HELIOS

29 Hercules Way
Aerospace Boulevard ▫ AeroPark
Farnborough ▫ Hampshire ▫ GU14 6UU ▫ UK

T +44 1252 451 651
F +44 1252 451 652
E info@askhelios.com
W www.askhelios.com

Study into Air Navigation Services to be opened to Competition in Norway: Part 1

Prepared for the Norwegian Ministry of Transport and Communications

an egis company

Document Information

Document Title	Study into Air Navigation Services to be opened to Competition in Norway: Part 1
Author	James Hanson, Chris Smith, Kate Snow, Ankira Patel, Irisa Chiu, Helios
Produced by	Helios 29 Hercules Way Aerospace Boulevard - AeroPark Farnborough Hampshire GU14 6UU UK
Produced for	Norwegian Ministry of Transport and Communications
Helios contact	James Hanson Tel: +44 1252 451 651 Fax: +44 1252 451 652 Email: James.Hanson@askhelios.com
Produced under contract	
Version	Final Draft
Date of release	13 November 2015
Document reference	P2108D001

Executive Summary

Introduction

As part of a broader political aim to improve the efficiency of the transport sector, the Government of Norway has decided that ANS (Air Navigation Services) provision at state-owned airports should be opened to competition. The objective is to achieve improved cost effectiveness of ANS, whilst at least maintaining current safety, security, national defence standards and service delivery quality.

This two-part study has been launched to investigate the options. This first part identifies *which* services are best suited to competition and *how* the competition should be phased in. The second part, to be documented separately, will determine the *conditions precedent* to facilitate this competition.

The scope of this study includes the following Air Navigation Services: approach control (“APP”); aerodrome control (“TWR”); Aerodrome Flight Information Services (“AFIS”); Aeronautical Information Services (“AIS”); meteorological services (“MET”); and communications, navigation and surveillance services (“CNS”). The primary focus however, is on approach and aerodrome Air Traffic Control (ATC) services.

In the course of this study, several parties have been consulted, both within and outside the Norwegian market. This has allowed us to develop a wide view on the key constraints, benefits and risks of opening ANS to competition as well as an opportunity to build on the lessons learned from other competitive ANS markets - in particular in Sweden, Spain, Germany and the UK. The information gathered has allowed us to develop a list of preferred service scenarios, a potential packaging of tenders and an initial phasing for their launch. Several recommendations have also been made for further study in order to determine the *conditions precedent* to facilitate this competition

Current Situation

The Ministry of Transport and Communications (MoTC) is the government authority responsible for civil aviation in Norway with Luftfartstilsynet, the Norwegian CAA, responsible for regulatory oversight and enforcement.

There are 52 Norwegian airports considered in this study, 43 of which are owned by Avinor AS, a state-owned limited company responsible for planning, developing and operating the Norwegian airport network. The others are owned by either the Norwegian Defence Forces (NDF), by the local municipality or by private parties. Avinor AS holds the license to operate 46 airports,

including three of the four Military-owned airports. It has a strategically important role to the government supporting employment both directly in the aviation sector and indirectly in the oil and gas sector, tourism and other industries.

With the exception of some private airports, ANS is provided by a single national monopoly provider, Avinor Flysikring ("Flysikring"), a wholly owned subsidiary of Avinor AS. TWR services are provided by Flysikring at 20 airports. APP services for these airports are co-located with the TWR service; or supplied from another airport tower; or supplied from an Air Traffic Control Centre (ATCC). Other airports generally rely on an Aerodrome Flight Information Service (AFIS). Flysikring also provides CNS (Communication, Navigation and Surveillance) services at all airports except Oslo.

Flysikring charges its airport customers, according to cost-related contracts with the airport operator. The airport operator pays for these contracts through Terminal Navigation Charges (TNC) levied on the aircraft. However, with the exception of the four largest national airports, most airports are unable to cover the costs of the ANS contract. In the case of Avinor AS-owned airports, there is a heavy reliance on subsidies from the commercial revenue generated within the airport group. There is no such subsidy available to the private airports, such as Torp and Rygge.

Considerations for competition

In general competition is assumed to optimise service provision as market forces incentivise service providers to be better organised, to seek cost reductions, to improve service quality and to focus more on customer issues as providers compete with one another for the market. However introducing competition requires a thorough consideration of the complexities of ANS provision and the following issues that may arise in tendering services.

- **Safety and transition:** Safety will always be of prime importance. Any new provider will be required to demonstrate sufficient safety as part of its certification requirements. Theoretically, a provider certified in accordance with SES legislation should be transferrable but in practice this has not always been the case elsewhere. Transition arrangements will be needed to manage safely any transfer: for example, it may be necessary to have a handover period of 6-12 months, during which time the outgoing provider would need to permit access to the new provider. Regulatory intervention may be needed to support a smooth transition process – for example to avoid issues with sight of the operational handbook/manual of procedures. We would expect an incoming provider to set-up or partner with a local company, and rely on existing local staff to supply the service and overcome the safety requirement to speak Norwegian (to manage non-ATC traffic at the airport for example).
- **Staff/Social/HR aspects:** The ability of an incoming supplier to reduce costs is an important factor in determining the potential for competition to improve cost efficiency (for example lower overheads, more efficient rostering, reduced overtime and reduction in support staff numbers). The incoming provider is likely to encourage staff to transfer, in order to retain their competence and minimise any disruption to the service. In general, we would expect most controllers would want to transfer and for employment costs and associated terms and conditions to be little different initially between incoming and outgoing providers. In the longer term, we would expect the incoming provider to seek to reduce the costs of the overall employment package. The impact of competition is also likely to strengthen the ability of Flysikring management to introduce changes that could increase its own cost-effectiveness.

- **Charges and cost recovery:** Although we would expect a new provider to seek costs savings in ANS they may not be sufficient to lower the cost of ANS (to the airport) to the point that that it is fully recoverable through the TNC charge. Hence, the current arrangements of cross-subsidy from commercial airport revenue would be likely to broadly continue. It is also possible that an incoming provider may seek to recover part of the APP service costs from the en-route cost base, as was the case in Sweden.
- **Military requirements:** The Norwegian Defence Force (NDF) currently has no competence in providing ANS. Furthermore the NDF does not intend to build up its own competence in ANS so, for certain airports, an incoming ANS provider may have to establish a security agreement with the Military and meet requirements such as: employing ATCOs that are Norwegian citizens; obtaining Norwegian and NATO security clearances; and giving priority to military operations. Assuming these requirements are satisfied, the NDF supports the introduction of competition.
- **Organisation of services:** The current organisation of services already reflects certain economies of scale that influence the possible packaging of tenders. It is important to introduce competition in a way that neither risks fragmenting services further nor 'un-bundles' existing structural efficiencies.
- **Operational aspects:** One of the major issues to determine before competing ANS is to clearly define the boundaries of the service, and ensure consistency between the operational service boundary and the cost-recovery boundary so that the service is cost-reflective. Another recognised issue is the difficulty of matching supply and demand for ATCO hours. In Sweden, more efficient service delivery was one of the methods adopted to reduce cost.
- **CNS & technical interfaces:** In general, CNS services ensure that the data and equipment is available and working sufficiently for an airport to operate. A high level of technical expertise is required from the incoming provider to use or manage the CNS infrastructure. Flysikring's ATM system, known as 'NATCON', is currently operated at all airports where a TWR service is provided and a new provider would need access to it, possibly through suitable (and potentially regulated) agreements or through transfer of the asset to the airport.
- **Assets and investment:** Flysikring and Avinor AS confirmed that ATC assets located at Avinor airports are largely owned by Avinor AS, which generally makes it easier to outsource the ATS. Consideration will be needed in relation to the cost of radar data and the Intellectual Property associated with Operations Manuals. Issues would arise when for assets is not owned by the airport, and this could add costs for the incoming provider.
- **Remote Towers:** In August 2015, Flysikring entered into a contract with Kongsberg Defence Systems and Indra Navia to supply equipment that will enable Flysikring to provide remote tower services for up to 15 airports from a single centre in Bodø. It is clear that Remote Towers could have a significant impact on cost in the longer term as they enable service delivery away from the airport and for costs to be shared between airports. Having already committed to a service delivery contract via remote towers, it is assumed that these 15 (mainly AFIS) airports will not be opened to competition in the near-term.
- **Market attractiveness:** To deliver savings there must be sufficient parties that value the opportunity to provide ANS services in Norway and are prepared to tender for it. It is important that the value of the contract on offer should be commensurate with bidding costs and the risk of being unsuccessful. For example, bundling some airports together into one tender package or extending the length of the service contract can increase the value of the

opportunity to bidders. The attractiveness will further be enhanced by a transparent and fair bidding process, which may require the separation of Flysikring from Avinor AS. At the same time, there must be fairness for Flysikring and Avinor AS in their involvement in Norwegian and international markets.

- **Procurement:** The complexity of ANS procurement requires a significant effort from the airport to develop the tender and to support the selection of candidates – as was demonstrated by an internal exercise by Avinor at Oslo. The tender process should seek not only lower costs but also maintenance of service quality (if not improvements and innovation) to enhance the overall 'value' to the airport. A good trade-off on tender contract length has to be determined in order to discourage the creation of a new monopoly but at the same time present an attractive opportunity to new providers.

Scenarios

There are in principle a wide range of scenarios for opening ANS to competition. However a large proportion of possible options can be discounted based on the current organisation of services and the economies of scale already embedded in the Norwegian system. In our opinion 'unbundling' co-located services, would be more likely to increase risk and potentially cost as it would require new boundaries to be defined between co-located services and could lead to duplication of shared costs, especially in the short term. For some services, including CNS, MET and AIS, some competition is already present so our recommendations are more specific, for example to improve the cost transparency of MET and CNS and to compete sub-elements of AIS.

For ATC services, three possible scenarios (ie what services and which airports) have been agreed upon. The three primary scenarios are:

- **A2, TWR services at Avinor airports where APP is not co-located:** Here the approach and aerodrome services are already geographically separated which makes the division of services more easily identifiable and minimises the risk of costs being duplicated. It therefore avoids introducing additional fragmentation to the system, whilst maximising potential benefits and preserving the freedom of the market to propose solutions. It also means that Flysikring retains competence in aerodrome services at those airports where it is co-located with approach. The targeted airports in Scenario A2 are Oslo, Stavanger, Bodø, Alesund, Kristiansund and Haugesund.
- **B3, TWR & APP services at co-located airports:** Scenario B3 takes full advantage of the benefits of competing TWR and APP services together while retaining existing economies of scale, such as in approach services provided from centralised locations. Co-located services mean that controllers will be able to switch between approach and aerodrome positions, provided that they are licensed appropriately, enabling more cost effective rostering. The targeted airports in Scenario B3 are Bergen, Trondheim, Tromsø, Kristiansand, Alta, Harstad Narvik, Kirkenes, Bardufoss, Lakselv, Andøya and Ørland.
- **D1, TWR services at the busiest AFIS airports:** Scenario D1 offers a low risk way to introduce competition into the market. Introducing competition in tandem with the introduction of moving from AFIS to ATC also avoids any issues associated with staff transfer and may reduce the cost increase associated with the change of service, for example due to the salary differential between AFISOs and ATCOs. It also offers greater scope for private providers to propose different ways to meet the airport requirements. This scenario covers Hammerfest, Brønnøysund and Molde airports.

Grouping and phasing

The implementation of a competitive tender process requires airports to be grouped to ensure that each tender is sufficiently attractive commercially. Grouping of airports also provides potential bidders with the opportunity to propose more integrated solutions to service provision. Based on our assessment of the considerations and risks identified earlier, we recommend several packages for opening ANS to competition. These take account of several specific situations at certain airports, for example the situations at both Stavanger and Bodø where APP services are not provided from the tower but from the ATCC centre which is actually adjacent to the tower and where TWR and APP services are provided by the same cadre of staff . Another exception concerns Ålesund and Kristiansund where there are inter-dependencies for the APP provided from Trondheim, which is a candidate for TWR/APP competition in Scenario B3. A final difficulty arises with Molde (D1), which also has APP provided by Trondheim.

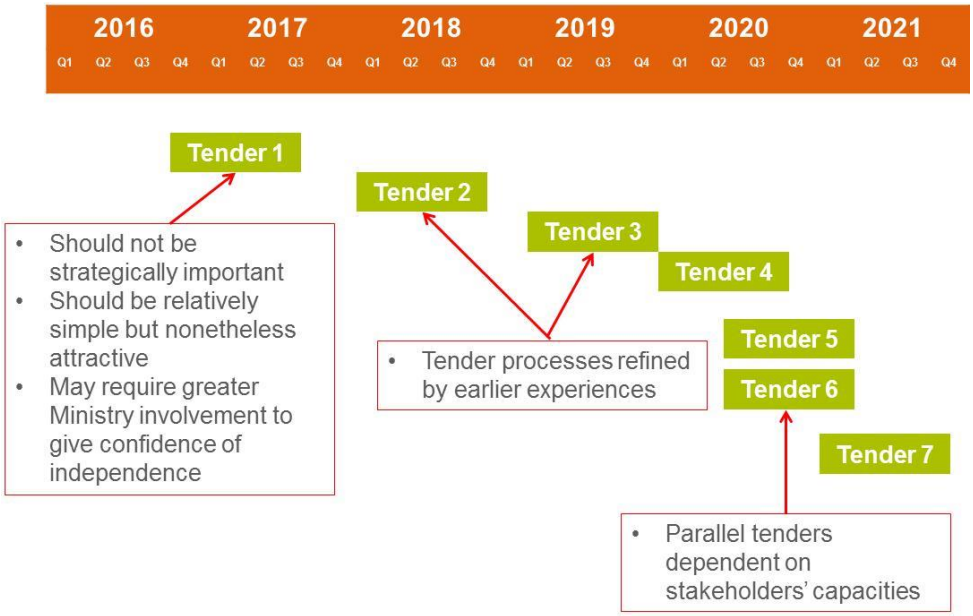
More detailed work would be required to determine which of these options were best for each of the airports, but for the purposes of this report we have included them within the packages and explained our rationale. This results in the following packages being proposed for tender:

- A2.1: TWR ATC at Oslo
- B3.1: TWR & APP ATC at Bergen and Stord
- B3.2: TWR & APP ATC at Stavanger with four TIA airports, as well as Haugesund, and possibly Kristiansand
- B3.3: TWR & APP ATC at Trondheim with Ålesund, Kristiansund, Ørsta Volda and Molde
- B3.4: TWR & APP ATC at Tromsø, Alta, Harstad Narvik, and Lakselv
- B3.5: TWR & APP ATC at Kirkenes
- B3.6: TWR & APP ATC at Bodø and perhaps some dependent airports
- B3.7: TWR & APP ATC at Andøya, Bardufoss and Ørland
- B3.8: TWR & APP ATC at Kristiansand
- D1.1: Transition from AFIS to TWR ATC at Hammerfest and Brønnøysund

We recommend these packages are not offered to the market at the same time partly because of resource burdens that would be placed on Flysikring, Avinor AS, the CAA and potential bidders. Additionally, by phasing the tenders, the process and documentation can be progressively refined and bidders can become more comfortable and confident in the fairness and efficiency of the competition. There is likely to be some flexibility in terms of the order in which the packages might be tendered. It would be better to start with a relatively simple package involving an airport(s) that is not strategically important to Flysikring (eg not A2.1 Oslo), since it would be desirable, from a market attractiveness perspective, if the first tender were not retained by Flysikring. Phasing would also enable those airports that are strategically important to the Military not to be tendered first or without further consultation with the Military. However it should also be noted that with the exception of B3.5, B3.8 and D1.1, all packages contain at least one airport which has been indicated by the NDF as being important.

A tender might take some 6 to 12 months to set-up and conduct, and it would be desirable to leave a similar period of up to a year in order that the experiences of the first tender could be evaluated and reflected in the next tender. Thereafter, there need not be such a gap between tenders.

The figure below outlines a possible time-table for the launch of the process. We consider that a first tender might be launched by the end of 2016 if a commitment were made in Q1 2016 allowing the detailed planning and implementation to start in Q2 2016.



Recommendations for Part 2

The subsequent part of this study will investigate and conclude on the requirements to be addressed to enable the implementation of competition outlined in the previous section. This is broken down into four key areas for investigation:

Financing ANS: Before competition can be introduced the contractual model for any new provider will need to be decided, including the risk sharing arrangements and the principles for allocating approach costs. Transparent and cost reflective payments for any national obligations placed on Flysikring may need to be specified. For airports under the Performance Scheme aspects such as risk sharing and tender award within a Reference Period will need to be considered.

Institutional structure: Full separation of Flysikring from Avinor AS may be necessary to create a fair market. An additional degree of separation between the regulated and un-regulated parts may also be necessary – as with the UK 'ring fencing' arrangements. We will also look into the freedoms of Avinor Flysikring, including the right to compete for contracts both domestically and markets abroad. The institutional framework also covers the roles and responsibilities of the different parties in the tender process, notably any new regulatory requirements that may be placed on the CAA or MoT – for example in relation to training and recruitment of controllers.

Asset and infrastructure ownership: For equipment at the airport not owned by the airport suitable arrangements to transfer or provide access may be required – for example the NATCON ATM system. Some operations and procedures may also be considered as an asset with Intellectual Property Rights and will need to be addressed. Usage arrangements may be put in place or alternatively a new provider may have access only to the data outputs from the system. Much of the required ATM and surveillance data is sent (or planned to be sent) via a closed network, STAMNET, which is owned and operated by Flysikring meaning that a data pricing

arrangement may be the most appropriate way forward. Any future ownership and pricing arrangements also need to ensure adequate incentives for asset maintenance and replacement. The responsibility for, and assets associated with, contingency requirements will also be considered.

Employment and people: Although we expect most controllers to opt to continue to working at their current airport it is important to clarify the requirements set out in Norwegian law and the current collective agreements on the transfer of staff to any new provider. This is especially important in the case of pensions. The context under which competition is introduced must also ensure adequate training of new ATCOs and continued training of existing staff. The existence of sufficient numbers of ATCOs is especially important given the role of the airport network in regional connectivity and contingency measures should be in place to maintain service provision in the case where staff choose not to transfer.

Contents

List of figures

List of tables

1 Introduction

1.1 Background

As part of a broader political aim to improve the efficiency of the transport sector, the Government of Norway has decided that ANS (Air Navigation Services) provision at the 40-plus state-owned airports should be opened to competition meaning that potential suppliers are invited to submit a tender for the exclusive rights to supply specified services for a pre-determined period of time (5-10 years).

This is a policy decision which recognises:

- a general dissatisfaction with the high costs of current service provision (in contrast to the generally high level of satisfaction with the quality of the provision); and
- the high level of State financial support given to domestic air transport in Norway.

This latter support takes two forms: (i) an extensive network of air services operating on a PSO (Public Service Obligation) basis; and (ii) a significant cross-subsidy of regional and local airports and of ANS from the larger airports.

The Government's primary objective of opening ANS for competition is to achieve improved cost effectiveness of ANS, while at least maintaining current safety, security, national defence standards and service delivery quality.

Finding cost efficient solutions to service provision is especially important for Norway's widespread network of regional airports (99.5% of the population can visit Oslo and return home on the same day) which are often not commercially viable by themselves. This is, in part, due to fixed or inelastic costs such as ANS costs, which are usually provided throughout airport opening hours, regardless of how much traffic is present. Such airports often do not have sufficient traffic from which to recover costs and are typically operated at a loss.

1.2 Aim of this study

The purpose of the first part of this study ("Part 1") is to decide, for state-owned airports, *which* air navigation services are best suited to competition and *how* the competition should be phased in.

The second part of this study ("Part 2"), to be documented subsequently, is to determine the *conditions precedent* that are needed to facilitate this competition.

1.3 Scope of the study

According to ICAO document No 9082/9 (2012)[1], the provision of Air Navigation Services (ANS) encompasses five broad categories of facilities and services; namely air traffic management (ATM), communication services, navigation services and surveillance services (CNS), meteorological services for air navigation (MET), aeronautical information services (AIS) and search and rescue (SAR). These services are provided to air traffic during all phases of operations (area control, approach control and aerodrome control).

[1] http://www.icao.int/publications/Documents/9082_9ed_en.pdf

Although the Ministry has specifically excluded en-route control from the scope of activities to be opened for competition, other aspects of ANS and Meteorological services[2] (MET) are potentially available for competitive provision.

The following diagram[3] highlights the services considered within this study, noting that the focus is on approach and aerodrome ATC services as these are the most significant in terms of cost and additionally the easiest to "unpick" from other ANS.

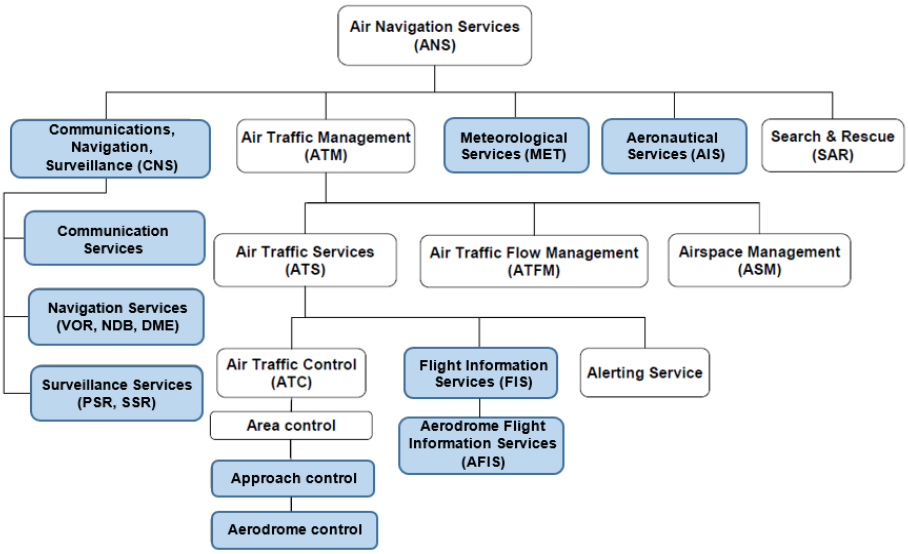


Figure 1: Scope of ANS covered in this study (shown in blue)

1.4 Method & approach

We have approached the first part of this study in three discrete Phases, namely information gathering; analysis and assessment; and synthesis and conclusions.

The information gathering phase has been principally about establishing the air navigation services provided in Norway, their cost, and details on the quality and performance levels currently achieved. We believe the information presented in this report to be accurate, although we aware of detailed variances between sources on airport ownership and operation. We believe that this does not undermine our conclusions.

Through broad consultation with stakeholders in Norway we have identified the key constraints and risks. We have also used this phase to look into case studies from other states which have undergone similar market liberalisation processes, notably Sweden, and to capture lessons learnt from their experience.

With each stakeholder we have discussed their opinions on the benefits, costs, and considerations for opening ANS to competition. In many cases this has been done on an iterative basis to ensure that we had fully captured their views within our evaluation.

[2] Currently provided by the Norwegian Meteorological Institute
[3] Adapted from EUROCONTROL Specification for Economic Information Disclosure V2.6

This information gathering enabled us to gain a broad understanding of the organisation of ANS in Norway and to develop and test a range of scenarios for how the services might be competed. These scenarios were presented and refined at a workshop meeting with the Reference Group.

We are most grateful to all who have given their time and knowledge so willingly.

Based on our understanding of the ANS industry and stakeholder consultation we have also defined a list of key considerations for opening ANS to competition, and these have been used to evaluate the agreed scenarios.

Having identified a set of suitable scenarios, we have considered the phasing options and an implementation roadmap for how to transition to it. Our final output of Part 1 of our work, as embodied in this report, provides a recommendation for which services should be competed, a risk assessment of our proposed options and an initial outline programme for how to compete them.

2 Current situation

2.1 Introduction

Civil aviation in Norway is the responsibility of the Ministry of Transport and Communications (MoTC). Responsibility for regulating civil aviation in Norway is given by the MoTC to Luftfartstilsynet, the Norwegian CAA. The following sections describe the airport network and air navigation services (ANS) provided at those airports.

2.1.1 Airport network

There are 52 Norwegian airports considered in this study, 43 of which are owned by Avinor AS, a state-owned limited company responsible for planning, developing and operating the Norwegian airport network. The others are owned by either the Norwegian Defence Forces (NDF), by the local municipality or by private parties. Avinor AS operates 46 airports in Norway[4], including four NDF airports. The ownership of Bodø will transfer from NDF to Avinor AS on 1st August 2016. Avinor AS has a strategically important role for the government supporting employment both directly in the aviation sector and indirectly in the oil and gas sector, tourism and other industries. Oslo is by far the busiest airport in terms of passenger numbers, handling some 24 million passengers per annum (mppa).The next busiest airports are Bergen, Stavanger and Trondheim, handling 4 to 6 mppa. Tromsø follows with some 2 mppa, and next come the two 'private' airports of Torp and Rygge, with just under 2 mppa each. Just three other Avinor airports handle more than 1 mppa. Traffic at many of the smallest airports is composed largely if not entirely of passengers travelling on PSO operations: some half of Avinor's airports had PSO representations at or very close to 100%.

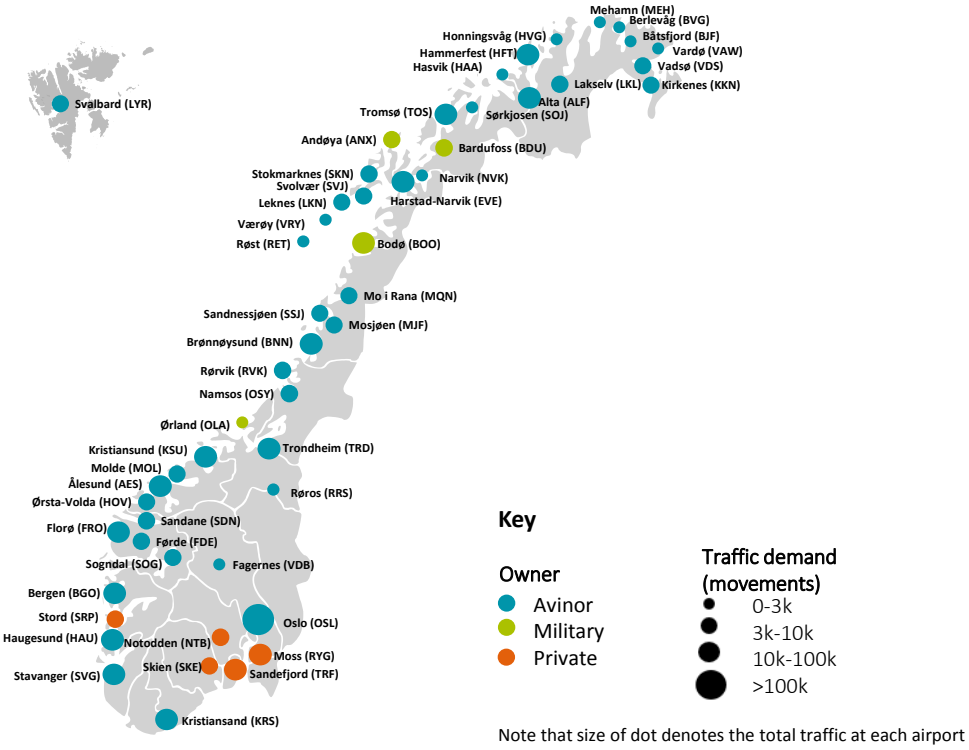


Figure 2: Airport ownership and traffic demand

[4] We note that Narvik is expected to be closed soon and that Skien is in the process of closing.

2.1.2 Air Navigation Services

The MoTC has immutable legal obligations, *inter alia* through the Chicago Convention, to ensure that appropriate ANS are provided within the territory of Norway. Luftfartstilsynet has certified the following service air navigation service providers (ANSPs) in Norway:

Certified ANSP	Services certified for
Avinor AS	ATS (only AFIS) MET and AIS (AIP)
Avinor Flysikring AS	ATS, CNS, MET and AIS (NOTAM)
Oslo Airport	CNS and MET
Statoil ASA	ATS (only HFIS) CNS and MET
ConocoPhillips	ATS (only HFIS) CNS and MET
Sunnhordland Airport	ATS (only AFIS) and MET
Skien Airport	Commercial operations now closed down including AFIS service
Notodden Airport	ATS (only AFIS) and MET
Kings Bay AS (Ny Ålesund)	ATS (only AFIS) and MET
Store Norske Spitsbergen Grubekompani AS (Svea)	ATS (only AFIS) and MET
Meteorologisk Institutt (met.no)	MET
StormGeo	MET (limited certificate, no service)

Table 1: List of certified ANS providers in Norway (source Luftfartstilsynet)

Only one entity can provide ANS at the point of delivery to the user. There is currently no scope for a multiplicity of providers offering services and the airspace user cannot select or change providers at a specific locations. This characteristic has meant that, with the exception of private airports which already have the legal right to tender for services, ANS is provided by a single national monopoly provider. The national monopoly provider in Norway is Avinor Flysikring - a wholly owned subsidiary of Avinor AS since 1st June 2014 (and often referred to simply as “Flysikring” throughout this study).

Operation of the following air traffic services has been designated by the MoTC to following providers:

- Aerodrome Control Services (Avinor Flysikring AS, until 31st December 2017)
- AFIS (Avinor AS, until 31st December 2017)
- Aviation Weather Services (The Norwegian Meteorological Institute, until 31st December 2017)
- Area Control and Approach Control Services (Avinor Flysikring AS, until 31st December 2024).

The Ministry does however have the option to terminate the concessions for approach control services, aerodrome control services and AFIS services at earlier dates.

There has been a steady growth in traffic, as shown in Figure 3. The diagram shows annual growth for IFR airport movements and IFR flight hours as reported by Avinor to EUROCONTROL and set-out in its ATM Cost Effectiveness (ACE) Report.

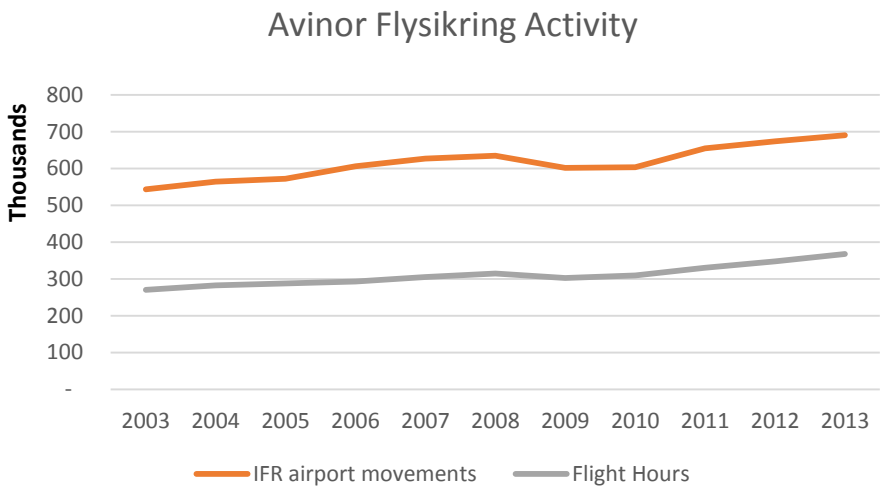


Figure 3: Flysikring traffic growth

2.2 Air Navigation Services provided

2.2.1 Organisation of services

Most air navigation services (ANS) in Norway are provided by either Avinor AS or Avinor Flysikring with a few exceptions such as the private airports of Notodden and Stord which supply their own services in some areas.

Table 2 summarises the ANS in Norway (a more detailed list is presented in Annex B). As may be seen, Aerodrome (Tower) control services (the abbreviation “TWR” is used throughout this report) are provided at 20 airports, which generally are the busier airports. Approach control (the abbreviation “APP” is used throughout this report) is: co-located with the TWR service; or is supplied from another airport tower; or is supplied from an Area Control Centre (ACC). In some cases, a full approach service is not provided, only an information service within a Terminal Information Area (TIA). 32 airports rely on an information service at the airport itself – ie an Aerodrome Flight Information Service (AFIS). Three private AFIS airports self-supply and Avinor self-supplies AFIS at its own airports.

Flysikring also provides CNS (Communication, Navigation and Surveillance) services at all airports with the exception of Oslo which has sufficient scale to self-provide its local CNS services. First and second line maintenance support for CNS is generally provided from locally based airport staff, or from regional pools of staff established by Flysikring. Third line support is generally provided from Oslo or Bergen.

Airport Type	Total Number	Aerodrome control (from TWR)	Approach control				AFIS	CNS
			From TWR	From another TWR	From ACC[5]	From ACC (TIA only)		
Large	4	4	2	0	2	0	0	3+1[6]
National	4	4	2	1	1	0	0	4
Regional	9	7	5	2	1	0	2	9
Local	29	2	2	6	11	10	27	29
Private/Mil	6	3	1	1	3	0	3	6
Total	52	20	12	10	18	10	32	52

Table 2: Organisation of ANS

Figure 4 indicates the location of ATC and AFIS service provision in Norway. In general, AFIS is provided at airports/airfields with insufficient traffic demand to require full ATC service.

[5] Excluding Terminal Information Area (TIA)

[6] Oslo airport supplies its own CNS service

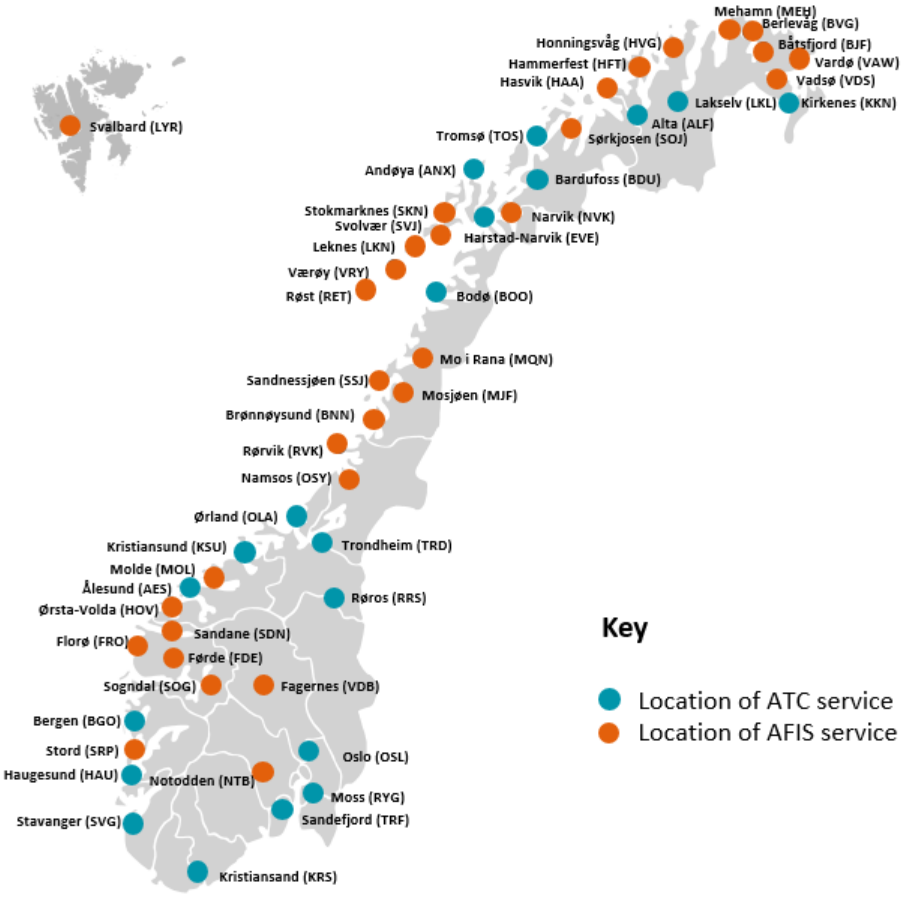


Figure 4: Location of ATC/AFIS service provision in Norway

Figure 5 indicates the locations from where APP or TIA services are provided. The highest number of APP and TIA services are both provided from Bodø area control centre, which supplies approach services to 9 airports and a terminal information area service to 5 airports.

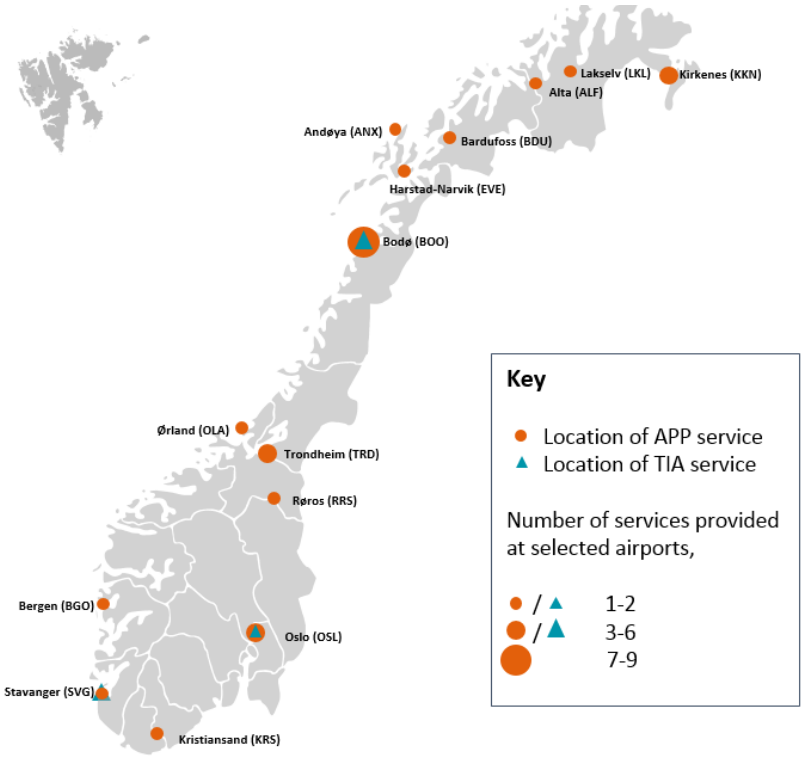


Figure 5: Location of APP/TIA service provision in Norway

2.2.2 Revenue for ANS

Avinor AS is both the owner of Flysikring, the ANS provider, and the operator of many of the airports at which Flysikring provides services. For airport ANS, Flysikring's primary customer is therefore its parent company. Other Flysikring income for airport ANS is due from the Norwegian Defence Forces, the private airports of Torp and Rygge, and some other smaller airports, some supporting the off-shore industry. Flysikring has contracts with the airport operators, but not with the aircraft operators using any of these airports. Hence, currently it does not need to consider the ability of these users to meet its costs – this is the challenge for the airport operators.

Prices charged to customers are based on costs incurred in providing the services. Currently, Avinor Flysikring operates on a system of fixed price contracts meaning the cost risk is borne by the ANS provider and not the airports. Airports are charged for air navigation services by Avinor Flysikring on the basis of the total cost allocated to them.An allowance for the cost of capital is added to the total allocated cost.

The airports in turn, recover part of the air navigation charge through Terminal Navigation Charges (TNCs). Four airports in Norway are subject to the Single European Sky (SES) economic regulation for Terminal ANS (TANS) performance, namely Oslo, Bergen, Stavanger and Trondheim. The TNC at these airports is set for each year of the reference period in consultation with the users based on the forecast costs and service units. The total cost base includes costs from both Avinor Flysikring and Avinor AS. The

2015 TNC for these four airports is set at NOK 1842.84 per service unit[7]. For other airports a lower TNC is set at 70 percent of the four airports ie at NOK 1289.99 per service unit.

The following graph shows how Avinor's reported terminal costs have increased between 2006 and 2013, relative to IFR aircraft movements at airport. This information is as submitted by Avinor to EUROCONTROL as part of the annual ATM Cost Effectiveness Benchmarking exercise. Figures are portrayed in nominal terms and the index is based on the financial data in Euros that is made available as part of the process. Changes in the exchange rate may therefore impact the cost trend.

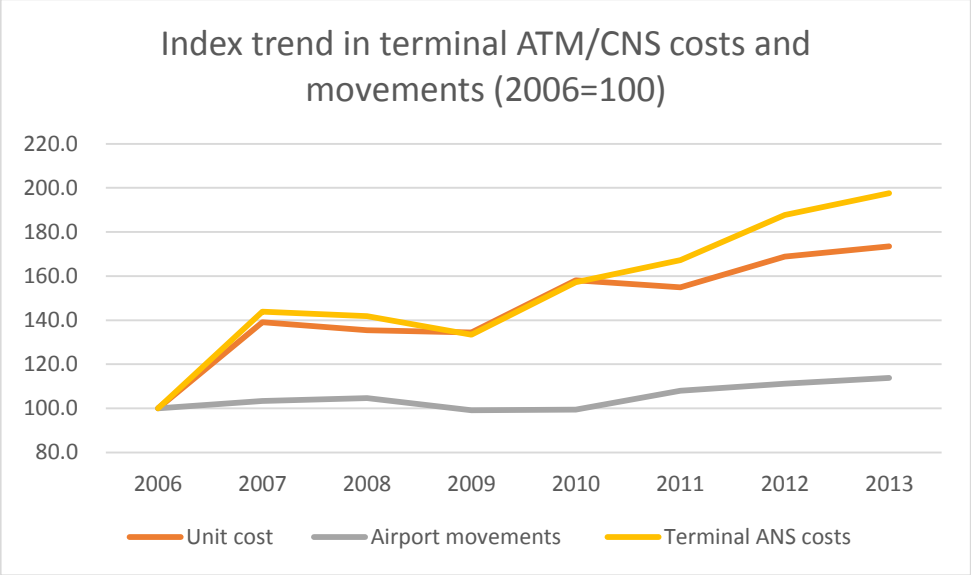


Figure 6: Terminal ATM/CNS costs and movements from 2006-2013

2.2.3 Contractual arrangements for ANS

Flysikring is in the process of changing contracts with its airport customers but at present, the contractual arrangements are characterised as follows:

- **Duration**: each contract is for a duration of one year only
- **Price**: the price of the ATS reflects the number of ATCO hours deemed necessary by Flysikring to cover the opening hours of the airport. More details on the cost of the ATS are provided in the section 2.3.
- **Quality of service**: with the exception of the contract at Oslo, Quality of Service (QoS) criteria are not included in the contract. At Oslo, Air Traffic Flow Management (ATFM) delay metrics are included. In addition, the four biggest airports have service level agreements with some airlines. Some aspects of these agreements drive contractual requirements for Flysikring, for example in relation to capacity and management of morning/evening traffic peaks.

[7] Service Unit = (MTOW/50) ^ 0.7

- **Equality**: Flysikring has stated that all airport customers (both internal and external) are treated equally. From our discussions with private airports (Torp, and Rygge), this principle seems generally to have been applied.
- **Customer relationship:** Contracts currently do not include any incentives or criteria that foster greater alignment of services provided to airport needs. This was recognised by Bergen Airport as an area needing improvement.

For ANS services provided at the privately owned airports, we observed the following:

- The contract between Torp Airport and Flysikring was signed in 2001, but terminated by Flysikring in November 2009. A court case is ongoing in which there is a dispute over payment for approach services currently provided by Flysikring, but excluded from the contract signed in 2001. Despite termination, the contract remains in force until the court case is resolved. Regardless of contractual arrangements Flysikring is still obliged to provide this service as part of its designation.
- Torp and Rygge airports are both currently in the process of launching a tender for ANS at their airports. Once concluded, this will result in a new contract at each airport. The process is ongoing and may depend on resolution of the court case mentioned above.
- Without sufficient ATC knowledge, it is difficult for airports to challenge Flysikring over the hours of service on which ATS contract prices were mainly based.

2.3 Cost of ANS

2.3.1 Cost Structure

Flysikring had a cost base of approximately 1.9B NOK in 2014. This cost base is predominantly made up of staff costs, as may be seen in the cost base shown below.

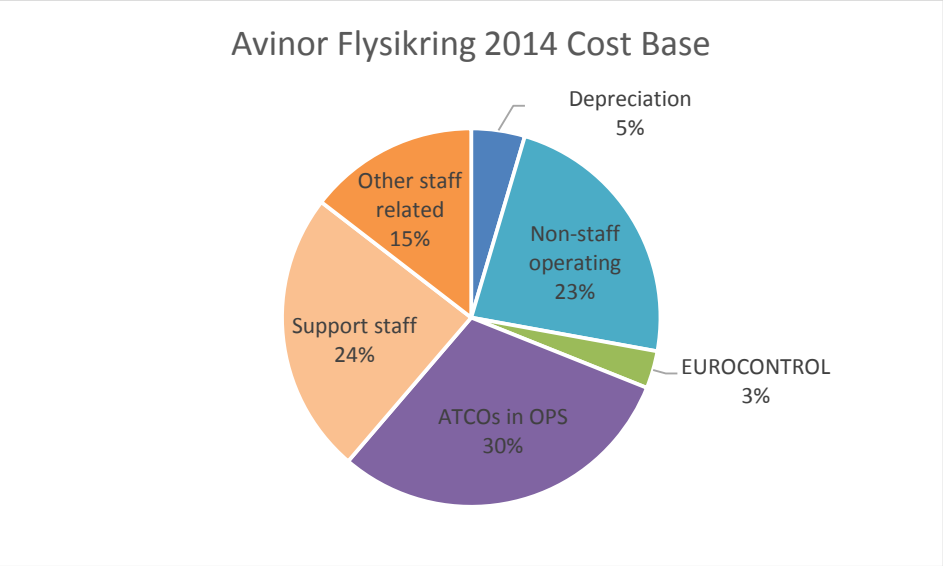


Figure 7: Avinor 2014 ANS cost base

The nature of an ANSP business is such that much of the cost base (and hence personnel) is not associated with a single service at a single location, but either provides a specific service at several different locations (eg in the CNS/Systems Operations area, staff in an ATCC), or supports more than one service at a given location (eg TWR and

APP from a single tower). This means that not only do a significant proportion of costs have to be allocated using algorithms (as discussed below) to estimate the cost of a specific service at a given location, but also (and important in the context of this project) that should a specific service transfer to a different provider not all costs would be similarly transferred or lost.

The calculation of charges also includes a margin, consistent with the aim of producing a pre-tax return for the Government as the owner of Flysikring.

Flysikring has organised its business into three distinct Business Areas, supported by a Headquarters function:

- **Business Area En Route (ENR)**: this is perhaps the most straightforward Business Area, providing ENR and running the three ATCCs. Some costs for APP, contained within this business area, are allocated between en-route and airport customers, but otherwise en-route ATS is outside the scope of this current study as it is not being opened to competitive provision;
- **Business Area TWR/APP**; this Business Area covers both TWR and APP services, sometimes co-located, sometimes providing APP services from one tower to more than one airport, and sometimes provided from an ATCC; and
- **Business Area System Operations (SO)**: this Business Area provides CNS services across all Avinor airports with the exception of Oslo Gardermoen which has a degree of self-provision in this area.

The Headquarters function, in addition to normal corporate functions, also assumes responsibility for project costs, such as the development of remote towers. Inevitably, each of the Business Areas also has a small headquarters function not involved directly in production or service delivery.

2.3.2 Subsidies

There are several areas of the provision of air transport infrastructure and services in Norway where subsidy is present, either explicitly or implicitly. This is a direct consequence of the large size and scattered population centres in the country, and the national policy of endeavouring to offer reasonable and easy access to Oslo and other larger conurbations to an extremely high proportion of the population. This is reflected in the extensive network of 43 airports owned by Avinor, with it operating a further four airports on behalf of the Norwegian Defence Forces (the legal holder of the airports' licences).

With the exception of a small number of the larger airports, most airports in the Avinor network make a loss.

Airport Type	EBIT (NOK m)	Comments
Oslo	Not provided	
Other 3 Large Airports	Not provided	
National Airports (4)	65.5m	Only Tromsø loss-making
Regional Airports (10)	-387.7m	All loss-making
Local Airports (28)	-695.4m	All loss-making

Table 3: Earnings before interest and taxes by its airport type

One of the reasons (but by far from the only one) for these losses is that Flysikring charges the airports in full for the services which it offers to them. At the level of TNC permitted at all but the four largest airports, it is not possible to recover the cost of the Flysikring services. In approximate terms, the TNC revenue covers about 1/7th of the total airport ANS costs for all but the four largest Avinor airports, and 1/4th of the total airport ANS costs including the largest Avinor airports. For example, the TNC for a Dash 8 aircraft, a type typically used at the smaller airports, is approximately NOK 600, whereas the ANS cost per movement at most smaller airports is a multiple of this figure.

Indeed, even if a higher TNC were allowed, it is questionable whether all the air services using each airport could sustain a higher cost burden. Already, a substantial proportion of activity at many of the smaller airports is based Public Service Obligation (PSO) operations: 18 airports are totally reliant on PSOs, with three others having in excess of 98% of their passengers on PSO flights. While PSO flights could sustain a higher TNC (but would require a higher level of support from the Norwegian Government), other operations (eg holiday charter flights) might no longer be sustainable: discouragement of such marginal operations would increase the burden on remaining flights as total ANS costs would not change.

2.3.3 Principles of cost allocation

Avinor Flysikring follows an activity-based costing system. All costs in Avinor Flysikring are allocated to a cost centre. Within each cost centre, costs are classified into seven cost categories: (i) depreciation (ii) direct costs (iii) group costs (iv) operating expenses (v) other salaries and personnel costs (vi) payroll expenses and (vii) project.

Following an initial allocation to cost centres, costs are then allocated across the business areas (en-route, tower-approach and systems operations) and subsequently to the users eg individual airports. All ANS services are grouped under one of these core business lines, for example AIS services are provided under the “TWR/APP” business area. The System Operations business area comprises mainly CNS, ATM data processing and MET, The distribution of the cost base across these three business areas is shown below:

Business area	Proportion of Total Costs
En-route	42%
System Operations[8]	19%
TWR/APP	39%

Table 3: Proportion of Flysikring cost per business area

The principles used to allocate costs to services and customers vary based on the service type and organisation of that service. Direct costs incurred for a service to a single customer are charged straight to that customer whereas shared costs are allocated across all users of the service. For example MET costs are proportionally allocated across all airports where MET is provided; similarly approach unit costs are allocated across the airports to which the unit provides approach services.

Some of the specific allocation principles used by Avinor Flysikring are summarised in the following table:

[8] This includes both, en-route and airport customers.

Cost categories	Allocation Method
Combined TWR and APP unit	80% to airport and 20% to en-route (60% to TWR and 40% to APP. APP costs are then further split into 50% to TWR and 50% to en-route.)
(Only) TWR units	100% to airport
Combined APP unit	50% to en-route and 50% to airports. Allocation amongst airports using approach services from a centralised approach unit, is done using proportion of number of movements.
AIS/NOTAM messages	Allocation amongst airports using proportion of AIS/NOTAM messages.
MET	Allocation amongst airports using proportion of AIS/NOTAM messages.
System Operations	Allocated amongst airports depending on which products they use, and how many units of products are used.

Table 4: Cost categories and the corresponding allocation method.

Activity based costing and the use of movements to measure services delivered and allocate associated costs is generally accepted within the industry as cost reflective. For example, with a combined approach unit serving several airports, costs are split by proportion of movements at the airports, which is good proxy for the ATCO time dedicated to providing the approach service. Principles applied for splitting services (such as the 60:40 rule for a combined tower and approach unit) are based on practical experience and observations of Avinor Flysikring.

An area where the cost allocation method may not be as reflective is system operations. In this case costs are allocated based on products purchased with standardised pricing for each product. However the true cost of providing a certain product varies based on the airport.

3 Considerations for competition

In general competition is assumed to optimise service provision as market forces incentivise service providers to be better organised, to seek cost reductions, to improve service quality and to focus more on customer issues as providers compete with one another for the market.

However, successfully introducing competition requires a thorough understanding of the complexities of ANS provision and the issues that can arise. This section presents the main issues or risks to be considered. Many of these issues will influence which services should be competed and when (documented in this report), while some will influence potential changes that may be needed in future to facilitate this competition (to be documented in Part 2).

For each consideration, we present below the potential issues highlighted from consultation meetings with impacted stakeholders, together with our views on how they might need to be addressed.

3.1 Safety & transition

Safety will always be of prime importance and the necessary safeguards to protect this must be established. Any new provider will be required to demonstrate sufficient safety as part of their certification requirements (for example they will be required to implement a safety management system). Theoretically, a provider certified in accordance with SES legislation should be transferrable. However, in practice this may not always be the case and will to a large extent in practice be determined by the trust between different regulators.

It is also likely that a new entrant would be subject to particularly close scrutiny from the Norwegian regulator since the regulator may not have any experience or working relationship with that provider. Aside from this, the cost of failure is arguably higher for a new entrant than an established one since it may not have the track record or history to help it to survive a significant safety failure. The impact on the regulator will also be an important consideration, particularly in terms of phasing the opening of the market to ensure that the regulator has sufficient resources to oversee the incoming provider(s).

Transition arrangements will be needed to manage any transfer safely. This may require the outgoing provider to permit access to the new provider in order to survey the equipment and to observe procedures – this is particularly the case if there were to be a change to any equipment or staff. Depending on the complexity of the service, a handover period of 6-12 months might be necessary. Regulatory intervention (eg by the NCAA) may be needed to support this, as the outgoing provider may not feel obliged to support a smooth transition process – particularly in the first transition, as the existing contract is unlikely to specify any obligations on transfer. On the other hand, the outgoing provider may also be motivated to ensure a smooth transition process so as to position themselves favourably for a future re-compete of the contract.

A more specific safety issue is that in Norway the tower controllers need to speak Norwegian for safety reasons to manage non-ATC traffic working on the airport (eg ground handlers, emergency crews) and for private pilots who may only be able to speak Norwegian. This could be a restriction for new providers, but we do not expect it to be a significant issue.

3.2 Staff/Social/HR aspects

The ability of an incoming supplier to reduce staff costs is important in determining the potential for competition to improve cost efficiency. Total staff costs are driven by a number of factors including productivity, overtime, pension costs, corporate overheads and ATM support functions such as safety and training. More efficient rostering, reduced overtime and reduction in support staff numbers are all possible ways to improve cost efficiency. However the ability of a new provider to implement cost reduction measures will be constrained. A new competitor may also reduce non-staff operating or depreciation costs, but from our experience staff optimisation remains central.

Air navigation services rely on highly skilled and well trained staff. The processes and procedures take a significant amount of time to learn, with air traffic controllers being licensed for the specific environments in which they work. From the perspective of the incoming provider and the airport operator, the simplest solution when changing service providers is for the staff to be transferred, in order to retain the competence and minimise any disruption to the service. Furthermore, tower controllers (and approach controllers where co-located TWR/APP services are provided) typically live locally to their airport and a significant proportion may be reluctant to move elsewhere. However, depending on the implications, the transfer of staff may not be straight forward.

We have not performed a detailed analysis of Norwegian employment law, but our understanding of the Norwegian Working Environment Act (Chapter 16 concerning employees' rights by Acquisitions[9]) is that the incoming service provider would be obliged to take over the existing employer's rights and obligations to staff that transfer from the outgoing service provider. We also understand that transferred employees would still have the right to retain the individual working conditions that follow from any collective agreement that bound their former employer, until that collective agreement expires or until a new collective agreement is made. The new provider may have some flexibility to change the pension scheme, but in general the incoming provider would be looking to attract the existing and experienced controllers to switch employment.

If employees turned down the employment offer of the incoming provider, then Flysikring would be responsible for deciding whether to re-locate or re-assign those employees or potentially to make them redundant. With ongoing pressure to reduce costs, Flysikring may not have the capacity to re-locate or re-assign these controllers at airports to which they no longer supply ANS. This is likely to be more of an issue at larger airports where there would be more staff to absorb.

In general, we expect that most controllers would prefer to continue working at their current airport, under the conditions offered to them by the new entrant. In effect this would mean employment costs are unlikely to be very different between incoming and outgoing providers. In the longer term though, we would expect the incoming provider to look for ways to reduce costs of the overall employment package for example by reducing the pension liability and/or increasing retirement age, and potentially recruiting new controllers on different terms and conditions.

During consultation, the unions highlighted the potential future role of the government or CAA in ensuring working conditions and training standards are maintained under

[9] https://lovdata.no/dokument/NL/lov/2005-06-17-62/KAPITTEL_16#§16-2

competition. NATCA expressed the opinion that "*there should be a regulatory framework regulating the working conditions for air traffic controllers owned by the Civil Aviation Authority (CAA) – this to cater for the safest operations possible – and it will also make sure working conditions not will be up for negotiations in a possible deregulated market*." NTL Luftfarten also expressed preference for government involvement in setting "*requirements for minimum skills for companies that offer air transport services*". The CAA also clarified that any new provider would need to be certified to be able to provide ATCO training, including refresher training.

A secondary impact could be a perceived threat of transfer or redundancy for the Flysikring employees providing the services that are put out to tender. A similar threat could apply if Flysikring were to be separated from Avinor AS. This threat could potentially strengthen the ability of Flysikring management to introduce change that could make Flysikring more competitive and that would otherwise be resisted by employees, for example cost efficiency changes such as:

- Limiting the costs of controller re-location. We understand that Flysikring covers the costs of relocating several controllers per year, who typically move from unpopular locations.
- Expanding the use of split-shifts to more efficiently match controller working hours with traffic peaks and avoid any time where more controllers are working than are needed for the traffic volume. For example a controller working (and being paid) only for the morning and evening peaks rather than for the full airport opening hours. Split-shifts are already used within Avinor AS.
- Appointing controller positions according to ATCO cost and ability, rather than the present obligation to appoint the most senior, and therefore most expensive controller to fill ATCO positions.

One of the challenges in reducing the cost of ANS provision is the limited supply (and therefore high demand) of Air Traffic Controllers (ATCOs) in Norway. One option would be to transfer the responsibility for financing the recruitment and training of new ATCOs to the CAA. In the process, the CAA could strengthen its own cadre of ATCOs and feed new controllers into the private or Flysikring system as required. SAN Avinor, the umbrella organisation for 13 academic unions including engineering, also expressed the opinion that "*educating ATSEP personnel is a responsibility (national obligation) that the ministry has placed on Avinor"* and that "*this has to change if Avinor is to educate personnel after the market is opened for competition."*

3.2.1 Pensions

The costs and risks associated with pensions are a major concern of many ANS providers across Europe.

In Norway all employee rights regarding pensions were transferred as ex-state employees when Avinor was established as a limited company in 2003. The pension schemes are generally funded through payments to Statens Pensjonskasse (the Norwegian Public Service Pension Fund, SPK), determined by periodic actuarial calculations.

Pensions are paid on a defined benefit basis. Different conditions apply depending on the number of years of service. After 30 years in a full–time position, staff reach the maximum possible entitlement of 66% of final salary. [10]

In 2013 the employer contributions to the Defined Benefit schemes were 16%, we understand they had increased to around 20% in 2015.

Pensions could be a key area of cost saving for an incoming provider. As mentioned above, the Norwegian Working Environment Act concerning employees' rights by Acquisitions, suggests that an incoming provider may have some flexibility to change the pension scheme. Cost savings could for example be made by increasing the retirement age, reducing the defined benefit payment and introducing contractual changes for new employees.

There is also an option for the Norwegian Government to take over the pension liability of such transferring staff, so that over time as new controllers are recruited by the new ANS provider it would be possible to offer lower cost employment packages. In other words, the Government would carry the pension burden although over the longer term it would grow lighter.

3.3 Charges and Cost Recovery

All airports we consulted considered that Flysikring's ANS costs were too high, and had increased significantly in recent years. This is reflected by Flysikring's ANS revenue discussed in Section 2.2.2. Indeed, Flysikring also recognised that cost reductions were needed, and has embarked on exercises in each Business Area. However, with the major cost element being personnel costs, progress is likely to be both slow and limited.

Despite high costs and the price sensitivity of the aircraft operators, Flysikring is profitable because of how it recovers its costs. Instead of charging aircraft users directly, Flysikring has cost-related[11] contracts with the airports for which it provides services, and it then becomes the problem of the airport operator to recover the costs or find a source of subsidy. As most of Flysikring's customers are part of Avinor Airports, they are able to rely on cross-subsidies within the Group (in fact Avinor AS is legally obliged to provide this subsidy), and it is only the privately operated airports of Torp and Rygge that face a problem in this regard.

The current arrangement could continue if there were to be new providers of ANS at Avinor's airports (assuming that there were no reform/restructuring (eg privatisation) of Norway's airport sector that somehow prevented Avinor AS from providing the cross-subsidy).

[10] Information based on stakeholder consultation in addition to details from the Final Report on Cost of Capital, Return on Equity and Pensions Costs of Air Navigation Service Providers (SDG March 2014).
[11] This assumes that the cost allocation principles are reasonable

In a contractual model, as applied today, the ANS provider faces traffic risk only as defined in the clauses of the contract, if at all. If the TNC charges were sufficient to cover the costs of ANS provision it would be possible to have a model where the ANS provider charges the users directly. In this case the ANS provider would bear all traffic risk.

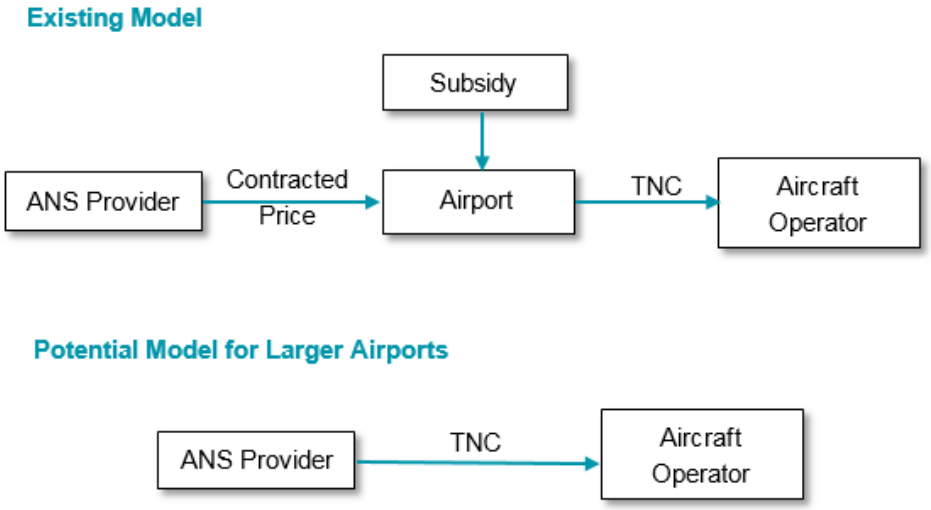


Figure 8: Current and the potential charging models for larger airports

However the model of direct charging by the ANS provider is likely to only be applicable in the case of the largest airports, which are already covered by the SES Performance Scheme. Under this regulation airports above 70 000 IFR annual movements have TNC charges set on a determined cost basis with pre-defined bounds for traffic risk sharing with airspace users in addition to provisions for cost risk sharing.

A further dimension to consider here is the approach service, for which cost recovery is less clear. Article 5 of Regulation (EU) 391/2013 (the Charging Regulation) recognises two types of charging zone, in which service charges are calculated:

- En-route zone: where charges are recovered through the en-route unit charge
- Terminal zone: where charges are recovered through the terminal navigation charge (TNC)

The en-route charges must, according to Annex IV of the charging regulation, be calculated taking into account that the distance flown “shall be reduced by 20 kilometres for each take-off and for each landing”. This is also in-line with CRCO principles[12] and the charging regulation[13].

However, there is no reciprocal requirement to say that the costs allocated to the terminal cost base should be calculated only on the basis of the first/last 20km of distance flown. An ANS provider of aerodrome and approach services would need to establish a controlled CTR service and also a TMA service. The charging regulation requires the

[12] Central Route Charges Office Customer Guide to Charges, August 2014, Version 9.0
[13] Regulation (EU) 391/2013 Annex IV

costs of approach service provision to be allocated to terminal services, but the ANSPs would have significant freedom in defining the scope of approach services.

This has historically resulted in a large proportion of the costs of terminal ANS being recovered through en-route charges[14] and potentially cross-subsidies from overflying aircraft to those taking off and landing. The variability in allocation of approach costs between terminal and en-route charges was most recently illustrated in a study for the EC to investigate the modulation of charges[15]:

ANSP	State	Total costs allocated to Terminal	Allocation basis for approach sector
Aena	Spain	21%	10% of final approach phase is allocated to terminal, 90% to en-route
ANS CR	Czech Republic	19%	Performance Plan does not mention it and no response received
Belgo Control	Belgium, Luxembourg	26%	Proportion of approach airspace within cylinder radius 20 kilometres around airport
Luxembourg Terminal	Luxembourg, Belgium	15%	Not stated
DFS	Germany	22%	Operational, financial and organisational responsibilities
DSNA	France	20%	Varies by cost centre. No detailed rule provided.
Finavia	Finland	26%	Share of distance controlled by approach which is within kilometres within 20 kilometres of airfield. This results in 80% of approach being allocated to en-route
Hungaro Control	Hungary	17%	50% of distance flown in approach is taken into account in en-route
LFV	Sweden	12%	100% of approach costs are allocated to en-route
LPS	Slovakia	11%	Distance controlled, include the 20 kilometre rule
LVNL	Netherlands	33%	Costs incurred above FL 30 or more than 18 kilometres from a controlled airport are allocated to en-route
NATS	UK	20%	Any approach services that are provided under contracts agreed with airport operator customers are 100% terminal
Skyguide	Switzerland	40%	Based on operational shifts

Table 5: Approach allocation. Source Steer Davies Gleave Report, April 2015[15]

For the approach service provided by Flysikring, costs arising in the 'TWR/APP' business unit are split into tower costs (60%) and approach costs (40%). The tower costs are intended to be solely recovered through terminal charges[16]. The approach costs are

[14] Study of the terminal charges for air traffic control services, PwC, 2001, paragraph 2.5.2
[15] Policy options for the modulation of charges in the Single European Sky, Final report April 2015, Prepared for the European Commission, Steer Davies Gleave

[16] As noted above, for most airports traffic volumes are not sufficient to generate sufficient revenues from terminal charges

further split into those recovered through terminal charges (50%) and those recovered from en-route costs (50%).

Based on the above, an incoming service provider offering an approach service might legitimately make the case to recover a reasonable proportion of costs from the en-route cost base – in effect a separate source of income for the provider than purely the TNC charge. The end effect might be that the incoming provider and airport operator (assuming it acts independently of the outgoing provider) are financially motivated to make the approach airspace as big as possible (since it can subsidise the cost of the service the airport pays) whereas the en-route service provider will seek to limit the size of the approach sector (to maximise the size of the airspace in which they can earn revenue - unless of course they are providing the approach service themselves). A key consideration here are the boundaries (cost, operational and legal) between the different service providers and the dynamics of this possibility will be investigated further in Part 2 of this study.

3.4 Military requirements

National security is also paramount, and the Defence Forces and Norway's obligations to NATO need also to be considered. The current situation, before any competition is considered, is that the Norwegian Defence Force (NDF) currently has no competence in providing ANS such as ATC or AIS. Neither does it have any power to conscript Flysikring employees that do have the competence in heightened alert (only in times of war, when any Norwegian citizens could be conscripted). Nevertheless, all Flysikring controllers are security cleared to 'secret' status as some controllers are trained to handle military traffic in classified tactical manoeuvres. It is not foreseen that the NDF would build up a competence in ANS and therefore the ANS provider will have to meet the requirements of the NDF.

The NDF identified the following state owned airports as being of specific military importance in peace, crisis and war; Andøya, Harstad Narvik, Bardufoss, Bodø, Ørland, Trondheim, Stavanger, Lakselv, Bergen, Røros, Kristiansund, Namsos and Oslo. Additionally the MoD has proposed that Andøya, Harstad Narvik, Bardufoss, Bodø, Ørland and Trondheim are not a part of the first tender for competition and has asked to be consulted should these airports be proposed for opening to competition.

The NDF also outlined the following military requirements at the specified airports:

- The service provider must have sufficient knowledge regarding military air operations and military airspace management.
- The service provider will be required to establish a security agreement with the Military as the information required by any new provider regarding airports capabilities, limitations and vulnerabilities that could be of national security and military interest.
- ATCOs must be Norwegian citizens as foreign ATCOs could be drafted to their own nations Military Forces in times of crisis or war
- ATCOs will be required to be able to obtain Norwegian and NATO security clearance as they will need to have knowledge of classified activities

- The Military requires sufficient priority to conduct necessary operations eg the possible need for priority for, take offs, landings, ground services and operational areas to meet operational requirements.

Assuming all military requirements are satisfied the NDF is open to the introduction of competition at all specified airports. However the NDF also expressed the opinion that "*regardless of fulfilment of all military requirements, there are uncertainties whether a commercial contract with a civil company will ensure the same level of assurance of services as that of a state owned (civil) company*."

3.5 Organisation of services

A re-organisation of provision ANS (as described in section 2.2.1) has the potential to reduce economies of scale – by unpicking horizontal or vertical integration. For example, not all costs will be location-specific, so a provider of airport ANS may well share some costs across multiple locations – such as communications, training, accounting etc. If one of those airports changes its service provider, these 'centralised' costs do not necessarily disappear but must instead be covered by the remaining locations. In fact the 'centralised' costs may even need to be duplicated by the incoming provider. In short, the achievement of overall system ANS cost savings in Norway is as dependent on the ability of Flysikring to remove the costs associated with services no longer required, as it is with the ability of the incoming provider to provide replacement services at a lower cost.

It may be the case that a number of airports could tender ANS together in a contractual 'lot'. In this situation the airports may find that an incoming service provider 'bundles' aspects of the services provided across some or all of the airports. This might lead to costs savings which could be beneficial to the airports, but equally it could also be a strategy to make re-competition of the service difficult. Airports may therefore wish, as part of their contracts with providers, to consider setting in place reversion clauses that 'unbundle' such integration for a future procurement.

3.6 Operational aspects

One of the major issues to determine before competing ANS is to clearly define the boundaries of the service. For a tower service this means the handover of responsibility from the tower controller to the approach controller (for a departing aircraft, and *vice versa* for an arriving aircraft). For the approach service, the boundary and division of responsibility with both the tower and en-route service needs to be clearly defined.

In our interviews, it was clear that there was no definitive boundary and that handover varied from one situation to another, and indeed sometimes from time to time at an individual location. In general, an arriving aircraft will normally be transferred to the tower controller whenever the arrival is separated from any conflicting departing traffic and/or is established in a sequence which ensures separation from preceding or succeeding arrivals. A departing aircraft is normally transferred from the tower controller to the approach control shortly after departure as soon as the aircraft is clear of local aerodrome traffic. Based on this, the time at which the handover takes place, may vary depending on actual traffic conditions, weather conditions and the type of approach or departure procedure in use.

These service boundaries can have significant operational impacts on airspace design and complexity as well as on potential controller productivity – ultimately impacting on the

cost of the service. However, based on the difficulty in establishing a definitive and consistent operational boundary the dynamic operational boundary may therefore not necessarily correspond to the fixed point, service definition or percentage used for the purpose of calculating charges. In the case of airports that share the same approach airspace ie terminal manoeuvring areas (TMA) or terminal information areas (TIA), the complexity is further increased by having to ensure that arrivals and departures in one airport are de-conflicted from those of the other airports served by the same airspace.

Another operational issue focusses on the difficulty of matching supply and demand for ATCO hours, particularly where traffic volumes are low. Scheduled air traffic naturally peaks in the mornings and evenings, meaning that ATCO rosters are normally established to accommodate the peak volumes. The quieter periods in the day are typically staffed at the same peak staffing level, so the productivity is lower. Flexibility in rostering is limited for several reasons:

- It takes time to train ATCOs to gain a license to operate a particular sector or service.
- There can be resistance from controllers – for example to working split shifts
- Controllers are typically limited in the number of sectors they can operate: In some cases ATCOs have multiple licenses and in certain airports advantage is taken of this, eg the same controller providing TWR and APP for low traffic periods. Flysikring has indicated that further optimisations could be made here, though there appears to be a differing view between Flysikring and the CAA as to how many aircraft could safely be handled at once in a situation where a single controller is responsible for TWR and APP functions.

3.7 CNS & technical interfaces

51 airports in Norway use the CNS services provided by Flysikring. CNS services ensure that the data and equipment is available and working sufficiently for the airport to operate and, for the other services (ATS, MET, AIS etc) to be provided where applicable.

In general, the CNS service is entirely separate from the air traffic services, and airports already have a choice as to how they want CNS service provided: for example Oslo self-supplies airport-based elements of its CNS services. Other airports such as Bergen are also considering such an option in future. Developing CNS experience internally (or collectively with other airports) will help airports to overcome the first hurdle which is whether there is sufficient knowledge in the airport to know what equipment is needed to support an ATS service. As a first step, airports will need to clearly identify the CNS equipment they own (or use) for ANS, together with details *inter alia* including its purpose, age, required interfaces, maintenance requirements and so on.

CNS also covers the national infrastructure that provides surveillance and flight data to the towers for the purposes of ATS. An incoming provider would need to know exactly what data is available and whether there is any cost associated with it. This is particularly the case for the data supplied from infrastructure that is outside the airport's control, such as flight data (processed or raw) generated in the national ATM system of Flysikring, or surveillance data from radars or surveillance sensors outside of the airport perimeter. Much of this data is sent (or planned to be sent) via a closed network, STAMNET, which is owned and operated by Flysikring. Suitable mechanisms may be needed to regulate pricing and access to data on this network. For example SAN Avinor commented that any

new provider would have to "*buy radar data from Avinor Flysikring AS, as well as lines to connect to the centralized ATM systems at the area control centers*".

It is worth noting that, article 5 (1) of Regulation (EU) No 1207/2011[17], requires ANSPs to exchange operational data pertaining to General Air Traffic (GAT) in real-time, to facilitate their operational needs while used only for operational purposes. Also, Article 4(2) of the same regulation, provides requirements for the establishment of formal arrangements between certified ANSPs.

The ATM system itself, known as 'NATCON', is a semi-bespoke system developed by Flysikring and Raytheon. It is currently operated at all airports where a TWR service is provided. Due to licensing restrictions, ownership of this system (and responsibility for modification/upgrade) lies with Flysikring. A new provider would need access to it, possibly through suitable (and potentially regulated) agreements. Flysikring is planning to upgrade to a new ATM system in the near future which may offer opportunities for more standard interfaces. However, without careful involvement of the airports, this could also introduce risks of incompatibility or at least an increase in controller workload if tower systems' architecture is not factored into the upgrade.

3.8 Assets and investment

Flysikring and Avinor AS confirmed that ATC assets located at Avinor airports are largely owned by Avinor AS. There are only a few exceptions, such as the NATCON equipment mentioned above.

Ownership of the ATC assets and equipment at the airport generally makes it easier to outsource the ATS, since the airport can easily make the tower and equipment available for use by any provider. This might not only facilitate change of ANS provider, but potentially widen the number of potential responders to a tender as it could reduce the up-front capital investment requirements and thereby allow smaller or start-up firms to bid.

Airport ownership also enables the airport to retain control of the overall architecture and state of repair of equipment though we found that generally the airports did not have a detailed inventory of equipment. The incoming provider will need to know details of the equipment in order to determine how to staff the air traffic service.

For the equipment that is not owned by the airport, the issue is more complicated. This is, for example, the case in the approach service provided away from the airport (such as Røyken ATCC for the Farris TMA). In this situation, an incoming provider would need to either find a way of moving the service to the airport or creating a separate new location for the service – both options could increase the costs of the service. Another example of equipment located away from the airport is the Remote Tower Centre, under development within Flysikring – this is discussed below.

There is also a matter of the ownership of the Intellectual Property (IP) of operating manuals. While some aspects of these manuals is reasonably generic, certain chapters contain information specific to the airport where service is being provided. This information covering operating procedures will normally have been developed over a

[17] COMMISSION IMPLEMENTING REGULATION (EU) No 1207/2011 of 22 November 2011 laying down requirements for the performance and the interoperability of surveillance for the single European sky

period of time by the staff of the incumbent ANS provider. However, without such detailed knowledge and manuals, a new ANS provider would not be able to offer services for some time as it re-developed the information. Hence, the IP of the manuals would need to transfer to a new provider, and it will be necessary to determine the best protocols for compensating the incumbent, Flysikring.

3.9 Remote towers

In August 2015, Flysikring entered into a NOK 400M bi-lateral contract with Kongsberg Defence Systems and Indra Navia to supply equipment that will enable Flysikring to provide remote tower services (initially AFIS) for up to 15 airports from a single centre in Bodø. The first five AFIS airports will be Mehamn, Berlevåg, Røros, Røst ,and Hasvik, with the remaining 10 not yet announced, however we understand that a commitment between the 15 airports and Flysikring has already been signed.

Although the initial investment in the technology is high, the longer term aim is clearly to reduce costs. Remote Towers could have a significant impact on cost as the technology divorces controllers from the location of an airport and potentially enables them to work at multiple airports during the same shift, giving the potential for much greater optimisations in matching airport demand with ATCO supply.

The technology on the airport will be limited to some cameras/sensors on a basic mast. The more expensive processing and display equipment will be located in Bodø. The owner of the RTC equipment is understood to be Flysikring.

In terms of opening the market to competition, the 15 airports that have already signed the agreement with Flysikring, are effectively precluded from open competition until the current agreement expires, five years after each airport starts operation.

3.10 Market attractiveness

A critical feature of the opening of any market to competition is that there are sufficient parties that find the opportunity attractive and are prepared to tender for it. A shortage of bidders, particularly if known by the actual bidders, is likely to limits the benefits of competition. The letting of PSO services in Norway potentially suffers from this, with very few airlines having even the aircraft equipment necessary to operate these services.

An organisation interested in providing ANS will generally first assess whether it can provide a competitive offer, and will be interested in whether the opportunity offers the chance to improve efficiency and/or reduce costs. Most parties will not take just a short term view but will consider a medium to longer term potential. This suggests that opportunities offered to potential new providers of ANS in Norway should be of sufficient scale and with the appropriate terms to allow a new provider to aspire to such savings.

Some parties may also be able to combine a new customer/service provision contract with other existing activities in their portfolios, and by sharing common costs over a greater number of activities reduce unit costs. Overhead costs would be one candidate category, but there might be some more operational costs where this might also be possible. However, it is not clear if and how the structure of a tender for ANS should be developed to allow for this possibility.

In other markets/sectors, bidders would also consider whether they had an opportunity to increase the size of the market in order to generate more revenue. However, in the

context of regulated cost recovery (and mandated cost and traffic risk sharing at the biggest airports), this is less applicable to the ANS market.

It is also important to recognise that bidding for a tender involves expenditure on the part of all bidders (and not just the successful tenderer). The 'size of the prize' on offer should be commensurate with these costs and the risk of being unsuccessful. This would be a reason to bundle some airports together.

It is also possible that there may be other parties that regard entry into the Norwegian ANS market as a strategic opportunity to demonstrate an international capability in a low-risk and stable country. They would be less interested in the direct financial reward that might be available. For these parties, the structure and rules of the tender would tend to be of less importance (provided that they were not wholly unreasonable).

The attractiveness to the market of an ANS contract in Norway will be enhanced by a transparent and fair bidding process (and conversely hindered by opaqueness and concerns over fairness). The current institutional framework in Norway where Avinor is the owner of the airports letting the new ANS contracts as well as being the owner of the incumbent ANS provider, is likely to be a concern to some, and possibly many potential bidders. Separation of Flysikring from Avinor Airports would undoubtedly improve the attractiveness to the market of ANS contracts in Norway.

The desire to increase the attractiveness of the proposition needs though to be balanced by ensuring fairness towards Flysikring. This fairness should be present not only in the tender processes themselves, but also in allowing Flysikring to compete in both foreign markets and in other related sectors. Allowing Avinor AS to compete in overseas airport markets should be considered concurrently. This point was also raised during union consultation: NATCA underlined that in the context of a deregulated ANS market in Norway "*it is essential that the Norwegian provider get the opportunity to compete on equal terms in the deregulated European market*." SAN Avinor, also highlighted this point in the context of CNS services, noting that "*if the goal is to open the market for true competition Avinor Flysikring AS needs to be allowed to compete on other contracts for maintenance of technical systems of national importance that are similar to SUR/ATM*.

Fair competition also means a level-playing field for Avinor Flysikring and other providers. Avinor Flysikring has highlighted the need to account for (and be able to finance) national obligations when assessing the pre-requisites for competition, a factor further highlighted by the unions NTL Luftfarten and SAN Avinor who raised the question of payment for "*services to the military, Ambulance and SAR, radar data, education and certification*".

3.11 Procurement

ANS is a complex and expensive service to procure. It requires a significant effort on the part of the airport to not only develop the tender, but also to support the selection of a candidate and the transition process. The scale of the effort involved should not be underestimated and is something that smaller airports should look to do in cooperation with others, to help share experiences and resource.

We understand from our discussions with Avinor that a tender exercise has previously been undertaken internally to examine how the airport and service provider respond to a tender for an ATC service. The exercise had also demonstrated the lack of competence in ANS on the airport side and the need for it in order to have a successful tendering

process. We were told that there was an intent to extend the exercise to the other three biggest Avinor airports by 2017.

We would expect initial tenders to minimise complexity and award contracts primarily on the basis of lowest cost. As airport experience grows, tenders would probably become more complex and involve quality criteria to encourage service providers to look for service quality improvements to improve the overall 'value' of their service to the airport – for example by contributing to airport team meetings and looking for ways to improve the overall efficiency of the airport services.

Other issues to consider, will be the sort of contracts to put in place – for example what would be the right length? A shorter contract would help to ensure that the service provider does not begin to act in a monopolistic way, but if it is too short then the service will seem a less attractive opportunity and may mean that the provider does not invest sufficient time or resource in it or may not be able to make longer term investments. Packaging a number of airports within the same contractual 'lot' may help to raise the profile and market interest, but on the other hand it could lead to solutions that encourage 'bundling' from the service provider that could make future re-tendering a more complicated process.

In principle, an airport operator should also have the ability to choose to 'self-provide' ANS. In practice, Oslo Gardermoen would be the most likely candidate for this. However, this option should not be used as a back door through which Avinor may re-enter the ANS market.

3.12 Summary

In this section, we have discussed and described a range of issues which in the first instance influence which areas of ANS may be opened to competition, and then, having determined where competition should be introduced, what actions and safeguards are needed to make the introduction of competition successful.

Topic	Summary
Safety & transition	• Safety will always be of prime importance. • The perceived competence of a service provider would, in practice, be determined by the trust between different regulators. • Transition arrangement may include permitting access by the outgoing to the incoming provider in order to observe operational procedures.
Staff/social	• The ability of an incoming supplier to reduce staff costs is key in determining the potential for competition to improve cost efficiency. • Most controllers are expected to opt to continue working at their current airport, under the conditions offered to them by the new entrant. • Cost reduction is expected to be achieved in the longer term through, for example, reduced pension liability. • Competition would increase pressure for Flysikring to reduce inefficiencies.
Charges and cost recovery	• Flysikring recovers its costs by establishing cost-related contracts with the airports for which it provides services. • An alternative charging model possible only at the busier airports would be the ANS provider charging the aircraft operators directly in the form of TNC.

Topic	Summary
Military	• NDF currently has no competence in providing ANS. • NDF has defined 13 state owned airports that are of military importance, of which 6 are of particular note • NDF would impose requirements on any incoming provider at the specified airports, including for all ATCOs to be Norwegian citizens and to be able to obtain Norwegian and NATO security clearance
Organisation of ANS	• The achievement of overall system ANS cost savings in Norway is as dependent on the ability of Flysikring to remove the costs associated with redundant services, as it is on the ability of the incoming provider to provide replacement services at a lower cost.
Operational aspects	• The boundaries of the services need to be clearly defined for operational and legal reasons. • The service boundaries can have significant operational impacts on airspace design and complexity as well as on potential controller productivity. • Difficulty may be experienced with removing ATCO 'idle hours'.
CNS & technical interfaces	• In general, CNS services ensure that the data and equipment is available and working sufficiently for the airport to operate. • High level of technical expertise is required from the incoming provider to supply CNS. • Flysikring retains ownership of the ATM system and the associated networks.
Assets & investment	• Ownership of the ATC assets and equipment at the airport generally makes it easier to outsource the ATS. • Intellectual Property right to Operations Manuals need to be determined • If not owned by the airport, the incoming provider would experience additional costs.
Remote Towers	• The new technology will enable Flysikring to provide ATC services for up to 15 airports from a single centre in Bodø. • Remote Towers could have a significant impact on cost in the long term as it enables the ATCOs to work at multiple airports during the same shift.
Market attractiveness	• A critical feature of the opening of any market to competition is that there are sufficient parties that value the opportunity and are prepared to tender for it. • The value of the contract on offer should be commensurate with bidding costs and the risk of being unsuccessful. • The attractiveness to the market of an ANS contract in Norway will be enhanced by a transparent and fair bidding process. • There may need to be a separation of Flysikring from Avinor AS • Flysikring and Avinor AS may need to be allowed to compete in other markets
Procurement	• ANS procurement requires a significant effort on the part of the airport to develop the tender and to support the selection of candidates. • Successful candidates are expected to look for service quality improvements to improve the overall 'value' of their service to the airport. • A good trade-off on contract length has to be determined in order to discourage the formation of monopoly and at the same time presents an attractive opportunity.
Other	• Features, such as ANS competence of the bidder, ability to improve service quality and the preservation of market competitiveness etc., should be carefully considered before opening market to competition.

Table 6: Summary of key issues for consideration

4 Case studies

A number of states across Europe have started to introduce competition for ANS services, including Spain, Germany and the UK. In general, with the exception of the UK, this is only for tower and approach services at regional airports as illustrated below:

	Single national Tower provider	Multiple Tower providers
Main Airports	Finland Norway Spain Sweden Austria France Germany Italy Ireland	UK
Regional airports	Finland Norway Austria France Italy Ireland	Spain UK Germany Sweden

Table 7: Competition for tower ATC provision in Europe

4.1 Sweden

Perhaps the most relevant example of opening of competition has been in Sweden. While there are many similarities between Norway and Sweden, there are also several significant differences:

- Although the number of airports is similar in both countries, in Sweden there are some 20 municipality owned airports, with the state-owned airport operator, Swedavia, being responsible for only 15 or so facilities.
- The national ANSP (LFV) reports to a separate Ministry department than Swedavia, and the two organisations are commercially independent.
- In Sweden, Military and Civil ANS is 'fully integrated', which we understand to mean that LFV has an operational agreement with the Military covering military fall-back and strategic planning obligations on LFV – all operated under an agreement of secrecy – effectively that employees have an obligation to the Military and can be relied upon in times of crisis.
- Different cost allocation principles are used which result in a significantly lower TNC than in Norway.

Discussions on opening the ANS market in Sweden began many years ago, and followed a number of institutional changes. First the regulator was separated from the service provider (around 2005), then the ANS provider (LFV) was separated from the national airport owner/operator (renamed Swedavia) in April 2010. Legislation to open the market entered into force on 1st September 2010[18]. It is not clear whether the intent was to open the market at all airports, as the preamble of the legislation implied that it would apply to

[18] http://www.lfv.se/en/News/New-2010/Market-for-air-traffic-services-deregulated/

only regional airports. Nevertheless, the market was opened in full and, so far as we can tell, with relatively few rules governing how the process would be managed.

4.1.1 Swedavia airports

Swedavia operated a network of 16 airports but had only just been created and therefore lacked competence in ANS, since that knowledge had been retained by LFV, the incumbent ANS provider. This led to confusion over matters such as ATC tower equipment ownership; the number of controllers needed; and the local regulations that applied. Many details of the service provided were contained in parts of the working handbook/manual of procedures that LFV considered to be intellectual property and therefore not something for the airport or another provider to have access to.

Another major issue was where to define the airspace boundary for the services being procured. Swedavia sought a large volume of airspace to optimise the approach service and to enable the costs to be absorbed as part of the en-route cost base, not just within the TNC (Swedish regulation TSFS 2012:34 allows for recovery of ATC costs incurred within 13km of the airport through the TNC and beyond 13km through the en-route charge). LFV on the other hand wanted to limit the airspace volume so as to retain as much as possible of the monopoly en-route service. A decision was taken, possibly without discussion between Swedavia and LFV, to define the boundary at Flight Level 95 (FL95). This was appealed by LFV and was one of the reasons that the first procurement was cancelled. One subsequent comment made during meetings in Sweden suggested that the boundary should be around the services provided not the airspace within which those services are offered.

A second procurement was subsequently attempted but this was also stopped. The main reason was an objection by the Swedish Military, as it relied on LFV for all ATC services, both in peace time and in times of crisis. Without a guarantee of LFV winning a tender, the military believed that national security would be at risk. By the time this had been resolved in court, the political landscape had changed and the situation at present is that Swedavia airports are excluded from competition. Since then a report[19] has been written, which we understand to present solutions for the military issue. This includes recommendations for the Armed Forces to identify strategic airports, to enter into agreement with their owners and to strengthen contingency planning including any necessary obligations to cooperate with LFV.

During the procurement process, Swedavia learned several lessons. For a large airport the value and criticality of a 5+ year air navigation service contract is very high – it requires a significant amount of expertise (technical, legal, procurement etc). Swedavia consulted with several other airports and suppliers throughout the process and was convinced that there was a market for ANS, particularly for airports or groups of airports with sufficient volume.

4.1.2 Municipality-owned airports

The first third party provision did not take place until 2011. A private company, ACR, took over TWR and APP at three municipality-owned airports, namely Västerås, Örebro and Småland, where LFV had previously provided service. Existing staff were offered

[19] Färdplan för framtiden– en utvecklad flygtrafiktjänst, Betänkande av Flygtrafiktjänstutredningen, Stockholm 2012

employment on the same terms and conditions as they enjoyed at LFV. Despite this, cost savings of 30% to 40% were achieved at this time, largely as a result of the much lower overheads of ACR. At the first airport to be taken over by ACR, insufficient controllers decided to transfer to the new provider, leaving a short-fall in ATCOs with LFV being obliged after regulatory intervention to providing bridging staff until ACR could recruit new personnel and have them licensed to operate at the airport.

ACR now operates 12 ATS units in Sweden (all TWR and APP), and is taking two more contracts in 2016, one for an AFIS operation. The business model applied by ACR relies on being able to legitimately recover a proportion of the approach service from the Swedish en-route cost base (directly from CRCO), as the Swedish regulation stipulates that this is possible beyond 13km from the airport.

In Sweden, ACR offered more or less the same employment benefits during the first year of employment including the retaining the same salary of incumbent controllers.

4.2 Spain, Germany, UK

4.2.1 Spain

In 2008, AENA, a corporatized entity wholly owned by the state, operated the majority of airports in Spain and was responsible for Air Traffic Control throughout Spain. According to benchmarking data at the time[20], AENA had total operating costs significantly larger than comparable ANSPs in Italy, the UK and Germany. This comparatively high cost was difficult to justify as Spain had a smaller number of controlled operations and the lowest productivity in Europe. In 2009, AENA was unable to cover all its costs and reported a negative operating margin. This, coupled with the downturn in the economy, and a strike in late 2010, led to the Spanish Government deciding to open to competition the provision of ATC and AFIS services at some Spanish towers in the hope of driving down the ANS cost closer to the European average.

As a result of the tendering competition, two consortia were designated by the Spanish government and granted 5 year contracts for the provision of tower services. The concession of ATC services at 13 airports resulted in reported savings of ~50%[21] relative to previous in-house provision, showing the ability of outsourcing to improve cost efficiency. The current ANS provision in Spain is summarised in the following table.

[20] ACE 2008
[21] Announcement of Isaias Taboas, State Secretary of Transport, at the conference “Infraestructuras Aeroportuarias”, held on 14 April in Madrid.

Provider	Type of provider	Services provided
ENAIRE	Corporatized entity wholly owned by the state (formed from AENA)	Area control services for all Spanish airspace. Approach control services at 19 airports TWR services at 32 airports[22]
FerroNATS	Joint venture (Ferrovial and NATS)	TWR services at 10 airports[23] under 5 (+1) year contracts which expire in 2017 (2018).
Saerco	Private Spanish company	TWR services at 3 airports[24] under 5 (+1) year contract which expires in 2017 (2018). (technical support from ANS Czech Republic)
Ineco	ENAIRE subsidiary	AFIS services at 4 locations[25]

Table 8: Summary of ANS provision in Spain

ENAIRE is the newly created name for the ANSP division of AENA. ENAIRE is a fully state owned entity and owns 51% of the shares of AENA S.A. ENAIRE is responsible for: area control services across Spanish airspace; for approach control at 19 airports; and aerodrome control at 32 airports - including all of the major Spanish airports. NATS signed an agreement with the Spanish firm Ferrovial and, under the newly created name 'FerroNATS', was awarded two of three contract 'lots' to provide tower services at 10 airports. The third lot was awarded to Saerco, who now operates tower services at three airports. Part-time ATC services have been downgraded to AFIS in four locations, and are provided by Ineco.

This is seen as a first phase of the liberation process of ATC in Spain. We understand that future plans include the possibility to privatise AENA, but that this has been postponed for the time being.

4.2.2 Germany

DFS is a company organized under private law but wholly owned by the Federal Republic of Germany. Area and approach services are provided by Bremen, Langen and München area control centres. Since 1994, DFS has been responsible for the handling of both civil and military air traffic in peacetime.

In 2006 the German legislator opened the ANS market to competition at regional airports. According to an amendment of the German Air Traffic Regulations (29th August 2009), DFS is appointed as the sole authorised provider for en-route services for a period of 20 years and the designated provider of approach and aerodrome control at the 16 international airports for a transitional period of 16 years[26]. The amendment allows other organisations to provide services at regional airports (such as Frankfurt-Hahn, Paderborn/Lippstadt or Augsburg) with a transitional period of 3 years to ensure a safe transfer of aerodrome control provision.

Any certified ANSP in Europe now has the right to tender for services at these regional airports. In anticipation of the liberalisation of the German and European airport ATC markets, DFS established a subsidiary called The Tower Company (TTC) in 2007. Since summer 2007, TTC has been in charge of air traffic control services at nine regional

[22] including Madrid-Barajas, Barcelona, Palma de Mallorca, Gran Canaria and Málaga-Costa del sol
[23] Alicante, Valencia, Ibiza, Sabadell, Seville, Jerez, Vigo, A Coroña, Melilla and Cuatro Vientos
[24] Fuerteventure, Lanzaroete and La Palma
[25] La Gomera, El Hierro, Burgos, Huesca-Pirineos
[26] Case Study on Commercialization, Privatization and Economic Oversight of Airports and Air Navigation Services Providers, Germany - http://www.icao.int/sustainability/CaseStudies/Germany.pdf

airports in Germany and Austro Control, the national ANS provider of Austria, is providing services at another 10 small airports. A further 20 towers at regional airports were planned to be tendered in 2015 though details of this are not clear. Current tower service provision is summarised in the following table.

Provider	Type of provider	Services provided
DFS	State owned, under private law	En-route services. Approach and TWR services at the 16 international airports
TTC	wholly owned subsidiary of DFS	TWR services at 10 regional airports
Austro Control	Limited company owned by Austrian government	TWR services at 10 small airports.

Table 9: Summary of ANS provision in Germany

4.2.3 UK

In the UK the market for ANS was liberalised in 1985 enabling certified European providers to tender for airport tower and approach services, except in the London terminal manoeuvring area (TMA) where the approach control is too complex to separate out for competition. NATS, the national ATC provider, provides (from its Swanwick centre) en-route services throughout the UK, together with approach services to airports with relatively high traffic movement such as in London and Manchester. Tower services are also provided by NATS to most busy airports in the UK.

Independent (private) ANSPs, such as Serco and HIAL, are operating at some airports such as Coventry and several Scottish airports. The most common form of ANS provision taken by airports in the UK is to self-supply, for instance at East midlands, Newcastle and most recently Birmingham.

More recently, a tender was awarded to provide tower services at London Gatwick - the second busiest airport in the UK and one of the busiest single runway airports in the world. The tender was awarded to a subsidiary of DFS – the national German service provider. The outgoing service provider initially launched court action in respect of the tender process, but this action has since been dropped. DFS subsequently founded a company in the UK named Air Navigation Solutions Ltd. (ANS) to provide services, originally planned to start in October 2015, but now delayed until March 2016. The following table presents an overview of recent contract awards for ANS in the UK.

Airport	Services	Date of tender	Compliant bids received	Outcome
Luton	TWR, CNS	2011/12	2 bids	3+2+1 year contract to NATS, start Oct 2013
Birmingham	APP, TWR, CNS	2012/13	1 bid + self-supply	Self-supply, start March 2015
Belfast	APP, TWR, CNS		Renegotiated	NATS 5yr contract, start April 2013
Cardiff	APP, TWR, CNS		Renegotiated	NATS 5yr contract, start April 2013
Gatwick	TWR, CNS	2013/14	3 bids	DFS, 10yr contract, start 2015/16
Manchester & Stansted	APP (not Stansted), TWR, CNS		Renegotiated	NATS 10yr contract, start March 2015
Heathrow	TWR, CNS	2014/15	Renegotiated	NATS 10yr contract, start April 2015

Table 10: Recent contract awards for ANS in the UK

Until the recent changes at Birmingham (from NATS to self-supply) and London Gatwick airport (from NATS to Air Navigation Solutions Ltd), the situation in the UK ANS market had been relatively static, despite being de-regulated for many years. In February 2012, the UK CAA published a consideration of contestability (under Annex 1 of the EC Regulation 1794/2006) and found[27] that the market was not contestable due to a much lower level of competitive activity in the provision of approach ATC. According to the CAA, this was considered to be for the following reasons:

- Changing ANSP is an ineffective strategy to reduce cost for the airport operator as it makes up a fairly low percentage of costs (especially true for airports with high traffic volumes)
- ANS is not the key differentiator to attract customers and passengers
- The fairy high overhead costs for a self-supply airport to contract an external ANSP.

According to the CAA (CAP1293) report, in the coming years a number of current NATS contracts will expire:

- London City in 2017;
- Edinburgh, Glasgow and Southampton in 2018; and
- Cardiff in 2019.

[27] CAP 1004

4.3 Lessons learned

The following table summarises some of the key lessons learnt through the case studies, with respect to the main topics for consideration identified in section 3.

Topic	Lessons Learned
Safety & transition	Regulatory oversight is likely to be needed, eg to specify transition period (6-12 months), ensure sufficient access to operations manuals, regulate surveillance data pricing etc. Note that there could be issues concerning Intellectual Property Rights of manuals. An incoming provider is likely to set-up or partner with a local company, and rely on existing local staff to supply the service (this would also avoid any language barriers).
Staff/social	Controllers generally move to the new provider, but - There can be issues (e.g. at the first airport competed, a critical number of ATCOs did not move and LFV had to provide temporary service) - Base salaries did not change in Sweden and their employment terms & conditions were more or less the same or better - Pension age increases were sought by ACR in Sweden - Cost savings came from lower overheads and service delivery changes
Charges and cost recovery	The monopoly provider may only cut costs after it loses a first contract, unions might also negotiate up their salary by threatening to move to new provider. A significant proportion of approach costs are recovered from en-route cost base in Sweden. There are several 'national' cost elements of the services provided that may need to be recovered through the en-route unit rate, for example AIP or SAR are both paid for in Sweden via the en-route unit rate.
Military	Military may not be able to rely on a provider, foreign or otherwise, to provide ANS in times of crisis. Armed Forces should identify strategic airports and ATM/CNS assets. Agreements with military may need to be put in place to strengthen contingency planning.
Organisation of ANS	Economies of scale and cost efficiencies may already have been introduced by the outgoing provider (if providing services to many locations), and competition could risk fragmenting or increasing the cost without careful consideration of the service organisation. Clauses can be used to avoid any 'bundling' becoming permanent, but this can add cost.
Operational aspects	In Sweden, the boundary between approach and en-route is FL95. Defining the airspace/service boundary and cost allocation basis is important (and may need regulation) as a significant proportion of approach costs are recovered from en-route cost base in Sweden. In some cases (for example a TMA serving multiple airports), the boundary is less obvious and may need to be defined as a 'service boundary' rather than an 'airspace boundary'. ACR claimed that, in addition to cost savings in overheads, more efficient service delivery (for example providing the minimum number of controllers to match the present traffic demand) was one of the ways it was able to reduce cost.
CNS & technical interfaces	The CNS service is largely separate from the ATC service. There is no particular need for it to be provided by the same company as the ATC provider and in fact more knowledge of CNS systems at the airport level could help with procurement of a new ATC provider. National CNS infrastructure may need to be regulated separately, with suitable access pricing arrangements. In Sweden, surveillance data is provided to airports by LFV at no cost to the airport.
Assets & investment	It is much easier for an airport to compete the ATC provision if it owns the assets that will be used by the service provider. Airports also need to have a very clear idea of what assets are available for use (and their state of repair) as this is critical for a service provider to be able to price their service. A survey of equipment may be necessary.
Remote Towers	Remote Towers could have a significant impact on cost as the technology divorces controllers from the location of an airport and potentially enables them to work at multiple airports during the same shift, giving the potential for much greater optimisations in matching airport demand with ATCO supply. Several ANSPs are in the process of developing remote services and could potentially compete with Avinor in this field.

Topic	Lessons Learned
Market attractiveness	Busy airports are likely to attract greater competition. The strategic nature of large airports could also attract even lower prices as new entrants try to secure a ‘foot in the door’ and with a longer term view to win more contracts in future. At smaller airports, we learned that there is a real market interest and even for AFIS (for example ACR recently tendered for Kiruna airport which provides less than 6,000 movements per year)
Procurement	Procuring a new provider of ATC requires considerable effort and knowledge. This can be difficult for small airports and clubbing together may be necessary. The tender process may also need to facilitate a survey of existing equipment and, once a contract is signed, access to aspects of the operations manual and local regulations, from the outgoing provider. Knowledge of existing ATCOs (age, ratings etc) may also need to be provided as part of the tender.

Table 11: Summary of lessons learned

5 Scenarios

5.1 Introduction

This section sets out a 'long list' of the possible scenarios for the introduction of competition into ANS provision. The focus of this 'Part 1' study is on *what* services. Therefore, each scenario represents a different combination of services, with variations for where it could apply. The section also includes consideration of phasing, ie *when* they could be implemented.

We begin the section by describing the long list scenarios, and discuss the rationale in reducing their number. This rationale was presented at a workshop with the Reference Group on 6th October 2015 and led to three primary scenarios, plus some options for other services. We then discuss these remaining scenarios in more detail, reflecting on the considerations in section 3 and lessons learned in the case studies presented in section 4. We then discuss the possible phasing of the scenarios. Finally, we expand on options for reforming what we term the 'support services' of CNS, AIS and MET.

It should be noted that the scenarios are not all mutually exclusive, and may be combined. This is particularly the case with scenarios relating to different lines of service/product.

5.2 Scenarios for opening ATS services to competition

The long list of scenarios was developed based on the current organisation of services (described in section 2.2.1). The current organisation of service provision already has some economies of scale through co-located services, for example the costs of approach at several aerodromes is provided in the same building as the en-route ATC and therefore shares several of the costs with en-route. In other cases the approach and tower services are co-located.

Our over-arching view is that 'unbundling' co-located services, would be more likely to increase risk and potentially cost as it would require new boundaries to be defined between co-located services (which might end up being argued by separate providers) and would split the shared costs, potentially causing them to be duplicated.

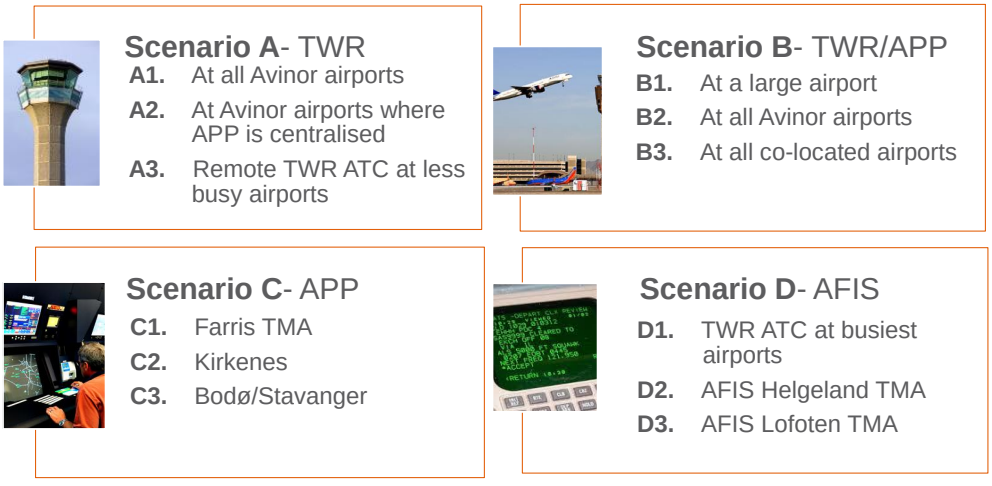


Figure 9 Scenarios of how the ANS market could be opened to competition.

We have categorised the twelve main ATS competition scenarios into four groupings (Figure 9):

- **Scenario A** concerns 'tower' (or aerodrome) services only; for which we have considered competition: at all Avinor airports (A1); at only those where approach services are 'centralised' (ie not co-located at the tower) (A2); or at selected airports potentially using remote technology (A3).
- **Scenario B** concerns 'tower and approach' services together; for which we have considered competition: at a large Avinor airport (B1); at all Avinor airports (B2); or at only those airports where tower and approach services are co-located (B3).
- **Scenario C** concerns 'approach' services only: for which we have considered competition to be for an environment serving a reasonable number of airports and in this case, existing terminal manoeuvring areas (TMA) serving at least 3 airports (C1-3).
- **Scenario D** concerns 'aerodrome flight information services': for which we have considered competition: for the busiest AFIS airports (and which are closest to being changed to an ATC service) (D1); and for a package of airports served by the same airspace, for example Helgeland or Lofoten TMA (D2-3).

The next sections present the relative merits for each scenario, together with a rationale for those selected for further assessment.

5.2.1 Scenario A: TWR services

Aerodrome (or 'TWR') services are provided from the airport tower, and generally cover the phase of flight from final approach to arrival on gate (and visa versa for departing aircraft). Aircraft are under the control of tower controllers only in the close vicinity of the airport before they are handed over to approach controllers (for departures too).

As the aerodrome service does not generally involve manoeuvring aircraft in the approach phase or terminal areas, it is fairly well bounded and a change in service provider is not expected to impact on the terminal airspace. By isolating the competition to the aerodrome service, the existing approach service provider would remain in place and no additional changes to airspace would therefore be necessary. This would mean that transition should be relatively simple and seamless from an airspace user perspective. The aerodrome service could also be provided by remote towers (A3). At this stage of maturity remote tower solutions are focussed on aerodrome services only and are not yet offered as a combined aerodrome and approach service. This means that isolating the competition to only tower services would be good for remote tower providers, and could help to accelerate the deployment of a technology that looks to be the way forward for airports in the future – the challenge here would be to calculate an appropriate pricing structure, given that the majority of remote tower assets would be located off the airport and typically owned by the service provider. Furthermore, 15 airports have already signed contracts with Flysikring to provide remote services, so would be excluded from this scenario.

There are also some disadvantages to competing only tower services. One issue, is that considerable knowledge and intellectual capital has been developed in the provision of aerodrome services. Airports are often seen as the bottle neck in the air traffic management network and therefore highly skilled controllers are employed and techniques developed over time to help manage capacity. Flysikring has developed a

significant amount of experience and know-how in aerodrome and approach control that enables it to contribute to wider ATM initiatives such as SESAR[28]. This know-how would potentially be lost with each airport they lose the right to provide services at. Given that Flysikring will remain a monopoly provider for en-route services, there is a case for ensuring that Flysikring retains at least some competence in aerodrome services to support a wider national interest in delivering a seamless 'gate to gate' ANS concept.

Careful oversight from the CAA may also be required to ensure that the cost of the approach service would not increase. Exchange of flight data is one area to look at in particular. This is because Flysikring indicated that flight data is passed automatically between approach and aerodrome controllers (by the NATCON system) once aircraft are detected by surveillance and that a new provider could require a different process of coordination that could introduce workload for the approach controllers.

A summary of the advantages and disadvantages is given in the table below:

Advantages	Disadvantages
• No airspace changes needed • Good for remote tower solutions	• No future possibility to share APP/TWR costs • APP costs could increase • Risk of Avinor losing TWR ATC competence, which is an important source of knowledge and IP (mainly A1) • Difficult for assets not owned by airport (eg NATCON) • Not clear who owns RTC equipment (A3 only)

Table 12: Relative merits of scenario A

5.2.2 Scenario B: TWR/APP services

Scenario B concerns the tendering of aerodrome and approach services together. As discussed in section 3.3 and as experienced in Sweden in section 4.1, the inclusion of the approach service (depending on where the boundary is drawn) could legitimately open up the possibility for recovering costs from both the TNC charge, and the en-route unit rate – eg directly from the Eurocontrol central route charges office (CRCO). This could potentially mean offering services at a lower cost to the airport and at increased margins for the provider.

Another advantage is that by competing both approach and aerodrome together, a new provider would be able to continue cost sharing between both services. Some cost sharing is already present (for example some of the building costs for co-located airports), but we believe that it may be possible for a new provider to introduce greater use of multiple-licensing to enable more rotation of controllers between approach and tower positions and this to enable a more cost-efficient rostering.

[28] Single European Sky ATM Research programme

In some cases, the approach sectors cover multiple airports (for example within the same Terminal Manoeuvring Area). These often represent a more efficient way of managing the airspace since the airports are so close that the approach sectors need to be coordinated. Analysing the suitability of these existing TMAs is a study in itself, so we have taken the general view that they have been established for good operational and/or cost-saving reasons. Splitting up a TMA can introduce complexity and inefficiency so we would expect, at least for the initial phases of competition, to retain the TMA sectors and compete them in totality with the aerodrome service (for one or more of the served airports) – this is generally expected to be an advantage for the market as it will increase the volume of airspace and amount of traffic from which revenue can be generated.

A disadvantage of this scenario would be the difficulty in agreeing on a specific boundary between approach and en-route airspace, which would impact upon the amount that the approach provider could legitimately recover from the Norwegian en-route cost base (in the event they are note the same provider). From an operational perspective the boundary and handover procedures would need to be defined through letters of agreement between the respective services providers and would be straightforward but there could be disagreement between competing providers over where the boundary sits from a cost recovery perspective. Given the current rules for en-route charges being exempt for the 20km of flight closest to the aerodrome[29], the CAA may need to intervene to ensure consistency with this rule, ie that the new provider's costs do not lead to airspace users paying for the same service twice or generate a net increase in the en-route cost base (as initially happened in Sweden).

Another disadvantage of a combined aerodrome and approach procurement relates to the added complexity of the service. For complex TMAs, the service may even be too complicated or challenging for smaller, less established service providers to compete for. It would also mean a more complicated procurement, for example pricing agreements would need to be established with Flysikring to ensure that data such as surveillance and flight data is made available to support the service as it would make little sense and only introduce costs if the new provider were required to introduce additional surveillance or flight data planning infrastructure afresh.

A further disadvantage, for some airports within variants B1 and B2, could be that approach services provided from centralised locations could become less efficient and potentially increase in cost. This is because the costs are shared with other facilities, for example many approach units are co-located with the en-route area control centres that may not be made available to an incoming provider – potentially requiring new buildings and infrastructure to be established.

[29] Regulation (EU) 391/2013 Annex IV

Advantages	Disadvantages
• More attractive to the market • Efficiencies in multi-license APP/TWR • Potential to package airports together (combined APP)	• May be difficult to agree APP/ENR boundary • Could 'unbundle' efficiencies where APP is already centralised (not B3) • More complicated procurement • Could split existing TMAs • Might limit suppliers • (Regulated) radar data sharing needed

Table 13: Relative merits of scenario B

5.2.3 Scenario C: APP services

Scenario C concerns competition of only approach services. The potential benefits of this scenario are not as obvious as other scenarios. The Farris TMA, includes both Torp and Rygge, as well as some smaller airports. Representatives of both of the larger airports have expressed some dissatisfaction over the quality of service offered by the TMA, the only criticism of service quality that we have received in our investigations. The possibility of including the full TMA services in a tender offer could be considered in order to improve service quality. It might also provide scale for future operations of an independent ANS provider and by combining it with Oslo TMA, which has been suggested in another study, it could provide a more efficient service for all airports in the Oslo region.

In terms of disadvantages, in this scenario boundaries could be challenging to define as there will be interfaces with up to two separate providers: one for aerodrome ATS and another for en-route ATS. This is likely to create additional complexity that would require intervention from the CAA to define the boundaries from an operational/legal aspect (through letters of agreement) and more importantly from an economical/cost recovery perspective to avoid users paying twice for the same service as explained above in scenario B.

A further issue is that without an aerodrome service included in the tender package, there will be no location from which to provide the services. The incoming provider may be able to procure or lease facilities from the outgoing provider, but there is no guarantee that the outgoing provider would allow this, especially if the location is only partly used for the TMA being tendered. The incoming provider may therefore need to establish a new approach centre potentially adding additional cost and somewhat contradicting wider EU policy to consolidate ANS infrastructure, not to fragment it further.

Another issue is that a new provider of an approach environment or TMA would seek airspace changes that might maximise the potential flying time and revenue generated in the airspace and remove it from neighbouring sectors that are not within the scope of the services provided. This would add complexity to the transition and may not result in the most efficient outcome for the airspace user.

Advantages	Disadvantages
• Possible to combine Farris with Oslo TMA to save manpower (see previous DNV report)	• Boundary between APP & TWR/ENR is challenging to define • Could separate combined TWR/APP efficiencies (eg Farris) • Likely to mean airspace changes • Difficult to cover costs • New APP centres may need to be established

Table 14: Relative merits of scenario C

In all three variants of scenario C, the disadvantages outweigh the advantages, and even the benefits are achievable within one of the other scenarios. For that reason it was agreed with the Reference Group to discount this scenario from any further assessment.

5.2.4 Scenario D: AFIS

Scenario D concerns the competition for aerodrome flight information services (AFIS). At present, AFIS services are 'self-supplied', in most cases by Avinor AS, but in the case of private airports by the airport operator at the airport. To some degree there is therefore a reduced need to introduce further competition as the airport operator is already sufficiently motivated to deliver the service cost effectively.

On the other hand, the CAA has indicated that some AFIS airports are close to the maximum level of traffic that can safely be handled by an AFIS service. This is because the pilot is still responsible for aircraft separation under an AFIS service, and as traffic increases the ability of the pilots to separate themselves is reduced. Under an ATC service, the controller has responsibility for separation and is able to handle higher volumes of traffic. Converting these airports from an AFIS service to an ATC service through a tendering process (D1) might well be a faster way to address this issue, whilst also potentially introducing new providers into the market. It would also increase safety at the airports and be a lower risk solution than introducing new providers into very busy airports.

Potential disadvantages could be that the airports do not individually, or even collectively have enough scale or traffic volume to generate sufficient profit to cover the bidding costs and risks of potential bidders. The three airports may therefore need to be packaged together, and possibly combined with other options.

A second issue is that Flysikring is investing heavily in remote towers, with plans to supply remote services to 15 of the AFIS airports. We understand that contracts have been put in place with these airports already, meaning that Avinor AS is unlikely to tender services at any of these 15 airports in the medium term – so they may be discounted by default. An interesting option would be to potentially encourage a supplier for scenario D1 to offer a remote solution as this would not only achieve the CAA goals of transferring busy AFIS airports to ATC, but it would also introduce a competitor for remote services. The knock-on effect might help to accelerate the remote tower implementation programme within Flysikring and Norway in general, therefore introducing the anticipated costs savings from remote towers at an earlier date.

Advantages	Disadvantages
• Lower safety risk • Accelerate changing busy AFIS to ATC	• AFIS undertaken by Avinor (Airports) not Flysikring • Jeopardises significant Flysikring investment in Remote Technology • May not have sufficient scale to attract bidders

Table 15: Relative merits of scenario D

5.3 Recommendations for opening of ATS services to competition

After presenting the different variations and relative merits of each scenario to the reference group, three specific primary scenarios have been selected for the introduction of competition to ANS in Norway:

- A2, TWR at Avinor airports where APP is not co-located
- B3, TWR/APP at co-located airports
- D1, TWR ATC at the busiest AFIS airports

The remainder of section 5.3 provides a more detailed specification and evaluation of the selected scenarios, reflecting on the relative merits in section 5.2. The section concludes by assessing the primary scenarios against the considerations (from section 3) and lessons learned (from section 4).

5.3.1 Scenario A2: TWR at Avinor airports where APP is not co-located

The reference group agreed that the most suitable variant to take forward from scenario A, was A2. In this primary scenario, TWR services at Avinor AS airports where APP are not co-located are opened to competition.

In scenario A2, the approach and aerodrome services are already geographically separated which makes the division of services more easily identifiable and minimises the risk of costs being duplicated. It therefore avoids introducing additional fragmentation to the system, whilst maximising potential benefits and preserving the freedom of the market to propose solutions. It also means that Flysikring retains competence in aerodrome services at those airports where it is co-located with approach.

Discounting private airports this scenario therefore covers the following airports:

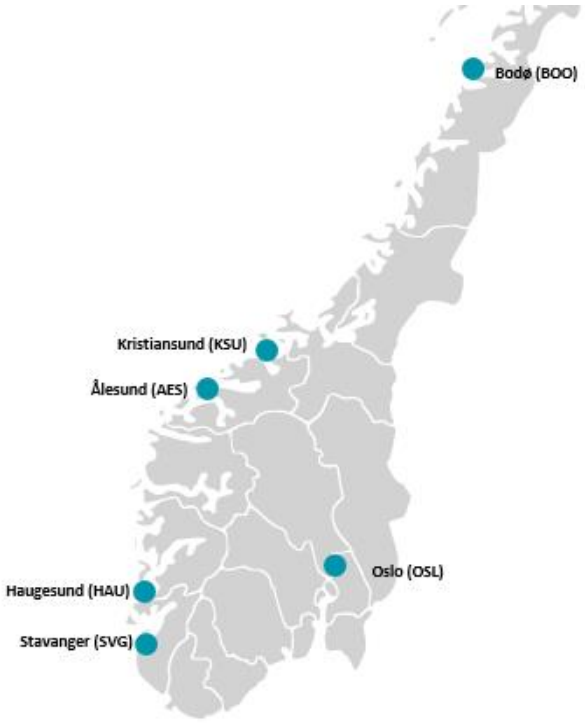


Figure 10: Airports for scenario A2

The following table shows the airport category, together with location from where approach and aerodrome services are provided.

Airport	Airport Category	TWR location	APP location
OSLO	Large	OSLO	Oslo ATCC
STAVANGER	Large	STAVANGER	Stavanger ATCC
BODØ	National	BODØ	Bodø ATCC
ÅLESUND	National	ÅLESUND	Trondheim
KRISTIANSUND	Regional	KRISTIANSUND	Trondheim
HAUGESUND	Regional	HAUGESUND	Stavanger ATCC

Table 16: Avinor airports where TWR and APP are not co-located.

5.3.2 Scenario B3: TWR/APP at co-located airports

The reference group agreed that the most suitable variant to take forward from scenario B, was B3. In this scenario TWR and APP services at Avinor AS airports where APP are TWR are co-located are opened to competition.

B3 takes full advantage of the benefits of competing TWR and APP services together while retaining existing economies of scale, such as in approach services provided from centralised locations. Co-located services means that controllers will be able to switch between approach and aerodrome positions, provided that they are licensed appropriately, enabling more cost effective rostering. Where a co-located approach service provides services to additional airports (other than that to which it is co-located – for example Bergen airport also provides approach services to Stord) the approach services could continue to be combined (or even further expanded) by being procured in the same package.

Including three military airports, this scenario covers the following airports:

Figure 11: Airports in scenario B3

Airport	Airport Category	TWR location	APP location
BERGEN	Large	BERGEN	Co-located with TWR
TRONDHEIM	Large	TRONDHEIM	Co-located with TWR
TROMSØ	National	TROMSØ AIRPORT	Co-located with TWR
KRISTIANSAND	National	KRISTIANSAND	Co-located with TWR
ALTA	Regional	ALTA AIRPORT	Co-located with TWR
HARSTAD NARVIK	Regional	HARSTAD NARVIK	Co-located with TWR
KIRKENES	Regional	KIRKENES AIRPORT	Co-located with TWR
BARDUFOSS	Regional	BARDUFOSS AIRPORT	Co-located with TWR
LAKSELV	Regional	LAKSELV	Co-located with TWR
ANDØYA	Local	ANDØYA AIRPORT	Co-located with TWR
RØROS	Local	RØROS AIRPORT	Co-located with TWR
ØRLAND	Local	ØRLAND AIRPORT	Co-located with TWR

Table 17: Avinor airports where TWR and APP are co-located.

5.3.3 Scenario D1: TWR ATC at the busiest AFIS airports

The reference group agreed that the most suitable variant to take forward from scenario D, was D1. In this scenario, TWR ATC is introduced, through a competitive tender, at the busiest AFIS airports where the level of movements has increased to the extent that ATC service is under consideration.

The introduction of competition at other AFIS airports has not been assessed further due to the contractual agreements already in place between Avinor AS and Flysikring at 15 AFIS for remote services, and the limited attractiveness to the market of AFIS at less busy airports and because airports are already self-supplying AFIS and therefore assumed to be seeking the maximum cost reductions already.

Scenario D1 offers a low risk way to introduce competition into the market. Introducing competition in tandem with the introduction of moving from AFIS to ATC also avoids any issues associated with staff transfer and may reduce the cost increase associated with the change of service, for example due to the salary differential between AFISOs and ATCOs. It also offers greater scope for private providers to propose different ways to meet the airport requirements.

This scenario covers Hammerfest, Brønnøysund and Molde airports. The airports are shown below.

Figure 12: Airports for scenario D1

5.3.4 Assessment against considerations

The following table evaluates the primary scenarios against the key considerations and lessons learned from sections 3 and 4 respectively.

Topic	Summary
Safety & transition	D1 will be the simplest service and lowest traffic levels. It will also potentially increase the safety by transferring from AFIS to ATC. A2 will involve more traffic and therefore higher complexity and risk. B3 provides the most complexity, particularly if a shared approach sector is involved. The increase in complexity between scenarios directly relates to a requirement for progressively more input from the CAA (eg surveillance pricing arrangements may be needed in B3 and some options in B2). The larger the airport, the longer the anticipated transition period will be. All scenarios are expected to involve a local company, with locally based controllers, but a remote solution for D1 could be an exception.
Staff/social	For A2 and B3 controllers would have the option to continue working at their current airport, under the conditions offered to them by the new entrant. For B3, multiple-licensing could introduce issues or be resisted by staff without some form of compensation or incentives. D1 could involve staff transfer but transition would therefore need to allow for re-training AFISOs as ATCOs. Alternatively it could be an opportunity to bring in new ATCOs, particularly if there is resistance to competition from Flysikring employees. Salaries would need to increase to cover the increased responsibility of an ATCO compared to an AFISO. In all scenarios, the employment terms and conditions may well remain the same or improve in the short term, with the possible exception of pension packages in the longer term or if new controllers were recruited.
Charges and cost recovery	For A2 and D1, cost recovery will only be possible through the TNC charge, meaning that without a sufficient number of movements, subsidy may still be required at the Avinor AS group level to pay for the aerodrome service. In B3, it is possible that some of the service could be recovered from the en-route airspace users, and potentially, depending on the airports selected, reduce the need for subsidy at the Avinor AS group level. The regulator will need to ensure that the recovered amount for the approach service is legitimate and does not unfairly increase the overall cost of the service for en-route airspace users (ie that Flysikring subtracts an equivalent or cost off their cost base for any approach services they do not provide). The regulator may need to allocate some national cost elements, to be separately regulated and recovered, for example through the en-route unit rate. These costs could include AIP or SAR costs (both of which are paid for via the en-route unit rate in Sweden).
Military	Irrespective of the scenarios, the Norwegian Defence Force (NDF) currently has no competence in providing ANS. Existing agreements ensure that Flysikring employees are cleared to secret level and this requirement will remain in place for new providers at Avinor AS airports of strategic military importance (Andøya, Harstad Narvik, Bardufoss, Bodø, Ørland, Trondheim, Stavanger, Banak, Bergen, Røros, Kristiansand, Namsos and Oslo.). The Military also highlighted the following six airports as of particular importance and advised that they should not be included in the first tender: Andøya, Harstad Narvik, Bardufoss, Bodø, Ørland and Trondheim.
Organisation of ANS	This has been a key driver in constructing the scenarios, and has already been assessed as part of the short-listing of scenarios in section 5.2.

Topic	Summary
Operational aspects	From an operational perspective, defining the boundary between services will be important in all scenarios. This could be an airspace boundary (such as FL95, used in Sweden for the APP/ENR boundary) or it could be a 'service' boundary which could be more complicated to define, but more cost reflective and potentially more operationally feasible to implement. For B3 the boundary between APP and ENR will be more difficult to define due to the potential for some approach service costs to be recovered from the en-route cost base. Combining or splitting existing approach sectors, could well introduce risk or delay to the transition to a new provider or inefficiencies to the service so it is recommended that this is avoided. Other operational issues to be handled could include introducing new rostering patterns, for example to accommodate multiple-licenses in B3, or potentially more flexible remote services in a variation of D1.
CNS & technical interfaces	All scenarios will rely on an interface to CNS systems owned either by Flysikring or predominately by the airport. Knowledge of those CNS systems at the airport level will help with the procurement of a new ATC provider as they will be able to build in the price of interfacing to those systems. As mentioned previously national CNS infrastructure and data (such as radar data or flight plan data used to support an approach service in B3) may need to be regulated separately, with suitable access pricing arrangements for the incoming provider (though in Sweden, surveillance data is provided to airports free of charge). The regulator may need to intervene to ensure that access arrangements are in place for this data and that licensing agreements are solved for systems that the incoming provider is required to use.
Assets & investment	Ownership of the ATC assets and equipment at the airport generally makes it easier to outsource the ATS. This approach is generally already in place for all scenarios, but the airports may need to improve their understanding of what assets are available for use (and their state of repair) as this is critical for a service provider to be able to price their service. A survey of equipment may be necessary as part of the procurement. IP for Operations Manuals needs to be determined.
Remote Towers	As mentioned previously, remote solutions are currently targeting less busy airports, either as an AFIS or ATC service. This would make them more suitable for scenarios A2 or D1. Encouraging remote tower solutions could help to accelerate the deployment of a technology that looks to be the way forward for airports in the future and can lower costs in the longer term. The challenge is that Avinor AS has already signed a contract with Flysikring and will therefore be unlikely to encourage deployment at any airports other than those already agreed. A key challenge in future here would be to calculate an appropriate pricing structure, given that the majority of remote tower assets would be located off the airport and typically owned by the service provider. The new technology will enable Flysikring to provide ATC services for up to 15 airports from a single centre in Bodø.
Market attractiveness	Scenarios A2 and B3 both offer more traffic volume and therefore more market attractiveness. A2 raises the question of whether Oslo Airport should be allowed to self-provide, which would not be an unreasonable position from an international perspective D1 is likely to attract interest from smaller ANSPs who are able to operate on lower margins. Several scenarios are likely to attract more bidders if packaged as multiple airports and with an appropriate length contract (in Sweden, this is typically 5 years, with 1 year optional extension). A bidding process in which a daughter company is invited by its parent, was generally perceived to be an unattractive tender to bid for, as the outcome would favour award to the daughter company.
Procurement	The procurement process for B3 is likely to be the most complex, and will require the most effort and knowledge to set-up. In all scenarios, and particularly for the smaller airports, clubbing together to share experience and develop requirements would be wise.

Table 18: Summary of key issues for consideration

5.4 Grouping of airports

The options for opening the ANS market just described are largely complementary and independent, meaning that with a small number of exceptions all could be implemented. Indeed, within each scenario, there is generally no obvious need to link individual airports into the same tender other than to create some potential for scale economies and help make the 'size of the prize' justify bidders' costs.

The situations at both Stavanger and Bodø create difficulties. Both airports are candidates for opening TWR services only to competition in Scenario A, since APP services are not provided from the tower but from the ATCC centre. However, as these ATCC centres are adjacent to the tower at each airport the staff move between APP and TWR duties as demand varies during the day ie the APP service is fully integrated organisationally with the TWR service. The situation is further complicated by the fact that from both ATCCs, TIA APP service is provided to a number of other airports: four from Stavanger ATCC, and five from Bodø ATCC (with a further 11 airports receiving normal APP service), with many of these airports due or likely to receive remote tower services.

The options available for these two airports are:

- Open to TWR competition only (ie A2 scenarios), with APP service remaining with the ATCC. This would probably mean accepting a cost increase in both TWR provision and APP provision as scale efficiencies were lost;
- Open to TWR/APP competition (ie B3 scenarios), and either segregate APP activities within the current ATCC facilities or construct new ATCC facilities as close to the tower as possible; and
- Exclude these airports from the opening to competition.

More detailed work would be required to determine which of these options were best for each of the airports. For the purposes of this report, however, we assume that at both airports TWR and APP are opened for competition (ie B3 scenarios), with APP service at some (but not necessarily all) of their 'satellite' airports also being included.

Another exception to these statements concerns Ålesund, Kristiansund and Trondheim. The first two airports which are candidates for TWR competition in Scenario A2, have their APP provided from the approach room in Trondheim, which is a candidate for TWR/APP competition in Scenario B3. Additionally, Trondheim also provides APP at Ørsta Volda, a nearby AFIS airport. One possibility would be to combine the four airports into a single package and competed for TWR/APP (ie a B3 hybrid scenario), and this is proposed below. A disadvantage of this would be that it structurally locks the four airports together and prevents other airport groupings that might have greater synergies, though as mentioned in Section 3.11, clauses could be included to 'unlock' this at a future date.

A final difficulty arises with Molde (D1), which currently has APP provided by Trondheim. The options here would be to move APP to Molde and include this with TWR or ATC provision, with an alternative being to include Molde in the Trondheim package, with the location of the four airports suggesting this might be preferred.

In Scenario A2, Oslo TWR is certainly of sufficient scale and interest to be tendered on a stand-alone basis. There is some merit in combining Stavanger and Haugesund, although as a B3 scenario with APP included. As noted one possibility for the other two Scenario A2 airports is to package them with Trondheim.

In Scenario B3, Bergen and its APP service to Stord could be a stand-alone tender, although the agreement of the owner of Stord (a non-Avinor airport) would be required. A package combining Trondheim and its three 'satellites' appears sensible. There may well be some merit in grouping four of the five northern airports of Tromsø, Alta, Harstad Narvik, and Lakselv together, with the possibility of also including Kirkenes although it does offer services to a number of the very small airports. A package based on Bodø (assuming that ownership does transfer from the NDF to Avinor in August 2016) would also be feasible. In view of the additional requirements that would be imposed on bidders by the NDF, it would be logical to group together the three remaining airports for which it is the license holder (viz Andøya, Bardufoss, and Ørland). This would leave just Kristiansand of the other B3 airports, and some combination with perhaps the Stavanger package might be appropriate. An alternative might be to tender Kristiansand separately, thereby possibly providing some synergies to bidders for a tender for Torp and Rygge, should it take place. Røros of the other B3 airports is not included as its traffic levels may no longer require ATC service.

In Scenario D1, it is probable that the airports should be offered as a single package to provide some scale economies in the bidding process.

In summary, the following packages might be offered for tender:

- A2.1: Oslo
- B3.1: Bergen and Stord
- B3.2: Stavanger with four TIA airports, as well as Haugesund, and possibly Kristiansand
- B3.3: Trondheim with Ålesund, Kristiansund, Ørsta Volda and Molde
- B3.4: Tromsø, Alta, Harstad Narvik, and Lakselv
- B3.5: Kirkenes
- B3.6: Bodø and perhaps some dependent airports
- B3.7: Andøya, Bardufoss, and Ørland
- B3.8: Kristiansand
- D1.1: Hammerfest and Brønnøysund

5.5 Implementation and phasing

It is considered that these packages are largely independent of each other, and in theory could be offered to the market at the same time. This though is not recommended for several reasons, largely associated with the resource capacity of the key stakeholder groups, namely Flysikring, Avinor, the CAA and potential bidders. Additionally, by phasing the tenders, the process and documentation can be progressively refined and bidders can become more comfortable and confident in the fairness and efficiency of the competition.

There is likely to be some flexibility in terms of the order in which the packages might be tendered. It would be better to start with a relatively simple package involving airport(s) that are not strategically important to Flysikring (eg not A2.1 Oslo), since it would be desirable for market attractiveness purposes if the first tender were not retained by Flysikring. It is also clear that some packages are intrinsically simpler to organise and to bid for than others.

The NDF has also proposed that Andøya, Harstad Narvik, Bardufoss, Bodø, Ørland and Trondheim are not part of the first tender and has asked to be consulted before these airports were competed. Under this proposal tender packages B3.3, B3.4, B3.6 and B3.7 would not be the first tender. It should also be noted that with the exception of B3.5, B3.8 and D1.1, all packages contain at least one airport which has been indicated by the NDF as being important in times of peace, crisis and war.

A tender might take some six to 12 months to set-up and conduct, and it would be desirable to leave a similar period of up to a year in order that the experiences of the first tender could be evaluated and reflected in the next tender. Thereafter, there need not be such a gap between tenders.

If it is concluded that Flysikring as the ANS provider and Avinor as the airport operator should be institutionally separated (and potentially the responsibility of different ministries), then an early tender might be organised with greater involvement of the Ministry to provide confidence in the independency of the process while the separation process is being planned and implemented.

Figure 13 outlines a possible time-table for the launch of the process. We consider that a first tender might be launch by the end of 2016 if a commitment were made in Q1 2016 allowing the detailed planning and implementation to start in Q2 2016.

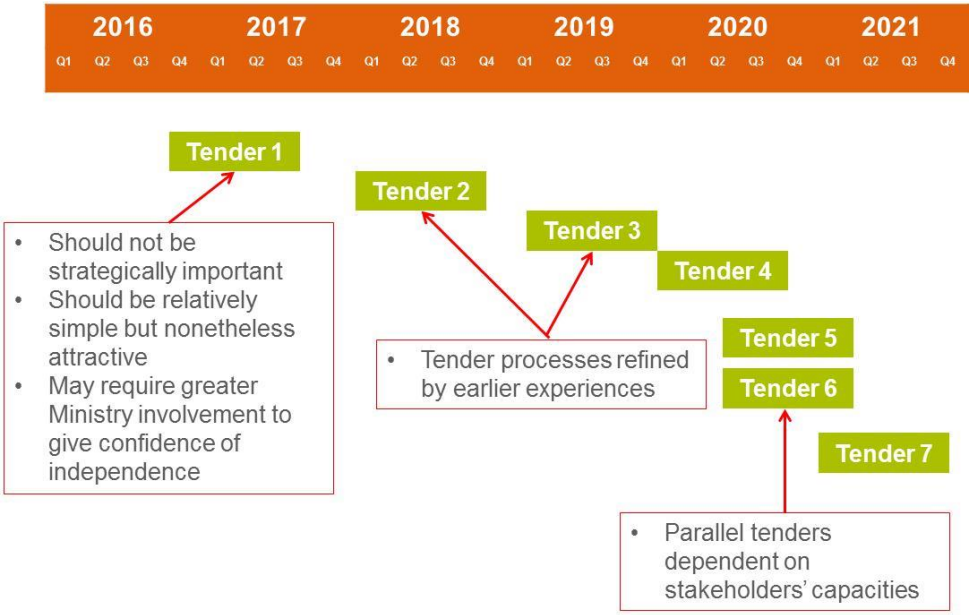


Figure 13 A possible time-table for the launch of the tender process

5.6 Opening support services to competition

As noted in section 1.3, ANS also includes CNS, MET and AIS services. Though relevant to this study, these are considered to be less critical to the opening to competition than the core ATS services presented in the previous sections.

Given the current organisation of these services, and because of the more limited potential benefits of outsourcing these services we do not present any scenarios for competition for support services. The following sections provide a more detailed discussion of the issues associated with these areas decision and present some suggestions.

5.6.1 CNS

CNS provision is not designated but Flysikring is obliged to provide CNS to Avinor airports, details of which are governed by contractual arrangements. This is not a monopoly though as airports are already able to choose a different CNS provider if they wish ie the market is open even though there may be limited competition. Oslo Airport for example self-supplies CNS provision, and others, such as Bergen, are keen to pursue a similar path. This is a sensible way forward as much of the CNS provision is airport-based and could be equally well performed by airport employees or by Flysikring.

For the national CNS infrastructure, including the network of communication, navigation and surveillance sensors, this is considered to be a part of a regulated cost base recoverable through the en-route unit rate. Defining the boundaries between this regulated en-route infrastructure and the local airport based infrastructure may be a necessary step to open the ATC market to competition.

5.6.2 MET

With the exception of MET observation, MET services are currently provided by the Norwegian Meteorological Institute. MET observations are mostly (with the exception of military airports) performed locally by observers (normally ATCOs or AFISOs) based at the airport and employed by either Flysikring or Avinor AS. The observation tasks are normally shared with their responsibilities for AFIS or ATC provision.

Whilst it would be possible to outsource all MET services required for ANS, based on previous experience the strongest bidders are likely to be foreign governmental agencies and it is important to consider what MET competence is required inside Norway. Any opening of competition in this area would also need to be accompanied with an obligation on the airports to provide MET observations to the national provider, as well as to any alternative local provider(s).

In our discussions with the Norwegian Meteorological Institute, it explained that an outsourcing exercise had indicated that an external provider would not be able to reduce costs beyond those already achieved by the Norwegian Meteorological Institute itself. It considered that existing cost containment measures, including international coordination to avoid duplication and better utilise resources, had already lowered costs substantially.

On the other hand, it was also clear that the 14 or so ‘products’ produced and sold to Flysikring, and indirectly the airports, were developed in a shared way that made it very difficult to identify their individual cost. Furthermore, with Flysikring acting as an intermediary between the Norwegian Meteorological Institute and the airports, there was

a potential lack of transparency as to what the airports were really paying for and how the cost of the services were calculated. We understand that new contracts are being prepared to provide a more detailed pricing breakdown for MET services, but that interdependencies in service provision will continue to make cost-reflective pricing difficult. This is perhaps an area to be considered further in future.

5.6.3 AIS

AIS include the provision of information such as Aeronautical Information Publications (AIPs), Notices to Airmen (NOTAMs), Aeronautical Information Circulars (AICs) and other relevant information to airspace users and other stakeholders (data users).

Currently these responsibilities are separated in Norway, with NOTAMs issued by Flysikring (for the time being at least) and the others issued by a separate and dedicated division within Avinor AS, called Avinor Aviation Services (AAS). AIPs are published ten times per year and issued to data users. AAS is currently in the process of jointly procuring a system with NATS, the UK service provider covering the data processing, verification and publication of aeronautical data. Given the need to maintain a common database, and because of the regulatory requirements on data quality, AIP and NOTAM publication is a natural monopoly and seeking costs savings through collaboration is a sensible strategy.

For other parts of the AIS information chain, such as data generation (aerodrome charting, procedure design), we believe that elements could be effectively outsourced. It is uncertain whether or not this would lead to cost savings, but has been an effective strategy in other countries such as the UK, Sweden and Denmark.

6 Conclusions

6.1 Part 1 recommendations on the introduction of competition

The introduction of competition within the ANS market in Norway needs to balance potential benefits, notably through reduced cost of service provision, with a wide range of other considerations associated with the entry into the market of a new provider. The most significant services (from both a cost and benefit perspective) are the approach and aerodrome ATC services and therefore these have been our focus.

As safety will always remain the paramount consideration within ANS provision any new provider will be required to demonstrate sufficient safety standards. For an ATC service a handover period would almost certainly be necessary (perhaps 6-12 months), and would potentially require regulatory intervention, as was the case in Sweden. The burden on the regulator more generally is an important consideration to the phasing of introducing competition.

The reliance on highly skilled staff, whose training and certification is partly location specific, means most controllers would need to continue working at their current airport, under the conditions offered to them by any new provider. However, as many will usually be settled in the vicinity this may well happen. Any new provider would be constrained by the conditions of Norwegian employment law and we therefore expect there to be little impact on staff salaries and conditions in the short term. A new provider at one of the airports of military importance would also need to meet a number of additional requirements, including for ATCOs to be Norwegian citizens and to able to attain Norwegian and NATO security clearances. While these constraints need to be accounted for when considering how competition should be introduced they do not form a barrier to the introduction of competition *per se*.

Previous experience in Sweden and Spain suggests that introducing competition to ANS can bring significant cost efficiency benefits. However, whilst competition and market forces are expected to incentivise service providers to be better organised, seek cost reductions and improve service quality, the overall cost reductions are very dependent upon Avinor Flysikring and its ability to reduce costs in the context of lost services.

At first consideration there are a wide range of scenarios for opening ANS to competition. However a large portion of possible options can be discounted based on the current organisation of services and the economies of scale already embedded in the Norwegian system. In our opinion ‘unbundling’ co-located services, would be more likely to increase risk and potentially cost as it would require new boundaries to be defined between co-located services and could lead to duplication of shared costs, especially in the short term. For some services, including CNS, MET and AIS, some competition is already present so our recommendations are more specific, for example to improve the cost transparency of MET and CNS and to compete sub-elements of AIS. We also recommend that there is no competition just for APP services. This is due to the likely cost and complexity, which would offset any potential benefits from competition.

We conclude that only Oslo Airport is appropriate for the competition of solely TWR ATC services. At all airports other than Oslo we recommend that APP and TWR ATC services be competed together. This is because at the majority of airports TWR and APP services are either provided from the same location, as at Trondheim, or are operationally integrated, as at Stavanger, where APP services are provided from the ATCC but staff

are shared across the APP and TWR services. There are also small airports where approach services are provided from nearby larger airports, as at Stord where APP services are provided from Bergen: optimally these airports should be competed together to preserve existing synergies. Introducing competition at the same time as moving from AFIS to TWR ATC, as proposed at Hammerfest and Brønnøysund, offers a relatively low risk way to bring a new provider into the market, also avoiding any issues of staff transfer. The contractual arrangements already in place for Remote Tower Services to be provided at 15 other AFIS airports has excluded these airports from our final recommendations.

The implementation of a competitive tender process requires airports to be grouped to ensure that each tender is sufficiently attractive commercially. Grouping of airports also provides potential bidders with the opportunity to propose more integrated solutions to service provision. Based on our assessment of the considerations and risks identified in section 3, we recommend the following packages for opening ANS to competition. The selection of these options is discussed in detail in section 5:

- A2.1: TWR ATC at Oslo
- B3.1: TWR & APP ATC at Bergen and Stord
- B3.2: TWR & APP ATC at Stavanger with four TIA airports, as well as Haugesund, and possibly Kristiansand
- B3.3: TWR & APP ATC at Trondheim with Ålesund, Kristiansund, Ørsta Volda and Molde
- B3.4: TWR & APP ATC at Tromsø, Alta, Harstad Narvik, and Lakselv
- B3.5: TWR & APP ATC at Kirkenes
- B3.6: TWR & APP ATC at Bodø and perhaps some dependent airports
- B3.7: TWR & APP ATC at Andøya, Bardufoss and Ørland
- B3.8: TWR & APP ATC at Kristiansand
- D1.1: Transition from AFIS to TWR ATC at Hammerfest and Brønnøysund

The situations at both Stavanger and Bodø create difficulties and although we have included them above as a combined APP and TWR service it would also be possible to compete only TWR services at these locations and the relative costs and benefits of each of these options should be further assessed before launching the tender, as discussed in section 5.4.

These packages are largely independent of each other, and in theory could be offered to the market at the same time. This, though, is not recommended due to: the resource requirements that it would place on key stakeholders (for example the CAA); and as phasing would enable subsequent refinement of the process and documentation. We recommend that the first package is a relatively simply one, with low strategic importance. However it is important that the market is convinced that the first package is not simply a trial for the introduction of competition but that it represents the first in a series of tenders.

It is now necessary to determine the *conditions precedent* that are needed to facilitate this competition, including recommendations on the financing of ANS, asset ownership and access and the institutional structure of Avinor Flysikring to ensure fair competition.

6.2 Recommendations for Part 2: *conditions precedent* to facilitate competition

The subsequent part of this study will investigate and conclude on the requirements to be addressed to enable the implementation of competition outlined in the previous section. This is broken down into four key areas for investigation:

1) **Financing ANS**: Avinor Flysikring is currently reimbursed for airport ANS services through contractual arrangements with individual airports. Before competition can be introduced the contractual model for any new provider will need to be decided, including the risk sharing arrangements and the principles for allocating approach costs, where appropriate, to the terminal and en-route cost bases. To ensure that Avinor Flysikring is able to fairly compete with a new provider there should be transparent and cost reflective payments made for any national obligations placed on Flysikring but that a new provider would not bear any cost for. For airports that are covered by the Performance Scheme (and in some cases ANS service level agreements with airlines) regulatory aspects such as risk sharing and practical aspects such as the award of tenders within a Reference Period will need to be considered.

2) **Institutional structure**: The current institutional framework in Norway where Avinor is the owner of the airports letting the new ANS contracts as well as being the owner of the incumbent ANS provider, is expected to be a concern to potential bidders that may necessitate a recommendation for full separation of Flysikring from Avinor AS to create a fair market. There is an additional degree of separation that should be considered between the regulated (ie non-competed) and un-regulated (ie competed) parts of the ANS business. In the UK the regulated and un-regulated entities are separate parts of the same group with ring fencing arrangements. We will also look into the freedoms of Avinor Flysikring, including the right to compete for contracts both domestically and markets abroad. The institutional framework also covers the roles and responsibilities of the different parties in the tender process, notably any new regulatory requirements that may be placed on the CAA or MoT – for example in relation to training and recruitment of controllers.

3) **Asset and infrastructure ownership**: While most equipment located at the airport is owned by the airport, facilitating the introduction of competition, there are a number of other assets for which access arrangements may be required. The NATCON ATM system is currently owned and operated by Flysikring as are other CNS assets such as surveillance sensors located outside the airport perimeter. The intellectual property currently held by Flysikring related to some operations and procedures may also be considered as an asset, and this topic will need to be addressed. Access to assets such as these can be defined at a number of different levels: usage arrangements may be put in place or alternatively a new provider may have access only to the data outputs from the system. Much of the required ATM and surveillance data is sent (or planned to be sent) via a closed network, STAMNET, which is owned and operated by Flysikring meaning that a data pricing arrangement may be the most appropriate. Any future ownership and pricing arrangements also need to ensure adequate incentives for asset maintenance and replacement. The responsibility for, and assets associated with, continegency requirements will also be considered.

4) **Employment and people**: Although we expect most controllers to opt to continue to working at their current airport it is important to clarify on the requirements set out in Norwegian law and the current collective agreements on the transfer of staff to any new provider. This is especially important in the case of pensions, as these form a significant part of total staff costs and as a new private provider may not be able to access the Norwegian state pension scheme that Flysikring employees are currently part of. The context under which competition is introduced must also ensure adequate training of new ATCOs and continued training of existing staff. The existence of sufficient numbers of ATCOs is especially important given the role of the airport network in regional connectivity and contingency measures should be in place to maintain service provision in the case where staff choose not to transfer.

Conclusions under these four areas will be integrated into and used to refine, where necessary, our current recommendations for opening ANS to competition in Norway. We will set out any overarching requirements for the introduction of competition, including on the institutional structure of Avinor Flysikring. The final phasing and service bundles will then be complemented by a discussion of any option-specific conditions eg for the financing of Performance Scheme airports.

A Meetings held

Organisation	Date	Start time	Duration	Location
Ministry	02-July	13:00	2hrs	Ministry offices
Avinor Flysikring	16-July	09:00	1 day	Avinor HQ, Oslo
Avinor Flysikring	17-July	09:00	1 day	Avinor HQ, Oslo
Torp Airport	28-July	14:00	2 hrs	Torp Airport
Avinor Flysikring	29-July	09:00	2 hrs	Oslo
Avinor AS (Oslo Airport)	29-July	09:00	2 hrs	Oslo
Avinor AS	12-August	10:00	1.5 hrs	Avinor HQ, Oslo
Rygge Airport	12-August	14:15	2 hrs	Rygge Airport
Reference Group	17-August	13:00	3 hrs	Ministry offices
MET	18-August	09:30	2 hrs	Oslo
Military	18-August	14:00	2 hrs	Oslo
Avinor Flysikring	19-August	08:30	1.5hrs	Avinor HQ, Oslo
Avinor Flysikring	19-August	10:00	3 hrs	Avinor HQ, Oslo
CAA	19-August	14:00	2 hrs	CAA, Oslo
Avinor AS (Regional airports)	20-August	10:00	1.5 hrs	Avinor HQ, Oslo
Avinor Flysikring	20-August	12:30	1.5 hrs	Avinor HQ, Oslo
Avinor Flysikring	20-August	14:00	0.5 hrs	Avinor HQ, Oslo
Swedavia	27-August	15:00	2 hrs	Stockholm
ACR (Sweden)	28-August	10:00	2 hrs	Stockholm
LFV (Sweden)	28-August	14:00	2 hrs	Stockholm
Reference Group	06-October	09:00	4 hrs	Ministry offices
Trade Unions	26-October	15.00	2 hrs	Ministry offices
Reference Group	27-October	09:00	4 hrs	Ministry offices

B Detailed list of services at airports

The following list is ordered by total number of movements

Type	Airport	Owner	Services (Provider)	TWR location	APP location	TMA	TIA	TOTAL movements (2014)
LARGE	OSLO	Avinor AS	ATC (Avinor Flysikring)	OSLO	Oslo ATCC	OSLO		248,550
LARGE	BERGEN	Avinor AS	ATC (Avinor Flysikring)	BERGEN	Co-located with TWR	WEST COAST NORTH		103,767
LARGE	STAVANGER	Avinor AS	ATC (Avinor Flysikring)	STAVANGER	Stavanger ATCC	WEST COAST SOUTH		90,862
LARGE	TRONDHEIM	Avinor AS	ATC (Avinor Flysikring)	TRONDHEIM	Co-located with TWR	VÆRNES		61,474
NATIONAL	TROMSØ	Avinor AS	ATC (Avinor Flysikring)	TROMSØ AIRPORT	Co-located with TWR	TROMSØ		43,723
NATIONAL	BODØ	Military	ATC (Avinor Flysikring)	BODØ	Bodo ATCC	BODØ		43,392
PRIVATE	SANDEFJORD TORP	Private	ATC (Avinor Flysikring)	SANDEFJORD TORP	Oslo ATCC	FARRIS		38,406
NATIONAL	KRISTIANSAND	Avinor AS	ATC (Avinor Flysikring)	KRISTIANSAND	Co-located with TWR	KJEVIK		20,126
PRIVATE	MOSS/RYGGE	Private	ATC (Avinor Flysikring)	MOSS/RYGGE	Oslo ATCC	FARRIS		17,920
NATIONAL	ÅLESUND	Avinor AS	ATC (Avinor Flysikring)	ÅLESUND	Trondheim	MØRE		16,978
LOCAL	HAMMERFEST	Avinor AS	AFIS (Avinor AS)	HAMMERFEST	Bodo ATCC	HAMMERFEST		14,013
REGIONAL	KRISTIANSUND	Avinor AS	ATC (Avinor Flysikring)	KRISTIANSUND	Trondheim	MØRE		13,882
LOCAL	FLORØ	Avinor AS	AFIS (Avinor AS)	FLORØ	Stavanger ATCC (TIA)N/A	N/A	Sogn TIA	11,836
REGIONAL	ALTA	Avinor AS	ATC (Avinor Flysikring)	ALTA AIRPORT	Co-located with TWR	ALTA		11,786
REGIONAL	HARSTAD NARVIK	Avinor AS	ATC (Avinor Flysikring)	HARSTAD NARVIK	Co-located with TWR	EVENES		10,735
LOCAL	BRØNNØYSUND	Avinor AS	AFIS (Avinor AS)	BRØNNØYSUND	Bodo ATCC	HELGELAND		10,637
REGIONAL	HAUGESUND	Avinor AS	ATC (Avinor Flysikring)	HAUGESUND	Stavanger ATCC	SOLA		10,331
REGIONAL	MOLDE	Avinor AS	AFIS (Avinor AS)	MOLDE	Trondheim	MØRE		9,556
REGIONAL	KIRKENES	Avinor AS	ATC (Avinor Flysikring)	KIRKENES AIRPORT	Co-located with TWR	KIRKENES		8,389
LOCAL	FØRDE	Avinor AS	AFIS (Avinor AS)	FØRDE	Stavanger ATCC (TIA)	N/A	Sogn TIA	8,183
LOCAL	MO I RANA	Avinor AS	AFIS (Avinor AS)	MO I RANA	Bodo ATCC	HELGELAND		7,430
PRIVATE	SKIEN	Private	AFIS (self-supply)	SKIEN	Oslo ATCC	FARRIS		7,201
LOCAL	VADSØ	Avinor AS	AFIS (Avinor AS)	VADSØ	Kirkenes Airport	KIRKENES		7,045
REGIONAL	SVALBARD	Avinor AS	AFIS (Avinor AS)	SVALBARD	N/A	N/A	Longyear TIA	6,745
LOCAL	SANDNESSJØEN	Avinor AS	AFIS (Avinor AS)	SANDNESSJØEN	Bodo ATCC	HELGELAND		6,699
LOCAL	ØRSTA VOLDA	Avinor AS	AFIS (Avinor AS)	ØRSTA VOLDA	Trondheim	MØRE		6,361

Type	Airport	Owner	Services (Provider)	TWR location	APP location	TMA	TIA	TOTAL movements (2014)
LOCAL	STOKMARKNES	Avinor AS	AFIS (Avinor AS)	STOKMARKNES	Bodo ATCC	LOFOTEN		6,177
LOCAL	MOSJØEN	Avinor AS	AFIS (Avinor AS)	MOSJØEN	Bodo ATCC	HELGELAND		6,108
LOCAL	LEKNES	Avinor AS	AFIS (Avinor AS)	LEKNES	Bodo ATCC	LOFOTEN		5,946
REGIONAL	BARDUFOSS	Military	ATC (Avinor Flysikring)	BARDUFOSS AIRPORT	Co-located with TWR	BARDUFOSS		5,920
LOCAL	SOGNDAL	Avinor AS	AFIS (Avinor AS)	SOGNDAL	Stavanger ATCC (TIA)	N/A	Sogn TIA	5,800
PRIVATE	NOTODDEN	Private	AFIS (self-supply)	NOTODDEN	N/A	N/A		5,664
LOCAL	SVOLVÆR	Avinor AS	AFIS (Avinor AS)	SVOLVÆR	Bodo ATCC	LOFOTEN		4,356
PRIVATE	STORD	Private	AFIS (self-supply)	STORD	Bergen	WEST COAST NORTH		3,557
REGIONAL	LAKSELV	Avinor AS	ATC (Avinor Flysikring)	LAKSELV	Co-located with TWR	BANAK		3,422
LOCAL	NAMSOS	Avinor AS	AFIS (Avinor AS)	NAMSOS	Bodo ATCC (TIA)	N/A	Namsos TIA	3,416
LOCAL	RØRVIK	Avinor AS	AFIS (Avinor AS)	RØRVIK	Bodo ATCC (TIA)	N/A	Namsos TIA	3,265
LOCAL	ANDØYA	Military	ATC (Avinor Flysikring)	ANDØYA AIRPORT	Co-located with TWR	ANDØYA		3,233
LOCAL	SANDANE	Avinor AS	AFIS (Avinor AS)	SANDANE	Stavanger ATCC (TIA)	N/A	Sogn TIA	3,020
LOCAL	MEHAMN	Avinor AS	AFIS (Avinor AS)	MEHAMN - RTS planned	Bodø ATCC (TIA)	N/A	Finnmark TIA	2,803
LOCAL	RØROS	Avinor AS	ATC (Avinor Flysikring)	RØROS AIRPORT	Co-located with TWR	RØROS		2,787
LOCAL	NARVIK	Avinor AS	AFIS (Avinor AS)	NARVIK	Evenes	EVENES		2,658
LOCAL	VARDØ	Avinor AS	AFIS (Avinor AS)	VARDØ	Kirkenes Airport	KIRKENES	Finnmark TIA	2,544
LOCAL	BÅTSFJORD	Avinor AS	AFIS (Avinor AS)	BÅTSFJORD	Kirkenes Airport	N/A	Finnmark TIA	2,524
LOCAL	SØRKJOSEN	Avinor AS	AFIS (Avinor AS)	SØRKJOSEN	Bodø ATCC (TIA)	N/A	Sørkjosen TIA	2,390
LOCAL	HONNINGSVÅG	Avinor AS	AFIS (Avinor AS)	HONNINGSVÅG	Bodø ATCC (TIA)	N/A	Finnmark TIA	2,303
LOCAL	FAGERNES	Avinor AS	AFIS (Avinor AS)	FAGERNES	Oslo ATCC (TIA)	N/A	Fagernes TIA	2,059
LOCAL	BERLEVÅG	Avinor AS	AFIS (Avinor AS)	BERLEVÅG - RTS planned	Kirkenes Airport	N/A	Finnmark TIA	1,822
PRIVATE	ØRLAND	Military	ATC (Avinor Flysikring)	ØRLAND AIRPORT	Co-located with TWR	ØRLAND		1,491
LOCAL	RØST	Avinor AS	AFIS (Avinor AS)	RØST - RTS Planned	Bodo ATCC	LOFOTEN		1,353
LOCAL	HASVIK	Avinor AS	AFIS (Avinor AS)	HASVIK - RTS Planned	Bodo ATCC	HAMMERFEST		1,278
LOCAL	VÆRØY	Avinor AS	AFIS (Avinor AS)	VÆRØY - RTS Planned	Bodo ATCC	LOFOTEN		1,252