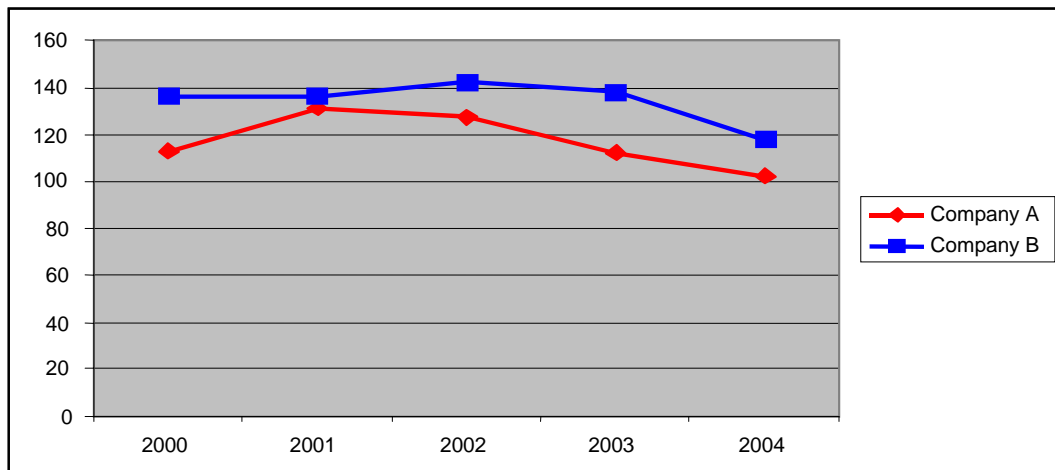


*Figure 7-13: Technical faults reported by pilots, per 1,000 flying hours*

The figure shows relatively stable levels for 2000 - 2002, and a decreasing tendency for both companies in 2003 and 2004. The level, 100 - 130 pireps per 1,000 flying hours, is regarded as normal in the industry.

### 7.5.7.3.6    *Technical faults (snags)*

The companies have somewhat different registration methods for registering technical faults. "Company A" registers the number of remarks per 1,000 flying hours, entered in DMR and Worksheets (Pireps and Techreps) ATA system 21 – 80, while "Company B" registers Techreps and Pireps separately.

The figures below, therefore, show the registrations from the two companies in separate figures.
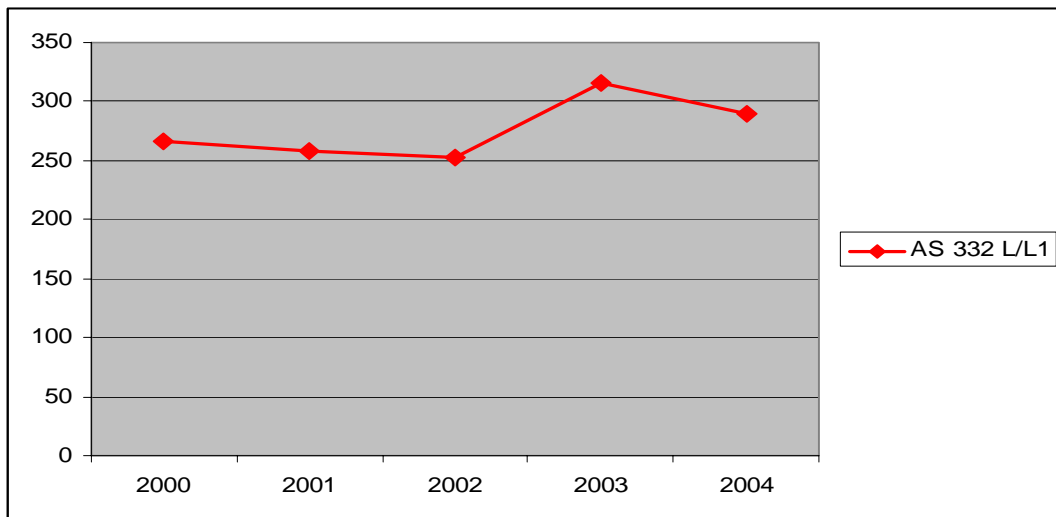


*Figure 7-14: Total Pireps and Techreps per 1,000 flying hours. AS 332 L/L1 - Company A.*
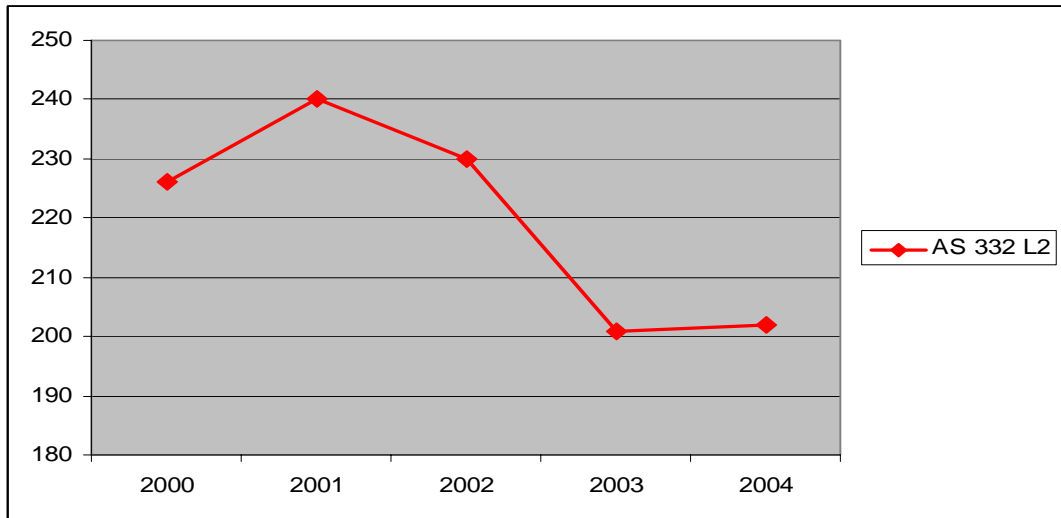
*Figure 7-15: Total Pireps and Techreps per 1,000 flying hours. AS 332 L2 - Company B*
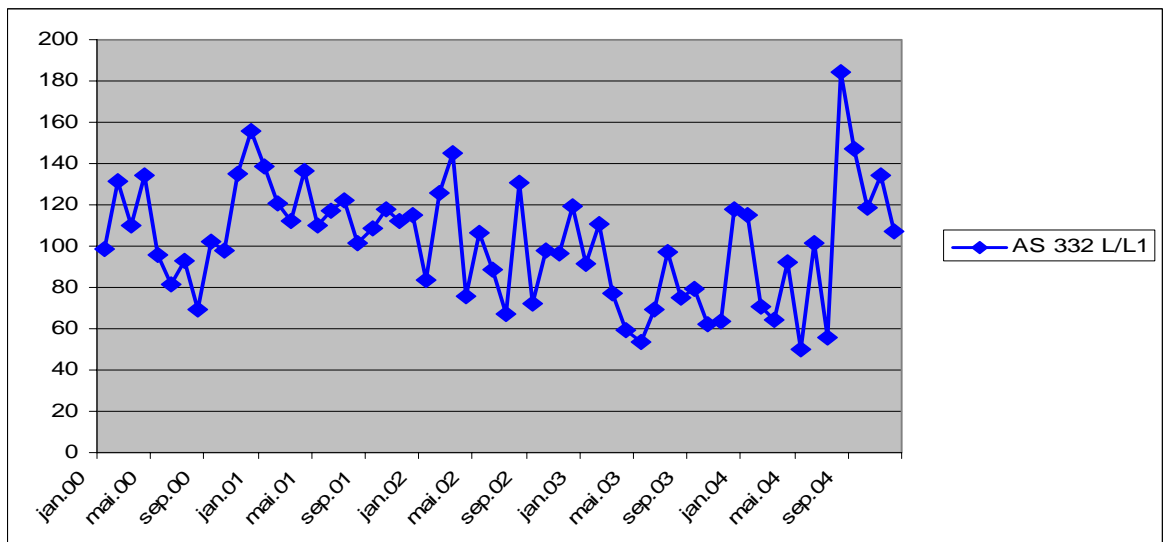


*Figure 7-16: Techreps per 1,000 flying hours. AS 332 L/L1 - Company B.*
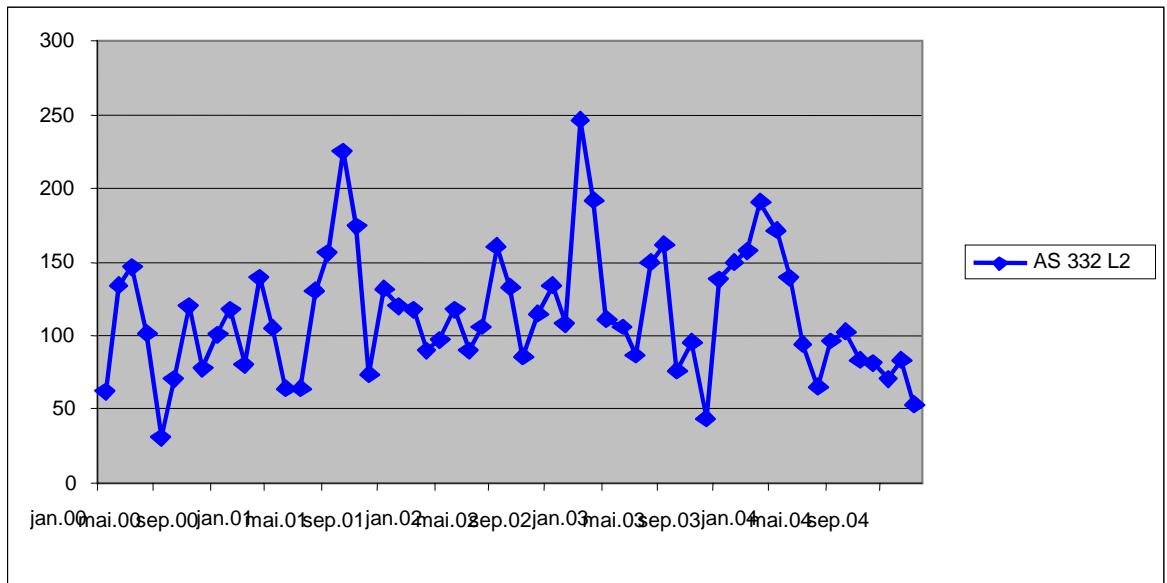
*Figure 7-17: Techreps per 1,000 flying hours. AS 332 L2 - Company B*

The figures show stable or decreasing trends for both companies.

### 7.5.7.3.7    *Absence through illness within the technical field*

*Figure 7-18* shows absence through illness trends within the technical field.
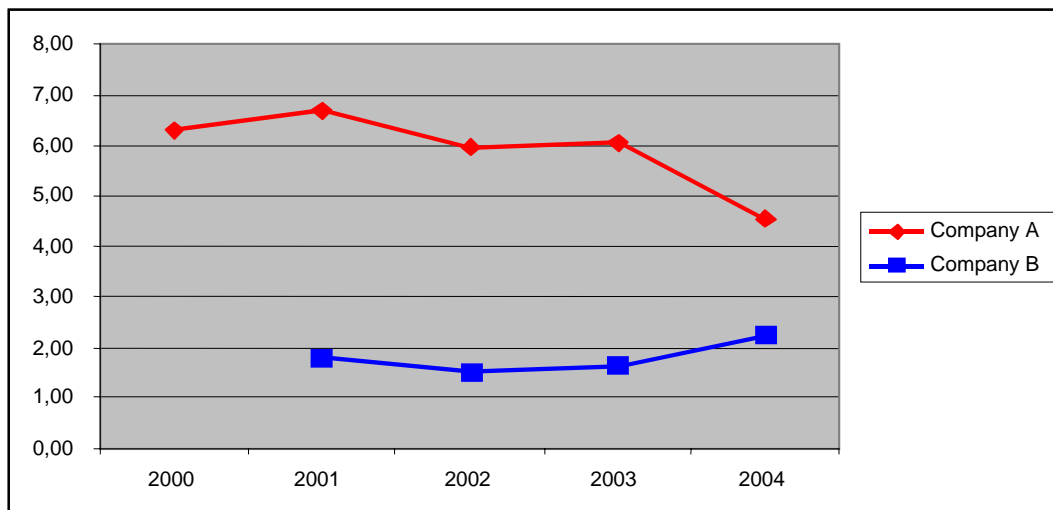


*Figure 7-18: Absence through illness within the technical field*

"Company A" shows a decreasing trend throughout the period, although the level is relatively high, on average approx. 6%. The 2004 level, approx. 4.5%, is regarded as normal for this sort of activity.

"Company B" has a stable, and very low, level of absence through illness.

### 7.5.7.3.8    *Comments on the safety indicators*
The most important indicators, ASR, technical dispensations and MEL, show stable levels throughout the period. Pireps and Techreps show a stable or slightly decreasing tendency.

The level of the study safety indicators is at the industry average or better.

Average maintenance costs per flying hour are in line with inflation.

Absence through illness shows a decreasing tendency and is mainly at a low level throughout the period.

There is, therefore, nothing in the statistical material that we have studied that indicates any reduced technical standard in the aircraft, or reduced maintenance quality.

### 7.5.7.4    *Major changes in the company during the period*

### 7.5.7.4.1    *Organisational changes*
Both companies have enjoyed stable ownership during the period. One of the companies has had changes in its senior management, including the Managing Director/Accountable Manager (several changes), Technical Director and Chief Engineer, while the other company has been extremely stable in its key personnel.

External bases and routes have been created (and closed) as part of commercial activities, cf. chapter 2.

### 7.5.7.4.2    *Staff changes*
With the exception of the changes involved in one of the companies splitting off CHC Astec as a separate company, there have not been any significant staffing changes within technical maintenance.

### 7.5.7.4.3    *Changes in levels of qualification and training*
One of the companies is in a transition phase between ICAO certification and JAR/EASA Part 66 certificates for aviation technicians, while the other has carried out this change.

### 7.5.7.4.4    *Changes in safety-related management systems*
The companies' safety management systems are mainly based on the current official requirements from the aviation authority, with certain additions to meet the clients' (petroleum companies) contractual requirements. Such requirements include risk analysis

of new activities (e.g. establishment of new bases) or significant change (e.g. acquisition of new types of aircraft) quality management that adheres to NS-EN ISO 9001, a documented system for environmental management (e.g. NS-EN ISO 14001) and reporting safety-related incidents to the client.

Following requirements from their Groups and clients, both companies are in the process of developing Safety Management Systems (SMS).

### 7.5.7.4.5    *Changes in maintenance programmes*

There have been no changes to the controller function or the extent of supplementary control (RII) in the period.

In general, the manufacturer's recommended maintenance programme is followed.

Both companies have made modifications to their maintenance programmes. This is based on sampling of several aircraft and has been carried out in collaboration with the manufacturer and is approved by the Civil Aviation Authority.

Downward adjustments in frequency have otherwise been carried out on the basis of incidents, reports and experience from certain systems.

### 7.5.7.5    *Analysis/conclusions*

The statistical development in the studied safety-related indicators shows a stable, or improved, level throughout the period. The level of the indicators shows that there is good control over technical safety in the companies.

One of the companies has had several changes in senior management in the period. Regular turnover of key personnel is generally unfortunate in a company, but there are no indications in the investigated material that the changes have had any negative impact on the technical level of safety.

The maintenance programmes mainly follow the manufacturer's standard system, with some modification, based on the company's operational pattern and the comprehensive experience base that the companies have built up.

There is, therefore, nothing in the statistical material that we have studied that indicates any reduced technical standard in the aircraft, or reduced maintenance quality.

## 7.6   Safety recommendations

- The airlines that have been studied should consider looking more holistically at their initiatives, and carrying out analyses to see how concurrent changes and use of dispensations, MEL and HIL lists affect safety. (The study has revealed that

MEL is not regarded as a safety reduction as long as the regulations concerning type and time are adhered to).

- The airlines are advised to survey cultural differences before considering association/mergers, and to integrate courses from the original companies in such a way that a "new" corporate culture can be established in a clear way for everyone involved.

# 8   GENERAL DISCUSSION OF SAFETY MANAGEMENT DURING THE CHANGES IN THE NORWEGIAN AVIATION

## 8.1 Introduction

In this study, the AIBN has emphasised surveying the ability of the Norwegian aviation sector to act and ensure that the changes the industry has been through over the past five years have not had a negative impact on the safety regime which, at any given time, shall protect the sector against serious incidents and accidents.

The reason for this approach is that, over time, the aviation sector has developed according to a strict, standardised and regulation-governed regime. The safety concept is based, as we have stated previously, on a global standardised technical and operational set of regulations that ensures that users and the support network operate according to the same safety principles.

## 8.2 How is aviation safety measured when changes are introduced?

Which measurement unit should be used to find out whether the changes that air operations have been through over the last five years have had a negative impact on the safety regime, which shall protect aviation at all times against serious incidents and accidents?

This study is not based on an air accident, but surveys whether the possibility of accidents occurring has changed as a result of the processes of change.

The AIBN has only been able to examine the various changes in detail and analyse their potential direct impact on air safety to a limited extent. The study has focused on whether the involved parties in the aviation sector have established the necessary ability and systems to process the changes proactively – i.e. to survey whether they have potentially affected any of the aviation safety characteristics that were originally integral to the transport system, its operations and/or administration (systems).

The changes' potential negative impact on air safety is rarely clear. Aviation safety is a complex product, consisting of many elements and characteristics in an intricate interaction. It is only when this interaction works well, that a high level of safety is achieved. This complex regime has been documented earlier and approved by the supervisory authority for aviation material, equipment, infrastructure, routines, expertise, organisations and management systems, etc. Changes in apparently modest elements require a systematic process in order to ensure that they, in the long run, do not have a negative impact on air safety.

### 8.2.1     Safety criteria used in the study

For that part of the study that considers what the involved parties have achieved proactively, the AIBN has based its work on the safety baseline for the operations that the companies had established and approved before the changes were introduced. In order to be able to "measure" whether and, if so, how this safety foundation has been affected by the introduction of the changes, the study has chosen the following safety criteria as preconditions and starting points for the study:

*A change must not reduce the established level of aviation safety*

This overall criterion was used as a starting point and reference, so that this study could establish a goal for:

1. If the change has impacted on the established level of aviation safety, in isolation and/or seen in a greater system perspective

2. If the operator has had preconditions that show that the original level of aviation safety is affected before a change is introduced.

It is a fact that there is not one single theory and method that can make the safety impact of the changes and process of change visible in a uniform manner. On the other hand, there are many theories and models which may be relevant in the understanding and analysis of various aspects of the processes of change.

### 8.2.2     Measurement indicators for the safety effects of the changes

The AIBN has also chosen to base this study on an approach that assesses both proactive and event-based measurement indicators of the impact on safety of the changes:

a) *The operator's safety assessment of the changes before they took place (proactive)*

The following elements, which partially interact, form the basis of this study as indicators that give an indication of content, depth and extent of the aviation safety assessment against which the changes are measured:

* whether impact assessments of the changes have been carried out
* whether the accumulated impact of previously implemented changes has been taken into account
* whether the players have identified and based their assessment on safety margins when considering whether change can impact on them
* whether, and in which way, compensatory safety measures have been introduced..

The AIBN considers adherence to these elements as decisive when assessing whether the original margins for aviation safety have been reduced, altered or removed during introduction of the changes.

b) *Safety-related measurement indicators of operational data for air operations (event-based)*

Consideration of the use of production data as aviation safety indicators in air operations shows a reduction of the established level of aviation safety after the introduction changes over the past five years.

In this study, the AIBN has reviewed and analysed large amounts of operational data from the aviation sector. The following performance indicators were selected because they give an indication of the consequences of changes that potentially could impact on aviation safety. These indicators were split into the following categories:

- *Result indicators, including damage/loss/ undesirable  incidents* (damage frequency, absence through illness, fatal accident rates)

- *Activity indicators* measure the effort used to reduce damage/loss (e.g."backlog", implementation of corrective orders from the Civil Aviation Authority, frequency of emergency training exercises, etc)

## 8.3 Safety problem areas within the organisation and management of Norwegian aviation

We show here some of the overall findings that the study has revealed concerning lack of safety management.

### 8.3.1    Cumulative impact of change

Individual changes that have been introduced over a long period of time can, because of their (potential) interdependency, result in a cumulative effect that has the potential to change the original safety level for a defined activity.

Example:

Pilots flying into and out of the STOL airports are exposed all of the time to changeable and somewhat extreme weather conditions. They depend for this reason on frequent access to updated weather forecasts at the airports when they land there (an important aspect in maintenance of established safety margins in air operations). Over time, the companies have reduced the aircraft's turnaround on the ground to 15 minutes. The airport owners are also obliged to introduce the new security concept which includes pilots, cabin crew and passengers being isolated from service personnel and activity around the aircraft while on the ground. This means that the pilots, in addition to their other regular tasks while on the ground, must leave the aircraft and go through strict security controls before they can collect the necessary paper-based weather forecasts. This is difficult to achieve in just 15 minutes. The new security measures are important from the security point of view, but probably have a negative cumulative effect, together with other changes, e.g. the reduction in time on the ground.

In the opinion of the AIBN, this example shows that such professions as route planners (time), meteorological service (weather forecasts), airport owner/managers (security), flight operations managers (flying), security/quality managers (security), seem to operate in isolation from each other without any overall system having the responsibility of a system safety view (e.g. supervisory authority) which can provide warnings when the lack of coordination between the professions can result in negative safety conditions.

Introduction of changes at various players will continually produce this sort of uncertainty as to whether existing safety margins have been/will be affected.

In many cases, changes are assessed and implemented in a decentralised manner in the individual parties' organisation. They can, however, have the potential of having negative safety coordination consequences outside the area in which they are introduced, if they are not assessed and coordinated centrally at a system level.

The AIBN has discovered that several of the parties in the aviation sector have organised delegation of responsibility and work processes, so that potential changes that are critical to safety can be initiated, accepted and implemented "locally" in the organisation. The person or persons, who are given operational responsibility for the obligations this involves, often lack the necessary holistic safety expertise to see the extent of the changes.

Such isolated changes should, ideally, form part of an impact assessment at overall system level in order to assess whether they will affect the total risk picture.


### 8.3.2    Effects of pressure on financial results

The operational aviation companies, the airlines, suffer from great pressure from the competition situation and the demand for short-term profitability, and this study has examined in particular whether and how senior managers are active promoters of work on aviation safety.

The owners and senior management of the airlines often prepare the way for a healthy and market-oriented profile that will characterise their corporate culture. This is, therefore, given priority in planning, decision-making and daily tasks. On a daily basis, if managements place priority on cost optimisation without having good aviation safety indicators that can warn early enough whether safety margins are eroded, the result may be serious disturbance to aviation safety. One important point in this connection is that the earnings potential for implementation of processes of change and restructuring is very visible and quantifiable (in monetary terms). Most of the threats to the established safety level in aviation activities are, on the other hand, virtually invisible, making it difficult to measure the gains in the short term.

The AIBN has found that profitability analyses and assessment of staffing conditions have been carried out in advance of the introduction of the changes. Assessment of the

impact of the same changes on established aviation safety levels has, in contrast, not been discussed. It has been made quite clear in the discussions that the AIBN has had with employees in connection with the study that the management focus has mainly been on the business aspect and not on the safety aspect when implementing the processes of change.

Example:

Call signs for scheduled flights must be chosen to be so distinct/different that misunderstandings and confusion are avoided on radar screens and in communication between air traffic controllers and pilots. An incident that took place earlier this year illustrates how an isolated market-initiated change can reduce such an integral safety margin:

Two major airlines were partially merged, and one of the airlines changed its call signs so the three first letters in the call signs were the same for both airlines. After the letters, four numbers were used, which in most cases begin with the figure 4. Based on the timetables, it was possible at Oslo TMA west in the period from 0700 – 0800 hrs. to transmit on the same frequency with the same letter combination and subsequent number combination in the call sign for different individual aircraft:

4502 – 4202 – 4002    - 2302 – 4102 – 4232
4007 – 4207
4741 – 4751 – 4011

At these times, air traffic controllers received many such call signs, which could easily be misunderstood, on their radio. These flights are carried out according to the instrument flying regulations in which the correct identification of call signs is an especially critical safety action. If misunderstandings and confusion occurs here, when an aircraft is "flying blind", and receives clearance and new instructions from the air traffic controller, at the same time as it is in heavy traffic in the airspace, it may have serious consequences that have small time margins to allow for error correction. In this period, a dramatic increase in misunderstandings was registered, as were situations in which the phrases "say again" and "confirm" were regularly in use.

This happened even though:

- The call sign changes had been focused on in aviation safety discussions

- The AIBN made a safety recommendation in an investigation in 2003 concerning this problem (SL RAP 16/2003)
- The Civil Aviation Authority has published two Aeronautical Information Circulars (AIC) which provide specified recommendations about how the airlines should proceed in the changes to the call signals AIC-N 31/02 and AIC-N 47/01

In this case, in the opinion of the AIBN, the operator has not carried out sufficient safety impact assessments before the change to the call signs was introduced, and this could have had serious consequences.

In this study, the AIBN has seen a clear need for an adjustment of this uneven ratio between market forces/finance and safety. Study of the safety matters should at least be prioritised as much as financial matters, if the processes of change are able to be carried out in a justifiable way.

### 8.3.3    Application of the safety criterion "A change must not reduce the established level of safety"

The requirement that *"A change must not reduce the established level of safety"* is a requirement that other industries, e.g. the rail and offshore industries, have enshrined in their safety regulations, but that aviation legislation and its associated regulations have not specified. Among other things, this has resulted in the management and quality/safety functions at several of the major aviation companies not being sufficiently familiar with this criterion, and not therefore implementing formal systems to prevent deterioration of aviation safety during processes of change. Certain operational organisational levels at some of the operators have such an integral scepticism to introduction of changes, and use their personal initiative to assess them and their potential impact on aviation safety.

The study has revealed that several of the involved parties in the Norwegian aviation sector are in danger of reducing their safety margins. This includes changes in many work processes at various levels in the organisations, including technical, operational and on the system side. This takes place at the same time as the same companies have not established the necessary administrative tools to identify any potential new risk conditions, and subsequently, therefore, not set compensatory measures in place if it should prove necessary to compensate for the reduction in aviation safety.

Absolutely fundamental elements of the safety network, on which aviation safety is based, are grounded in regulations and acceptance/approval of the safety-related core skills, as well as supervision by the authorities.

The AIBN has revealed weaknesses with respect to the Civil Aviation Authority's:

-    Criteria for acceptance/approval of changes and associated requirements governing safety documentation

-    Aviation and safety expertise requirements for  the airlines nominated post holders and quality/safety managers

-    Supervision of the airlines' systematic safety work that prevents processes of change and restructuring having a negative impact on aviation safety.

## 8.4 Conclusion

The AIBN has considered the aviation sector's processes for maintaining aviation safety when processes of change and restructuring are introduced:

The AIBN has surveyed in particular whether the following safety criteria have been implemented:

- whether impact assessments of the changes have been carried out
- whether the accumulated impact of previously implemented changes has been taken into account
- whether the players have identified and based their assessment on established safety margins when considering whether new changes can impact on them
- in which way compensatory safety measures have been introduced.

The AIBN has concluded that none of the companies that we have investigated has included the above four criteria fully and wholly in their assessments of their change and restructuring. Nor have the companies been able to document use of other safety criteria that can tell us whether the established safety criteria may have been reduced as a result of the changes and restructuring.

The investigation has also examined the processes that the authorities have established for systematic follow-up of the Aviation Act and its regulations, the conditions of operational licences, specified requirements imposed on companies, and the Civil Aviation Authority's role in safety to ensure that safety margins in the aviation sector are not reduced when changes are introduced.

The AIBN has concluded that the airlines' and authorities' processes for ensuring maintenance of safety levels during introduction of changes and restructuring contain a number of matters that should be improved before they can be said to be sufficient for this purpose. Our current modern operational models are the result of changes in the aviation industry introduced in order to adapt to a competition situation that is constantly changing. This makes it necessary to supplement the event-based and regulation-managed safety regime adopted in the aviation industry with modern risk-based management and leadership principles.

## 8.5 Safety recommendation

- Overall follow-up and administrative routines at the supervisory authorities and airline operators should be developed and integrated, which will include systematic and documented protection of air safety matters associated with the processes of change. This should form a supplement to the regulated and event-based quality systems that exist, and are mainly used, today. New recruitment/development of associated safety expertise should be considered in this connection.

# 9 EXPRESSIONS AND ABBREVIATIONS

| | |
|---|---|
| AAD | The Ministry of Labour and Government Administration |
| AIBN | Accident Investigation Board Norway |
| A/C | Aircraft |
| ACC | Area Control Centre |
| ADEXP | ATS Data Exchange Presentation |
| ADS | Automatic Dependant Surveillance |
| AFIS | Aerodrome Flight Information Service (local flight information service) |
| AFP | ATC Flight Plan Proposal |
| AGAS | Action Group for ATM Safety |
| AIC | Aeronautical Information Circular |
| AIP | Aeronautical Information Publication |
| AMAN | Arrival Manager (automatic sequencing equipment for approach control) |
| ANS | Air Navigation Service |
| ANSP | Air Navigation Service Provider |
| AOPA | Aircraft Owners and Pilots Association |
| APP | Approach Control |
| ARI | Airline Risk Index |
| AS | Public Limited Company |
| ASA | Limited Liability Company |
| ASCA | Automatic SSR-Code Assignment |
| ASR | Air Safety Report |
| ASSR | Avinor's Academy Røyken |
| ASST | Avinor's Academy Trandum |
| ATC | Air Traffic Control |
| ATCC | Air Traffic Control Centre |
| ATFM | Air Traffic Flow Management |
| ATM | Air Traffic Management |
| ATS | Air Traffic Service |
| AWOS | Automatic Weather Observation System |
| AWSAR | All Weather Search and Rescue |
| BAA | British Airport Authority |
| B&R | Fire and Rescue Service |
| BSL | Bestemmelser for sivil luftfart (Provisions governing civil aviation) |
| BTS | Braathens Technical Service |
| CAA | Civil Aviation Authority |
| CAA/N | Civil Aviation Authority – Norway |
| CAR | Civil Aviation Rules |
| CCC | Common Core Content |
| CFIT | Controlled Flight Into Terrain |

| | |
|---|---|
| CFMU | Central Flow Management Unit |
| CHC | CHC Helicopter Corporation |
| CIP | Convergence Implementation Plan |
| CNS | Communication, Navigation and Surveillance |
| CORM | Corporate Resource Management |
| CRM | Cockpit/Crew/Company Resource Management |
| CRS | Certificate of Release to Service |
| DFS | Deutsche Flugsicherung |
| DfT | Department for Transport |
| DHC | De Havilland Canada |
| DNV | Det Norske Veritas |
| DP | Subproject in Take-Off-05 |
| EAA | Experimental Aircraft Association |
| EASA | European Aviation Safety Agency |
| EC | Executive Controller |
| ECAC | European Civil Aviation Conference |
| EFTA | European Free Trade Association |
| EMP | Electromagnetic pulse |
| EN | European Standard |
| ENBD | Bodø ATCC/Bodø Area of Responsibility |
| ENGM | Oslo Airport Gardermoen |
| ENOS | Oslo ATCC/Oslo Area of Responsibility |
| ENTR | Trondheim ATCC/Trondheim Area of Responsibility |
| ESARR | Eurocontrol Safety Regulatory Requirement |
| EU | The European Union |
| EEA | European Economic Area |
| FAA | Federal Aviation Administration |
| FAR | Fatal Accident Rate |
| FKA | The Norwegian Government Standing Committee on the family, culture and administration |
| FLH | Flight hours |
| FNT | ANS (Air Navigation Services) |
| FrP | Fremskrittspartiet (the Progress Party) |
| GA | General Aviation |
| GAP | Ground Accident Prevention Program |
| HET | Manual for electro-technical services |
| HF | Human Factor(s) |
| HIL | Hold Item List |
| HQ | Avinor Head Office |
| HSE | Health, Safety and the Environment |
| HOK | Manual for operative information services |
| HRO | High Reliability Organisations |
| HSLB | AIBN, Accident Investigation Board Norway |
| IA | Inclusive working life |

| | |
|---|---|
| IBM | IBM Business Consulting Services |
| ICAO | International Civil Aviation Organization |
| ICT | Information and Communication Technology |
| ISO | International Organization for Standardization |
| IT | Information Technology |
| JAA | Joint Aviation Authorities |
| JAR | Joint Aviation Requirements |
| KS | ATCC |
| KrF | Kristelig Folkeparti, the Christian People's Party |
| LCIP | Local Convergence Implementation Plan |
| LFV | CAA/S, Civil Aviation Authority, Sweden |
| LHT | Airport services |
| LOSA | Line Operations Safety Audit |
| LT | CAA/N, Civil Aviation Authorities, Norway |
| LTT | ATC, Air Traffic Control |
| LV | Luftfartsverket, Civil Aviation Authorities before 2000 |
| M-ADS | Modified Automatic Dependant Surveillance |
| MDR | Maintenance Data Record(ing) |
| MEDA | Maintenance Error Decision Aid |
| MEL | Minimum Equipment List |
| MESYS | Avinor's incident reporting system |
| MET | Meteorological/meteorology |
| METAR | Meteorological Aerodrome Report – routine weather observation for aviation |
| MMEL | Master Minimum Equipment List |
| MMOE | Maintenance Management & Organisation Exposition |
| MRM | Maintenance Resource Management |
| MSAW | Minimum Safe Altitude Warning |
| NAIS | Norwegian Aeronautical Information System |
| NARDS | Norwegian Automated Radar Display System |
| NASA | National Aeronautics and Space Administration |
| NATCON | Norwegian Air Traffic Control System |
| NATS | National Air Traffic Services, UK |
| NAV | Navigation/navigation aids |
| NG | New Generation |
| NLR | Nationaal Lucht- en Ruimtevaartlaboratorium |
| NLF/NAK | Norwegian Air Sports Federation/Norsk Aero Klubb |
| NOK | Norwegian krone |
| NS | Norwegian Standard |
| NSM | National Security Authority |

| | |
|---|---|
| NTL | Norsk Tjenestemannslag, Civil Servants union |
| OJT | On-the-Job Training |
| OPS | Operations |
| ORCAM | Originating Region Code Assignment Method |
| OSL | Oslo Lufthavn AS, operator of Oslo Airport Gardermoen |
| PAL | General flying and air sport project |
| PANS-ATM | Procedures for Air Navigation Services – Air Traffic Management |
| PANS-RAC | Procedures for Air Navigation Services – Rules of the Air and Air Traffic Services |
| PC | Planning Controller/Personal Computer |
| PFO | Periodic professional refresher courses |
| PIREP | Pilot Report |
| PR | Public Relations |
| QA | Quality Assurance |
| QP | Quarter Platform |
| RaADS | Radar and ADS Display System |
| RC | Radar Controller |
| RFL I | Instructions for performance of air traffic control services (from former Regulations for air traffic control) |
| RFL II | Supplementary regulations for air traffic control services |
| RII | Required Inspection Item |
| RTT | Council for technical terminology |
| SAFA | Safety Assessment of Foreign Aircraft |
| SANA | Safety Assessment of National Aircraft |
| SAR | Search and Rescue Service |
| SAS | Scandinavian Airlines |
| SD | Ministry of Transport and Communications |
| SEK | Swedish kronor |
| SEROS | Centre for Risk Management and Societal Safety |
| SGS | SAS Ground Service |
| SID | Standard Instrument Departure |
| SINTEF | Norwegian Foundation for Scientific and Industrial Research |
| SLA | Service Level Agreement |
| SLS | Safety Management System |
| SMS | Safety Management System |
| SOL | Simulation and optimalisation of airspace, project initiated by the  Civil Aviation Authorities |
| Sp | Senterpartiet, the Centre Party |
| SSR | Secondary Surveillance Radar |
| STAR | Standard Instrument Arrival |

| | |
|---|---|
| STCA | Short-Term Conflict Alert |
| STEP | Sequential Timed Events Plotting |
| STK | Scandinavian Supervisory Agency Office |
| STS | SAS Technical Service |
| SW | Software |
| SWOP | Safe Winter Operation Project |
| TECHREP | Technical/Maintenance Personnel Report |
| TGL | Temporary Guidance Letter |
| TMA | Terminal area |
| TO-05 | Take-Off-05 |
| TOA | General flight section at the Civil Aviation Authorities 's Technical Operative Department |
| TWR | Control tower |
| TØI | Norwegian Centre for Transport Research |
| UNDAF | University of North Dakota Aerospace Foundation |
| VCS | Voice Communication System |
| VFR | Visual flight rules |

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