Study on the resources deployed in the area of European aviation safety before and after the creation of EASA

Final Report

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Written by: Ecorys Nederland BV and National Aerospace Laboratory NLR

Contracted by: European Commission, DG Mobility and Transport

Abstract

In 2003, the European Aviation Safety Agency was established. More than ten years later, the European Commission is intending to evaluate the overall functioning of the EU aviation safety system with a view to proposing possible improvements. One of the issues that the Commission intends to look at is the availability, use and evolution of resources which are necessary for the effective and efficient functioning of this system. The underlying intervention logic for a potential implementation of improvements is in essence the upcoming challenge to maintain the very high aviation safety standard in Europe, while at the same time traffic is forecasted to grow in the coming decades, and while substantial technological and economic shifts will apply in the aviation system. At the same time, budgetary pressures exist and are likely to continue on Member States, national aviation authorities and EASA. This study analyses the availability, efficiency of utilisation and evolution of human resources and the financing needs and sources of the European aviation safety system in relation to the tasks which were performed before the creation of EASA, and which are performed today. In addition, it identifies strong points, best practices and shortcomings and proposes possible options for improvement.

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Executive Summary

Introduction

The present civil aviation safety system in the EU is based on common safety rules designed for uniform application across the Union. The Joint Aviation Authorities (JAA) developed the first common standards for aviation safety in Europe based on a voluntary cooperation of Member States between 1970s and early 2000s. With the adoption of Regulation (EC) No 1592/2002 and the subsequent creation of the European Aviation Safety Agency (EASA) in 2003 a new regulatory framework was created. It aims above all at a high level of civil aviation safety in Europe while protecting the environment and facilitating the free movement of goods, persons and organisations in the internal market. It has now been over ten years since the creation of EASA, and the European Commission (Commission) is intending to evaluate the overall functioning of the EU aviation safety system with a view to proposing possible improvements. One of the issues that the Commission intends to look at in this respect is the availability, use and evolution of resources which are necessary for the effective and efficient functioning of this system. The underlying intervention logic for a potential implementation of improvements is in essence the upcoming challenge to maintain the very high aviation safety standard in Europe, while at the same time traffic is forecasted to grow in the coming decades, and while substantial technological and economic shifts will apply in the aviation system. At the same time, budgetary pressures exist and are likely to continue on Member States, national aviation authorities and EASA. This is a risk for the current EASA system. As such, one needs to review to which extent there are major shortcomings in the way aviation safety resources are used in the EU, the adverse impacts that these shortcomings could have on aviation safety in the future, and to identify options for change. The objective of this assignment is therefore to analyse the availability, efficiency of utilisation and evolution of human resources (including number and category of personnel and relevant costs, as well as their productivity, necessary qualification and expertise) and the financing needs and sources of the European aviation safety system in relation to the tasks which were performed before the creation of EASA, and which are performed today. In addition, it aims at identifying the strong points, best practices and shortcomings in this respect and to propose possible options for improvement.

Developments in resources and workload on European level

Since the establishment of the EASA system in 2003, a significant amount of human resources has been recruited by EASA to manage the remit transferred to the newly established organisation as well as to cope with the remit EASA has developed over time. After the initial period of a sharp increase in workload and resources of the Agency and up to the 2008 extension to the remit of the Agency, the increase in workload and resources of EASA has continued to be strong, adopting a lower rate of increase nevertheless. In the period after the first and second expansions of the scope of EASA, nearly all departments relevant to technical staff have seen an increase in the human resources deployed by the Agency to handle their respective tasks.

The increase in staff in the 2008-2013 period has been mainly driven by the increase in the scope of EASA as an outcome of the amended Basic Regulation and the progress of the internalisation strategy that aimed to reduce the Agency's reliance on National Aviation Authority (NAA) staff. An example of the latter is the sharp increase in staff attributed to the certification directorate despite a milder increase in the overall number of certificates issued. This is also probably affected by the change in the mix of certificates issued and the respective workload from them, as more major

certification projects with a higher complexity have been carried out in the last few years. Moreover, in some cases additional human resources were pooled to respond to an increase of the workload of activities already under the scope of the Agency.

Before ATM was included in the scope of EASA, there were around 20—25 FTE active in rulemaking, standardisation audits and oversight activities at Eurocontrol. Additionally, there were around 35 people working at the JAA which were reduced to 18.5 after the initial transfer of activities from JAA to EASA. In summary the development in resources is provided in the following table.

Table S1: Availability of aviation safety technical staff (in FTE) on European level

Organisation	2003	2008	2013
EASA	1	340	535
Eurocontrol	22.5	22.5	5
JAA	22	-	-

Developments in resources and workload on national level

The total staffing data indicate, at first glance, an increase of 35% of the total staffing level of the CAs across Europe over the last 10 years. In the states that provided data for all 3 periods (2003, 2008, 2013) under investigation the staffing level (in terms of technical staff) increased from 2426 in 2003 to 2646 in 2008 to 3267 in 2013. The last increase occurred mainly because of a significant increase in two states, merely caused by differences in the way the total amount of staff was calculated in these 2 periods. As such these calculated differences distorted the overall picture significantly. In order to take into account these anomalies, the study team focused on the developments of the technical staffing levels in the 3 largest domains (AIR, OPS and PEL),as for these domains we did not see strong outliers and more detailed information was available from other sources which made a cross-check possible. The totals of the technical staff working in these 3 domains (based on a sample of 17 CAs) increased from 1574 in 2003 (pre-EASA) to 1727 in 2008, and then decreased to 1659 in 2013 (current situation). Hence, in terms of technical staff, the trend is initially an increase of 10%, followed by a decrease of 4%. Compared to 2003, 2013 shows an increase of 5%. See also the table below.

Table S2: CA technical staff in the 3 main domains of aviation safety (AIR, OPS, PEL) (n=17)

Organisation	2003	2008	2013
CAs*	1574	1727 (+10%)	1659 (-4%)
AIR	*917*	*892 (-3%)*	*919 (+3%)*
OPS	*395*	*516 (+31%)*	*446 (-14%)*
PEL	*262*	*319 (+22%)*	*294 (-8%)*

* Based on a sample of 17 CAs

The domains confronted with new regulations, ANS, Aerodromes, SAFA and Safety Analysis & Research followed a different trend. Staffing levels in these domains increased significantly over the last 10 years at CAs. Furthermore, the creation of EASA did not lead to a decrease in staff at CAs involved in International Cooperation.

Two of the indicators that can be used to address the developments in the size of the aviation industry across Europe are the number of aircraft on the national registries and the number of aeroplanes and helicopters used in Commercial Air Transport (CAT). Both increased over the 10 years under investigation, the total number of aircraft on national registers with 15% and the aeroplanes and helicopters used in CAT with 23%.

The funding of the CAs increased from 2003 to 2008, but then decreased from 2008 to 2013. When focussing on those states of which data are available for all three periods (14 states in total), the summation of the budgets indicates that from 2003 to 2008 the total budget increased from 372 million Euro to 455 million Euro (22%), while from 2008 to 2013 (427 million Euro) the total budget decreased with 6%. Between 2003 and 2013 the overall increase amounts to 15%. This pattern is similar to the development in resources for the 3 largest domains.

Benefits of the system

From the previous analyses it became clear that in Europe the available resources and budget in the area of aviation safety increased over the past 10 years. This has resulted in substantial benefits, the creation of EASA and reshaping of the European aviation safety system. The following benefits have been identified in the study:

- Safety benefit due to increased safety standards;
- Industry cost savings and promotion of the common market due to centralisation of certification;
- Efficiency gains in the system due to centralisation of certification;
- Simplified regulatory process.

Problem analysis

Three high level problems have been identified in relation to the main objectives of the EASA system as set out in the Basic Regulation. These are:

- An unpredictable safety situation: Looking to the future, global air transport forecasts indicate an expected 5% growth annually until 2030 while the number of commercial aircraft in operation is anticipated to double by 2031. Thus, in the context of a stable fatal accident rate, the number of accidents can be expected to increase as a by-product of steadily increasing traffic volumes;
- An industry bottleneck: the limits of the current system in terms of the available resources to some CAs has led to a situation in which countries must prioritise oversight and surveillance of existing certificates over the processing of new applications, leading to backlogs in tasks, particularly in addressing new organisations and new requests from the industry. This resources-workload imbalance therefore has a causal effect on industry bottleneck;

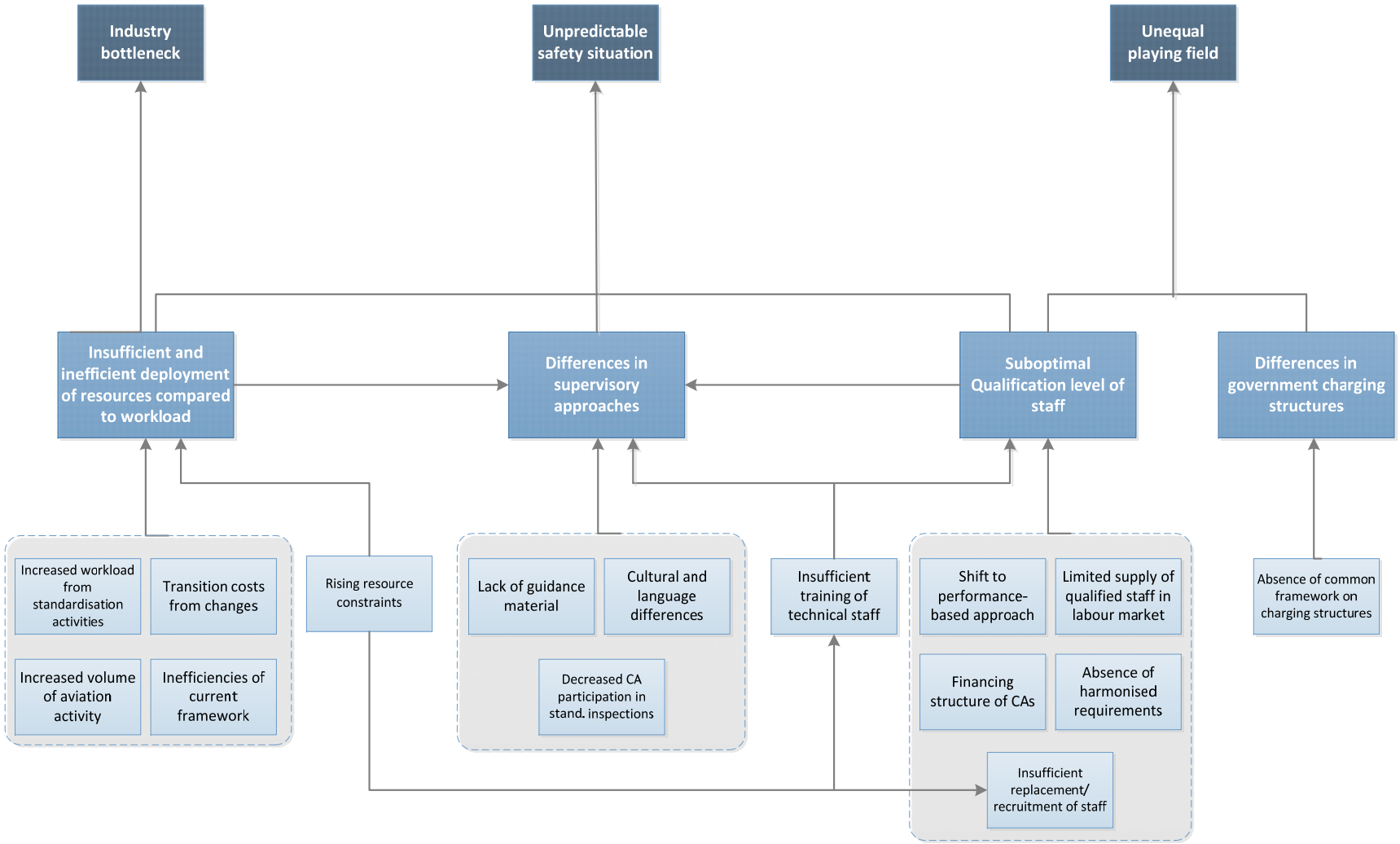
- An unequal playing field for industry: both industry and the CAs must deal with an unequal playing field in the different MS, which may potentially undermine the common market/system. In the context of the objectives of the current study, this problem is causally linked with the differences reported in both the supervisory approaches of CAs and in the financing/charging structures implemented by the different MS.

Four main problem drivers have been identified:

- The insufficient and inefficient deployment of resources compared to workload. This imbalance between an increasing workload and stable or decreasing resources is causally linked to the potential future safety risks and industry bottleneck, as well as the differences in supervisory approaches implemented by the different EU/EFTA MS. Eleven root causes are identified in relation to the "resources-workload imbalance" problem driver;
- Another finding of this analysis is the fact that the qualification level of the staff of some CAs has been reported by CAs and industry representatives alike, , to be suboptimal, which has been confirmed by the findings of the Annual Standardisation Reports of EASA. This is particularly the case in smaller CAs facing extremely high resource-workload constraints as well as those characterised by a relatively larger ageing workforce. This contributes to the unpredictable future safety situation as it causes an underperformance of these authorities and is linked with seven root causes;
- Among the 32 MS of EASA, significant differences in supervisory approaches can be observed. This means that the way industry oversight is performed in the EU/EFTA MS can differ significantly in terms of the uniform level of implementation of EU regulations, either administratively or even technically, despite the common regulatory system and the standardisation effort. This is confirmed by the uneven implementation of EU regulations, particularly in the domains marked by less 'maturity' (i.e., OPS, FCL, ATM/ANS). These differences are a source of mistrust between specific CAs as they create potential safety risks and contribute to the unequal playing field for industry. Six root causes are linked with the differences in supervisory approaches as problem driver;
- Finally, there are significant differences in the national charging structures imposed on industry by the CAs in the 32 EU/EFTA MS. These differences are a cause for the unequal playing field for industry, potentially undermining the system. One root cause is linked to this problem driver.

The different root causes are further explained in the main report. A summary of these is provided in the problem tree as depicted below.

Figure S1: Aggregated problem tree



Policy options

The previous sections have demonstrated that there is room for improvement in the area of resources deployed on aviation safety in Europe and the related workload. Four policy options are developed to address these shortcomings as well as to reinforce positive developments. These are characterised in the table below. A full description of the option elements is provided in chapter 7 of the main report.

Table S3: Options 1-4

	Policy options
1	**Baseline** Any policy action must be compared with a baseline option that reflects a situation of no EU action. For this study, this implies that the Basic Regulation and associated Implementing Rules will not be revised, with the exception of the limited changes expected to be introduced through the SES 2+ policy package. Concretely the option means that: ▪ The distribution of roles and responsibilities between EASA and the CAs of the EASA Members States remain as they are to date. The same applies as to the distribution of roles and responsibilities between EASA, ICAO and Eurocontrol; ▪ Cooperation mechanisms and levels between CAs do not change in comparison to what they are today; ▪ The system evolves on the basis of existing mechanisms of interaction between MS and EASA.
2	**Enhanced cooperation within the system** This option is comprised of a set of individual actions that contribute to addressing a number of the core problem drivers, such as “insufficient resources compared to workload” and “differences in implementation of supervisory approaches”, however without changing fundamentally the structure of the system nor requiring any significant alterations to the existing legal framework. This option would focus on creating closer relations among the relevant actors in the system and on encouraging exchange of best practices through common forums under EASA auspices, and further development of the pool of experts.
3	**A joint oversight system with voluntary or mandatory transfer of responsibilities** Under this third option EASA and CA of EU MS retain their status of separate organisational entities but work closely together as a joint system. A legal framework is created to facilitate the delegation of responsibilities or allocation of specific oversight tasks on an ad hoc basis. For oversight of complex/multinational organisations, Member States have the possibility to delegate the responsibilities to EASA. This is referred to as the option 3a for the voluntary transfer of responsibility. The sharing of work is facilitated by common quality standards ensured through system-wide allocation of certain certification tasks for a specified period of time to a selection of qualified (accredited) CAs with resources available, and standardisation mechanisms which cover also common training and qualification requirements for staff. Alternatively this option could also envisage that for certain types of organisations or tasks the transfer of responsibilities from national to EU level would be mandatory. In this case, we refer to an option 3b for mandatory transfer of responsibilities.

	Policy options
4	**Single European Competent Aviation Authority (ECAA)** Under this option EASA becomes the competent authority for aviation safety in the EU. All responsibilities for regulation and oversight in all domains are set on European level, while the European competent authority allocates tasks to National Authorities, which act as local implementation offices. This would only occur if these National Authorities are capable to exercise the tasks up to the required standard. Under this option ECAA fully controls the work of National Authorities (where they act within the scope of the ECAA system) and allocates the tasks to them based on the actual demand for certification and oversight work in the system. ECAA sets a minimum acceptable time (in hours) requirement for inspections, the requirements for competent staff in terms of training and qualifications, and trains the inspectors. Standardisation mechanisms are replaced by an internal quality mechanism of ECAA which covers also the National Authorities.

Impact assessment results

In the following table, the impacts of Options 2, 3a, 3b and 4 on each of the impact categories are summarised. The magnitude of the impacts intensifies as the interventions to the existing system become more significant moving from Option 2 towards Option 3 and Option 4. Clearly, Option 4 scores well on both the safety impact and reduction in costs.

Table S4: Overall rating of options (score of options 2-4 is compared to option 1)

Impact	Option 2	Option 3a (Option 3b)	Option 4
Safety	+	--	++++
Regulatory compliance costs for public authorities (including government budget)	-	--	+++
Regulatory compliance costs for regulated entities	-	-	--
Functioning of the system	0/+	+ (++)	+++
Industry growth/competitiveness	0/+	+	++
Innovation	+	+	++
Employment conditions	0/+	0	+
Job creation	+	+	-
Qualification level	+	+	+
Environmental impacts	0/+	0/+	0/+

In addition to the qualitative assessment of the options, as summarised in the table above, quantitative estimates of the costs have been made. A summary is provided in the table below.

Table S5: Net present value, € mln, (4% discount rate), 2016-2030. Options 2-4 compared to Option 1

	Option 2	Option 3a (Option 3b)	Option 4
NPV of regulatory compliance costs for public authorities (EU)	9.6	10.6	7.4
NPV of regulatory compliance costs for public authorities (national)	4.9	37.5	-117.3
NPV of regulatory compliance costs for regulated entities	N.K	N.K.	4,062.0
NPV of other impacts (national budgets)	0	0	-4,062.0
Total additional costs (NPV)	14.5	48.1	-109.9

Option 2 is likely to result in additional costs of €14.5 million over the period 2016-2030 (compared to option 1) while option 3 is expected to add around €48 million. Option 4 is expected to lead to a cost saving of around €110 million for the 2016-2030 period. In the table above, we have separately shown the shift of €4 billion (NPV 2016-2030 or €400 million per annum) from national budgets to industry as a result of moving towards a fully industry funded system. As explained in chapter 8, the costs that have been quantified are not the only costs. Additionally, there are some costs elements for which quantification was not possible. However, there have been a series of benefits qualitatively described in chapter 8, and summarised in table 9.1, that represent as well a value. The safety benefits under option 2 and 4 are key in this respect. Clearly the above values are estimates, and depend heavily on the chosen implementation mode of options and assumptions taken.

Conclusions

The establishment of EASA and the introduction of the EU aviation safety requirements aimed at creating a common aviation safety regulatory system for the countries of the EU/EEA. A decade after the introduction of the system and the subsequent extension of its initial remit, the EASA system heads towards consolidation. In this context this study has focused on identifying the impact of the introduction of the EASA system on the availability and sufficiency of human resources to address the existing workload.

The quantitative analysis of data regarding the evolution of resources and workload for the European CAs, EASA, Eurocontrol and the JAA since the establishment of EASA revealed that both resources and workload have increased in this period. The increase of the workload was due to (amongst other) the aviation industry expansion, the standardisation requirements of the system and the increased amount of regulation. While new regulation is expected to have contributed to increasing the safety standards overall in Europe, the regulation was extensive in size and complexity, and subject to frequent changes. On the other hand, the resources increase occurred at a slower rate than the increase in the workload due to the budgetary and funding structure constraints in various CAs. All in all, the conclusion is that the resources – workload balance has deteriorated over the 10 years under study. This mismatch between resources and workload is intensified by a sub-optimal allocation of resources across the system and pressure on the qualification level of staff. Combined, these aspects prevent competent authorities from performing up to expectations. Additionally, the insufficient harmonisation of working approaches between CAs and the differences in charging schemes contribute to creating an uneven playing field, which undermines the common market in Europe, as well as to an unpredictable safety situation under conditions of a stable accident rate and increasing air traffic predictions.

Looking at EASA, the budget and resources of this Agency have increased over the past decade and EASA has shown a considerable output over these years.

The European aviation safety regulatory system that has been shaped in the past decade has brought substantial benefits. First and foremost, the European aviation safety track record is strong, as Europe is one of the world's safest regions to fly, with a very low accident rate. The system brought also significant benefits to industry as a result of the centralisation of certification.

A set of options have been examined in order to tackle the root causes of the problems of the current system and improve system performance to be ready for the coming decades, that will be characterised by new technologies that need to be incorporated into the system, as well as an increasing demand for air transport. The proposed options gradually develop the level of interventions starting from a series of light measures with minimal budget impact that do not require substantial legal amendments (Option 2). This option, including the development of a pool of experts, smoothens the negative impacts of the problem drivers and improves system performance without however structurally dealing with the essence of the problems. A more impactful intervention (Option 3a) requires the legal foundation of a cooperation framework to voluntarily delegate tasks between CAs and between CAs and EASA and an increased effort to harmonise the system, focusing on staff training and qualification levels. The effectiveness of this option is considerable especially when the delegation of tasks becomes mandatory (Option 3b) in case of persistent shortcoming of a national CA. Although it has not been possible to quantify, it should be noted that this sub-option addresses a shortage of resources in the core, as persistent shortages detected at a national CA allow EASA to take over oversight tasks and thus increase the output in terms of safety oversight in a certain country. The downside of this option is that the roles and responsibilities become more unclear as they may differ for certain domains between national and European level, with a negative effect on safety.

Finally, the transition towards a European Competent Aviation Authority (ECAA) encompasses a restructuring of the system in which all responsibilities for regulation and oversight in all domains are set at European level, and where the European competent authority may allocate tasks to national authorities, which act as local offices. This would only occur if these national authorities are capable to take up this responsibility. Option 4 also introduces a common charging framework. The option is expected to have a substantial positive effect on safety first of all. Additionally, it may result in regulatory compliance costs savings for public authorities, as the central allocation of tasks allows to optimise resources over the need to implement these tasks. The option can be expected to significantly improve the overall functioning of the system and facilitate technological and organisational innovation, positively affecting industry competitiveness. At the same time it would significantly increase the regulatory compliance costs for industry, as oversight would be nearly entirely financed through statutory fees and charges. This itself affects the level playing field for industry positively.

Recommendations

Based on the analysis, the study team has developed the following recommendations.

It is recommended that the Commission at least implements policy option 2. This option is in our view a no-regret option: it has limited implementation costs. On the other hand, there are positive impacts on safety, system performance, innovation and qualification levels. On balance, this option is thus worthwhile to implement.

However, option 2 does not address the problems and their drivers to a large extent due to the voluntary nature of the option elements. Both option 3b and option 4 would contribute significantly to solving core problem drivers as resource shortages at national CAs and their differences in supervisory approaches. As option 4 scores on many criteria, such as implementation costs, safety, a common approach throughout Europe and optimal standardisation of approaches, better than option 3b, it is recommended that the Commission implements this option to contribute to achieving its policy objectives in the area of European aviation safety, given the challenges ahead in the coming two decades.

One of the elements of option 4 is the transition to an overall funding of the certification and oversight tasks in European aviation safety based on industry charging. It should be noted that the effects of option 4 as summarised above, may also be achieved if there would be sufficient funding from the traditional mix, i.e. funding from the general national budgets and industry funding. It is therefore recommended that the Commission includes the political feasibility of this option element in the trade-off for the final formulation of the option.

List of abbreviations

Abbreviation	Full description
A/C	Aircraft
AATF	Airport and Airway Trust Fund
ADR	Aerodrome
ADR.OR	Aerodrome Operators
ADR.OPS	Aerodrome Operations
AEA	Association of European Airlines
AIR	Airworthiness
AMC	Acceptable Means of Compliance
ANS	Air Navigation Services
ANSP	Air Navigation Service Provider
AOC	Air Operator's Certificate
AR	Authority Requirements
ARA	Authority Requirements for Aircrew
ARO	Authority Requirements for Air Operators
ARP	Aerospace Recommended Practice
ASD-Europe	Aerospace & Defence Industries Association of Europe
AST	Office of Commercial Space Transportation
ASR	Annual Safety Review
ATC	Air Traffic Controller
ATCO licensing	Air Traffic Controller licensing
ATM	Air Traffic Management
ATO	Approved Training Organisations
AUR	Requirements for Airspace Users
AUX	Auxilary Agents
AVS	Aviation Safety
BASA	Bilateral Air Safety Agreements
BRLOS	Beyond Radio Line-Of-Sight
BVLOS	Beyond Visual Line-Of-Sight
CA	Competent Authority

Abbreviation	Full description
CAA	Competent Aviation Authority
CAMO	Continuing Airworthiness Management Organization
CAT	Commercial Air Transport
CC	Cabin Crew
CDG	Charles De Gaulle
CoA	Certificate of Airworthiness
COM SP	Communication Service Provider
CS	Certification Specifications
CS-LURS	Certification Specifications for Light Unmanned Rotorcraft and Aeroplanes
DGAC	Directorate General for Civil Aviation
DNM	Directorate of Network Management
DOA	Design Organisation Approval
DPS	Department Pan-European Services
EASA	European Aviation Safety Agency
EASp	European Aviation Safety Plan
EBAA	European Business Aviation Association
EC	European Commission
ECAA	European Competent Aviation Authority
ECAC	European Civil Aviation Conference
EEA	European Economic Area
EFTA	European Free Trade Association
ENAC	Italian Civil Aviation Authority
ESARR	EUROCONTROL Safety Regulatory Requirement
ESIM	ESARR Implementation Monitoring and Support
EU	European Union
EUR	Euro
FAA	Federal Aviation Administration
FAB	Functional Airspace Blocks
FCL	Flight Crew Licensing (See also PEL)
FSTD	Flight Simulation Training Devices
FTE	Full Time Equivalent
GA	General Aviation

Abbreviation	Full description
GAMA	General Aviation Manufacturers Association
GM	Guidance Material
IAG	International Airlines Group
ICAO	International Civil Aviation Organization
IFR	Instrument flight rules
ILT	Human Environment and Transport Inspectorate
INT COOP	International Cooperation
JAA	Joint Aviation Authorities
JAA LO	Liaison Office part of the JAA
JAA TO	Training Organisation part of the JAA
JAR	Joint-Aviation Regulation
JARUS-ORG	Civil RPAS operators and Approved Training Organisations for remote pilots
KLM	Royal Dutch Airlines
LBA	Federal Office for Civil Aviation of German y
MED	Medical
MS	Member State
MUAC	Maastricht Upper Area Control Centre
NAA	National Aviation Authority
NCF	Non-Compliance Findings
NCO	Non Commercial Operations
NK	Not Known
NPV	Net Present Value
NSA	National Supervisory Authority
OPS	Operations
ORA	Organisation Requirements applicable to Air Crew
ORO	Organisation Requirements for Air Operations
PBA	Performance Based Aviation
PBS	Performance Based Study
PEL	Personnel Licensing
POA	Production Organisation Approval
RAT	Risk Assessment Tool
RLOS	Direct Radio Line-Of-Sight

Abbreviation	Full description
RMT	Rulemaking Task
RPAS	Remotely Piloted Aircraft Systems
RPK	Revenue Passenger Kilometres
SAAQ	State Aviation Activities Questionnaire
SAFA	Safety Assessment of Foreign Aircraft
SAFOBENCH	Safety Oversight Comparative Analysis Study
SAR	Safety Analysis and Research
SAS	Scandinavian Airlines
SERA	Standardised European Rules of the Air
SES	Single European Sky
SESAR	Single European Sky ATM Research
SMS	Safety Management System
SNE	Seconded national agents
SPA	Operations Requiring Specific Approvals
SPO	Specialised Operations
SRC	Safety Regulation Commission
SRU	Safety Regulatory Unit
SSP	State Safety Programme
SWOT	Strengths, Weaknesses, Opportunities and Threats
TA	Temporary Agents
TC	Type Certificate
TLS	Tolerable level of safety
UAS	Unmanned Aircraft Systems
USOAP	Universal Safety Oversight Audit Programme
VLOS	Visual Line-Of-Sight
WA	Working Agreement

1 Introduction

1.1 Background of this study

The present civil aviation safety system in the EU is based on common safety rules designed for uniform application across the Union. The Joint Aviation Authorities (JAA) developed the first common standards for aviation safety in Europe based on a voluntary cooperation of Member States between 1970s and early 2000s. With the adoption of Regulation (EC) No 1592/2002 and the subsequent creation of the European Aviation Safety Agency (EASA) in 2003 a new regulatory framework was created. It aims above all at a high level of civil aviation safety in Europe while protecting the environment and facilitating the free movement of goods, persons and organisations in the internal market.

Through the subsequent EU regulation the scope of the EU aviation safety system and of responsibilities of EASA were further increased. In brief, Regulations (EC) No 216/2008 (also call the "EASA Basic Regulation") and (EC) No 1108/2009, amending the former, extended the initial scope of EASA activities from airworthiness and environmental certification of aeronautical products to air operations, pilots' licences and to the safety of third-country aircraft and even further to cover also the safety of aerodromes, air traffic management and air navigation services. The first generation of detailed rulemaking in all these areas is now largely completed.

The recent evaluation of the EASA system conducted under Article 62 of the EASA Basic Regulation suggests inter alia that some national Competent Authorities (CAs) are finding it difficult to fulfil their statutory and EU safety responsibilities due to staffing and financial issues. The Article 62 evaluation also acknowledged that in the current economic climate, there is a huge strain on the resources of Member States, CAs and EASA.

It has now been over ten years since the creation of EASA, and the European Commission is intending to evaluate the overall functioning of the EU aviation safety system with a view to proposing possible improvements. One of the issues that the Commission intends to look at in this respect is the availability, use and evolution of resources which are necessary for the effective and efficient functioning of this system.

Towards the future

The underlying intervention logic for a potential implementation of improvements is in essence the upcoming challenge to maintain the very high aviation safety standard in Europe, while at the same time traffic is forecasted to grow in the coming decades, and while substantial technological and economic shifts will apply in the aviation system (e.g. SESAR deployment, drones integration). At the same time, budgetary pressures exist and are likely to continue on Member States, national aviation authorities and EASA. This is a risk for the current EASA system. As such, one needs to review to which extent there are major shortcomings in the way aviation safety resources are used in the EU, the adverse impacts that these shortcomings could have on aviation safety in the future, and to identify options for change.

1.2 Objective of the assignment

The objective of this assignment is to analyse the availability, efficiency of utilisation and evolution of human resources (including number and category of personnel and relevant costs, as well as their productivity, necessary qualification and expertise) and the financing needs and sources of the European aviation safety system in relation to the tasks which were performed before the creation of EASA, and which are performed today. In addition, it aims at identifying the strong points, best practices and shortcomings in this respect and to propose possible options for improvement.

1.3 Structure of this report

This report is the final report for this study. It consists of the following chapters:

- Chapter 2 that describes our approach for the study, and data collection effort;
- Chapter 3 that provides an overview of the resources and workload at European level;
- Chapter 4 that details the resources and workload at member states level;
- Chapter 5 analyses the effect on the overall European aviation safety system of the creation of EASA combining the findings of Chapters 3 and 4;
- Chapter 6 that provides the main problem analysis regarding resources and workload in the current situation;
- Chapter 7 describes a number of policy options to address the problems;
- Chapter 8 details the various safety, economic, social and environmental impacts of the policy options;
- Chapter 9 provides the conclusions and recommendations.

2 Approach and data collection

2.1 Approach of the study

The approach for this study consists of seven main tasks. These are listed below:

- Task 1 Assessment of current situation;
- Task 2 Assessment of pre-EASA situation;
- Task 3 Comparison of current situation and pre-EASA situation;
- Task 4 SWOT of current situation;
- Task 5 Baseline assessment;
- Task 6 Option formulation;
- Task 7 Impact assessment.

Basically, these seven tasks can be grouped in three major building blocks to be undertaken for this study:

1. **Comparative analysis;**
2. **Problem Analysis & Option definition;** and
3. **Impact Assessment & comparison of options**.

The following table details the approach of these tasks and also outlines where the outputs of these tasks are reported.

Task	Approach	Output
Task 1 Assessment of current situation	Assessment of the situation today in terms of resources and workload deployed for aviation safety in Europe. This is done for EASA, Eurocontrol and competent national aviation authorities (CAs). Inputs have been EASA standardisation data, and a survey among CAs, which have been analysed by the study team, amongst others by developing workload/resource ratios.	The outputs of these three tasks have been reported in chapter 3 (European level) and 4 (national level). The current and pre-EASA situation have been combined in the analysis by showing both the pre-EASA data and current situation data, in a single graph or table, showing the trend for the different indicators. The findings of these two chapters are combined in chapter 5 to analyse the overall evolution of
Task 2 Assessment of pre-EASA situation	Equivalent analysis as in task one, but now for the pre-EASA situation. The pre-EASA situation is defined as the situation before competences in a certain domain moved to EASA. Inputs have been data from the JAA audits, ICAO USAOP data and a survey among CAs. The data have been analysed by the study	

Task	Approach	Output
	team, amongst others by developing workload/resource ratios.	resources.
Task 3 Comparison of current situation and pre-EASA situation	The outputs of the previous tasks have been compared in this task. The draft findings have been presented in a Verification Workshop at EASA with experts from the Agency, to challenge the draft results. Comments raised in this workshop have been processed in this report.	
Task 4 SWOT of current situation	The output of task 3, as well as a document review and extensive interview programme have been used by the study team to analyse the main problems in the current situation, their drivers and underlying root causes. The draft findings have been presented in a Verification Workshop at EASA with experts from the Agency, to challenge the draft results. Comments raised in this workshop have been processed in this report.	The output of this task has been reported in the chapter on the Problem Analysis, chapter 6.
Task 5 Baseline assessment	An assessment of external trends, as well as planned activities of authorities has been carried out to establish a baseline assessment. This serves to determine to how the problems identified in the previous task will develop (increase or decrease in severity in the future). A gap analysis is conducted on the baseline scenario. The gap analysis estimates what level of resources (staff and budget) would be required in the years 2020 and 2030 to ensure a continuation of the current resource levels (baseline) – relative to workload – based on industry level activity forecasts and the associated evolution in workload trends (for all relevant actors).	The output of this task is provided in chapter 7, in the assessment of the baseline scenario option.
Task 6 Option formulation	Possible policy options to address shortcomings of the current aviation safety regulatory system have been formulated. These are linked with the problem drivers and root causes.	The output of this task is provided in chapter 7, that describes the 3 policy options in addition the baseline scenario option undertaken in Task 5.
Task 7 Impact assessment	Each of the policy options is studied, and the different safety, economic, social and environmental impacts are determined. This	The output of this task is provided in chapter 8, that describes the impacts of

Task	Approach	Output
	includes the costs for different actors of implementing the option.	options and chapter 9, in which options are compared in terms of impacts.

2.2 Data collection process

In order to make the analysis of the different tasks, an extensive data collection effort has been conducted, aiming to gather relevant information that was scattered among various sources. In summary, the following main data collection efforts have been undertaken:

- Quantitative and qualitative information regarding the workload and availability of human resources at EASA collected through documentation made publicly available by the Agency, such as EASA Annual Reports, EASA Multiannual Staff Policy Plans, EASA Business Plans, as well as legislative documentation, such as the different versions of the Basic Regulation[1] and previous study reports;
- Quantitative and qualitative information regarding the resources available in CAs and implementation of standardisation collected through Annual Standardisation reports; workload and resource data for year 2013 retrieved also from EASA Standardisation database;
- Quantitative and qualitative information regarding resources and workload in the pre-EASA situation retrieved from the JAA archives. These have been stored at EASA, and contained data from the JAA audits regarding resources and workload, mainly feeding the task on the assessment of the pre-EASA situation;
- Additional data collected from the 2009 SAFOBENCH[2] study, in which also an analysis of resources and workload was carried out;
- Data on ICAO retrieved from the ICAO USAOP programme;
- Data collected through an electronic survey dispatched to all 28 member states of the European Union (EU), and all 4 states not being member of the European Union but members of the European Free Trade Association (EFTA), together forming 32 EU/EFTA Member States. This survey aimed at filling in the missing information gaps left after the analysis of data from the sources mentioned above. The details of the survey are addressed in chapter 4;
- Qualitative information collected via semi-structured interviews with CAs, Eurocontrol and other relevant stakeholders concerning the impact of the creation of EASA on their operations, their views on the future of the EASA system and interpretation of the data collected:
  - Interviews with Competent Authorities: 16;
  - Interviews with EASA: 2;

[1] Regulation (EC) No 216/2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency (20 February 2008), formerly Regulation (EC) No 1592/2002, as amended by Regulation (EC) No 1108/2009.

[2] NLR, Safety Oversight Comparative Analysis Study, 2009.

- Interviews with Eurocontrol: 2;
- Interviews with other relevant stakeholders: 5.

Interviews or discussions were held with the following organisations listed below. An overview of the main findings and conclusions from these stakeholder consultations can be found in Annex I to this report.

Organisation	Country
Federal Ministry for Transport, Innovation and Technology	Austria
Federal Public Service Mobility and Transport	Belgium
Department of Civil Aviation of Cyprus	Cyprus
Civil Aviation Authority of the Czech Republic	Czech Republic
Danish Transport Authority	Denmark
Estonian Civil Aviation Authority	Estonia
Finnish Transport Safety Agency	Finland
Directorate General for Civil Aviation (DGAC)	France
Federal Office for Civil Aviation of German y (LBA)	Germany
Italian Civil Aviation Authority (ENAC)	Italy
Human Environment and Transport Inspectorate (ILT)	The Netherlands
Civil Aviation Authority of Norway	Norway
Civil Aviation Office of Poland	Poland
Romanian Civil Aeronautical Authority	Romania
Spanish Civil Aviation Authority	Spain
Civil Aviation Authority	UK
European Aviation Safety Agency (EASA)	
Eurocontrol	
SESAR JU	
Association of European Airlines (AEA)	
Aerospace & Defence Industries Association of Europe (ASD-Europe)	
European Business Aviation Association (EBAA)	
General Aviation Manufacturers Association (GAMA)	

In order to make a comparison possible between the situation ‘before’ and ‘after’ the establishment of EASA, three different periods are distinguished when analysing the available data.

- Period 1 reflects the situation in 2003 or close to this year;

- Period 2 reflects the situation in 2008 or close to this year; and
- Period 3 reflects the situation in 2013 or close to this year.

Hence, period 1 refers to the pre-EASA situation; period 2 refers to the situation in which some of the aviation domains are already under responsibility of EASA, while other domains (Operations, Licensing, ANS and Aerodromes) are not, and period 3 refers to the current situation in which EASA has responsibility in all the main aviation domains.

2.3 Methodology for assessment of workload and resources and data quality

This study relies to a large extend on the extensive data collection effort to collect relevant data for the quantitative parts of the analysis assessing the impact of the creation of EASA on the resources available to aviation safety in the EASA system.

A major challenge of this study was the absence of a standard model for assessing the resources and workload of the aviation safety system. The absence of a standardised approach is even more apparent when attempting to derive appropriate specific indicators as there exist no widely used and accepted indicators for measuring the resources and workload in the aviation safety system.

The final selection of indicators used intended to match the availability of relevant data with the calculation of meaningful quantifications. Initiating from an analysis of the actual tasks performed in the different domains of aviation safety, the study team focused on the creation of indicators that could quantify the output of the tasks performed in each domain, leaving the minimum possible room for misinterpretation or quantifications that are based on subjective performance outputs.

Another major challenge for this study was dealing with the lack of completeness of the available datasets. For example the data required for our analysis were not consistently collected by the relevant stakeholders for all the years of the analysis and therefore the study team had to deal with data gaps especially regarding the data collected from the inquired MS. To overcome these data gaps in our analysis various methodologies have been used (such as the use of proxy data, different samples of states for assessing different indicators, averages values etc.) as elaborated in the relevant sections of this report. The practical implication of this approach is that most of the quantifications performed in this study should be considered approximations rather than solid numerical calculations. Therefore in this report we emphasis were necessary on the estimation of trends rather than absolute changes in the indicators used.

This resulted in the use of higher level indicators such as the number of certificates or licenses issued that do not allow for subjective performance assessment (i.e. such as the hours spent etc.). The use of higher level indicators also facilitates the search for coherent data, data on higher levels are available by more sources. Overall the choice made was to provide with a solid quantitative basis for our analysis that could then be assessed in detail with the use of the extensive qualitative input that was also collected.

A downturn of the use of higher level indicators is the loss of detail through the aggregation of specific indicator categories that might have significant differences (i.e.

different types of certificates can require significantly different amounts of effort). Taking this loss of critical detail into consideration, where possible, this study has investigated targeted lower level indicators as can be seen in the following chapters.

Additionally, the emphasis on the use of quantitative indicators of work output led to inaccuracy in assessing or even inability to assess the workload in domains and tasks with a less standard quantified output. Such domains are those of international cooperation, safety analysis and research etc. There, the use of quantifications can lead to considerable misjudgements regarding the effort required as the effort needed for a unit of output can differ considerably. In these cases, the qualitative input collected was critical for our assessments.

As presented in the previous section, a multitude of sources where used to collect the relevant quantitative data. The use of multiple sources to collect the relevant data was more of a necessity rather than a choice for the study team. However, it has been noted that the data originating from different sources was not always coherent. This can be attributed to a number of reasons. Amongst them are the differences in definitions used, perception of the data inquiries, accounting methods as well as the possible use of rough estimations in previous reporting. This has been the case especially for the data referring to the indicators used for assessing the resources and workload of the CAs.

Altogether, these data inconsistences lead to the need to carefully handle the collected data. In order to reach an as coherent as possible inventory, the data collected have been critically reviewed and compared with relevant data retrieved from other sources or referring to other time periods. Additionally, in case of larger inconsistences acknowledged, the survey was used as a first means to verify data for which doubts arose. Additionally, the interviews with the extended selection of MS were used to further cross-validate “suspicious” values.

The data that have been retrieved have been used with every precaution and accounting for the quality of the data set. Where possible the quantitative analysis has been based on the most coherent set of data available. Moreover, the estimation of trends is made on a more concrete basis, to rely on datasets with internal coherence.

2.4 Verification workshop with EASA

As briefly indicated in section 2.1, draft results of tasks 1-4 of the study have been presented during a Verification Workshop at EASA on 27 November 2014. In this 5-hour workshop, five representatives of the Agency technically challenged the draft results presented by the study team. These were representatives from the Certification, Standardisation and SAFA departments / units of EASA. The main outcome of the workshop has been processed in the results, as presented in this report.

3 Workload and resources available at a European level

3.1 Introduction

In this section workload and resources in the area of aviation safety on a European level are described. The main part of the chapter is about the development of the responsibilities of EASA in connection to the evolution of its workload and the human resources employed by EASA to fulfil the assigned mission. The analysis of the responsibilities of EASA is based on (i) the existing EU regulations that create the framework for the tasks the Agency is assigned to perform, which have been retrieved from EASA's website, as well as (ii) on the Article 62 Evaluation of EASA. The quantitative information regarding the workload of EASA and available human resources to perform the tasks of EASA are retrieved from documentation made publically available by the Agency, such as Annual Reports, Budgets, Work Programmes, Business Plans, Multiannual Staff Policy Plans and Business Plans, as well as from the Annual Standardisation reports.

Additionally we describe the current and past role of Eurocontrol in the area of aviation safety, as well as the former role of the Joint Aviation Authorities (JAA).

3.2 Overview of development of EASA

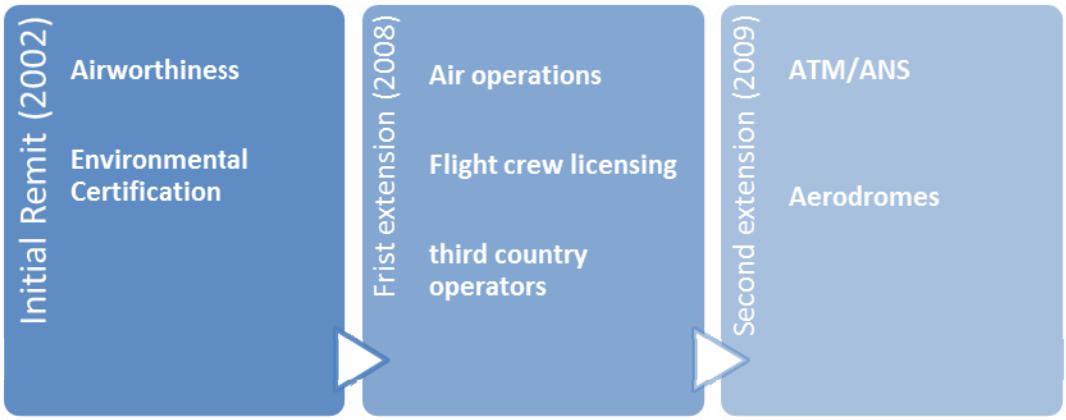
On 15 July 2002, the European Parliament and the Council of the European Union adopted Regulation (EC) No 1592/2002 establishing common rules for the EU in the field of civil aviation and creating a new European Aviation Safety Agency (EASA). The main objectives of the EASA system as defined in this Regulation are:

- To establish and maintain a high, uniform level of civil aviation safety in Europe;
- To facilitate and promote the objectives of the common EU market (i.e., the free movement of goods, persons and services); and
- To provide a level playing field for all actors in the internal aviation market.

Since its establishment in 2002, EASA has progressively taken over the responsibilities of the former JAA system, which ceased to exist on 30 June 2009. The JAA system developed the first common standards for aviation safety at the European level based on a voluntary cooperation between Member States. Unlike its predecessor, which had no force of law to apply its harmonised Joint Aviation Requirements (JARs), the EASA regulatory framework is based on a set of common safety rules developed for uniform and mandatory application across the EU. The Agency oversees on behalf of the Commission the implementation of these rules by CAs.

The Agency derives its legal powers from the 'Basic Regulation' Regulation (EC) No 216/2008 of 20 February 2008 (formerly Regulation (EC) No 1592/2002) as amended by Regulation (EC) No 1108/2009 of 21 October 2009. Through these successive regulations, the Agency's responsibilities and the scope of its work have increased, from the initial scope covering airworthiness and environmental certification of aeronautical products to air operations, flight crew licensing and the safety of third-country aircraft, to the safety of aerodromes, air traffic management (ATM) and air

navigation services (ANS). The figure below illustrates the EASA legal framework and scope of EASA competences.



The Agency has a number of specific regulatory and executive tasks in the domains falling under its remit. The primary tasks of the Agency include:

- *Rulemaking:* The Agency prepares draft rules and provides technical advice for consideration within the EU legislative procedures and, for certification purposes, issues certification specifications (CS), acceptable means of compliance (AMC) and guidance material (GM);
- *Type-certification and organisation approvals:* The Agency is directly responsible for certain certification and approval tasks, detailed further in the following sections;
- *Standardisation and inspections:* Where CAs are responsible for the implementation of the adopted rules, the Agency monitors their implementation through continuous monitoring activities, including standardisation inspections and audits;
- *Safety Analysis and Research*: This includes the collection of data, analysis and research aimed at improving aviation safety;
- *International cooperation*: The Agency may cooperate with other aeronautical authorities of third countries and international organisations, but may not establish relationships with third countries directly. The latter is the remit of the EU and its Member States, with the Agency assisting the EU and MS.

The following sections detail the evolution of EASA and its expanding set of responsibilities and activities from its establishment to the present.

3.2.1 Establishment of EASA: 2002 – 2007

Since the adoption of Regulation No 1592/2002 in 2002 and subsequent creation of EASA on 15 July 2003, the Agency has assumed its responsibilities progressively. Initially, the Regulation established only the basis of EU action in the Airworthiness and Environmental Certification domains. The main tasks assigned to the Agency

under the Basic Regulation 1592/2002 include: (1) Rulemaking; (2) Certification and Approvals; (3) Standardisation and inspections, and; (4) research.

EASA became operational on 28 September 2003 with the entry into force of Commission Regulations (EC) No 1702/2003 implementing the Part-21 certification procedures and (EC) No 2042/2003 on Continuing Airworthiness, at which point EASA assumed responsibility for the initial and continued airworthiness and environmental certification of all aeronautical products, parts and appliances designed, manufactured, maintained or used under the regulatory oversight of the EU MS.

Regarding its rulemaking tasks, the Agency contributes to the drafting of all legislation related to the regulation of civil aviation safety and environmental compatibility which fall within the scope of Regulation 216/2008. It submits opinions to the Commission and, for certification purposes, issues certification specifications (CS), acceptable means of compliance (AMC) and guidance material (GM).

The Agency's tasks in certification encompass all post-certification activities, including the approval of changes to, and repairs of, aeronautical products and their components, and the issuing of airworthiness directives to correct any potentially unsafe situation. EASA also became the competent authority to approve and oversee the organisations involved in the design of aeronautical products, parts and appliances. It carries out the same function for foreign organisations involved in the manufacture or maintenance of such products. In these domains, the Agency has therefore taken over the certification and approvals tasks previously under the remit of Member States.

Finally, where EU law is implemented by CAs, EASA is tasked with carrying out all standardisation functions for all aviation safety certification activities of EU Member States and other European states associated with the EU aviation safety system. The specific roles assigned to EASA include the performance of standardisation inspections and continuous monitoring of CAs. EASA became the competent authority for the abovementioned tasks as per 1 August 2006 following the entry into force of Commission Regulation (EC) No 736/2006. EASA is also the competent authority to oversee the management and coordination of the EU SAFA (Safety Assessment of Foreign Aircraft) programme regarding the safety of foreign aircraft using EU airports, applicable as per 1 January 2007 under Commission Regulation (EC) No 768/2006.

Table 3-1 below summarises the chronological establishment of EASA's competencies under Regulation (EC) No 1592/2002.

Table 3-1 EASA's competences under Regulation 1592/2002

Domain	Implementing Rule	Reg. entry into force	Start date of EASA as CA
Initial airworthiness *Part 21*	EC No 1702/2003	28 September 2003	28 September 2003

Domain	Implementing Rule	Reg. entry into force	Start date of EASA as CA
Continuing airworthiness *Part M, 145, 147, 66*	EC No 2042/2003	29 November 2003	29 November 2003
Standardisation Inspections* *Initial/Continuing Airworthiness*	EC No 736/2006	1 June 2006	1 August 2006
SAFA* *Collection and exchange of data, EASA central coordination*	EC No 768/2006	9 June 2006	1 January 2007

*Not an EASA rulemaking task under Regulation 1592/2002.

3.2.2 First extension: 2008

With the adoption of Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 (the EASA "Basic Regulation"), the scope of EU competence was extended to cover air operations, flight crew licensing and aircraft used by third country operators into, within or out of the EU. As a result, the Agency acquired additional operational responsibilities (Rulemaking, etc.) to cover its new remit.

In the air operations domain, the Agency was given responsibility for determining corrective actions and disseminating information to react without undue delay to a problem affecting the safety of air operations. In the domain of flight crew licensing, the Agency is competent for the approval and oversight of pilot training organisations and aero-medical centres located outside the territory of the EU; the certification of flight simulation training devices operated by the training organisations it certifies, or by those located outside the territory of the EU, or located in the EU territory, if the Member State concerned so requests. Concerning third country operators, the Agency is responsible for the authorisation and oversight of commercial operators; for the oversight of non-commercial operators when they are required to declare their activities; and for the authorisation of third country aircraft when they are not in compliance with ICAO Standards.

Finally, the scope of standardisation activities tasked to the Agency under its new remit was similarly extended to Operations (OPS), Flight Crew Licensing and Flight Simulation Training Devices (FSTD).

Applicability of first extension competences

Member States' national rules continued to be the rules applicable to FCL and OPS until the Implementing Rules on FCL and OPS were adopted and became applicable on 8 April 2012 (and subject to additional opt-out clauses contained in the respective Implementing Regulations).

The new standardisation functions became applicable under Commission Implementing Regulation (EC) 90/2012 on 8 April 2012 (subject to additional opt-out clauses contained in the respective Implementing Regulations). **Table 3-2** below presents this development.

Table 3-2 Development of EASA's competences under Regulation 216/2008

Domain	Implementing Rule	Reg. entry into force	Start date of EASA as CA
Air crew *Part FCL, MED*	EC No 1178/2011	15 December 2011	8 April 2012
Air Crew *Part CC, ARA, ORA*	EC No 290/2012	25 April 2012	8 April 2012
Air operations *Part ARO, ORO, CAT, SPA*	EC No 965/2012	28 October 2012	n/a
Air operations *Part NCC, NCO*	EC No 800/2013	25 August 2013	n/a
Air operations *Part SPO*	EC No 379/2014	24 April 2014	n/a
Standardisation extension *SAFA, OPS, FCL and FSTDs*	EC No 90/2012	4 February 2012	4 March 2012
Third country operators	EC No 452/2014	26 May 2014	26 May 2014

n/a – not applicable to EASA as CA.

3.2.3 Second Extension: 2009

The EU subsequently adopted Regulation (EC) No 1108/2009 amending Regulation (EC) No 216/2008 in the fall of 2009 as part of a larger aviation package that also included the second round of legislation for the Single European Sky (SES II), further extending EASA's scope to cover the fields of air traffic management (ATM) and air navigation services (ANS) and aerodrome/airport safety and interoperability. The second extension of the Basic Regulation further widened the scope of the Agency's rulemaking, certification and oversight, and standardisation activities to include the areas of ATM/ANS and Aerodromes.

ATM/ANS

Under the amended Basic Regulation, the Agency's main tasks in the field of ATM/ANS include rulemaking and standardisation, as well as certain certification and oversight responsibilities.

The scope of EASA rulemaking competence covers ATM/ANS providers, safety oversight, ATCO licensing, SERA, Requirements for airspace users (AUR) and ATM/ANS systems and equipment. The extension also empowers the Agency to take the necessary measures related to certification and oversight of Pan-European and third country ATM/ANS organisations, as well as for the air traffic controllers' training organisations located outside the territory of the EU.

Regarding standardisation the Agency commenced its standardisation inspections in ATM/ANS from April 2012 onwards with the twofold aim to ensure uniform implementation of the common rules as well as to reinforce the national competent authorities in their own oversight role.

Aerodromes

In the field of aerodromes, EASA's rulemaking and standardisation tasks are expanded to cover the design, maintenance and operation of aerodromes; the design, production and maintenance of aerodrome equipment; CS for aerodrome design and safety oversight. No certification role is foreseen for EASA in the field of aerodromes under the second extension.

International Cooperation

In the area of International relations: EASA assists the EU and the MS in their relations with third countries. Though EASA participates in certain ICAO working groups, only the MS are members of ICAO. EASA also plays an active role in technical assistance to third countries.

Applicability of second extension competences:

The Agency's new rulemaking and certification functions under the amended BR became applicable with the entry into force of the related Implementing Rules in September 2011. Though not applicable to EASA as competent authority, the implementing regulations bringing aerodromes under the domain of EASA entered into force in February 2014. The new standardisation functions regarding ATM/ANS became applicable in March 2012 Regulation (EC) 90/2012. Standardisation activities in the aerodrome domain are due to begin as of 2018. See **Table 3-3** below for an overview.

Table 3-3 Development of EASA's competences under the amended Regulation 216/2008

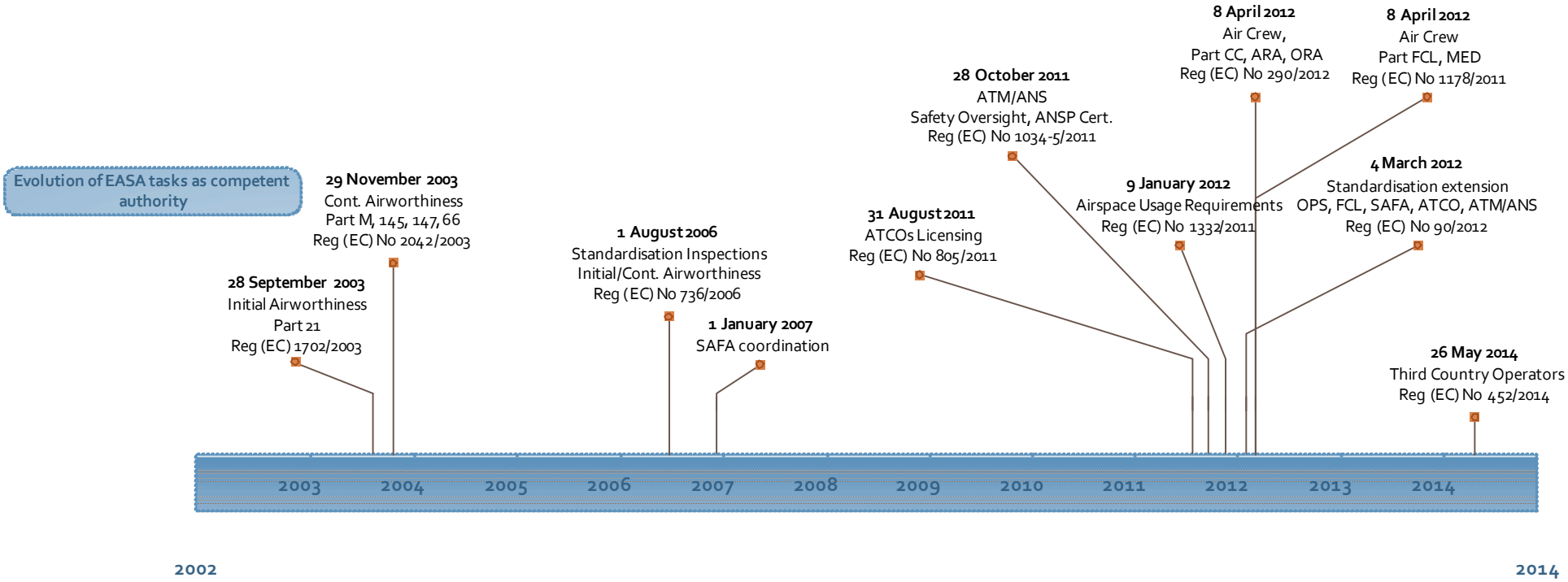
Domain	Implementing Rule	Reg. entry into force	Start date of EASA as CA
ATCOs Licensing	EC No 805/2011	31 August 2011	31 August 2011
ATM/ANS *Safety Oversight*	EC No 1034/2011	28 October 2011	28 October 2011
ATM/ANS *ANSP Certification*	EC No 1035/2011	28 October 2011	28 October 2011

Domain	Implementing Rule	Reg. entry into force	Start date of EASA as CA
AUR *Airspace usage requirements*	EC No 1332/2011	16 December 2011	9 January 2012
SERA *Common Rules of the air*	EC No 923/2012	23 October 2012	n/a
Systems	To be defined		
Aerodromes *Part ADR.AR, ADR.OR, ADR.OPS*	EC No 139/2014	12 February 2014	n/a
Standardisation extension *ATM/ANS, ATCO*	EC No 90/2012	4 February 2012	4 March 2012

3.2.4 Evolution of tasks

The evolution of EASA's competences as established in the successive regulations as well as its practical responsibilities are depicted in the timelines below.

Figure 3.1 Evolution of EASA responsibilities as competent authority



3.3 Quantitative development over time of EASA workload and resources

3.3.1 Quantitative development of workload over time

The establishment of the EASA system in 2003 and the gradual transfer of competencies from the JAA and the CAs to the Agency as defined under Regulation 1592/2002 as well as the first and second extensions to the EASA scope, led to an increasing workload for the Cologne–based Agency since its creation. Of course this has been influenced also by other factors, such as the global and European aviation trends regarding both technical and economic aspects.

In the following table, an attempt to capture the evolution of the workload of EASA staff is made by presenting a number of indicators that measure the outcome of their work regarding some of the most significant tasks of the Agency (where quantification was possible and meaningful).

Table 3-4: EASA workload

EASA Workload Indicators	2005	2008	2013
Rulemaking (Decisions + Opinions issued)	1+11	11+6	20+12
Certificates issued	7931	4360*	3741
(of which)			
TC New Derivatives, Major changes, Major repairs	*1338*	*919*	*1017*
Minor changes/Minor repairs	*5444*	*1678*	*643*
Organisations approved	1917	2108	2501
Standardisation audits/inspections	26	79	112
SAFA inspections	-	0	13
Safety analysis and research	No proper indicator		
International cooperation			
- Bilateral and Working Agreements negotiated	8	14	9
- Technical Assistance Projects	1	?	9

** Certification data of 2009 are used for consistency with the 2013 data as the counting methodology changed. The 2005 data have been produced using a different methodology*

In 2003, when EASA was established, the Agency, at that time employing only its Executive Director, did not have the capacity to take up any workload yet until it had increased its ranks with the appropriate staff members. By 2005, the workload performed by the Agency in the fields of Rulemaking, Certification, Organisations approval and standardisation seemed to be considerable, nevertheless, EASA was at that time relying considerably on the contribution of Member State experts to undertake this. Thereafter, the situation has changed significantly. In all areas of EASA activity, the reliance of EASA on MS for performing this workload has decreased while also new activities have been added to its scope ultimately increasing the workload for EASA agents, both by 2008 as well as between 2008 and 2013.

Since its establishment, EASA has been issuing a steadily increasing number of Rulemaking Decisions and Opinions. Especially Decisions have risen from 1 in 2005 to between 8 and 14 for the 2007-2011 period, to around 20 in years 2012 and 2013. The latter may as well have been the consequence of the increased scope of EASA activities after the second extension of its scope which became effective in late 2011 and early 2012. However, with the rulemaking activity of EASA having produced, by 2013, the main aviation regulations according to EASA's extended remit, the EASA Rulemaking department has been abolished in the recent reorganisation of the Agency. Rulemaking activity is now focused primarily on maintaining and updating the existing regulatory system instead of producing regulations for new areas. With the only major exception to that being the prospective regulation of new technologies such as RPAS. Nonetheless, any potential further expansions to the scope of the regulation framework or the addition of new concepts (such as the introduction of a performance-based approach to aviation safety oversight or that of safety management systems) are expected to require significant amounts of resources due to the need to completely review the current regulatory framework before such changes can become effective.

Contrary to other aspects of EASA workload, over the lifespan of the Agency a decrease in the number of certificates issued can be observed. However, even after taking into account the variations in the workload required for different certificate types, the actual workload performed by EASA has actually increased. First of all the mix of certificate types has evolved between 2008 and 2013, with EASA issuing now more *TC New Derivatives, Major changes*, and *Major repairs* (which require the most effort to issue), while the number of the *minor changes/minor repairs* certificates has substantially decreased over that period as DOA organisations have been allowed to produce these certificates. The second factor explaining an increased EASA workload in the area of product certification, is the fact that EASA has increasingly internalised this task. Over time the participation of MS staff in certification activities has steadily decreased with EASA staff contribution rising from about 5% in 2004 to about 80% currently. These factors have led to an overall increase of the actual workload performed by EASA staff in the field of certification since the establishment of the Agency, as seen in Table 3-5.

Table 3-5: EASA internalisation of certification workload

	2005	2008	2013
Internalisation rate of Certification task	13%	38%	80%
Certificates produced	7931	4360	3741
EASA workload (approx.)	**1031**	**1657**	**2990**
Major certificates produced	1338	919	1017
EASA workload (approx.)	**174**	**349**	**814**

Also, the number of organisations approved by EASA over the same period of time has increased (from 1917 in 2005, to 2108 in 2008 and finally to 2501 in 2013, which represents a 30 % increase). Although the extension of the EASA scope brought additional workload through the introduction of new organisation categories (flight

crew licensing and ATM/ANS organisations), this increase in the absolute number of organisations approved is driven mainly by an increase in the production and continuing airworthiness organisations.

Regarding the standardisation inspections, there is also an observed increase in the total number of inspections performed. The following table provides a break-down of these inspections to the various domains of aviation safety while indicating (where figures were available) the share of the standardisation team members provided by EASAs.

Table 3-6: Standardisation inspections of EASA

Standardisation domain	**2005**		**2008**		**2013**	
	Number of Inspections	**EASA team members***	**Number of Inspections**	**EASA team members***	**Number of Inspections**	**EASA team members***
Airworthiness	26	18%	39	46%	44**	62%
Air Operations	n/a		12	n/a	16	74%
Flight Crew Licensing	n/a		11	n/a	16	75%
MED	n/a		11	n/a	12	81%
FSTD	n/a		6	n/a	9	52%
ATM/ANS	n/a		-	n/a	15	77%
Total	**26**	**18%**	**79**	**46%**	**112**	**69%*** **
EASA workload (approx.)	**4,7**		**36.3**		**77.3**	

* Team members from EASA as share of the total inspection team (CA+EASA staff).

** Includes production and maintenance. From 2011 onwards the inspections for continuous and initial airworthiness have been merged. In this case 22 inspections have been nominally made but 44 are accounted for to retain comparability of data to 2008 data.

*** Weighted average of all the other fields.

n/a = not available.

The transfer of the standardisation inspections from JAA to EASA for Air Operations, Flight Crew Licensing, Flight Simulation Training Devices as well as the introduction of ATM/ANS standardisation inspections to the EASA system according to the second extension of the EASA scope have led to an overall increase in inspections performed by EASA. In addition, the number of Airworthiness standardisation inspections performed by EASA has slightly increased over the studied period. The inspection effort of EASA has further increased when considering the introduction of SAFA inspections to its scope. It should be also noted that the teams performing these

standardisation visits consist of a combination of EASA and CA employees. For the domain of Airworthiness, where data availability allows for comparisons, it can be noted that the participation of MS inspectors in the teams has significantly decreased over time. Overall, inspections take place with a smaller but still important participation of experts seconded by the CAs of Member States.

In assessing the workload of the safety research and analysis, no appropriate quantifiable workload indicator has been identified. This task is performed by a steady number of experts that actually produces indicators after the analysis of safety data to trigger rulemaking activity. In that perspective, the workload performed by these experts can be considered increasing over the examined time period with the expansion of the EASA remit to new domains

Finally, the indicators used to measure the international cooperation tasks performed by EASA produce a mixed picture. The decrease in the number of Bilateral Air Safety Agreements (BASAs) and Working Agreements (WAs) negotiations with EASA participation after 2008 can be considered to be countered by the increased workload related to Technical Assistance Projects with Third countries undertaken by EASA. Moreover, the implementation of the BASAs and WAs can require additional resources increasing further the overall workload in the field of international cooperation.

3.3.2 Quantitative development of resources over time

Since the creation of EASA in 2003 and the subsequent extension of its remit, both the workload and corresponding human resources have increased. The data regarding the human resources of the Agency are retrieved from documents made publically available by EASA and therefore the breakdown of employees to the various tasks where EASA is active, is based on the departmental breakdown of EASA.

All in all, EASA has grown from its very beginning in 2003 to employing 176 staff members by the end of 2005, which sharply rose to 447 by the time when the first extension of the scope of EASA was adopted in 2008. Furthermore, in 2013, and with the implementation of the second extension of the EASA scope being underway, the Agency was employing 764 agents. Temporary Agents (TAs), are the largest staff category. They have increased from 153 in 2005 to 404 in 2008, to finally reach 648 in 2013. As seen in the following table, in the same time also Contract Agents increased from 16 in 2005, to 37 in 2008 to finally 85 in 2013. EASA also identified an increasing number of Seconded National Experts (SNEs) in its ranks. The first SNE was joined EASA in 2008 and by 2013 the Agency was hosting 16 SNEs. Overall, EASA was already employing in its technical departments 150 staff by the end of 2005, which rose to 341 by 2008 and 535 by year 2013. In the following table, we present the developments in EASA staff since its creation in parallel the development of the Agency's overall budget over the same period. There it can be observed that the increase in EASA budget was more steep during the initial period of its development while it has slowed down over the period following the extension to the EASA scope where an increase in technical staff by about 50% resulted in a mere 25% increase in budget needs.

Table 3-7: EASA staff per contract category

EASA staff categories	2005	2008	2013
Temporary agents	153	404	648
Contract agents	16	37	85
Auxiliary agents	7	-	-
Interim	-	-	15
Seconded national agents	0	1	16
Total	176	442	764
Total technical departments	**150**	**341**	**535**
EASA budget	**36.5**	**100.9**	**124.9**
Industry funded	15.75	69.09	82.95
EC subsidy funded	20.78	31.83	35.83

The following table presents the evolution of the EASA human resources specialised in aviation safety. The figures exclude those employed in the Finance & Business Services Directorate, as well as those deployed in the Executive (E) Directorate which are not relevant to the examined tasks and considered not to be relevant for this study.

Table 3-8: Human resources of EASA

Human resources	2005*	2008	2013
EASA Total (Technical departments)	**194** 150	**442** 340	**764** 535
Rulemaking	22	46	96
Certification	100	149	223
Standardisation & approval of organisations	22	100	151
(of which)			
Standardisation	*n/a*	*24*	*51*
Organisations	*n/a*	*61*	*66*
SAFA	n/a	6	7
Safety & Analysis research	3	19	36
International cooperation	3	9	29

Human resources	2005*	2008	2013
Other staff	**44**	**112**	**146**
*Due to reporting style change of the source documents, this includes only temporary agents employed by as per January 2006			

EASA hired a considerable amount of specialised human resources already by 2008 to be able to address the field of competencies attributed to it by the Basic Regulation. The introduction of the first and second extensions to the Basic Regulation increased even more the specialised human resources employed by the Agency.

The overall increase of personnel working in the relevant departments of the Rulemaking Directorate of EASA indicates the increase in rulemaking activity performed by EASA. This can be attributed both to an increase in the workload performed by departments dealing with responsibilities attributed to EASA already by the Basic Regulation, as well as to the introduction of the ATM/ANS and airports domains to the EASA scope The following table presents an estimation of the distribution of effort of technical staff to the domains of rulemaking activity according to the staff policy plan of 2012.

Table 3-9: Breakdown of rulemaking effort to domains

Rulemaking domain	% of rulemaking resources
Airworthiness	37%
Flight crew licensing	11%
Air Operations	25%
Airports	11%
ATM/ANS	16%

Concerning the certification activities performed by EASA employees and specifically the major certificates (Table 3-5), they have doubled between 2005 and 2008, while between 2008 and 2013, the increase in activity has been roughly 130%. This development overpasses the overall personnel increase in the relevant EASA department which increased by 50% in each of these periods while implementing the internalisation strategy, which calls for an increased EASA contribution to the overall certification effort. These imply an increase in the efficiency performance of EASA staff overtime.

The department of organisations approval has seen in the 2008-2013 period only a slight increase in human resources. The total increase in personnel by 5 employees can be partly attributed to the additional personnel hired for the approval of Flight Crew Licensing organisations or for the approval of ATM/ANS organisations as these 2 domains have come under the scope of EASA. The increase in personnel for Continuing Airworthiness organisations approval makes up for the rest of the increase in human resources. Despite the rather steady resources applied, the department has performed an increased number of organisation approvals both in the 2005-2008 period as well as in the 2008-2013 period. In addition, the internalisation strategy of

EASA has to be taken into account as over the same period, the reliance of the Agency on MS experts to perform organisations approval has been reduced.

The personnel employed in standardisation activities has also increased from 24 in 2008 to 51 in 2013. This sharp increase is in line with the extension of the scope of EASA to perform standardisation inspections on Air Operations, Flight Crew Licensing and Flight Simulation Training Devices as well as the introduction of ATM/ANS standardisation inspections to the EASA scope. In any case, taking into account the internalisation process of EASA in this field, (Table 3-6) the workload performed seems to have increase to a level slightly more than double of what it was in 2008. The following table presents an assessment of the distribution of standardisation resources to the different domains under the scope of EASA according to the staff policy plan of 2012.

Table 3-10: Breakdown of standardisation effort to domains

Standardisation domains	% of standardisation resources
Airworthiness	33%
Flight crew licensing	25%
Air Operations	22%
ATM/ANS	20%

Additionally, the 6 employees employed in the SAFA department in 2008 began performing standardisation inspections for EASA from 2009 onwards. The staff of the SAFA department has increased slightly by 2013 from 6 to 7. Given the sharp increase in inspections performed in the SAFA domain, the staffing policy plan target for 2014 was to retain these 7 staff members dedicated to SAFA.

Resources deployed in safety analysis and research have been constantly increasing since the establishment of the Agency, to reflect the widening of the activity performed with the addition of new domains to the remit of the Agency. Since the restructuring of EASA in 2014, the safety research and analysis department has been reduced to the staff actually perceived as producing safety analysis, as the staff members dealing with issuing Airworthiness and Emergency Airworthiness Directives have been relocated to certification directorate. This leaves it with 9 staff members that deal with the relevant workload.

Finally, a steep increase has been realised in the resources deployed in the field of international cooperation. These resources have increased from 3 staff members in the very first days of the Agency, to 9 in 2009 and currently they comprise a total of 29 (17 TAs, 10 Contract Agents and 2 SNEs).This increase can be attributed to the increased effort to maintain existing BASAs and WAs as well as to the increase in the number of new Agreements negotiated over time and the increasing number of technical cooperation projects for the execution of which EASA has been successfully selected. These projects are financed by grants in addition to the EU contribution and are to a large extent carried out by contract agents.

3.4 Developments at Eurocontrol

Safety aspects are currently addressed within two parts of Eurocontrol:

- Directorate of Network Management (DNM), which is providing technical support to ANSPs a.o in deployment of safety tools and SMS implementation;
- Directorate of Pan-European Services (DPS) that is providing technical support to NSAs in implementing SES.

Directorate of Network Management

At the DNM there are currently 16 FTE employed, involved in many tasks including technical ANSP support such as the support in the deployment of safety tools and in ANSP's SMS implementation. This is technical support provided to ANSPs, which falls outside the scope of current activities of EASA. Some CAs argue that this activity would need to be done by EASA. However, there is no evidence that this activity is currently carried out by EASA and as such there is no indication for a duplication of effort between EASA and Eurocontrol in this area. If it were decided that this specific activity should be taken up by EASA in future, the effort would also shift from Eurocontrol to EASA, hence it would be a transfer of costs incurred rather than a saving.

In the past years, Eurocontrol shrank overall by 25-33%, while DNM saw its resources reduced by 40%. The impact of the establishment of EASA on DNM's resources is considered minimal, general budget cuts are driving the development of resources. The most import impact is the role of EASA as competent authority overseeing Eurocontrol's function as the network manager. Most of the CAs interviewed considered that the roles and responsibilities of this department of Eurocontrol (DNS) are clearly demarcated from EASA now.

Directorate of Pan-European Services

At DPS there are currently 15 FTE working, supporting NSAs in the area of traffic performance, safety and economic performance. Of these 15 FTE, there are 5 technical experts involved in safety:

- Of which 3 support NSAs;
- Of which 2 are involved in safety analysis (occurrence data analysis).

The three FTE supporting NSAs are involved in activities such as providing assistance to revise their handbooks and processes, supporting NSAs in addressing corrective actions after findings in from EASA standardisation inspections, and support to NSAs in the area of analysing safety occurrences by applying the Risk Assessment Tool (RAT).Supporting the NSAs in addressing corrective actions after the findings from EASA standardisation inspections is a role also undertaken by EASA creating an overlap between EASA and Eurocontrol.

Additionally, EASA has recently been assigned the role of analysing safety occurrences[3] as reported by MS. This causes a duplication of reporting lines for NSAs that now have to report twice.

The two FTE involved in occurrence data analysis provide the output of their analysis(i) to the Performance Review Commission & Body, and (ii) to EASA to be inserted in the Annual Safety Review as the ATM chapter. These two activities seem to be in the realm of EASA. It can therefore be considered that this division of responsibilities is not clear. However, despite the duplication in reporting lines, the activity of analysing the ATM occurrence data itself is not duplicated as EASA performs to date little analysis of these data. Even if this analysis activity was moved to Cologne, the effort to undertake the analysis would still be needed sparing only the duplication of reporting lines. There is however a risk for duplication if EASA, following Regulation 376/2014, would carry out occurrence analysis in ATM *in addition to* Eurocontrol.

Pre-EASA situation

Before ATM became part of EASA's remit there were approximately 20-25 FTE working at the Safety regulatory Unit (SRU) and support to states involved in safety. Of this number, there were around 7-8 FTE involved in rulemaking, and 5-6 FTE in audits of national authorities, and another 3-4 FTE in MUAC oversight.

Roles and responsibilities

Rulemaking, oversight, audits (ESIM) activities now entirely stopped at Eurocontrol. Our interview sessions with key stakeholders indicated that the division of roles and responsibilities is generally considered to be clear for stakeholders. The only overlap that is existing is with the Safety Regulatory Commission (SRC), as Regulation is now the remit of EASA for EU+EEA. The Safety Regulation Commission (SRC) undertakes EUROCONTROL's work in the field of ATM safety regulation *across the whole ECAC area* and is composed of senior executives from within organisations responsible for ATM safety regulation at national level. The SRC advises Eurocontrol's Provisional Council on safety matters based on safety occurrence data. Although the regulation drafting has not been carried out by SRC since the establishment of EASA, the body in itself is still existing. There are no FTE directly associated to the SRC; the two FTE that are involved in this SRC are included in the FTE of DPS (see above). There is support to the SRC by the department of DPS, which is incorporated in the FTE mentioned above.

3.5 Joint Aviation Authorities

Back in 1970, the first steps in the development of a common European framework in aviation were made with the start of the Joint Airworthiness Authorities. Originally its objectives were only to produce common certification codes for large aeroplanes and for engines. This was in order to meet the needs of the European Aviation Industry and particularly for products manufactured by international consortia (e.g. Airbus). Following the Cyprus Arrangements concerning the development, the acceptance and

[3] Article 7(5), Regulation (EU) 376/2014.

the implementation of Joint Aviation Requirements in 1990, the National Aviation Authorities of the States who signed the Arrangements ('Member States') committed themselves to:

- Co-operate in all aspects related to the safety of aircraft, in particular its design, manufacture, continued airworthiness, maintenance and operation to ensure that a high consistent level of safety was achieved throughout the Member States;
- avoid duplication of work between the Authorities; and
- facilitate exchange of products, services and persons not only between the Authorities but also between the Authorities and others.

From this moment, the JAA was known as the Joint Aviation Authorities, and in the years that followed its work was extended to operations, maintenance, licensing and certification/design standards for all classes of aircraft.

Next step in the development of a common European framework was the adoption of EEC Regulation 3922/91 on harmonisation of technical requirements and administrative procedures in the field of civil aviation. This Regulation was applicable to the harmonisation of the technical requirements and administrative procedures in the field of civil aviation mentioned in Annex II of the Regulation, referring to, among others, JAR 145. The result of this Regulation was that JAR 145, among others, became immediately enforceable as law in all EEC Member States simultaneously. Transposition into national law first was not any longer necessary for these States.

With the adoption of Regulation (EC) No 1592/2002 EASA and a new regulatory framework were created in European aviation, as set out in the beginning of this chapter. Airworthiness requirements were set in this Regulation and further defined in Regulation EC 2042/2003. These took over the functioning of Joint Aviation Requirements formerly known as JAR-OPS part M, JAR 145, JAR 66 and JAR 147. With the adoption of EC Regulation 216/2008 the competences of EASA were extended into the fields of operations and licensing, and EC Regulation 1592/2002 was revoked. This marked the latest major step in the development of a common European framework. The JAA ceased to exist as per 30 June 2009.

The JAA organisation in itself was relatively small. By the time EASA was established, there were **35 people** working for the JAA itself, the majority of which were people seconded to the JAA from national authorities or other organisations, who participated in audit teams and in working groups. After EASA developed its competencies to an adequate level to sufficiently take over the tasks it was attributed with, the role of the JAA was diminished to avoid duplication of work and confusion. To do so, a roadmap[4] was laid down to reduce the JAA to only its training activities and the activities related to liaison with non-EASA JAA members as per January of 2007. This plan meant a reduction of the JAA staff from 35 to only 10 FTEs that were considered necessary for the continuation of its remaining activities. These activities include operating an office to liaise between EASA and the JAA non-EASA members and a training organisation. Reducing the relevant to the aviation safety JAA staff to 10. This staff of the JAA was

[4] Working Group on the Future of JAA (FUJA), Road map for JAA, 2005.

gradually absorbed into EASA or by the national authorities that had seconded them to the JAA. Similarly the budget of the JAA was reduced from € 4.1 million in 2006 to about € 1.2 million in 2007 after the absorption by EASA of the resources relevant to aviation safety.

A second reorganisation of the JAA was designed in 2009[5] according to which the Liaison Office part of the JAA (JAA LO) together with its staff was absorbed by EASA, while the Training Organisation part of the JAA (JAA TO) became an associate organisation to the ECAC retraining its training management staff. In any case, the activities performed by JAA after its first reorganisation according to the recommendations of the FUJA report are not considered part of the scope of this analysis as they do not regard technical expertise. Therefore the staff and budget under the service of the JAA LO and JAA TO as well as their successor institutes are not accounted for in this analysis.

Eventually, most of the JAA original activities and staff have been absorbed by EASA after the second reorganisation of the JAA.

3.6 Conclusions:

- Since the establishment of the EASA system in 2003, a significant amount of human resources has been recruited by EASA to manage the remit transferred to the newly established organisation as well as to cope with the remit EASA has developed over time. After the initial period of a sharp increase in workload and resources of the Agency and up to the 2008 extension to the remit of the agency, the increase in workload and resources of EASA has continued to be strong, adopting a lower rate of increase nevertheless. In the period after the first and second expansions of the scope of EASA, nearly all departments relevant to technical staff have seen an increase in the human resources deployed by the Agency to handle their respective tasks;
- The increase in staff in the 2008-2013 period has been mainly driven by the increase in the scope of EASA as an outcome of the amended Basic Regulation and the progress of the internalisation strategy that aimed to reduce the Agency's reliance on CA staff. An example of the latter is the sharp increase in staff attributed to the certification directorate despite a milder increase in the overall number of certificates issued. This is also probably affected by the change in the mix of certificates issued and the respective workload from them, as more major certification projects with a higher complexity have been carried out in the last few years. Moreover, in some cases additional human resources were pooled to respond to an increase of the workload of activities already under the scope of the Agency;
- The Rulemaking Directorate of EASA has been abolished in 2014 since it is considered that now the basic structure of the regulatory system is in place and only small additions to its remit might be needed. However, due to the overall system complexity, it is expected that the introduction of new concepts, (such

[5] Working Group on the Future of JAA (FUJA II), Final report of the FUJA II Working Group, 2009.

as the PBA and SMS) will require resources to be able to fully review the system and adjust it to these new concepts;

- The overall efficiency of the output of EASA staff has increased considerably with the internalisation of tasks and an increase in workload handled with a smaller than proportional increase in staff (certification, standardisation, organisation approval);
- The Agency's resource needs in terms of staffing appear to have stabilised following the above mentioned growth period from 2008-2013, however the Agency remains understaffed in relation to its current staffing plan goal. Over the years, staffing plan goals have not been realised for a number of factors, including budget constraints. In particular, staff is currently needed for Continuous Airworthiness, aerodromes standardisation and new technologies, as well as in order to keep in touch with the growing market demand for certification activities. In order to achieve the staffing plan goal of 2013, the Agency needs to employ approximately 50 FTE;
- No proper indicator has been identified to assess the efficiency of the staff occupied with safety analysis and research. The output of the currently around 9 FTE at the Agency applied in safety analysis and research feeds new regulation needs aiming at improving the overall safety of the system;
- There are currently around 5 FTE at Eurocontrol active in support to NSAs and safety analysis. Before ATM was included in the scope of EASA, there were around 20—25 FTE active in rulemaking, standardisation audits and oversight activities at Eurocontrol. The majority of these FTE moved to other departments or joined the overall Eurocontrol staff reduction scheme (early retirements). As such, the reduced funding need for these FTE is part of the overall budget decrease of Eurocontrol that has been implemented in the past years. It is estimated that this resulted in savings of around € 2 million per year[6];
- Regarding the division of responsibilities between EASA and Eurocontrol the issue of ATM occurrence analysis is worthwhile to mention. The DPS department of Eurocontrol has continued to undertake this since the extension of EASA's remit into ATM. One would expect that this activity will be transferred to EASA and be incorporated in EASA's overall safety analysis activities. This does currently however not lead to duplication of analysis effort but rather only to double reporting lines for MS.

Before the establishment of EASA, there were around 35 people working at the JAA which were reduced to 18.5 after the transfer of activities from JAA to EASA. This staff was employed in liaison (JAA LO) and training (JAA TO) activities. While the first eventually got absorbed by EASA, the second still remains as an institute associate to the ECAC. The majority of tasks were carried out by staff employed by national authorities. Eventually the majority of JAA activities, together with their staff were absorbed by EASA.

[6] Own calculation based on aviation agency salary estimation of: Deloitte&Touche; Study on the Structure and Staffing of the future European Aviation Safety Agency, 2002, corrected for inflation.

4 Workload and resources available at national level

In this chapter, the results of the analysis on the workload and resources deployed at national level are presented. As such, it provides the output of task 1-3 of the study, for the developments at Competent Authorities of the EASA Member States. As described in section 2.2., this analysis has been based on different data sources, such as data from the EASA standardisation database, JAA archives, ICAO USAOP programme, the 2008 SAFOBENCH study, complemented with a survey among CAs of Member States. The objective of the data analysis is to measure past and current resources and workload ratios in the different EASA member states, not to compare the states among each other, but to identify European wide trends.

Of the 32 EASA member states, the following 24 states responded by means of completing and returning the questionnaire (response rate of 75%):

1	Austria	11	Hungary	21	Slovenia
2	Belgium	12	Italy	22	Sweden
3	Bulgaria	13	Latvia	23	Switzerland
4	Croatia	14	Lithuania	24	United Kingdom
5	Cyprus	15	Luxembourg		
6	Denmark	16	Malta		
7	Estonia	17	Norway		
8	Finland	18	Poland		
9	Germany	19	Romania		
10	Greece	20	Slovakia		

Eight states did not return the questionnaire, but of these states still some data were available as access was granted to standardisation data collected by JAA and EASA, SAFOBENCH data collected by ECAC and SAAQ data collected by ICAO. Only of the state Lichtenstein no data are available.

In order to guarantee anonymity, a unique code has been assigned to each State. In the results only these codes are displayed.

When discussing workload ratios in the different aviation domains, a comparison is also made between large states and small states, and between states with a CA fully funded by the government (state budget or grants) and states with a CA fully funded

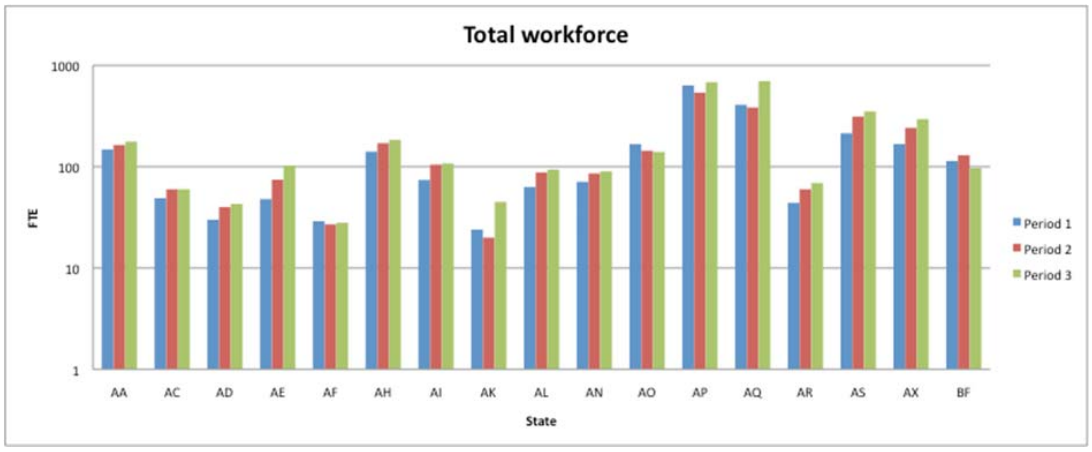
by the aviation sector (fees or charges). The distinction between large and small was made based on the number of aircraft on register, number of aircraft involved in CAT, number of AOC holders and number of certified organisations. The states AM, AP, AQ and BE are considered to be large, the states AB, AC, AF, AG, AK and AR are considered to be small.

4.1 General

4.1.1 Staffing

For 17 States there were total staffing data available for all three periods, containing technical and support staff including staff contracted in. The totals over these three periods indicate an *increase* of the overall staffing level, rising from 2426 in period 1 to 2646 in period 2 to 3267 in period 3, a 35% increase over 10 years' time. However, this 35% increase between 2003 and 2013 was mainly because of a significant increase in the reported staffing level of the countries AP (+147) and AQ (+315). As we know from our interviews, this increase was not only caused by an increase in staffing level, but merely because of differences in the way the total amount of staff was calculated in these two periods. As such, these calculation differences distort the overall picture significantly. In the figure below more details are provided.

Figure 4-1 Total workforce (n=17)

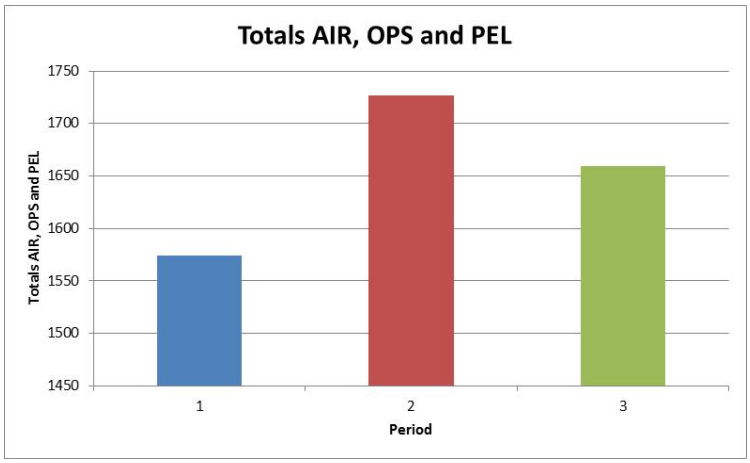


Due to the data quality limitations mentioned above, we focussed on the technical staff in the three largest domains, airworthiness (AIR), operations (OPS) and personnel licensing (PEL) as for these domains we did not see such strong outliers and more detailed information was available from other sources which made a cross-check possible. This focused approach solved to a great extent the data reliability issue. Summing the total technical staff of these 3 domains (from the 17 Member States which provided the data for the three reference periods) provides totals of 1574 in period 1, 1727 in period 2 and 1659 in period 3 (**Figure 4-2**)[7]. Hence, in terms of technical staff, the trend is initially an increase of 10%, followed by a decrease of 4%. With respect to period 1, period 3 shows an increase of 5%. Further details are

[7] Figures represent the summation of the AIR staff of 28 states, OPS staff of 27 states and PEL staff of 23 states.

provided in paragraph 4.2 for airworthiness, 4.3 for operations and 4.4 for personnel licensing.

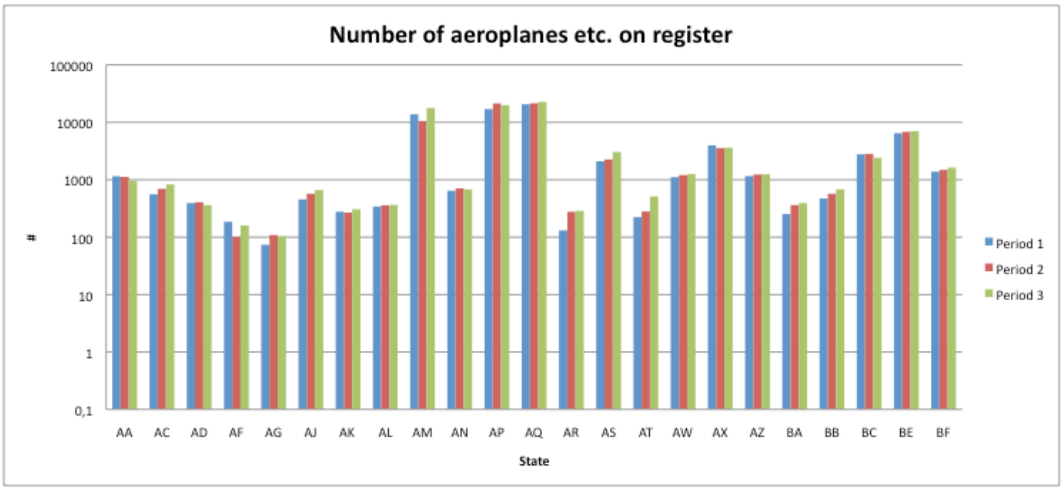
Figure 4-2 Total workforce in AIR, OPS and PEL domain (n=17)



4.1.2 Number of aircraft on register

The development in the size of the industry measured by means of the total amount of aircraft on national register indicates *an increase*. In period 1, the total of 23 states that submitted data for all three periods was 75,554. In period 2, the total of these 23 states that delivered data in this period was 79,620 (an increase of 5%), and in period 3 the total of these 23 states was 88,057 (an increase of 11%). The overall increase over 10 years amounted to 16.5%. **Figure 4-3** provides the overview.

Figure 4-3 Number of aeroplanes, etc. on national register (n= 23)

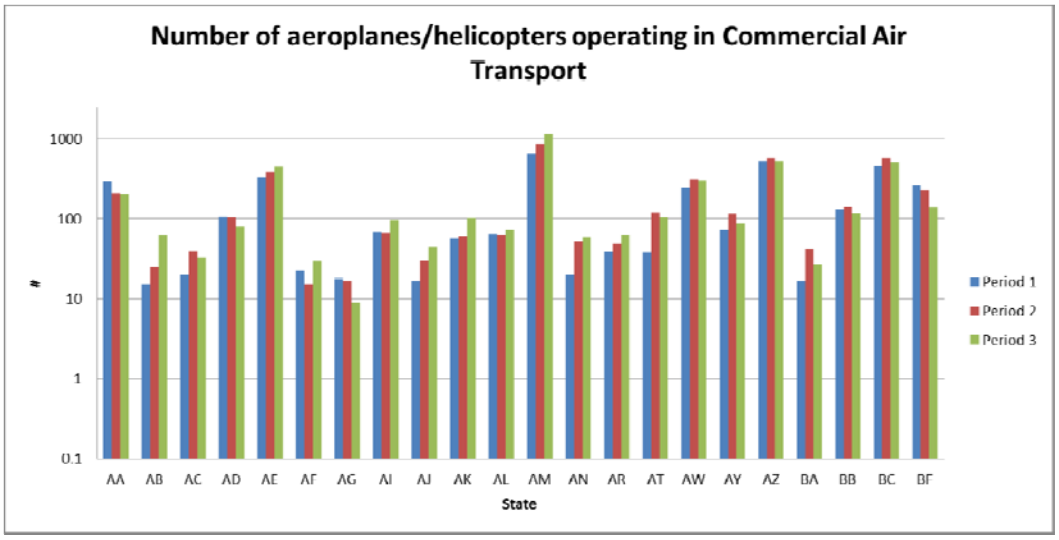


4.1.3 Number of aeroplanes and helicopters in Commercial Air Transport (CAT)

The number of aeroplanes and helicopters involved in Commercial Air Transport (CAT) can also be used as an indicator for the size of the respective country's aviation industry. The totals of the 3 periods indicate, just like the total number on national register, an i*ncreasing* trend. When countries of which no data are available for all three periods are not taken into account, the totals for the 22 remaining countries in period 1, 2 and 3 are respectively 3494, 4127 (+18% compared to period 1) and 4307

(+4% compared to period 2), an increase of 23% over 10 years' time. **Figure 4-4** illustrates the development in this figure in 22 countries:

Figure 4-4 Number of aeroplanes and helicopters operating in CAT (n=22)



4.1.4 Funding

In general terms Competent Authorities (CAs) can be funded in three different ways. They can be fully funded by the government (state budget or grants), they can be fully funded by the aviation sector (fees or charges), or they can be funded by a combination of both. 20 states provided information for all three periods. **Figure 4-5** - **Figure 4-7** show the respective percentages of these 20 states with these different means of funding in each of the three periods:

Figure 4-5 Division of funding in period 1 (n=20)

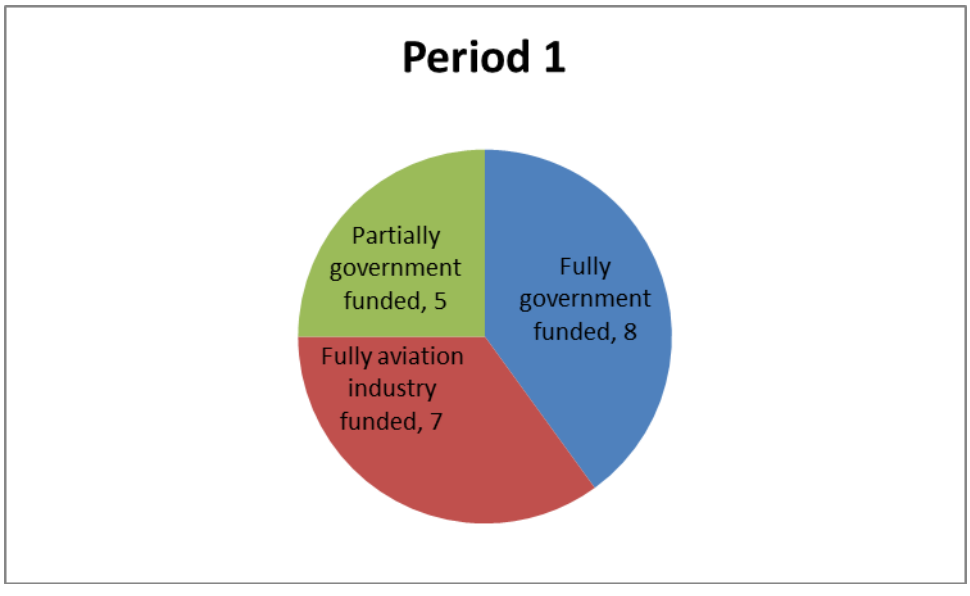


Figure 4-6 Division of funding in period 2 (n=20)

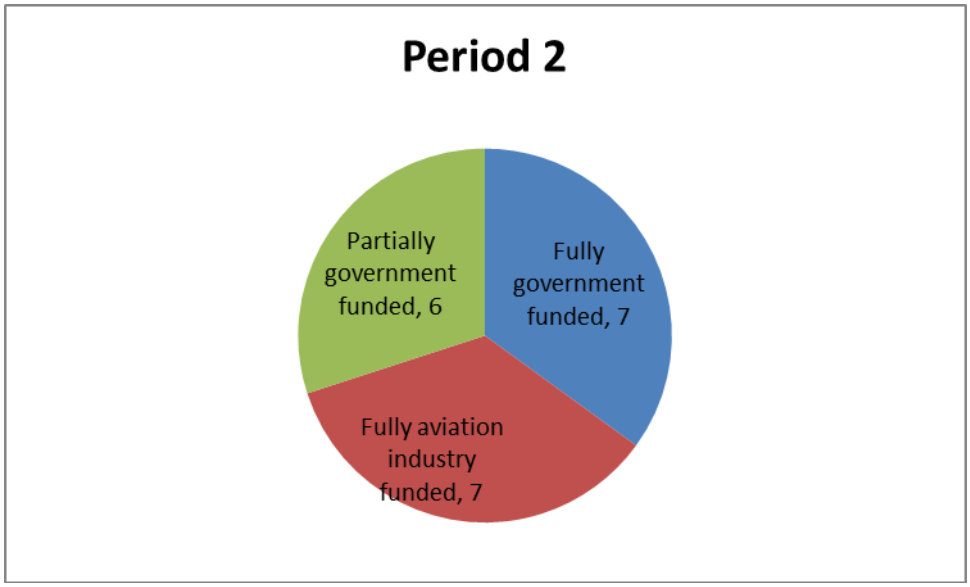
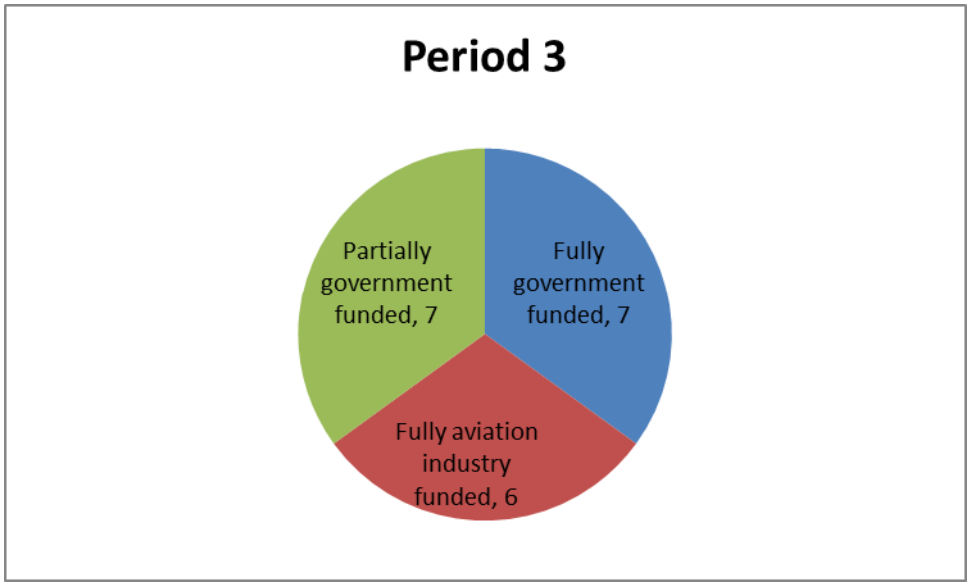


Figure 4-7 Division of funding in period 3 (n=20)



The way in which CAs are funded is quite stable. Only 1 state changes from fully government funded in period 1 to fully industry funded in period 2 to partially government funded in period 3, and only 1 state changes from fully industry funded in period 1 to partially government funded in period 2 and 3 (but this change was very limited: this particular state changes from 100% industry funded in period 1 to 98% industry funded and 2% government funded in period 2 and 3). For all the other states the division remains identical in all three periods.

The developments in the total budget are illustrated in figure 4.8. For this figure, only those states were selected for which reliable data were available for period 3 and at least one other period. The budgetary data retrieved regard the overall budget of the agencies. This choice was made as available data did not always make a distinction

between the budget devoted to aviation safety and overall budget of the CA. Given the differences in the scope of activities undertaken by CAs in different MS, this means that there can be a significant difference as to the activities which are covered by the budget. Nevertheless, as long as the focus of the analysis is on the trend rather than absolute figures, these differences do not significantly distort the overall picture which should be rather accurate.

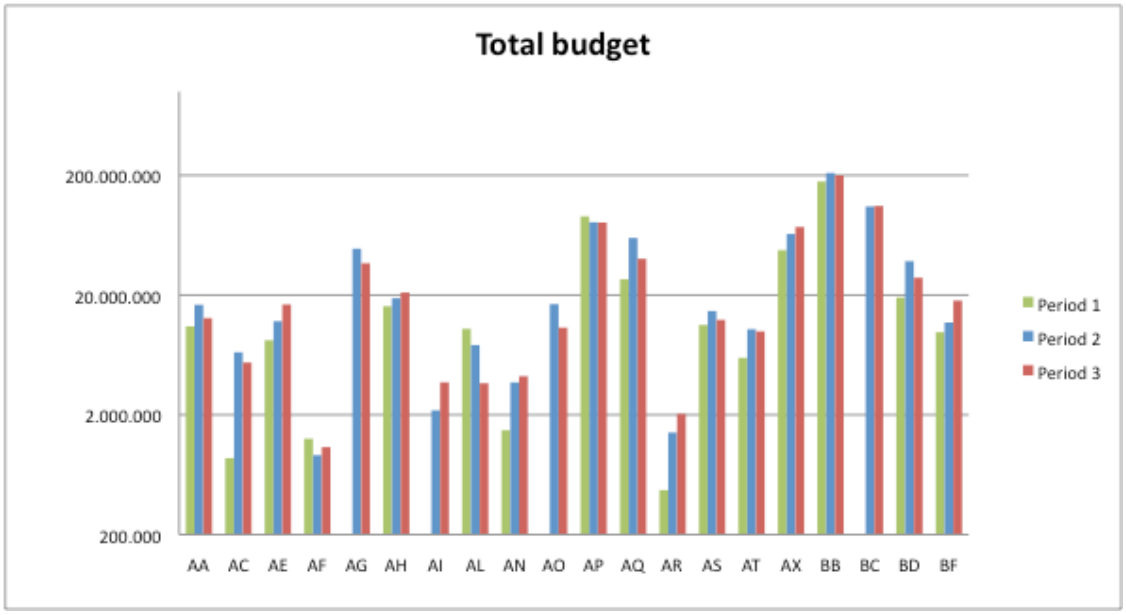
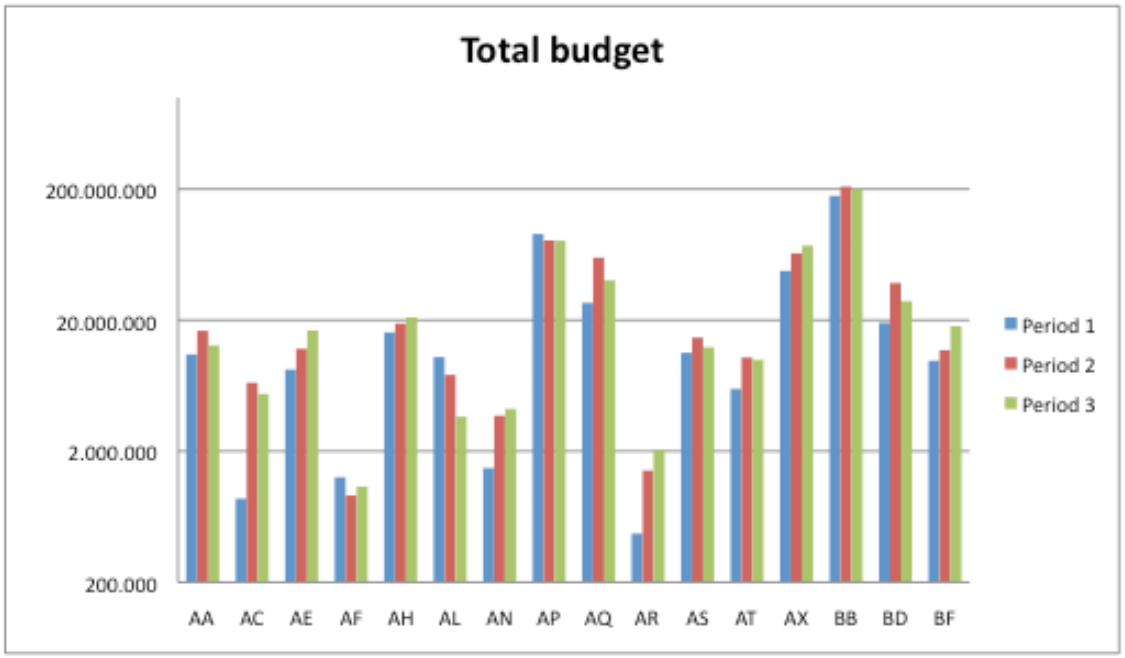


Figure 4-8 Total budget in Euro (n=20)

Figure 4-9 Total budget in Euro (n=16)



When focussing on those states of which data are available for all three periods (16 states in total), the summation of the budgets in period 1, 2 and 3 indicates that from period 1 to period 2 the total budget *increased* from 439 million Euro to 558 million Euro (27%), while from period 2 to period 3 (530 million Euro) the total budget *decreased* with 5%, which is in line with the observed trend for technical staff evolution described under Section 4.1.1. Between period 1 and 3 the overall increase amounts to 21%. It should however be noted that in these trends the relative large budget of state BB is included. The budget of state BB is that high because airport operations and air traffic control are included. However when taking account of the adjustment for inflation for the same figures, the summation of the budgets shows a *decrease* of 3% between period 1 and 3, where the total adjusted budget for the period 3 is 427.5 million Euro.[8]

4.2 Airworthiness

For the airworthiness domain, among others information about the following subjects was collected:

- Number of airworthiness technical staff (inspectors, engineers);
- Number of certified organisations (CAMO, Part-145, Part-147, Part-M subpart F, POA 21G);
- Number of valid aircraft maintenance licenses;
- Number of audits and inspections;
- Number of aeroplanes and helicopters with an EASA Certificate of Airworthiness;
- Number of aeroplanes and helicopters meeting the criteria of Annex II of the basic regulation;
- Number of staff (FTE) exclusively dealing with Annex II aeroplanes and helicopters.

Based on this information, the following workload ratios could be defined:

- Number of certified organisations per airworthiness technical staff member;
- Number of audits and inspections per certified organisation and per airworthiness technical staff member;
- Number of aeroplanes and helicopters with an EASA CoA per airworthiness technical staff member.

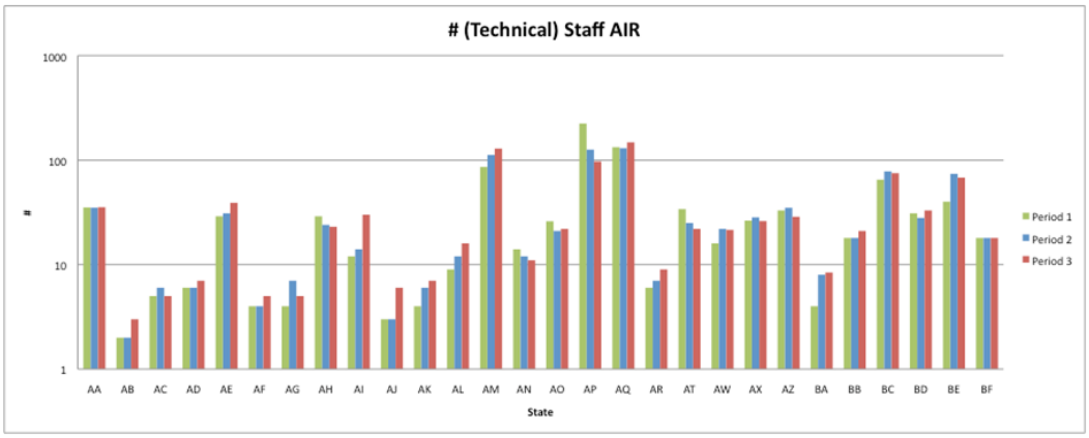
4.2.1 Airworthiness (technical) Staff

Information about airworthiness (technical) staff was available for 28 states. When the data for these 28 states in the three different periods are summed, the totals indicate a *decrease* from period 1 (total of 917) to period 2 (total of 892, a decrease of almost 3%), and an *increase* from period 2 (total of 892) to period 3 (total 919, an increase of 3%). The establishment of EASA initially caused this figure to decrease, as certification became a responsibility of EASA right from the start of the organisation,

[8] Figures calculated from Eurostat HICP data.

but other developments like an increase, by 53%, in the number of certified organisations (CAMO, Part-145, Part-147, etc.) between period 1 and period 3 caused this figure to rise again (see also paragraph 4.2.2). Details are provided in **Figure 4-10**.

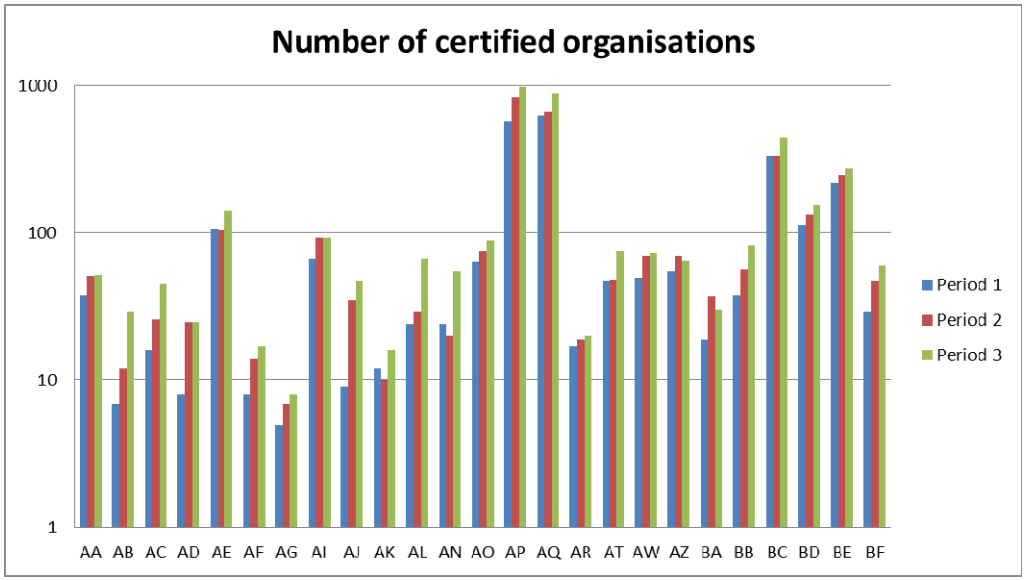
Figure 4-10 Number of (technical) staff airworthiness (n=28)



4.2.2 Number of certified organisations in the airworthiness domain

The trend in total numbers of certified organisations in the three different periods is increasing. Data concerning all three periods was available for 25 states. The total number of certified organisations in those 25 states in period 1 was 2504, in period 2; 3069 (an increase of 23% compared to period 1) and in period 3 3840 (an increase of 25% compared to period 1 and of 53% compared to period 1).. **Figure 4-11** provides an overview of the developments in these 25 states.

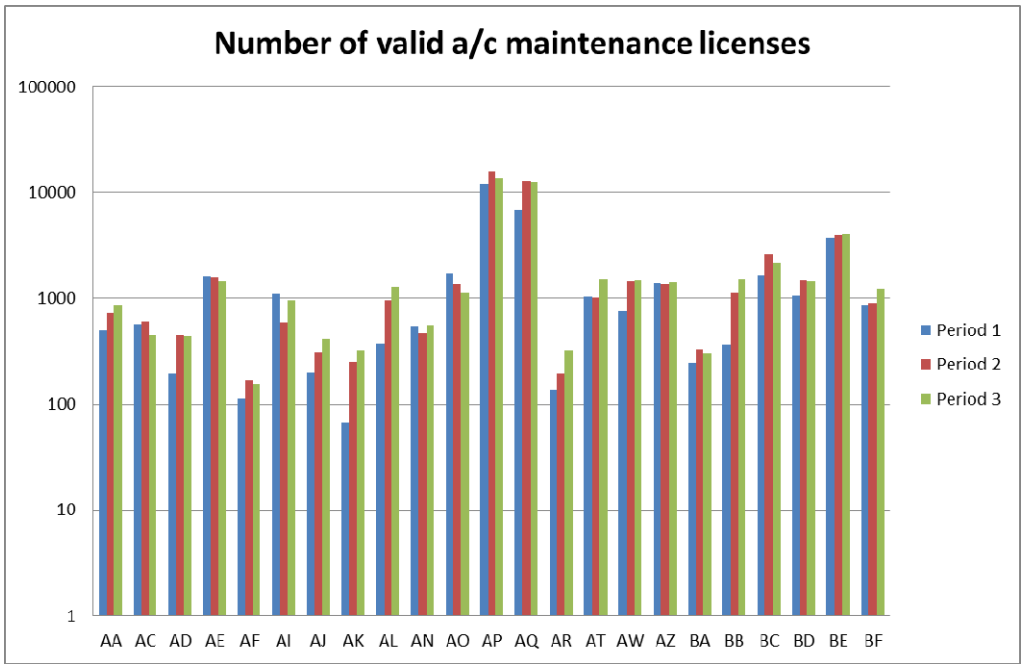
Figure 4-11 Number of certified organisations in the airworthiness domain (n=25)



4.2.3 Number of valid aircraft maintenance licenses

Figure 4-12 gives an overview of the trend in the number of valid aircraft maintenance licenses in 23 states from which data were available for each of the 3 periods. The general trend for these 23 states indicates an initial increase from 37,288 in period 1 to 50,399 (35%) in period 2, and thereafter a decrease to 49,890 (1%) in period 3. From period 1 to period 3 there is an increase of 34%). No clear explanation could be found for this trend.

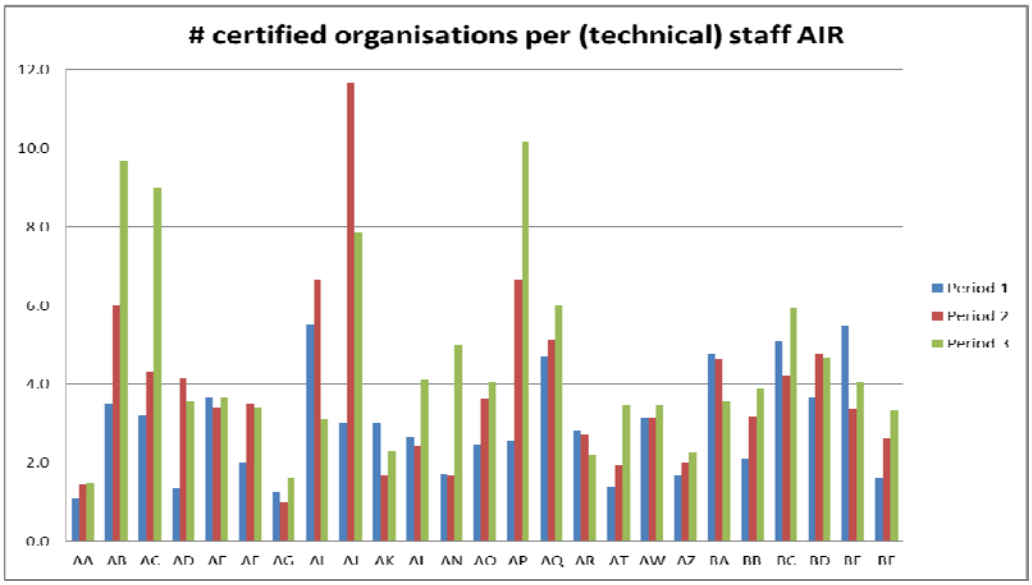
Figure 4-12 Number of valid aircraft maintenance licenses (n=23)



4.2.4 Number of certified organisations per airworthiness (technical) staff member

Following the data available for both the number of certified organisations in the airworthiness domain and the number of airworthiness (technical) staff members, it is possible to define the first workload ratio. The outcomes are presented in **Figure 4-13**.

Figure 4-13 Number of certified organisations per (technical) staff airworthiness (n=29)



When focusing on states that delivered data for all 3 periods, 25 states in total, the trend is an *increase* from – on average – 2.9 certified organisations per (technical) staff member in period 1 to 3.8 certified organisations per (technical) staff member in period 2 (+31%) to 4.5 certified organisations per (technical) staff member in period 3 (+18% compared to period 2), indicating an *increase* in workload when measured by this ratio. The increase with respect to period 1 is 55%.

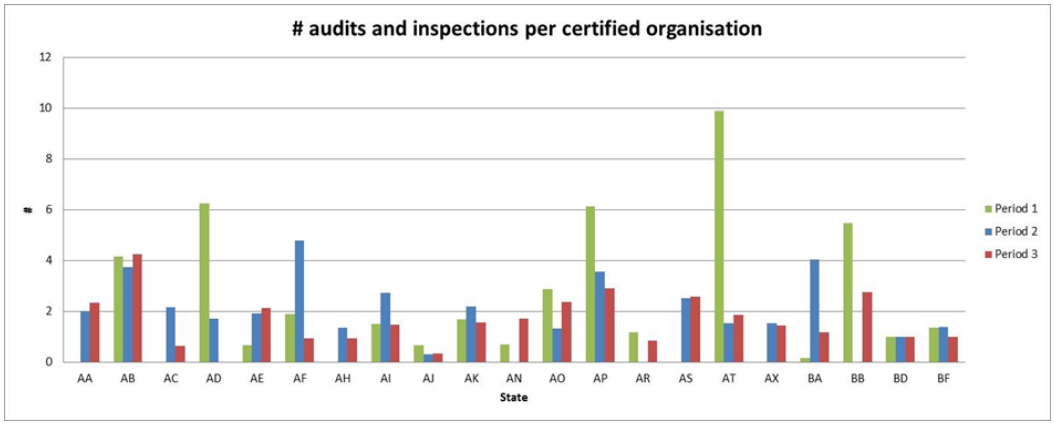
When comparing the trends of big countries (AP, AQ, BE) with that of smaller countries (AB, AC, AF, AG, AK) we see that the trend of both big countries and small countries is increasing, up to 59% with respect to period 1 for big countries and up to 100% with respect of period 1 for small countries. The rates of the big countries (period 1: 4.2, period 2: 5.1, period 3: 6.7) are consistently higher than those of the smaller countries (period 1: 2.6, period 2: 3.3, period 3: 5.2).

When comparing rates of 100% government funded states (AB, AG, AJ, AL, AQ, AY and BB) and 100% industry funded states (AF, AI, AP, AR, AT, AW and BD) it shows that the rates of the first group (period 1: 2.9, period 2: 4.9, period 3: 5.5) are mostly higher than those of the latter group (period 1: 3.0, period 2: 4.2, period 3: 4.4).

4.2.5 Number of audits and inspections per certified organisation

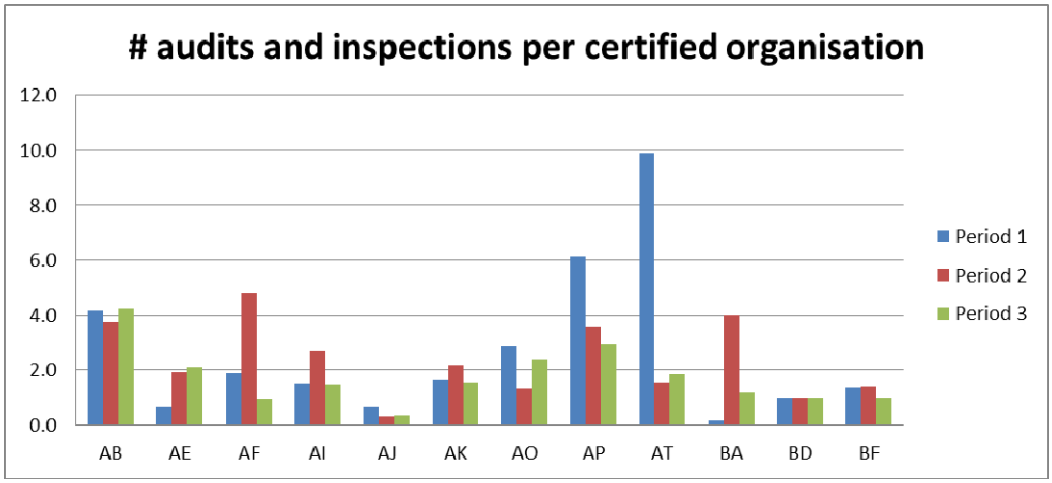
Information was available for 21 states about both the number of audits and inspections carried out and the number of certified organisations in the airworthiness domain. This information is provided in **Figure 4-14**.

Figure 4-14 Number of audits and inspections per certified organisation (n=21)



As can be seen, not all of these 21 states provided information for all three periods. Only 12 did that, see **Figure 4-15**. This is because the states that participated in the study did not provide too much information about their oversight activities, and information about this aspect in the other information sources used was also limited. For information purposes the decision was made to provide both figures in this report.

Figure 4-15 Number of audits and inspections per certified organisation (n=12)



When using the information from the 12 states which provided data for all three reference periods, the trend that could be identified – but again one should take notice of the rather limited amount of states involved – is that in period 1, on average 2.7 inspections and audits were carried out per certified organisation, in period 2 on average 2.4 (-11%) and in period 3 on average 1.7 (-29%), which is a decrease of 34% with respect to period 1. Under the assumption that the nature of the audits and inspections carried out did not change over the last 10 years, this figure would indicate a decrease in workload in terms of number of audits and inspections. However, what also could be the case is that the audits and inspections became more intensive, and for that reason the total number could be decreased. Data based on which a final conclusion can be drawn in this respect is not available.

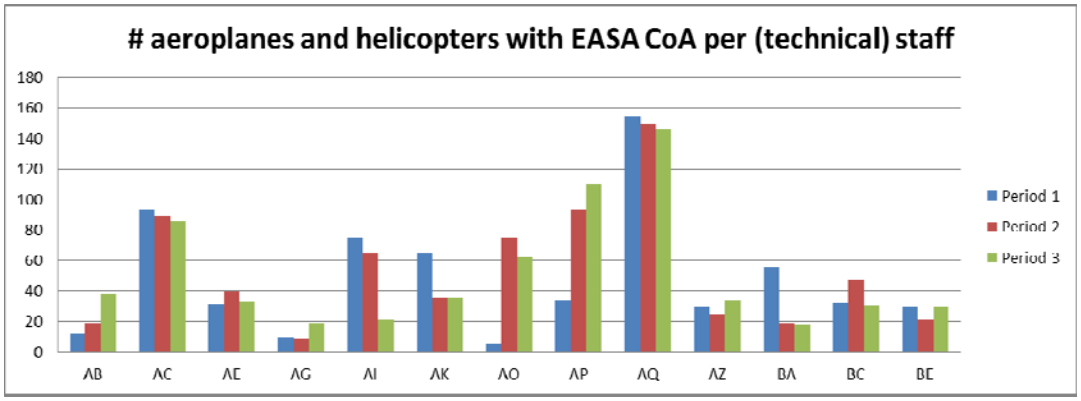
Because of insufficient data it is not possible to compare big countries with small countries.

When comparing rates of the number of audits and inspections per certified organisation of 100% government funded states (AB, AJ) and 100% industry funded states (AF, AI, AP, AT, and BD) it shows that the rates of the first group (period 1: 3.6, period 2: 7.7, period 3: 6.0) are mostly higher than those of the latter group (period 1: 4.1, period 2: 2.7, period 3: 1.6).

4.2.6 Number of aeroplanes and helicopters with an EU Certificate of airworthiness per airworthiness (technical) staff member

Based on the data available for 23 states the developments in the ratio of the number of aeroplanes and helicopters holding an EU Certificate of Airworthiness per airworthiness (technical) staff member could be defined as workload ratio. 13 states provided data for all 3 periods. The trend that could be defined with respect to that group of States is that initially this ratio increased from 48 in period 1 to 53 in period 2 (a 10% increase). In period 3, this ratio decreased to 51 (an almost 4% decrease), but which is still an increase of 6% with respect to period 1. In **Figure 4-16** the details are provided.

Figure 4-16 Number of aeroplanes and helicopters with EASA CoA per (technical) staff (n=13)



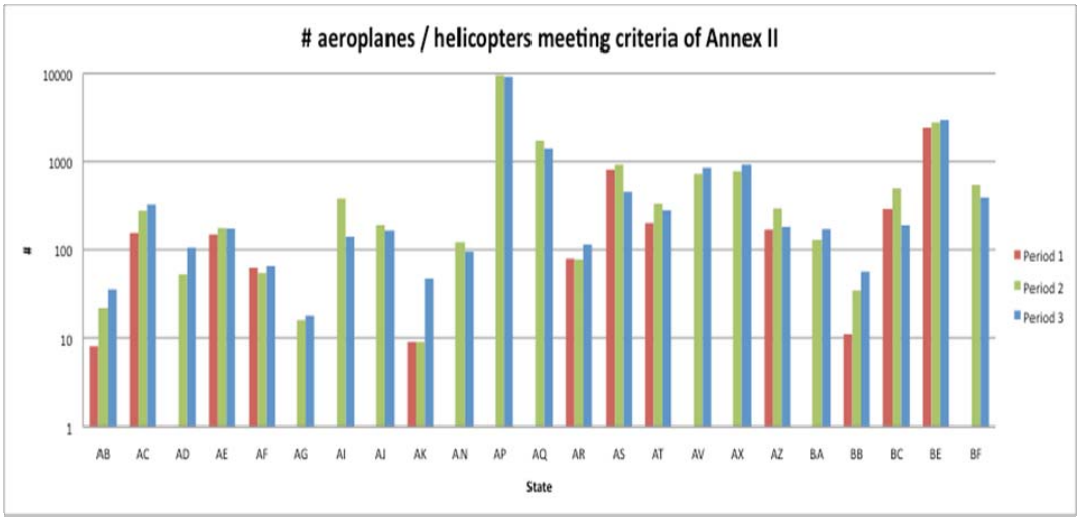
When comparing the trends of big countries (AP, AQ, BE) with small countries (AB, AC, AG, AK) we see that the trend of the big countries is increasing, up to 30% with respect to period 1, whereas the trend for the small countries first shows a decrease in period 2 (16%) and an increase of 18% from period 2 to period 3. The magnitude of the average rates of the big countries (period 1: 73.0, period 2: 88.0, period 3: 95.2) is larger than those of the small countries (period 1: 44.9, period 2: 37.8, period 3: 44.5).

When comparing rates of 100% government funded states (AB, AG, AQ) and 100% industry funded states (AI, AP) it shows that the rates of the first group (period 1: 58.8, period 2: 58.8, period 3: 67.4) are in two periods comparable to those of the latter group (period 1: 54.0, period 2: 78.9, period 3: 65.6).

4.2.7 Number of aeroplanes and helicopters meeting the criteria of Annex II

The EASA Basic Regulation and its implementing rules do not apply to aircraft meeting the criteria of Annex II of the Basic Regulation. For these aircraft national regulations apply. In order to gain insight in the number of aircraft meeting the criteria of Annex II across Europe and any trends in this figure the subject was addressed in the questionnaire. **Figure 4-17** provides the information:

Figure 4-17 Number of aeroplanes and helicopters (aircraft) meeting the criteria of Annex II (n=23)



Of 12 states information was available for all 3 periods, while of 23 states information was available for the last 2 periods. Therefore, the latter is used for further analysing. Summation indicates that the total number of Annex II aircraft in these 23 states decreased slightly (7%) between period 2 (19,722) and period 3 (18,323).

The number of staff involved in oversight of Annex II aircraft was also being asked. While the question clearly referred to FTE exclusively dealing with Annex II aircraft, the answers provided did not take this into account. Therefore these data cannot be used unfortunately.

4.3 Operations

For the operations domain, among others the following information was collected:

- Number of operations (technical) staff;
- Number of AOC holders;
- Number of audits and inspections.

This information made it possible, together with the information already collected, to define the following ratios:

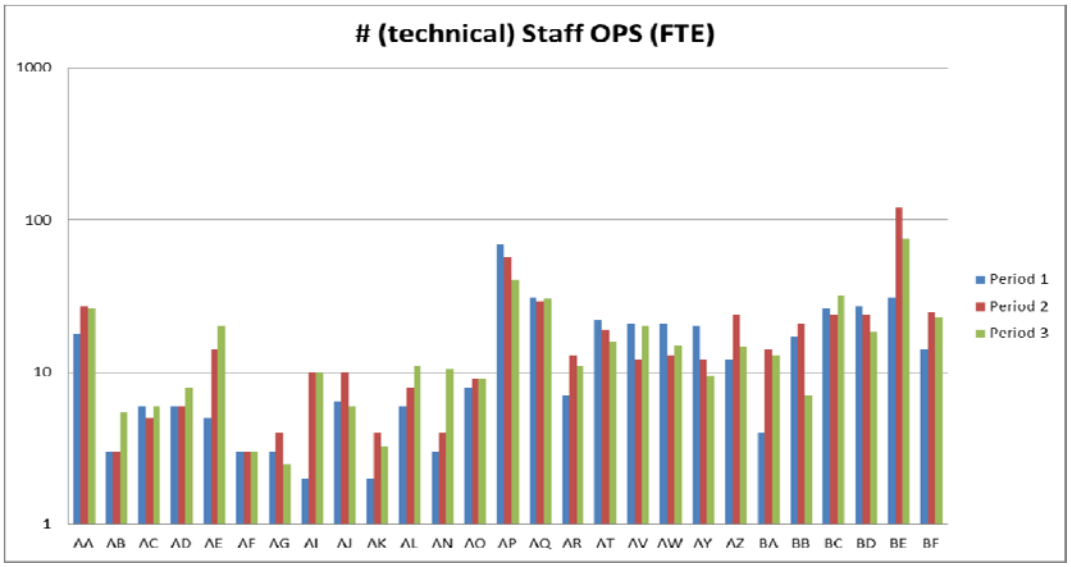
- Number of aeroplanes and helicopters per operations (technical) staff member;
- Number of AOC holders per operations (technical) staff member;
- Number of audits and inspections per AOC holder.

In the following paragraphs these elements and ratios are discussed in more detail.

4.3.1 Number of operations (technical) staff

To analyse whether or not a trend can be identified over the 3 periods under investigation, it is necessary to focus on the 27 of the 31 states of which data are available for all 3 periods. Information concerning the number of operations (technical) staff is provided in **Figure 4-18**. In period 1, the total number of operations (technical) staff was 395. This increased to 516 in period 2, an increase of 31% and decreased to 446 in period 3, a decrease of 14%. This is still an increase with respect to 2003 of 13%. This trend is identical to the trend in the budget, and can therefore be the result of the economic downturn that started in 2008, and forced CAs to continue their work with reducing budgets and staffing levels.

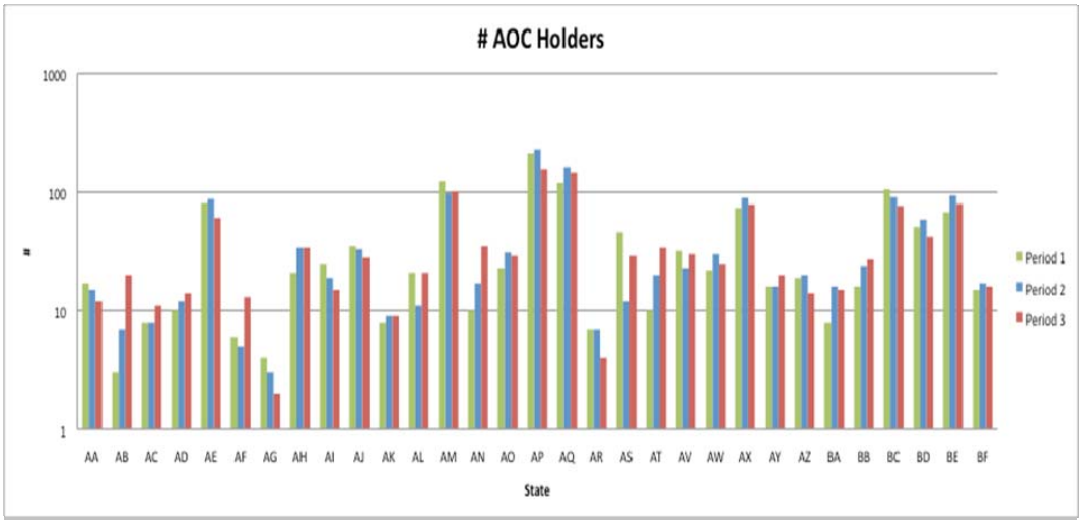
Figure 4-18 Number of (technical) staff (n=27)



4.3.2 Number of AOC holders

The trend in the number of AOC holders in each of the 31 states is shown in **Figure 4-19**. For all 31 states data are available for all 3 periods. The trend was that from period 1 to period 2 the total number of AOC holders in the 31 states increased from 1221 to 1304 an increase of almost 7 %. From period 2 to period 3 however, the trend was decreasing: in period 3 there were 1201 AOC holders left, a decrease with respect to period 1 of 2%.

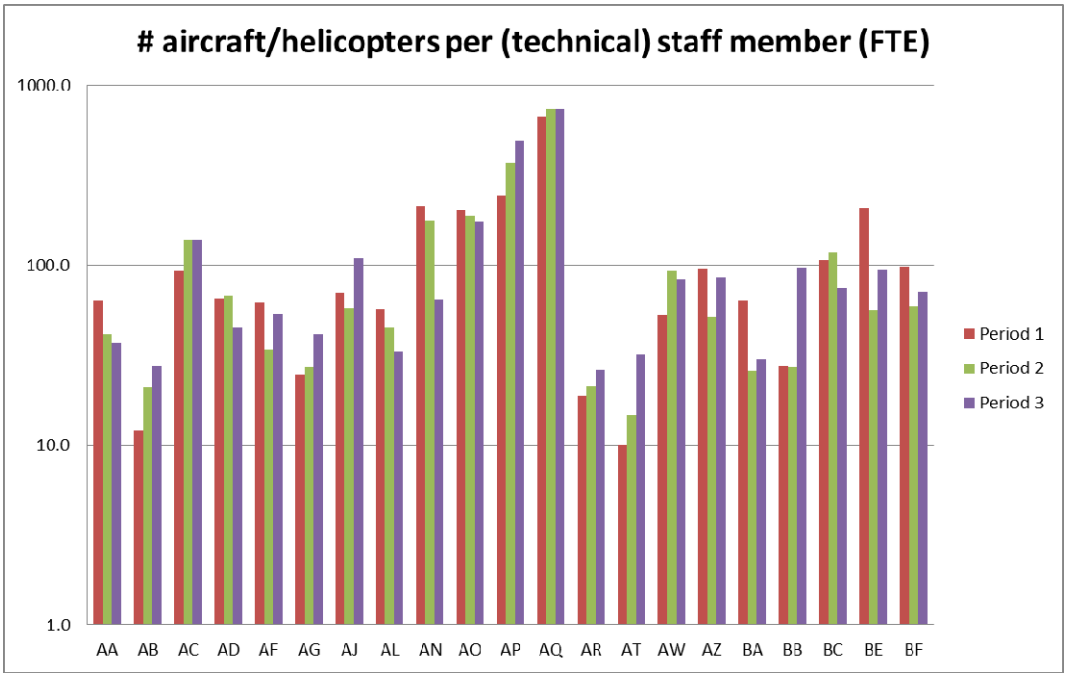
Figure 4-19 Number of AOC holders (n=31)



4.3.3 Number of aeroplanes and helicopters per (technical) staff member

The first workload ratio that can be defined is the number of aeroplanes and helicopters per operations (technical) staff member (see **Figure 4-20**).

Figure 4-20 Number of aeroplanes and helicopters per operations (technical) staff member (n=21)



In **Figure 4-20** information from 21 states is included of which reliable information is available for all 3 periods. The averages of the totals indicate initially a decreasing trend, from 117 aeroplanes and helicopters per operations (technical) staff member in period 1 to 113 in period 2 (-3%), but towards period 3 this ratio increases to 122 aeroplanes and helicopters per operations (technical) staff member, an increase with

respect to period 2 of 8% and with respect to period 1 of 4%. Hence, the workload initially decreased but later increased again when expressed by means of this ratio.

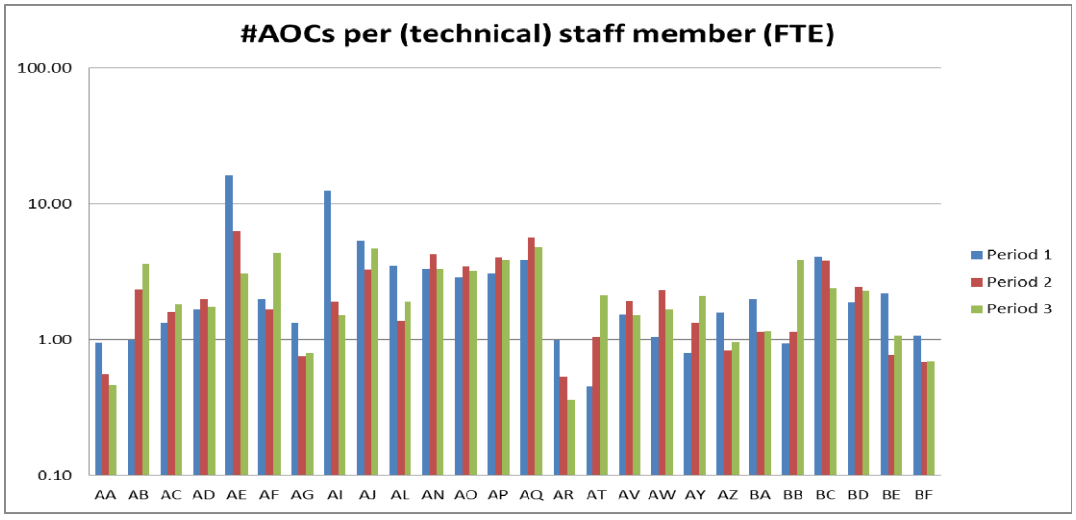
For both the big countries (AP, AQ, BE) and the small countries (AB, AC, AF, AG, AR) we see a steady increase in the rates from period 1 to period 2 to period 3. These rates are 372.2, 388.8, 442.8 for the big countries and 47.9, 55.2, 65.1 for the small countries. We also see a substantial difference between large and small countries in the absolute numbers of the ratio.

States that are 100% funded by the government (AB, AG, AJ, AL, AQ, BB) show rates (142.7, 152.7, 175.6) that are higher than those (77.3, 106.8, 137.0) of 100% industry funded states (AF, AI, AP, AR, AT, AW, BD).

4.3.4 Number of AOCs per operations (technical) staff member

The number of AOCs per operations (technical) staff member, per state and period are provided in **Figure 4-21**. For 26 states information is available for all 3 periods. For this set of states the average trend is initially decreasing (from 2.98 in period 1 to 2.20 in period 2, a decrease of 26%) but towards period 3 increasing again (2.28 in period 3, an increase of 4%). Period 3 shows a decrease of 23% with respect to period 1.

Figure 4-21 Number of AOCs per operations (technical) staff member (n=26)



Focussing on big and small countries shows different trends. After an increase from period 1 to 2 for big countries (14%) and small countries (12%), the average rates for big countries decreases from period 2 to 3 (-6%) and increases for small countries (67%). The average rates of the big countries are higher than those of the small countries: period 1: 3.0, period 2: 3.5 and period 3: 3.3 versus period 1: 1.4, period 2: 1.6 and period 3: 2.7.

The average rates for all identified 100% government funded states are also larger than those of 100% industry funded states: period 1: 2.4, period 2: 2.3 and period 3: 3.1 versus period 1: 1.7, period 2: 1.9 and period 3: 2.3.

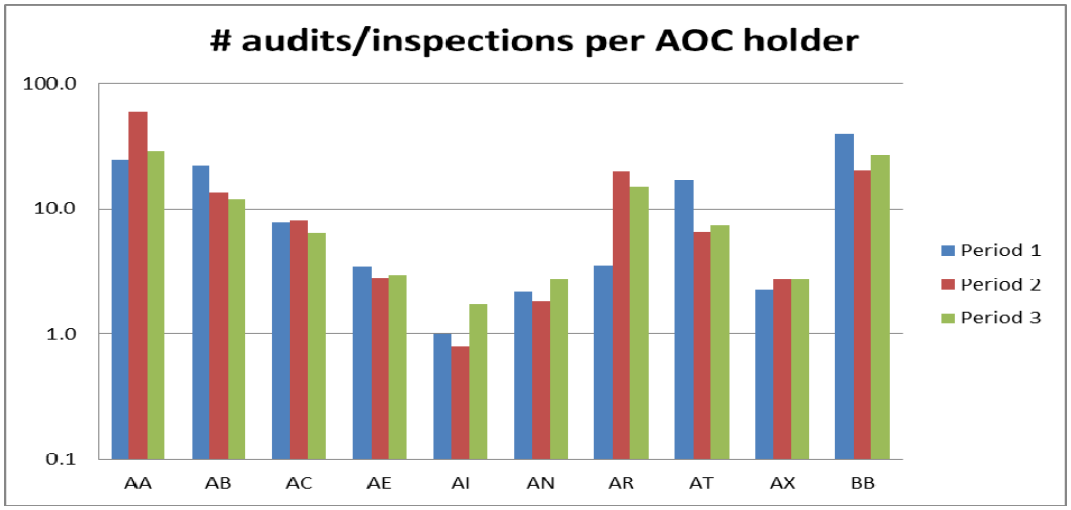
4.3.5 Number of audits and inspections per AOC holder

Information about the number of audits and inspections is used to calculate the workload ratio number of audits and inspections per AOC holder (**Figure 4-22**). Given the fact that not too many states were willing to provide information about their oversight activities, the number of states for which this ratio could be defined is rather limited. When only states for which data are available for all 3 periods are selected, the total set of states is limited to 10. The trend however is in line with the earlier results of the study. Initially, there is an increase in the average number of audits and inspections per AOC holder, from 12.4 in period 1 to 13.6 in period 2 (+10%). From period 2 to period 3 however, this figure decreases to 10.7 in period 3 (-27%), a decrease with respect to period 1 of 14%.

Insufficient data is available to compare big countries with small countries.

The average rates of 2 100% government funded states (AB, BB) are much higher than the average rates of 3 100% industry funded states (AI, AR, AT): period 1: 30.9, period 2: 16.9 and period 3: 19.4 versus period 1: 7.2, period 2: 9.1 and period 3: 8.0.

Figure 4-22 Number of audits and inspections per AOC holder (n=10)



4.4 Personnel licensing

For the personnel licensing domain, information was collected related to the:

- Number of (technical) staff;
- Number of issued and validated flight crew licenses;
- Number of (approved) flight training organisations; and
- Number of audits and inspections of training organisations.

With this information, the following ratios could be defined:

- Number of licenses and validations per (technical) staff member; and

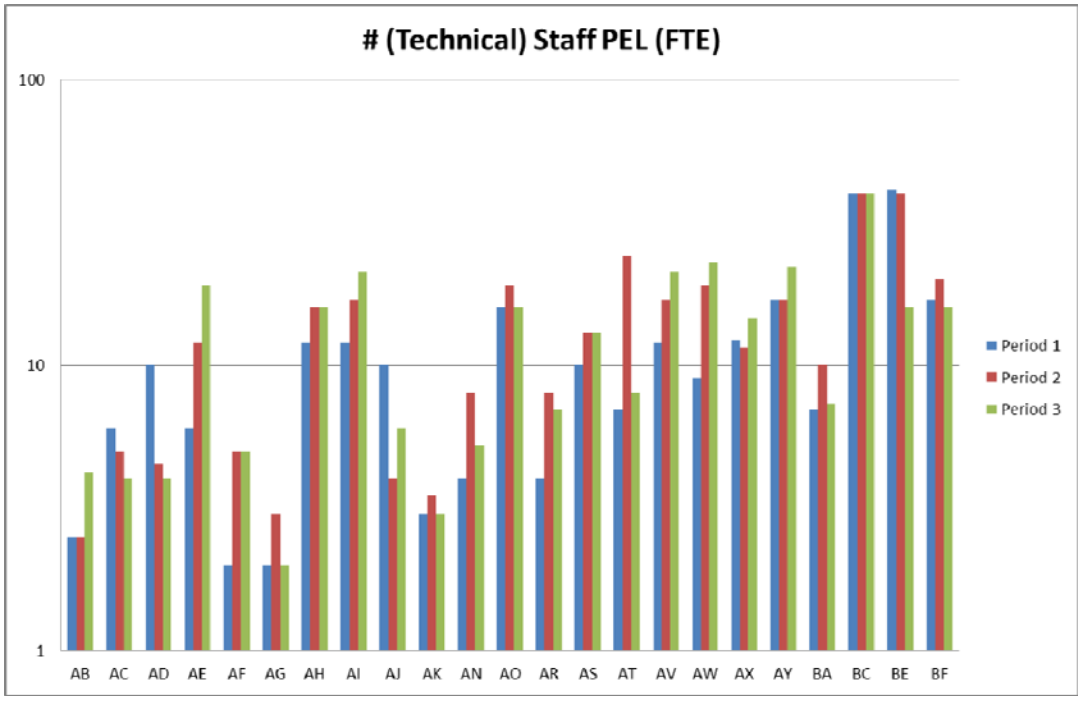
- Number of approved training organisations per (technical) staff member.

Effort was made to collect also information related to both theoretical (ground school) examinations and practical (flight) examinations. Because it was not possible to obtain reliable data, and given the fact that the direct involvement of the (technical) staff of the CA in this kind of examinations is limited - most of the (practical) examinations are performed by proper qualified examiners which are not employed by the CA - the decision was made not to analyse these data.

4.4.1 Number of personnel licensing (technical) staff

Figure 4-23 provides an overview of the technical staff in the PEL domain. Selection was made based on the criterion that data should be available for the 3 periods distinguished (23 states):

Figure 4-23 Number of PEL (technical) staff (n=23)

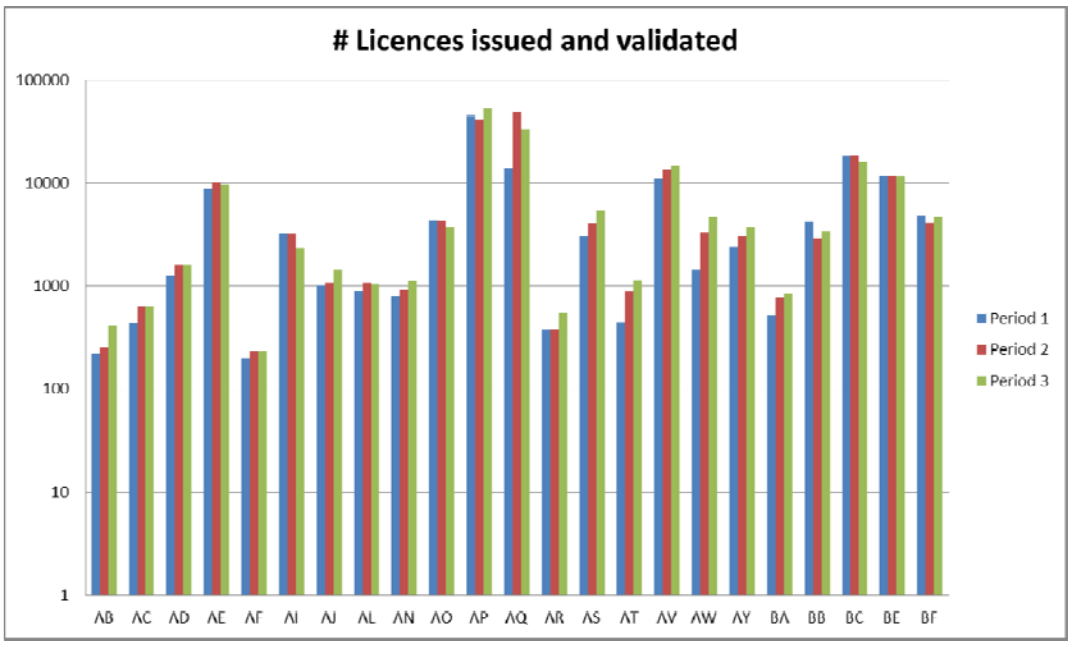


The trend which could be identified indicates that initially, the staff level increased from 262 in period 1 to 319 in period 2 (+22%), but from period 2 to period 3 the staff level decreased to 294 (-8%). With respect to period 1, this means an increase of 12%.

4.4.2 Number of flight crew licenses issued and validated

The number of flight crew licenses issued and validated by each of the 23 states of which data are available in all of the three periods is given below (**Figure 4-24**):

Figure 4-24 Number of flight crew licenses issued and validated (n=23)

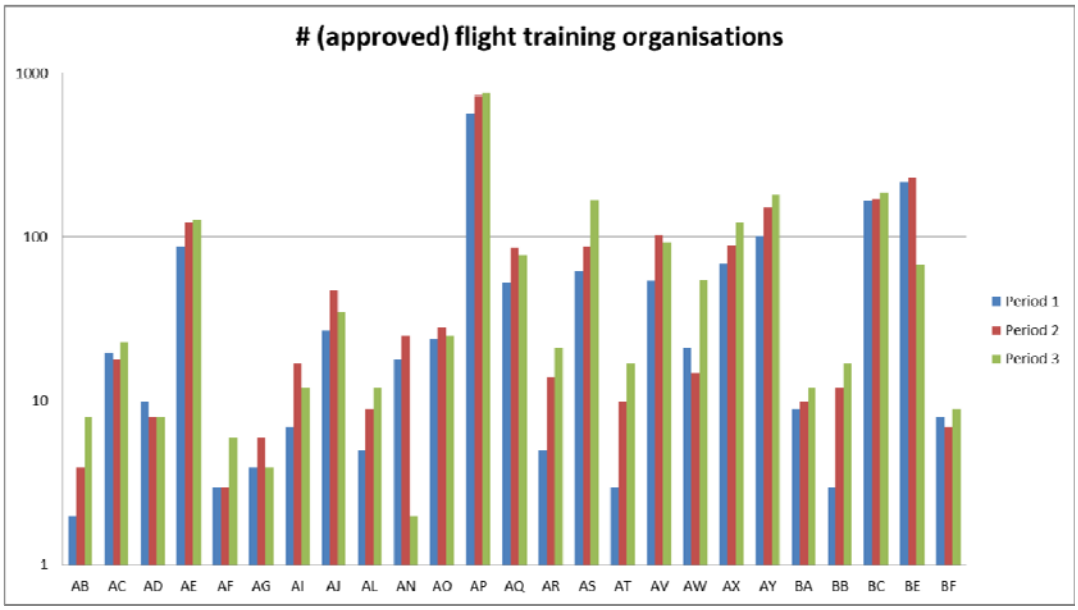


These data indicate that the number of licenses and validations increased from period 1 (139,258) to period 2 (176,575), an increase of 27% and decreased from period 2 to period 3 (175,383), which is a small decrease compared to period 2 (-0,6%) but an increase with respect to period 1 of 26%.

4.4.3 Number of (approved) flight training organisations

The development in the number of (approved) flight training organisations (aeroplanes, helicopters, sailplanes, balloons, airships) is depicted in **Figure 4-25**:

Figure 4-25 Number of (approved) flight training organisations (n=25)

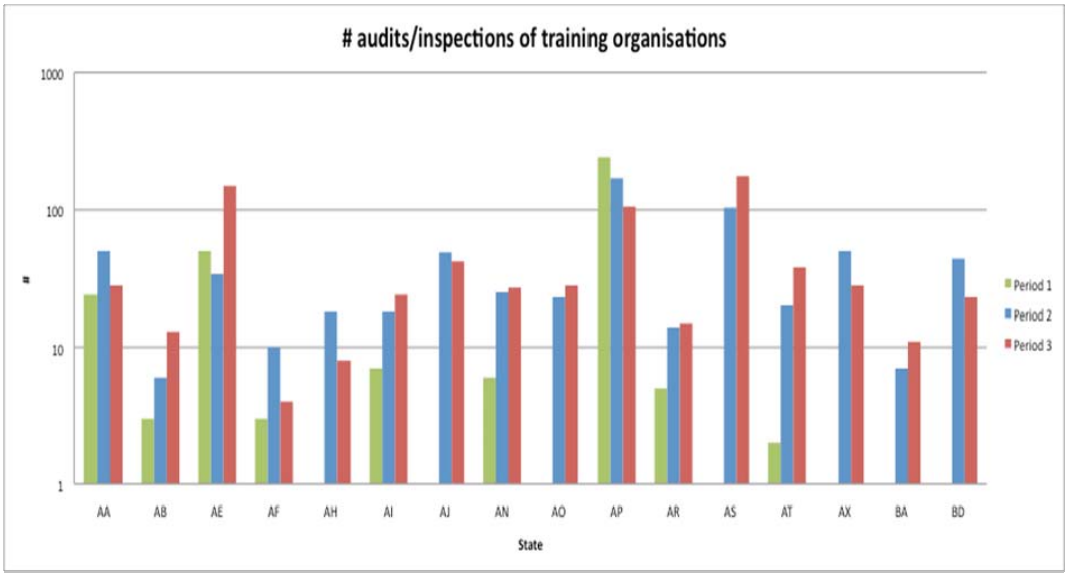


The general trend in the 25 states of which data are available for all 3 periods is an increase: the total in period 1 was 1544, in period 2 it was 2010 (+30%) and in period 3 it was 2047 (+2%), an increase of 33% with respect to period 1.

4.4.4 Number of audits and inspections of training organisations

Next to the number of flight crew licenses issued and validated and the number of (approved) training organisations, also the number of audits and inspections of training organisations is an indication of the workload of the staff of the PEL domain (Figure 4-26):

Figure 4-26 Number of audits and inspections of training organisations (n=16)

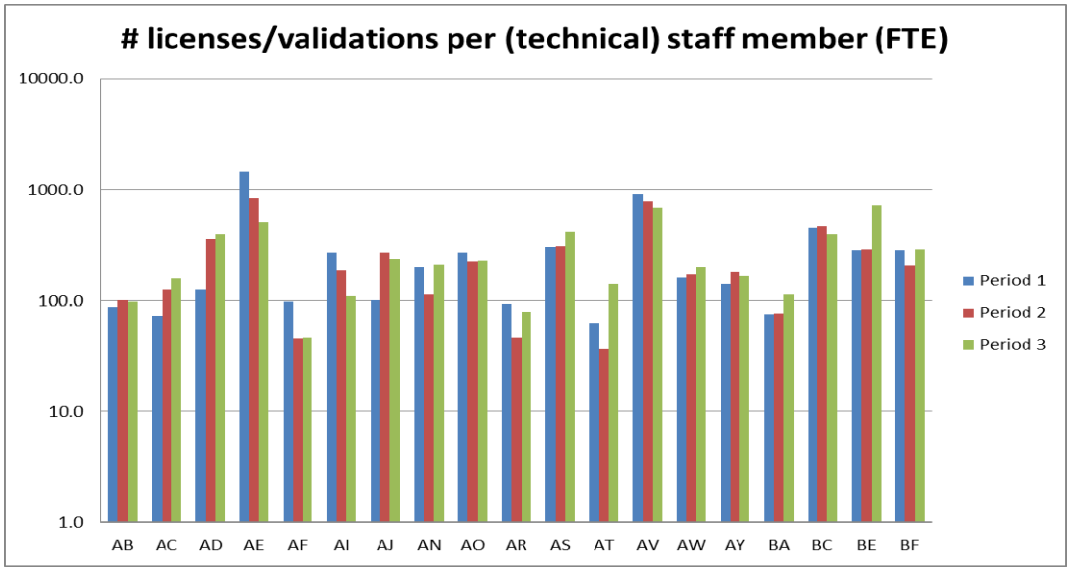


The number of states of which data are available for all 3 periods is only 9, which is a low number. Therefore, for the analysis of a trend for period 2 and period 3 we use the date of the 16 states as presented in **Figure 4-26**. For those states, the number of audits and inspections increased from 643 to 722, which is 12%. The trend for period 1 and period 2 can only be an indication because of the few states for which also data is available for period 1: it shows for these 9 states an increase from 344 in period 1 to 348 in period 2, i.e. 1%.

4.4.5 Number of licenses and validations per (technical) staff member

The ratio number of licenses and validations per (technical) staff member shows the following (**Figure 4-27**):

Figure 4-27 Number of licenses and validations per (technical) staff member (n=19)



19 states could be used for defining an average trend. The number of licenses and validations per (technical) staff member initially decreased from 289 (period 1) to 257 (period 2), a decrease of 11%, but then increased again to 276 (period 3), which is an increase of 7% but the figure is still 5% lower than in period 1.

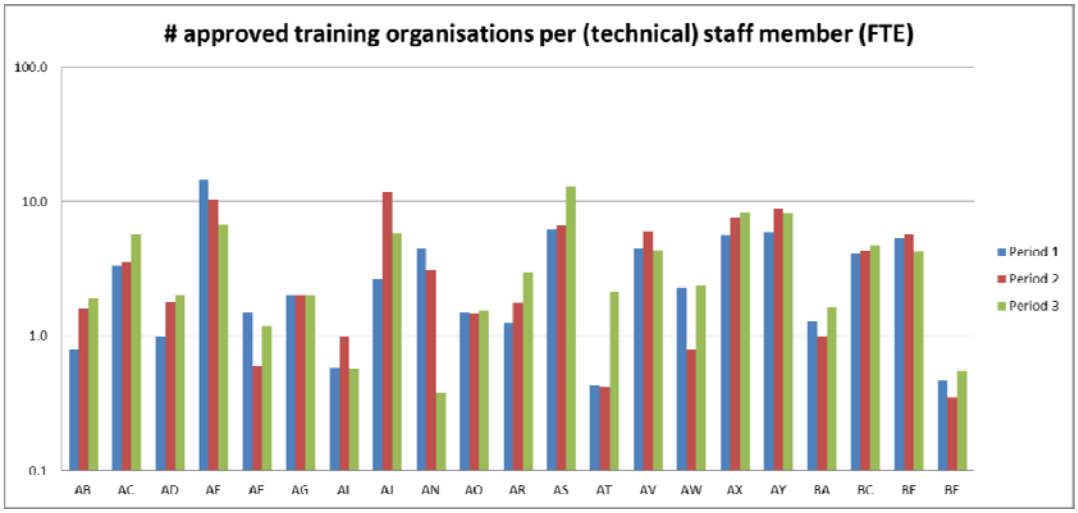
Insufficient data is available to compare the trends in big countries and small countries. The selection of small countries (AB, AC, AF, AR) shows a similar trend as the overall picture.

The average rates for 3 100% government funded states (AB, AJ and AY) are 110.5 for period 1, 184.8 for period 2 and 169.3 for period 3. The average rates for 5 100% industry funded states (AF, AI, AR, AT and AW) are 137.8, 98.1 and 115.5. For period 2 and 3, the average rates for the industry funded states are much smaller than for the 100% government funded states.

4.4.6 Number of (approved) training organisations per (technical) staff member

Figure 4-28 shows the developments in the number of (approved) training organisations per (technical) staff member in the PEL domain:

Figure 4-28 Number of approved training organisations per (technical) staff member (n=21)



Focusing on the 21 states with data for all 3 periods, an average trend in the number of (approved) training organisations per (technical) staff member could be identified which initially increased (from 3.3 in period 1 to 3.9 in period 2, an increase of 18%) and from period 2 to period 3 (3.8) decreased (-2,5%). With this, period 3 shows an increase of 15% with respect to period 1.

Insufficient data for big countries is available to compare the trends in big countries and small countries. The trend for the small countries (AB, AC, AF, AG, AR) however, is steadily increasing (8% from period 1 to 2 and 45% from period 2 to 3).

The average rates for 4 100% government funded states (AB, AG, AJ and AY) are 2.9 for period 1, 6.1 for period 2 and 4.5 for period 3. The average rates for 5 100% industry funded states (AF, AI, AR, AT and AW) are 1.2, 0.9 and 1.9 respectively, which is lower than the rates for the 100% government funded states.

4.5 Air Navigation Services (ANS)

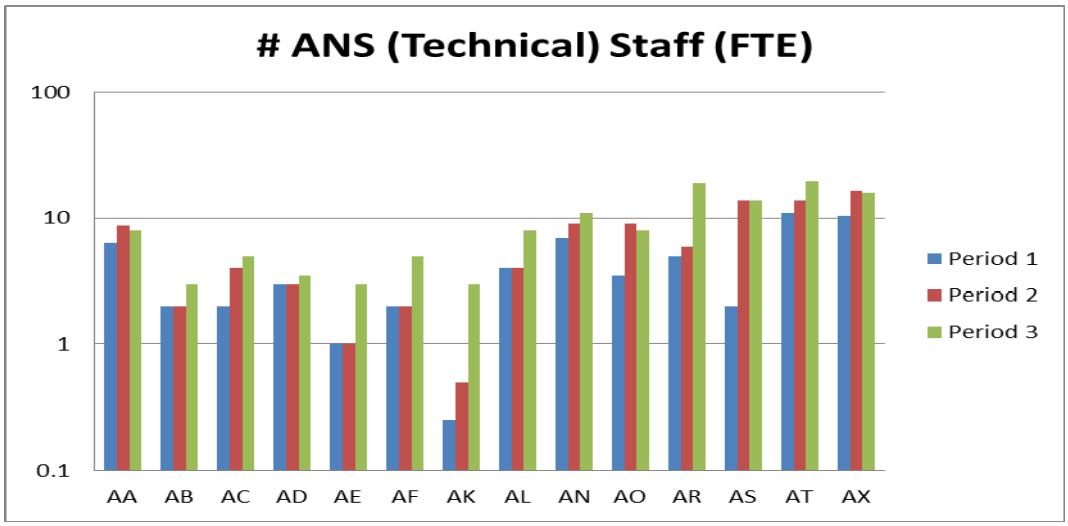
For the Air Navigation Services domain, among others the following data were collected:

- Number of ANS (technical) staff;
- Number of ANS organisations under surveillance;
- Number of ANS organisations per technical staff;
- Number of audits and inspections per ANS organisation; and
- Number of audits and inspections per ANS (technical) staff member.

4.5.1 Number of ANS (technical) staff

Figure 4-29 provides an overview of the number of ANS (technical) staff available in the different states over time. It only shows the 14 states for which data were available for the three periods.

Figure 4-29 Number of ANS (technical) staff (n=14)



Within those states with data for all 3 periods (14 in total) an increasing trend in the number of ANS (technical) staff could be identified, from 60 in period 1 to 94 in period 2 (+57%) to 127 in period 3 (+35%), an increase of 112% with respect to period 1. This trend is the result of the increasing attention for regulation and oversight of ANSP organisations, initially under the responsibility of Eurocontrol and at the end of the 10 years-time period under investigation under the responsibility of EASA.

4.5.2 Number of ANSP organisations under surveillance

The data submitted and collected concerning the number of ANSP organisations under surveillance varied widely. This was mainly caused by the fact that some countries considered each and every ATC providing unit as a separate entity, while others considered the ATC organisation as 1 nationwide organisation. The same happened with CNS organisations. Hence, one should be very careful when interpreting **Figure 4-30**, because it was unfortunately impossible to check and correct all possible inconsistencies. Furthermore, the large variations in the number of ANSP organisations in the different periods distinguished seem to stem from interpretation difficulties of the questions rather than from real developments in the sector.

Figure 4-30 Number of ANSP organisations under surveillance (n=19)

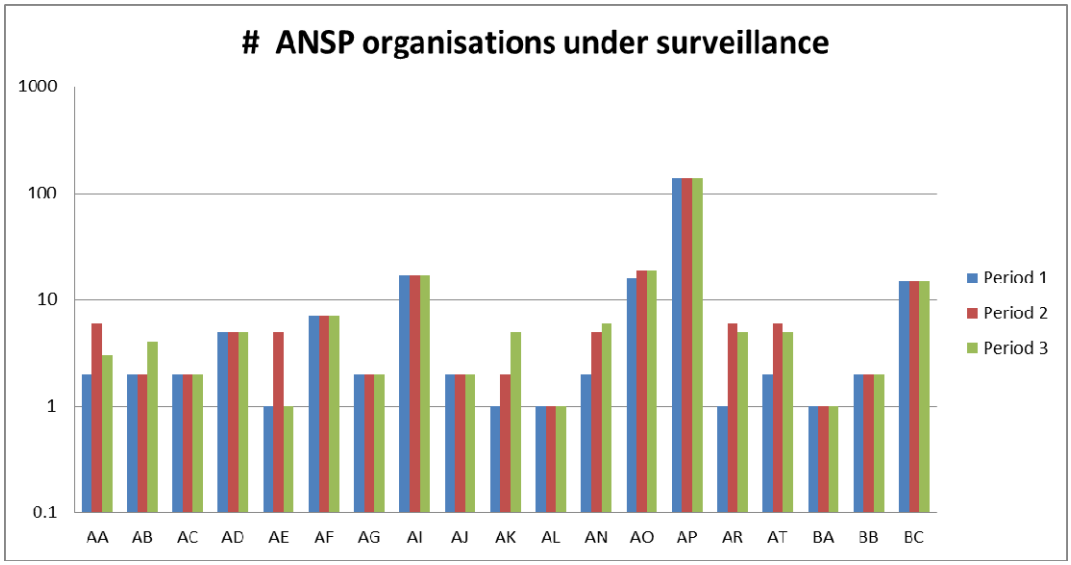


Figure 4-30 shows the data of the three periods of 19 states. The total number of ANSP organisations under surveillance changed from 218 (period 1) to 242 (period 2) (+11%) and 239 (period 3) (-1%). Due to the different way of counting ANSP organisations, these numbers do not mean much in an absolute sense. Relatively speaking, the number of ANSP organisations does not change much over the years, as can be expected: the number of ANSP organisations in a state is not likely to change much in 5-10 years' time.

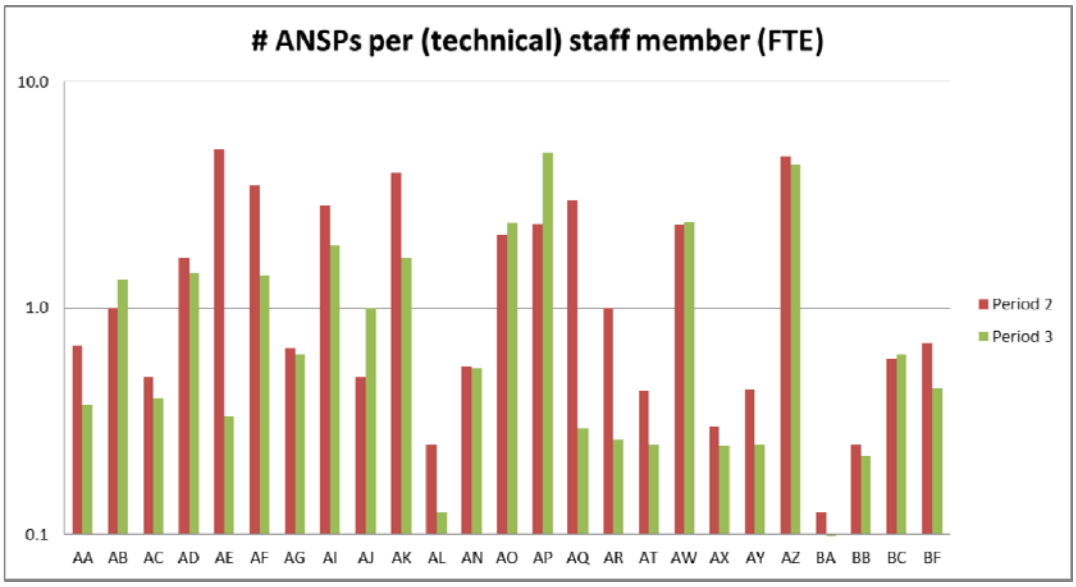
4.5.3 Number of ANSP organisations per ANS (technical) staff member

The remarks made in the previous paragraph have their consequences when defining the ratio number of ANSP organisations per ANS (technical) staff member. Therefore the results of Figure 4-31, including 25 states for which data are available for period 2 and 3 should be interpreted with care. Given the rise in staff members the expectation is that the number of ANSP organisations per (technical) staff member decreases over time, which is supported by the data (from an average of 1.6 organisations in period 2 to an average of 1.1 organisations in period 3, a decrease of slightly more than 30%. For period 1 insufficient data were available).

For big countries AP and AQ, the average rate decrease from period 2 to period 3 is 3% (from 2.7 to 2.6). For small countries AB, AC, AF, AK, AR, the average rate decrease from period 2 to period 3 is 53% (from 1.8 to 0.9).

The comparison of 100% government funded states (AB, AG, AJ, AL, AQ, AY, BB) and 100% industry funded states (AF, AI, AP, AR, AT, AW) also is limited to period 2 and period 3. The average rates are 0.9 and 0.6 for the 100% government funded states and 2.1 and 1.8 for the 100% industry funded states. The latter are at least a factor 2 larger.

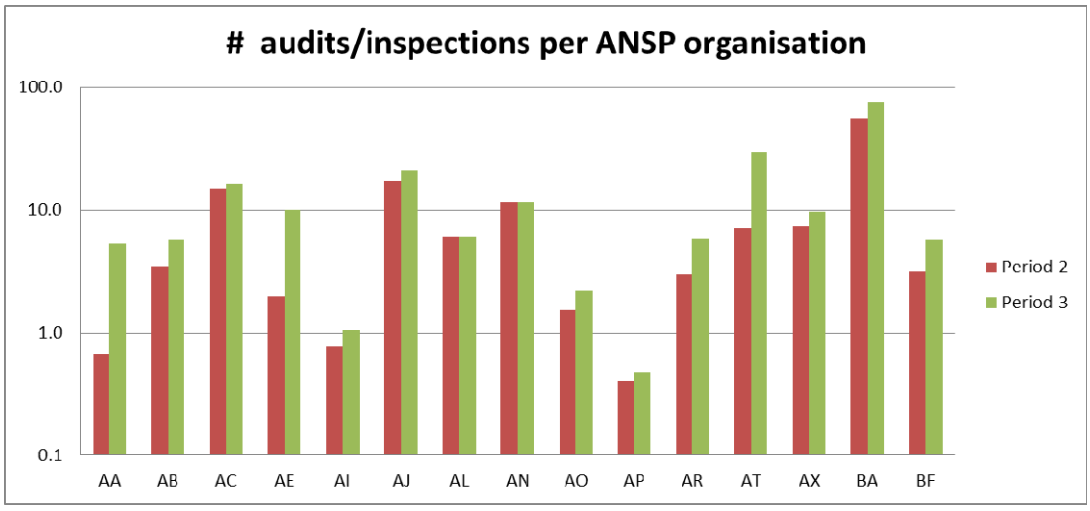
Figure 4-31 Number of ANSP organisations per ANS (technical) staff member (n=25)



4.5.4 Number of audits and inspections per ANSP organisation

Figure 4-32 provides the information concerning the number of audits and inspections per ANSP organisation of 15 states of which data are available for period 2 and 3:

Figure 4-32 Number of audits and inspections per ANSP organisation (n=15)



The remarks made related to the number of ANSP organisations under supervision have their influence on this ratio as well. While being aware of this footnote, the trend which could be identified (from period 2 to period 3 as there are insufficient data available for period 1) is an increasing trend, from an average 9.1 audits and inspections in period 2 to 13.8 in period 3, an increase of 52%. This can be interpreted as an increase in the workload of the ANS (technical) staff, what can be expected against the background of new developed regulations in this domain.

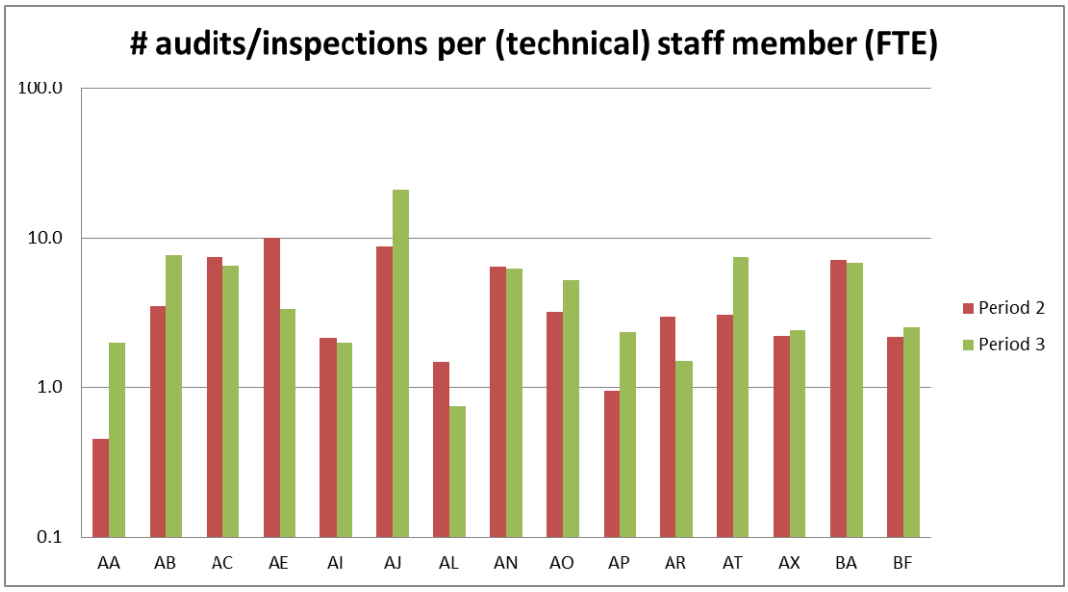
Information is available for 1 big country only, which is insufficient for a comparison with small countries. The average trend for 3 small countries (AB, AC, AR) shows an increase from period 1 to 2 of 54% and from period 2 to 3 of 30%.

The comparison of 100% government funded states (AB, AJ, AL) and 100% industry funded states (AI, AP, AR, AT) also is limited to period 2 and period 3. The average rates are 9.0 and 10.9 for the 100% government funded states and 2.8 and 9.3 for the 100% industry funded states. The latter are smaller than the former.

4.5.5 Number of audits and inspections per ANS (technical) staff member

A last workload ratio that could be defined based on the information available is the number of audits and inspections per ANS (technical staff member) (**Figure 4-33**):

Figure 4-33 Number of audits and inspections per ANS (technical) staff member (n=15)



Given the limited data available for period 1, a trend could only be identified from period 2 to period 3, for 15 responses. The average number of audits and inspections per ANS (technical) staff member increased from 4.1 in period 2 to 5.2 in period 3, an increase of 26%. Hence, despite the fact that the number of staff significantly increased, the workload as expressed by this ratio also increased.

Information is available for 1 big country only, which is insufficient for a comparison with small countries. The average trend for 3 small countries (AB, AC, AR) shows an increase from period 1 to 2 of 106% and from period 2 to 3 of 13%. This means an increase from period 1 to period 3 of 132%.

The comparison of 100% government funded states (AB, AJ, AL) and 100% industry funded states (AI, AP, AR, AT) also is limited to period 2 and period 3. The average rates are 4.6 and 9.8 for the 100% government funded states and 2.3 and 3.3 for the

100% industry funded states. The latter are at least a factor 2 smaller than the former.

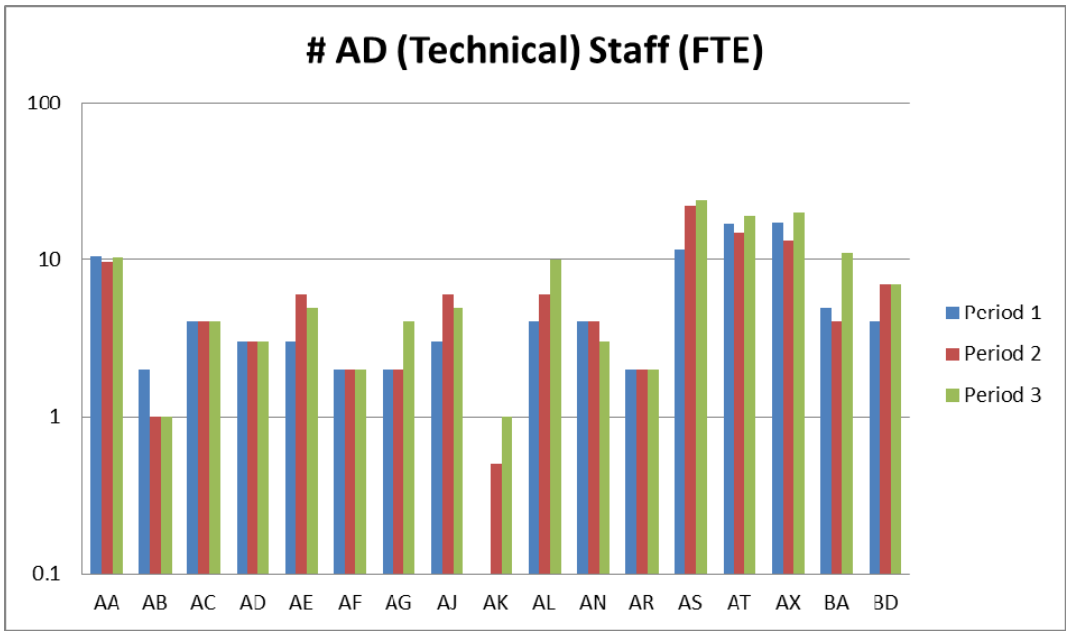
4.6 Aerodromes

For the aerodrome domain the available information was unfortunately limited to some basic indicators, namely the number of aerodrome (technical) staff, the total number of aerodromes and heliports and the number of aerodromes that do not fall in the scope of the basic regulation. Hence, the only workload ratio that could be defined was the number of aerodromes and heliports per aerodrome (technical) staff member.

4.6.1 Aerodrome (technical) staff

Figure 4-34 indicates the developments over time in the number of aerodrome (technical) staff. The totals of the states that submitted data for all 3 periods (17 states) indicate an increasing trend from 94 in period 1 to 108 in period 2 (+15%) to 131 in period 3 (+21%), which is an increase of 39% when compared to period 1. This increasing trend is mainly caused by new, additional (certification) requirements in the aerodrome domain.

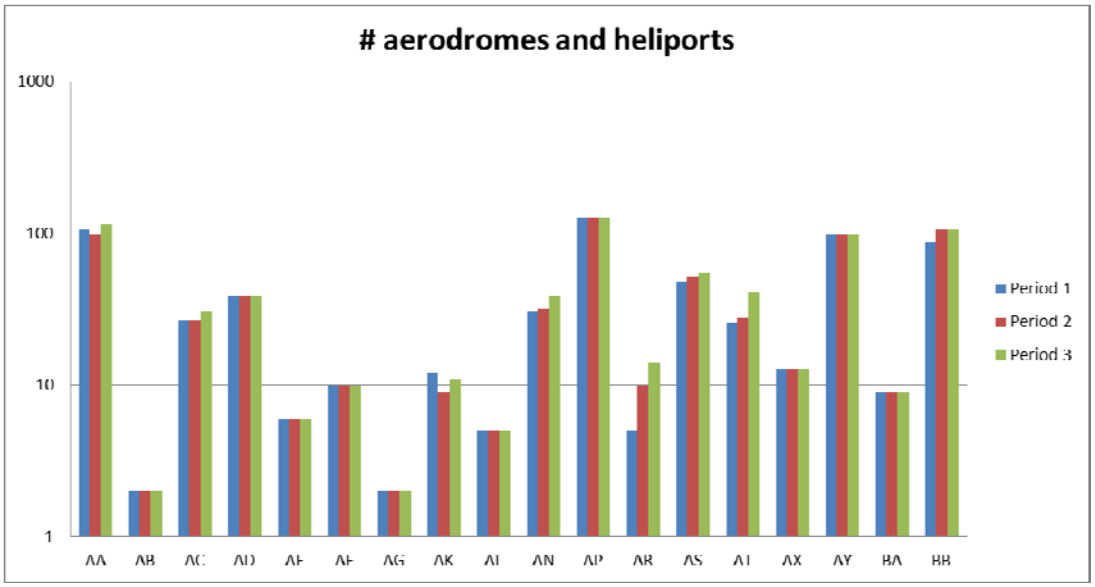
Figure 4-34 Number of aerodrome (technical) staff (n=17)



4.6.2 Number of aerodromes and heliports

The changes in the number of aerodromes and heliports over the different periods are of course limited. This is illustrated in **Figure 4-35**. In some cases information from the respective AIPs is used to complete the information submitted. No trend is defined as the added value of that is too limited.

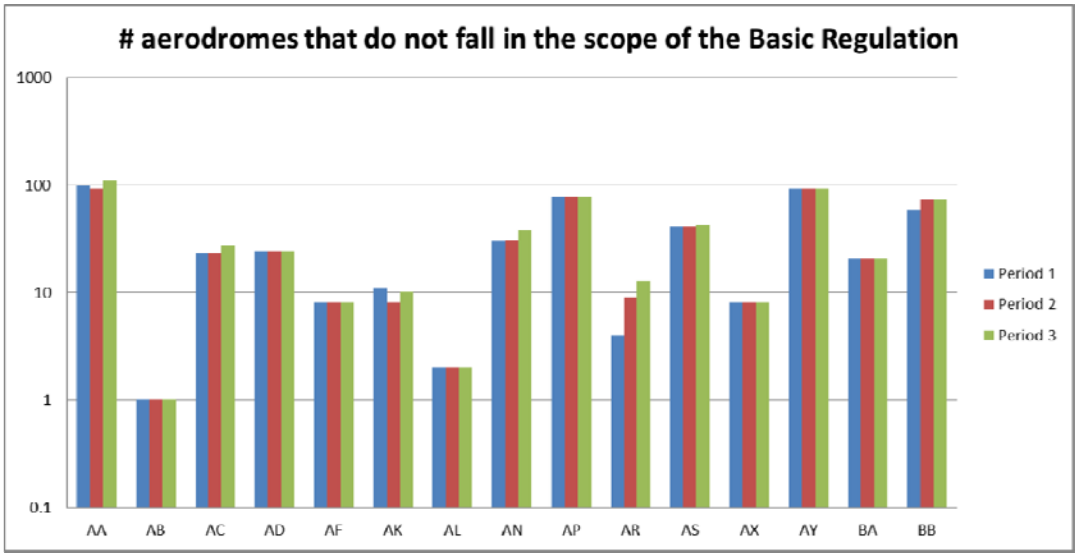
Figure 4-35 Number of aerodromes and heliports (n=18)



4.6.3 Number of aerodromes that do not fall in the scope of the basic regulation

One of the more interesting elements of the aerodromes domain is the total number of aerodromes that do not fall in the scope of the basic regulation. **Figure 4-36** provides an overview of this. The total figure based on the available data is 548 in period 3.

Figure 4-36 Number of aerodromes that do not fall in the scope of the basic regulation (n=15)

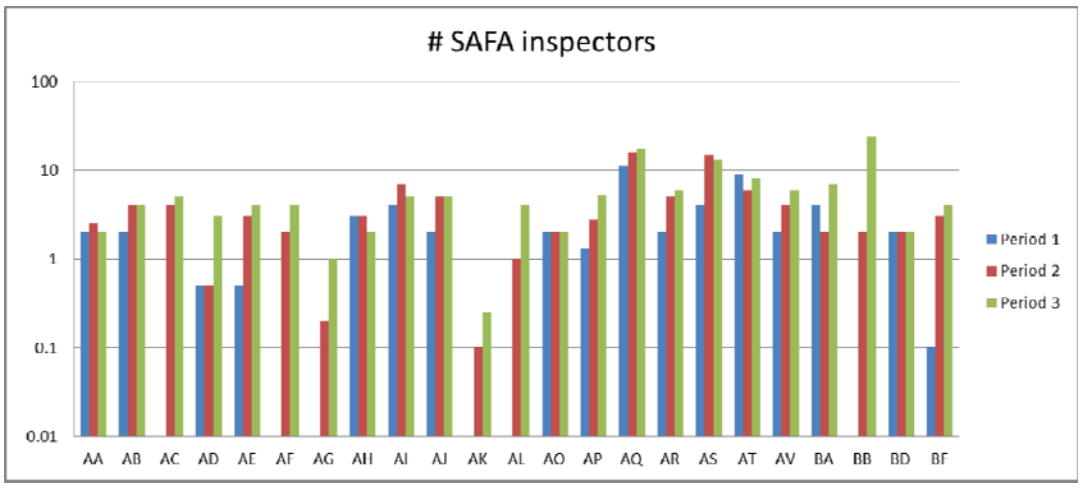


4.7 SAFA

The SAFA programme is nowadays part of part-ARO of Commission Regulation 965/2012. In the following figures an overview is provided of the number of SAFA inspectors in each of the 31 states, in each of the periods distinguished, and of the

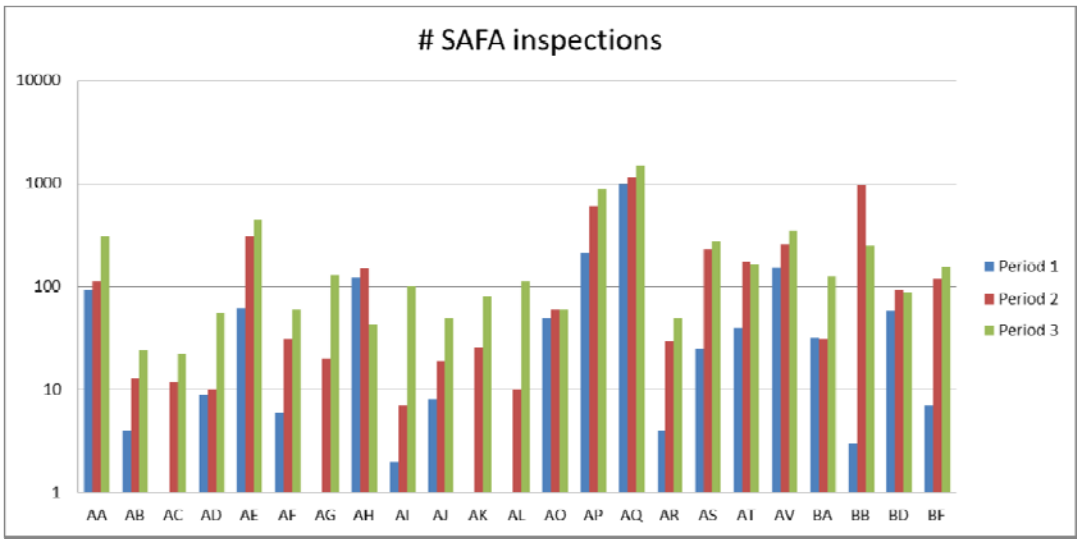
number of inspections executed. The execution of the programme is closely monitored by EASA.

Figure 4-37 Number of SAFA inspectors (n=23)



The total number of SAFA inspectors grew significantly over the 3 periods (from 51 in period 1 to 92 in period 2 (+80%) to 133 in period 3 (+45%), which is 160% more than in period 3). Please note that in this calculation only those states are used who submitted data for all 3 periods under investigation.

Figure 4-38 Number of SAFA inspections (n=31)



Also the number of inspections carried out increased over the 3 periods. In period 1 a total of 1887 inspections were carried out, in period 2 a total of 4444 (+136%), and in period 3 a total of 5370 (+21%), an increase of 185% when compared to period 1. For these totals only those 23 states were used who were also used when calculating the total amount of inspectors. This makes it also possible to address the ratio between the number of inspectors and the number of inspections carried out: in period 1 this ratio was 1887/51 = 37, in period 2 this ratio was 4444/92 = 48 (30%), and in period 3 this ratio was 5370/133 = 40 (-17%). Hence, the workload expressed

by means of this ratio indicates an initial increase followed by a decrease. One should however realise that in many countries, SAFA inspections are carried out by staff who are also involved in other kinds of oversight activities in both the AIR domain and the OPS domain.

4.8 Safety analysis & research

The participating states were also asked to submit data concerning the manpower spent (in terms of FTE) on safety analysis & research (SAR). 23 states delivered data for at least 2 periods – the number "zero" is considered to be information in this case as well. In almost half of these 23 states, no one is – in terms of FTE – involved in SAR. The remaining figures indicate an increasing trend (from 20 to 38.5 (+92.5) to 57.6 (+50%)), also when the states AS and AX with questionable figures, are not taken into account as the figures of these 2 states are quite high (from 19 to 20 (+5%) to 31.7 (+59%)) (table 4.1).

Table 4-1 Number of staff involved in safety analysis and research

	# staff involved SAR		
Key	**Period 1**	**Period 2**	**Period 3**
AA	1	2	2.7
AB	0.5	0.5	1
AC	1	1	1
AD	0	0	0
AE	0.5	0.5	2
AF	1	1	1
AG	0	0	0
AH	0	0	0
AI	1	4	5
AJ	0	0	0
AK	1	1	3
AN	3	2	1
AR	0	1	1
AS	1	7	11
AT	5	2	6
AV	0	0	0
AW	0	0	0
AX	Unknown	11.5	15

# staff involved SAR			
AY	0	0	0
AZ	0	0	0
BA	0	0	3
BC	0	0	0
BD	5	5	5

4.9 International Cooperation (INT COOP)

Concerning International Cooperation, 5 states indicated that their CA does not spend any time on International Cooperation. This could for instance be the case when these kinds of matters fall under the responsibility of the Ministry of Transport and not of the CA. The figures provided indicate an increasing trend (from 52.2 to 72.2 (+38%) to 91 (+26%)), also when states AC, AL and AX are not taken into account as the figures of these 3 states are quite high (from 13.2 to 22.4 (+70%) to 31.2 (+39%)) (table 4.2).

Table 4-2 Number of staff involved in INT COOP

# staff involved INT COOP			
Key	**Period 1**	**Period 2**	**Period 3**
AA	1.2	3.8	1.6
AB	1.0	2.0	4.0
AC	25.0	30.0	36.0
AD	0.0	0.0	0.0
AE	1.0	1.0	2.0
AG	1.0	1.0	1.0
AH	0.0	0.0	0.0
AI	0.0	0.0	4.0
AJ	0.0	0.0	0.0
AK	0.0	0.1	0.3
AL	7.0	10.0	12.0
AN	1.0	2.0	2.0
AR	1.0	1.0	1.0
AS	3.0	7.5	8.4
AT	2.0	2.0	5.0
AV	0.0	0.0	0.0

# staff involved INT COOP			
AW	0.0	0.0	0.0
AX	7.0	9.8	11.8
AY	0.0	0.0	0.0
AZ	0.0	0.0	0.0
BA	2.0	2.0	2.0
BC	0.0	0.0	0.0

4.10 Conclusion

The results of the analysis of the resources study can be summarized as follows:

General

The total staffing data indicate, at first glance, an increase of 35% of the total staffing level[9] of the CAs across Europe over the last 10 years. In the states that provided data for all 3 periods under investigation the staffing level (in terms of technical staff) increased from 2426 in period 1 to 2646 in period 2 to 3267 in period 3. The last increase was mainly because of a significant increase in the state AP (+147) and state AQ (+315), merely caused by differences in the way the total amount of staff was calculated in these 2 periods. As such these calculated differences distorted the overall picture significantly. In order to take into account these anomalies, the study team focused on the developments of the technical staffing levels in the 3 largest domains (AIR, OPS and PEL), as for these domains we did not see such outliers and more detailed information was available from other sources which made a cross-check possible. The totals of the technical staff working in these 3 domains (based on a sample of 17 Member States) increased from 1574 in period 1 (pre-EASA) to 1727 in period 2, and then decreased to 1659 in period 3 (current situation). Hence, in terms of technical staff, the trend is initially an increase of 10%, followed by a decrease of 4%. With respect to period 1, period 3 shows an increase of 5%.

Two of the indicators that can be used to address the developments in the size of the aviation industry across Europe are the number of aircraft on the national registries and the number of aeroplanes and helicopters used in Commercial Air Transport (CAT). Both increased over the 10 years under investigation, the total number of aircraft on national registers with 15% and the aeroplanes and helicopters used in CAT with 23%.

The funding of the CAs increased from period 1 to period 2, but then decreased from period 2 to period 3. When focussing on those states of which data are available for all three periods (16 states in total), the summation of the budgets in period 1, 2 and 3 indicates that from period 1 to period 2 the total budget *increased* from 439 million Euro to 558 million Euro (27%), while from period 2 to period 3 (530 million Euro) the total budget *decreased* with 5%. Between period 1 and 3 the overall increase amounts

[9] Containing technical and support staff including staff contracted in.

to 21%[10]. This pattern is similar to the development in resources for the 3 largest domains.

Airworthiness

The totals of the (technical) staff working in the airworthiness domain decreased from period 1 to period 2, most probably caused by the fact that certification became the responsibility of EASA. From period 2 to period 3 however, the (technical) staffing level increased again to a level slightly higher than the level in period 1. Hence, the shift of certification tasks to EASA did only initially lead to a reduction of staff in this domain as other developments, like an increase of 53% in the number of certified organisations (CAMO, Part-145, Part-147, etc.) between period 1 and period 3 caused this figure to rise again.

Several indicators can express the developments in workload in the airworthiness domain. The number of certified organisations increased in 10 years' time by 53% and the ratio of the number of certified organisations per staff member increased in 10 years' time by 55%. The number of audits and inspections per certified organisation decreased. This could well be caused by the rise in workload, as the work of the airworthiness (technical) staff involves more than only the execution of audits and inspections. The number of aeroplanes with an EU certificate of airworthiness per airworthiness (technical) staff member increased from period 1 to period 2 by 10%, and then decreased by 4%.

Special attention was paid to the number of aeroplanes and helicopters meeting the criteria of Annex II of the basic regulation. The data indicated that, over the last 5 years this number decreased slightly. In 2013 there were over 18.000 Annex II aircraft in Europe. Unfortunately no reliable data were available to answer the question how much staff (in FTE) is exclusively dealing with Annex II aircraft.

Operations

The number of operations (technical) staff increased from period 1 to period 2 by 31%. From period 2 to period 3 however, the staffing level decreased by 14%. Compared to 2003 the level of 2013 is 13% higher. As such, the level of operations (technical) staff has a comparable trend as the budget of the CAs. A possible cause could be the economic downturn since period 2.

The economic downturn probably also had its influence on the workload indicators, the number of AOC holders to mention first. While this number increased from period 1 to period 2, from period 2 to period 3 the number of AOC holders decreased to a level slightly lower than that in period 1. When the number of AOC holders is expressed per operations (technical) staff member, the trend is opposite because of the changes in staffing level. From period 1 to period 2 the ratio decreased by 26%, and from period 2 to period 3 the ratio increased by 4%.

[10] It should be noted that in these trends the relative large budget of state BB is included. The budget of state BB is that high because airport operations and air traffic control are included.

When workload is expressed by means of the ratio of the number of aeroplanes and helicopters per operations (technical) staff member, the trend is also initially a decrease (of 3%), followed by an increase (of 8%) to a level higher than the original value of this ratio in period 1.

The last workload ratio defined in the operations domain was the number of audits and inspections per AOC holder. This ratio increased over the first 5 years (by 10%), but then decreased with 21%. This trend could be the result of the initial decrease in workload, leaving more time to inspect, but following the increase in workload from period 2 to period 3, the number of audits and inspections carried out decreased significantly (by 21%).

Personnel licensing

The trend in the (technical) staffing level of the personnel licensing domain increased from period 1 to period 2 by 22%. From period 2 to period 3, the staffing level decreased again by 9%. The number of flight crew licenses initially grew 27% (from period 1 to period 2), after which it remained almost stable from period 2 to period 3. In terms of the number of flight crew licenses, the workload of the PEL staff increased over the last 10 years.

The number of (approved) flight-training organisations increased over the last 10 years by 33%. Expressed in a workload ratio (the number of (approved) flight training organisations per PEL (technical) staff member) there was from period 1 to period 2 an increase of 18% and then a decrease, from period 2 to period 3, of 2.5%. The number of audits and inspections increased over the last 10 years by 18%, mainly caused by the significant increase of the number of (approved) training organisations.

One can conclude that, despite the small decrease in the number of (approved) flight training organisations per PEL (technical) staff member from period 2 to period 3, the workload in the PEL domain increased.

ANS

The staffing level in the ANSP domain increased significantly over the last 10 years. In total, an increase of more than 100% could be defined. This trend is the result of increased attention to ANSP oversight and regulation. Given this increase in staff and the relative constant total number of ANSP organisations, the workload expressed in terms of the number of ANSP organisations per ANS (technical) staff member of course decreased. But expressed in terms of inspections and audits per ANS (technical) staff member, an increase could be defined of approximately 20%, despite the growth in staffing level.

Aerodromes

The information available with respect to the aerodromes domain was, as said, rather limited. The main finding was that the staff in the aerodrome domain grew significant over the last 10 years, by 40% what is most probably related to new, additional (certification) requirements in the aerodrome domain. While the EU Aerodrome rules are very recent, the ICAO requirement for the certification of aerodromes does exist

some quite some time now. This has all to do with new, additional (certification) requirements in the aerodrome domain.

SAFA

The SAFA programme, nowadays part of the Authority Requirements of Commission Regulation 965/2012, grew significantly over the last 10 years. The number of inspectors increased by 160%, the number of inspections by 184%. In terms of the ratio between the number of inspectors and the number of inspections carried out the workload increased from period 1 to period 2 with 30%, but from period 2 to period 3 this ratio decreased by 17%. It should however be noted that in many countries, SAFA inspections are carried out by staff that are also involved in other kind of oversight activities in both the AIR and OPS domain.

Safety analysis and research (SAR)

The participating states were also asked to submit data concerning the manpower spent (in terms of FTE) on safety analysis & research (SAR). 23 states delivered at least data for 2 periods – the number "zero" is considered to be information as well in this case. In almost half of these 23 states, no one is – in terms of FTE – involved in SAR. The remaining figures indicate an increasing trend.

International Cooperation (INT COOP)

Concerning International Cooperation, 5 states indicated that their CA does not spend any time on International Cooperation. This could for instance be the case when these kinds of matters fall under the responsibility of the Ministry of Transport and not of the CA. The figures provided indicate an increasing trend.

Overall conclusions

Following the analysis in the different domains one can conclude that, in general terms, the staffing levels of the technical staff in the larger domains OPS and PEL increased from period 1 to period 2, and, following the economic downturn since 2008, decreased from period 2 to period 3. Exceptions to this trend are the AIR domain, which initially, from period 1 to period 2, decreased following the transfer of responsibilities to EASA, but from period 2 to period 3 increased again to a level slightly higher than the original level in period 1. The shift of certification tasks to EASA did only initially lead to a reduction of staff in this domain. The domains confronted with new regulations, ANS, Aerodromes, SAFA and Safety Analysis & Research also followed a different trend. Staffing levels in these domains increased significantly over the last 10 years.

The creation of EASA did not lead to a decrease in staff involved in International Cooperation. Of course one should keep in mind that these conclusions are based on the data received, which sometimes only refer to a relatively small selection of the EASA member states.

In terms of workload the general trend is that of an increase, especially over the last 5 years. In addition to that, one should realise that not all of the tasks of employees of CAs were covered by the questionnaire. For instance all the work that has to be done related to the (standardisation) work of EASA was not explicitly part of the questionnaire, but was being addressed during the interview sessions (see next chapter). All in all, the conclusion is that the resources – workload balance has deteriorated over the 10 years under study.

Concerning the comparison between big countries (AP, AQ, BE) and smaller countries (AB, AC, AF, AG, AK), no particular trends or significant differences could be identified. Concerning the comparison between State funded CAs and industry funded CAs it could be identified that, except for one workload ratio (number of ANSP organisations per ANS staff member) the workload ratios of State funded CAs are (significantly) higher than the workload ratios of industry funded CAs.

5 European aviation safety system resources

In this chapter, the findings of previous Chapters are integrated. The evolution of resources available and applied on aviation safety at a European level[11] since the creation of EASA in 2003 is presented here. This combines the resources applied in the field of aviation safety in EASA, the MS of EASA, Eurocontrol and JAA. Subsequently, a comparison with the FAA from the US is drawn. Finally, in this chapter the benefits stemming from the creation of EASA are discussed.

5.1 Resources at a European level

In the previous chapter, an in-depth analysis has been provided of the trends in staffing levels, output and workload ratios at CAs across Europe. This provides by far the largest part of the picture. In chapter 3 we have assessed the development in workload and resources at EASA, Eurocontrol and JAA. Key figures related to the staffing of these organisations are provided for overview purposes again in the table below.

Table 5-1: Availability of aviation safety technical staff (in FTE)

Organisation	2003	2008	2013
EASA	1	340	535
Eurocontrol	22.5	22.5	5
JAA	22**	-	-

The staffing levels of Eurocontrol and JAA - which are playing a significant role in the aviation domain - do not have an impact on the trends in CA staffing as identified in chapter 4. The main reason for this is of course because the staffing trends identified in chapter 4 are based on the staffing of the working domains of AIR, OPS and PEL (as seen in **Table 5-2**) which differ from the main tasks of Eurocontrol, but also because these total amounts are relatively limited. The impacts of the creation and expansion of EASA on the staffing levels of the CAs have been already elaborated on section 4.10.

[11] In this chapter, reference to European level impacts refers to the EASA geographical scope and not to the whole of Europe. This means that non-EASA States are excluded from the analysis in this chapter.

Table 5-2: CA technical staff in the 3 main domains of aviation safety (AIR, OPS, PEL)

Organisation	2003	2008	2013
CAs*	1574	1727 (+10%)	1659 (-4%)
AIR	*917*	*892 (-3%)*	*919 (+3%)*
OPS	*395*	*516 (+31%)*	*446 (-14%)*
PEL	*262*	*319 (+22%)*	*294 (-8%)*

** Based on a sample of 17 Member States*

In order to compare the current European system with for instance the FAA, the total summation of staff and budget of both CAs and EASA, together with some of the key output indicators of the member states together, becomes interesting to note and is presented below.

Staffing and budget on European level in 2013

The present total staffing level in Europe (CAs, EASA and Eurocontrol) can be estimated as follows. From our data collection effort, we have an indicative number of approximately 4000 FTEs employed at CAs (rounded data; based on the response of 24 states for total staff –support and technical-; 2013 data). This means an average of 165 per CA. Multiplied by 31 (EASA member states excluding Liechtenstein) would give an estimated total figure for the staffing of the CAs of around 5,100. Including EASA and Eurocontrol technical aviation safety staff, an estimate of the total would be approximately **5,600**.[12] Of course this calculation is rather broad and should therefore only be used as an indication. The reason for making this estimation is that no precise data are available for all member states. Limiting the calculation to technical staff does not solve this problem as not all member states did submit these data as well. Note also that in these calculations we do not account for the complete staff of Eurocontrol but only for that dealing with rulemaking, standardisation audits and oversight activities (see chapter 3).

A similar analysis can be done for the budget. Based on our data collection, we have an indicative value of € 581 million (2013, based on 18 states). This means an average of € 32 million per CA multiplied by 31 gives an estimate of the total amount of € 810 million Euro (rounded). Including the budget of EASA and Eurocontrol[13] an

[12] Starting from an estimated average of 165 per CA for the 24 CAs that data were collected and multiplying by 31 (EASA member states excluding Liechtenstein) would give an estimated total figure for the staffing of the CAs of around 5,100. Including EASA and Eurocontrol an estimate of the total would be approximately **5,600**. Of course this calculation is rather broad and should therefore only be used as an indication. The reason for making this estimation is that no precise data are available for all member states. Limiting the calculation to technical staff does not solve this problem as not all member states did submit these data either. The only purpose of this estimation is to make a rather general comparison possible between the FAA and the situation in Europe. Note also that the staff figures used for Eurocontrol refer only to the Eurocontrol staff relevant for the scope of this assignment.

[13] This refers to the part of the Eurocontrol budget as estimated in relation to the number of staff employed in the domains relevant to this analysis

estimate of the total budget is € **940 million**. Again, this is only a rather broad estimation.

Selection of workload indicators on European level

Based on our data collection effort, a summary of key workload figures can be presented. Data for 2009 are additionally added in order to understand the trends over the last few years:

Table 5-3: Selection of workload indicators (2013 and 2008, for 31 states)

	2008	2013
Number of aircraft on register	98,081[14]	107,500[15]
Number of aircraft active in CAT	11,703[16]	12,134
Number of certified airworthiness organisations	4,425[17]	5,448[18]
Number of a/c maintenance licenses	64,567[19]	74,098[20]
Number of AOC holders	1,304	1,201
Number of pilot licenses issued and validated	253,833[21]	255,204[22]
Number of approved training organisations	2801	2,833[23]

Please note that just for the reason of comparison with the FAA, some assumptions had to be made to be able to deal with missing data. These assumptions have been

[14] 91,754 based on 29 states. Amended to 31 states based on average.

[15] 100,544 based on 29 states. Amended by Ecorys to 31 states based on average.

[16] 2,207 under the assumption that for one state the average of the 2003 figure and the 2013 figure is representative.

[17] 4,282 based on 30 states. Amended to 31 states based on average.

[18] 5,272 based on 30 states. Amended to 31 states based on average.

[19] 60,401 based on 29 states. Amended to 31 states based on average.

[20] 71,708 based on 30 states. Amended to 31 states based on average.

[21] 253,833 under the assumption that for two states the average of the 2003 and 2013 figures are representative for 2009.

[22] 255,204 under the assumption that the figures of 2013 were identical to those in 2008 for 2 states that did not deliver data for 2013.

[23] 2,833 under the assumption that the figures of 2013 were identical to those in 2008 for 2 states that did not deliver data for 2013.

detailed in the footnotes accompanying the table. Due to these assumptions, the data presented in table 5.2 might differ slightly from the data used in chapter 4, were similar assumptions were not made.

5.2 Comparison with the USA

Overview

The Federal Aviation Administration (FAA) is the agency of the United States Department of Transportation responsible for the regulation and oversight of civil aviation within the U.S., as well as operation and development of the National Airspace System. Its primary mission is to ensure safety of civil aviation.

The primary responsibilities of the FAA include:

- Regulating civil aviation to promote safety within the U.S. and abroad;
- Encouraging and developing civil aeronautics, including new aviation technology;
- Developing and operating a system of air traffic control and navigation for both civil and military aircraft;
- Researching and developing the National Airspace System and civil aeronautics;
- Developing and carrying out programs to control aircraft noise and other environmental effects of civil aviation;
- Regulating U.S. commercial space transportation. The FAA licenses commercial space launch facilities and private launches of space payloads on expendable launch vehicles.

The FAA is organized into four business areas (Lines of Business) that work together to contribute to the agency's goal of safe and efficient air travel for all:

Airports

Optimizes the safety, capacity and condition of the nation's airport system, including all programs related to regulations and inspections as well as standards for design, construction and operation.

Air Traffic Organisation (ATO)

Responsible for keeping air traffic moving safely throughout the skies. ATO's workforce includes more than 35,000 air traffic controllers, technicians, engineers and support personnel directing more than 50,000 commercial, private and military flights through our national airspace each day.

Aviation Safety (AVS)

Ensures the certification, approval and airworthiness of aircraft along with the certification of all pilots, mechanics and other air safety-related professionals. AVS also works to develop the regulations by which these aircraft and individuals are

governed. Distinction can be made between Fight Standards, Aircraft Certification, Aerospace Medicine, Air Traffic Safety Oversight, Rulemaking, Accident Investigation & Prevention Service and Quality, Integration & Executive Services.

Office of Commercial Space Transportation (AST)

Protects the public, property and interests of the nation during the launch or reentry of commercial spacecraft. As the FAA's only space-related business area, AST is responsible for all activities related to the U.S. commercial space transportation industry.

Financing

The FAA is funded primarily by the Airport and Airway Trust Fund (Trust Fund or AATF), which receives revenues from a series of excise taxes paid by users of the national airspace system — and by the General Fund. The Airport and Airway Revenue Act of 1970 created the Trust Fund to provide a dedicated source of funding for the aviation system independent of the General Fund.

The Trust Fund's purpose was to establish sources of funding that would increase concurrently with the use of the system, and assure timely and long-term commitments to capacity increases. The Trust Fund was designed to finance investments in the airport and airway system and, to the extent funds were available, cover the operating costs of the airway system as well.

Trust Fund revenues are derived from excise taxes on:

- Domestic airline passenger tickets;
- Domestic airline passenger flight segments;
- International passenger arrivals and departures;
- Air cargo waybills;
- Aviation fuels and;
- Amounts paid for the right to provide mileage awards.

In 2014 the AATF provided 80% of the total funding of the FAA. The total budget of the FAA in 2014 was 15,8 billion USD, and they had 45,543 employees.

Comparison with Europe

The responsibilities and tasks of EASA together with the responsibilities and tasks of the CAs are for a large part comparable with the responsibilities and tasks of the Aviation Safety (AVS) line of business. Therefore, some key figures of the AVS line of

business are presented here (year 2014 budget request[24]). Data for 2008 are provided in order to visualize any trends over the last few years:[25]):

- Total **budget** AVS: $ 1.2 billion (€ 1.0 billion);
- Total **staffing level**: 7,238 FTE of which 6,283 FTE are safety critical staff and 955 FTE operational support.

Some key industry figures for FAA-AVS (May 2012):

We have listed some key figures for the FAA-AVS below for 2008 and 2012.

Table 5-4: Selection of workload indicators FAA-AVS (2008 and 2012)

	2012	2008
# AOC holders[26]	4,570 (2,686 when excluding agricultural operators)	5,147 (2,958 when excluding agricultural operators)
# Pilot training schools and pilot training centres	921	675
# Aircraft on register[27]	210,463 (199,952 when inactive aircraft excluded)	319,549 (227,872 when inactive aircraft excluded)
# Active pilots[28]	496,053	507,591
# Mechanics with Inspection Authority	21,740	20,458
# Mechanics and repairmen	378,561	363,217
Repair Stations	4,852	4,957
# Approved Manufacturers	1,619	1,647

While the core of the activities of AVS are, as said, comparable with the tasks and responsibilities of EASA and the CAs, one should however keep in mind that there are significant differences between the United States and Europe as well. Just to mention a few, the United States are known to train a lot of foreign pilots. While the data provided in table 5.3 are corrected for that, this fact also has its consequences for instance the number of pilot training schools and the number of mechanics with inspection authority. Another important difference is the fact that the United States have, in their operational regulations, a distinction between part 121 (airline

[24] http://www.dot.gov/sites/dot.dev/files/docs/FAA_FY2014_Budget_Estimates.pdf

[25] http://www.dot.gov/sites/dot.dev/files/docs/FAA_FY2014_Budget_Estimates.pdf.

[26] Major air carries, commuter air carriers and on-demand air taxies, commercial operators, external load, agricultural operators.

[27] Air carrier aircraft, commuter air carrier aircraft, on-demand air taxi aircraft, general aviation aircraft, inactive aircraft.

[28] ATP, CPL, PPL, RPL.

operations) and part 135 (commuter type of operations). In Europe we do not make this distinction. A last example is the fact that the United States are known to perform audits on the level of States when operators from a foreign State intend to start operating into the United States. While the number of AOCs issued presented in table 5.3 is corrected for the fact that those foreign operators need to apply for a certificate, this programme has of course its consequences for the staffing level of the FAA.

Concluding remarks

Given the significant differences referred to above a one by one comparison of the key factors is a delicate exercise. Some conclusions can however be drawn. There is not a too large difference between the total budget of the FAA and the European system (total budget of Europe is partly based on a rather broad estimate); the total staffing level in Europe is lower (again, the estimate of Europe is partly based on a rather broad estimate), but also the output level is less because the industry size is smaller (table 5.4):

Table 5-5: Comparison between Europe and USA on key indicators

Indicator	Europe (2013)	FAA (2012)
Budget	€ 1,13 billion	€ 1,0 billion
Total staffing level (technical and support staff)	5,600	7,238 (AVS only)
# AOC holders	1,201	2,686
# Aircraft on register	107,500	199,952
# Active pilots	255,204	496,053

Given the fact that differences in regulations have their consequences for organizations like pilot training schools, repair stations (United States) vs. certified organizations (Europe) and individual mechanics with inspection authority and mechanics & repairmen (United States) vs. individuals holding an a/c maintenance license (Europe), a direct comparison of these elements is too vulnerable for mistakes. Therefore these data are not repeated in table 5.5, but they can of course be used as a general impression for the size of the respective industry (table 5.2 and 5.3).

5.3 Benefits of the European aviation safety system

From the previous analyses it became clear that in Europe the available resources and budget in the area of aviation safety increased over the past 10 years. This has resulted in substantial benefits, the creation of EASA and reshaping of the European aviation safety system. This section aims to present the most significant improvements to the European aviation safety system overall brought by the creation of the European Aviation Safety Agency.

Safety benefit due to increased safety standards: Although very difficult to quantify, it is commonly acknowledged that the creation of EASA has brought along an improvement to the aviation safety standards of Europe compared to the period before

2004. According to the annual safety reviews issued by EASA[29], over the last decade, a large improvement in aviation safety has been achieved in the EASA area since the creation of the Agency. This has been achieved due to multiple causes, one of them being the creation of the Agency which has improved the aviation safety situation through a number of paths. First of all by introducing common rules for aviation safety which are stricter than the rules many MS had previously, as well as by the creation of detailed norms to substitute more general ones that were in place before the establishment of the EASA system. Secondly, by pursuing more consistently the standardisation of aviation safety in the MS, although this might not have been yet achieved to a level where the European aviation safety system can be considered totally harmonised, let alone standardised, as evidenced by the results of the EASA standardisation (see extracts from the EASA Annual Standardisation Report in Chapter 6). The interviews conducted with national CAs and industry representatives revealed that it is commonly thought that the standardisation of CAs' oversight practices leads to a better safety output. There is certainly an improvement in comparison with the voluntary, and less strictly imposed standardisation system of the JAA era. Also the participation of CA staff in the standardisation teams has positively affected their experience, thus increasing the aviation safety capacity of CAs.

Industry gain and promotion of the common market: The European aviation industry can be considered a net beneficiary of the new scheme. Even though mutual recognition of certificates was also the case during the JAA era, the adoption of Regulation 1592/2002 and creation of EASA have established i. a. a common Type Certificate as well as common certificates for parts and appliances with validity for the whole of the EASA area. As a result EASA certified aircraft can operate in all member states of the EU, which is a main strength of the current system and is beneficial for national authorities and industry, reducing considerably administration costs and eliminating duplication of procedures for mutual recognition. The single certification scheme for aircraft design and production organisation approval of Airbus is another prominent example in this respect. The efficiency gain, despite the stricter regulations applied, is especially relevant –as noted especially in the interviews with industry stakeholders - for larger industry actors that would otherwise have to deal with multiple authorities. Additionally, with the introduction of harmonised practices, the common internal market concept is promoted, although there is still a long way to go until a level playing field is totally achieved. On the other hand, the impact on smaller industry stakeholders and general aviation has not been reported – in most of the interviews with the CAs and industry stakeholders - of being as positive. Especially for companies active within only one or few MS, the impact of the creation of EASA on aviation safety processes has been perceived as increasing the administrative burdens, whereas the benefits from the facilitated international operations are not relevant for those stakeholders.

Efficiency gain due to centralisation: A number of the activities previously performed by individual CAs, are now performed by EASA. The centralisation of some of these activities produces economies of scale and specialisation. A key example is the case of product design certification centralisation. According to input received from most of the conducted interviews, this led to a significant reduction of the staff involved in certification in these specific areas in most MS, against a lower increase of

[29] EASA, Annual Safety Review 2013, 2013.

these resources at EASA[30]. Another case where centralisation has led to increased efficiency is international cooperation where adopting a unique representation for all the EU/EFTA MS has increased the leverage applied in bilateral negotiations, in comparison especially to the negotiation power that some of the medium and smaller CAs would have had.

Simplified regulatory process: Furthermore, while under the JAA system JARs were developed for almost all aviation domains, in the end there still was a need to transpose the JARs into the national regulations. From the perspective of standardization this was a complication. In the current system of European aviation regulations without any longer a need for transposition into national legislation, a new regulation is directly applicable when it comes into effect in a MS, which facilitates standardisation.

All together the revision of the aviation safety regulatory system and associated budget increases have resulted in significant benefits for Member States, industry and passengers.

[30] The analysis in chapter 4 shows that these staff have been put on other tasks, as the overall staff level in CAs in Europe has increased.

6 Problem analysis

6.1 Introduction

In the previous chapters, an assessment of the workload and resources available at the EASA level and at the Member State level (CAs), has been provided. The results of the quantitative analysis as presented in the previous chapters show that over the first decade an increase in the workload and resources of both EASA and the CAs has been observed, and that workload increases have generally outpaced resource increases, with variations observed between the MSs and per domain. It has been also observed that following an initial increase in resources, a decreasing trend could be observed in the period between 2008 and 2013.

Building on the previous parts of the study, this chapter presents the main problems that have been identified in relation to the current regulatory system and the governance of the EASA system followed by a detailed analysis of their respective problem drivers and root causes. The analysis has been conducted on the basis of survey data collected; 25 interviews with CAs, EASA and international organisations and industry associations; and desk research on the workload and resources available to the CAs across Europe.

6.2 Problem definition

Three high level problems have been identified in relation to the main objectives of the EASA system as set out in the Basic Regulation (see section 3.2). These are:

- An unpredictable safety situation;
- An industry bottleneck; and
- An unequal playing field for industry.

These are discussed below.

6.2.1 Unpredictable future safety situation

As stated in the EASA Article 62 Panel Evaluation Final Report (2013) and the Roadmap to the Policy initiative on aviation safety and possible revision of the Basic Regulation (2014)[31], the current system is characterised by consistently high – and

[31] EASA, "Article 62 Panel Evaluation – Final Report," 9 December 2013; Roadmap, "Policy initiative on aviation safety and a possible revision of Regulation (EC) No 216/2008 on common safety rules in the field of civil aviation and establishing a European Aviation Safety Agency," 2014. 26 March 2014. http://ec.europa.eu/smart-regulation/impact/planned_ia/docs/2015_move_001_revision_easa_regulation_en.pdf.

steadily improving[32] – safety levels. In 2013, the number of IFR flights in EU/EFTA MS totalled 9.447 million.[33] According to EASA's *Annual Safety Review (ASR)* for 2013, the number of fatal accidents involving an aeroplane operated by an operator registered in EASA Member State has decreased over the last decade, with no more than 1 fatal accident per year since 2007 and no fatal accidents in 2013.[34] This represents a slightly lower rate of fatal accidents than that achieved in North America during this same period. Accidents and serious incidents at aerodromes are also decreasing. Between 2009 and 2013, 14 accidents and serious incidents were reported in which the aerodrome was involved.[35]

The consistently high safety rate of the EASA system notwithstanding, the aviation accident rate has remained relatively stable since 2010 (*EASA Annual Safety Review 2013*). Looking to the future, global air transport forecasts indicate an expected 5% growth annually until 2030 while the number of commercial aircraft in operation is anticipated to double by 2031. [36] Thus, in the context of a stable fatal accident rate, the number of accidents can be expected to increase as a by-product of steadily increasing traffic volumes, creating an **unpredictable future safety situation**.

Table 6-1 Fatal accident rate per million IFR flights (three year average, 2011-2013) [37]

Fatal accidents	2011	2012	2013	3 year average
CAT aeroplanes	1	1	0	0,667
CAT helicopters	2	0	3	1,667
Total	3	1	3	2,33
IFR flights (millions)	9,784	9,548	9,447	9,593

Taking the three year average of the number of fatal accidents fatal accidents in EU/EFTA MS operated CAT aeroplanes and helicopters (above 2,250 kg MTOM)

[32] As reported in the Impact Assessment accompanying the Commission Proposal for a Regulation of the European Parliament and the Council on Occurrence Reporting in Civil Aviation (SWD(2012) 442 final), this statement is supported by the measure of passenger fatalities per 100 million miles flown which went from 5 in 1945 to below 0.05 in 1997 (European Aviation Safety Agency, Annual Safety Review 2005).

[33] *EASA Annual Safety Review 2013*, European Aviation Safety Agency: Luxembourg, 2014, p. 18.

[34] Ibid. p. 6.

[35] Ibid., p. 56.

[36] EASA Article 62 Panel Evaluation Final Report, p. 10.

[37] Number of fatal accidents in EU/EFTA MS operated CAT aeroplanes and helicopters above 2,250 kg MTOM. The three year average is applied in the EASA Annual Safety Review 2013.

amounts to approximately 2.3 fatal accidents per year, with an average of 0.24 per million IFR flights. Assuming a stable fatal accident rate of 0.24 per million flights is maintained in the baseline (see chapter 7), the number of fatal accidents per million IFR flights will amount to 2.6 in the year 2020 and 3.1 in 2030. What emerges is a situation in which the total number of accidents increases, all else being equal, in the context of increasing number of flights in a continuation of the baseline scenario. EASA and the CAs must ensure that the accident rate continues to decline in order to preserve the current low level of fatalities and incidents. Such decline in the accident rate requires an optimal European aviation safety regulation and oversight system.

Using the number of findings classified as non-compliant (i.e., class (C) and (D) findings) according to Art. 13 of Regulation 736/2006 as an additional barometer for measuring safety performance of Member States' CAs, the overall trend is an improving safety situation. See Table 6-2 below.

Table 6-2 Standardisation Inspections' results: Findings raised in 2013[38]

	Class A	Class B	Class C	Class D	Class E	Class F	Total (2012)	% 2013	% 2012
AIR	7	14	207	37	0	0	**265** (316)	31.74%	36.41%
OPS	-	-	22	44	-	-	**66** (105)	7.90%	12.10%
FCL	0	3	41	7	0	0	**51** (28)	6.11%	3.23%
MED	0	1	39	9	0	0	**49** (12)	5.87%	1.38%
FSTD	0	4	35	6	0	0	**45** (63)	5.39%	7.26%
ATM/ANS	1	1	128	173	2	0	**305** (259)	36.53%	29.84%
SAFA	-	-	45	9	-	-	**54** (85)	6.47%	9.79%
Total % 2013	8 0.96%	23 2.75%	517 61.92%	285 34.13%	2 0.24%	0 0.00%	**835**		
(2012 %)	1.50%	1.84%	70.39	26.15%	0.12%	0.00%	**868**		

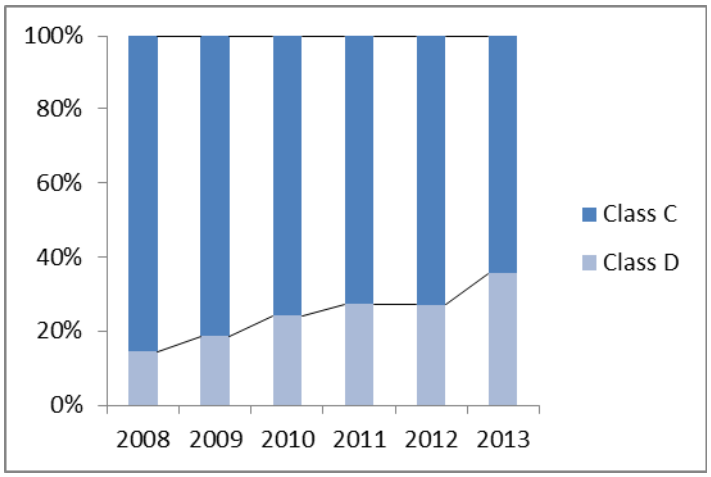
All findings are classified according to Art. 13 of Regulation 736/2006, as follows:
(A) Fully compliant;
(B) Compliant, but improvement is recommended in certain areas for better efficiency;
(C) **Non-compliant**, with objective evidence of **minor deficiencies** showing noncompliance with the applicable requirements in areas which could raise standardisation concerns.
(D) **Non-compliant**, with objective evidence of **significant deficiencies** showing non-compliance with the applicable requirements in areas, which, besides standardisation concerns, raise safety concerns if not promptly corrected.
(E) Not applicable;
(F) Not confirmed, when the authority inspected commits to produce shortly after the visit material evidence of compliance on findings otherwise classified as in (C) or (D), this material evidence not being directly available at the time of the visit.

Source: EASA Standardisation Annual Report 2013.

[38] Adapted from the EASA Annual Standardisation Report 2013.

More specifically, in 2013, the EASA Annual Standardisation Report shows a decline in the total number of findings (i.e., findings raised under all classes) from 868 in 2012 to 835 in 2013 and the number of non-compliance findings (NCFs) (i.e., the sum of class (C) and class (D) findings) similarly decreased from 838 in 2012 to 802 in 2013. The overall proportion of non-compliances (C and D findings) relative to the total number of findings raised remains stable at around 96% in 2012 and 2013, a slight increase over the 2010 non-compliance rate of 91%.39 According to the Standardisation Report for 2013, this is due to the findings raised in the ATM/ANS domain, accounting for 38% of the class (C) findings and 61% of class (D) findings, and more than 50% of total non-compliance findings. Moreover, it should be noted that the more mature areas, such as Airworthiness and SAFA, show a decrease of safety-relevant class (D) findings (accounting for approximately 10%), while ATM/ANS and OPS account for more than 50% of non-compliance findings. On the other hand, there is a clear trend towards an increased proportion of class (D) findings – i.e., evidence of significant deficiencies raising safety concerns if not duly corrected - in the last six years, accounting for 34.13% of the total number of findings in 2013, up from 26.15% in 2012 and 15% in 2008. See Figure 6-1 and Table 6-3 below for the evolution of non-compliance findings.

Figure 6-1 Distribution of non-compliance findings per year



Source: EASA Standardisation Annual Report 2013.

39 Findings prior to 2009 were classified in accordance with the JIPs. Information in the EASA Standardisation Annual Reports between 2007 and 2009 provides an indication of the number of findings requiring corrective action for the domains OPS, FCL (LIST & MEST) and FSTD, however total number of findings raised are not given. Findings requiring corrective action are comparable to Class (D) findings, and observations are comparable to class (C) findings. EASA, Standardisation Annual Report 2010, Standardisation Department: Cologne (Germany), March 2011.

Table 6-3 Evolution of non-compliance findings, 2008 - 2013

	2008[i]	2009[i]	2010[ii]	2011[ii]	2012[iii]	2013[iii]
Class C	359	417	586	537	611	517
Class D	61	95	186	201	227	285
Total NCFs	420	512	772	738	838	802
% Class D	15%	19%	24%	27%	27%	36%

[i] Data for 2008 and 2009 include only the findings raised under the Initial Airworthiness and Continuing Airworthiness domains. Findings requiring corrective action that were raised between 2008 and 2009 in the domains of OPS, FCL, MED, FSTD were classified in accordance with the JIPs, and are therefore not directly comparable.

[ii] Data for 2010 and 2022 include NCFs raised in the domains AIR, OPS, FCL, MED and FSTD.

[iii] Data for 2012 and 2013 include NCFs raised in the domains AIR, OPS, FCL, MED, FSTD, ATM/ANS and SAFA.

Source: EASA Standardisation Annual Report 2013.

These challenges need to be addressed in conditions of serious strain on the resources of Member States, CAs and EASA - in terms of budgets and number of staff employed. **The workload and resources imbalance** (also corroborated in standardisation findings, discussed in section 6.3.1) limits the capacity of the actors involved to perform the necessary activities, in turn requiring CAs to prioritise between competing tasks that can be performed with the available resources. It can also be expected that the pressure on resources will directly affect the quality and quantity of activities and services performed, hence creating potential future safety risks. This should not necessarily be perceived as a below threshold level of quality of all activities performed by the CAs and EASA – the safety track record of the European aviation industry is a proof for that. Nevertheless, it is critical that these limited resources are used and deployed with greater efficiency by all relevant actors in the EASA system in order to ensure that high levels of safety are maintained.

In addition,11 CAs – including large (5) and small (6) - have reported concerns over possible **declining qualification levels of personnel** in both their own staff as well as in other MS CAs. This concern is reflected in the main conclusions of the EASA Standardisation Report 2013, which finds that technical inspecting staff in the fields of OPS, ATM/ANS and PEL in particular are sometimes insufficiently trained and qualified for the allocated tasks. Lower levels of qualified staff naturally lead to insufficient output, both in terms of quantity and effectiveness. Proper implementation of regulations may be at risk without qualified staff with the necessary expertise to ensure their implementation and oversight. Finally, the **differences in supervisory approaches** (i.e., insufficient implementation of standardisation) reported in the EASA Annual Standardisation Report 2013 across EU MS is a third problem driver responsible for the increased proportion of the safety-relevant class D findings. This has been confirmed in more than half of the interview sessions held with MS CAs. These problem drivers are discussed further below.

6.2.2 Industry bottleneck

In addition to the safety-related challenges, there is also the challenge of overcoming **industry bottleneck** within the European aviation safety regulatory system. Interviewees from both MS authorities and industry revealed two different issues at

play here: First, the limits of the current system in terms of the **available resources** to some CAs has led to a situation in which countries must prioritise oversight and surveillance of existing certificates over the processing of new applications, leading to backlogs in tasks, particularly in addressing new organisations and new requests from the industry. This resources-workload imbalance therefore has a causal effect on industry bottleneck. Exact figures on how industry bottleneck is measured in the different Member States ("size/amount" of bottleneck nor cost) were not provided, making it difficult to quantify the magnitude of this problem. However, in two separate interviews, the CAs reported having deliberately chosen to delay requests from new operators due to insufficient capacity/resources available, prioritising instead oversight and surveillance of those that already have a certificate in order to ensure they meet the requirements for existing operators (existing safety) against new applications. On the other hand, in four interviews with industry, industry representatives reported that the insufficiency of resources in MS CAs has resulted in CAs being unable to provide assistance to, e.g. their operators to overcome issues linked to the implementation of the new legislation. This leads to a backlog in tasks while also hampering new initiatives, and thus the development of industry. It can therefore be expected that a CA which is unable to respond to new requests by industry, let alone perform existing tasks, will hamper industry activity levels and development in that country.

Second, the detailed **prescriptive aviation safety rules** are perceived by the industry to be overly complex, burdensome and often lacking clarity which leads to unnecessary administrative workload. Five of the six interviews with industry association representatives indicated that unjustified, from a safety point of view, effort is needed to comply with present system requirements, which also hampers innovation. The impact of the complexity of the regulatory framework on available resources was also reaffirmed in the majority (12) of interviews with CAs and is discussed in more detail in section 6.3.1 below. In addition, three industry representatives interviewed reported that due to the heavy regulatory burden imposed on industry, significant financial resources are often required in order to bring a product to market. The transition to risk/performance based regulation and oversight is therefore expected to bring substantial gains to industry in terms of efficiency and stimulating innovation, by reducing inspection-related costs for well-performing operators and allowing greater focus on issues, areas or organisations where there are higher risks to safety. Industry representatives were unanimous in respect to their position on the expected benefits from risk/performance based oversight. Moreover, technologies and innovative business models evolve quickly, creating situations that are not always covered under the existing regulatory framework (e.g. remotely piloted aircraft systems, commercial space transport). EU should provide the appropriate regulatory means to address and oversee these new industry developments.

6.2.3 Unequal playing field

Finally, both industry and the CAs must deal with an **unequal playing field** in the different MS, which may potentially undermine the common market/system. In the context of the objectives of the current study, this problem is causally linked with the differences reported in both the supervisory approaches of CAs and in the financing/charging structures implemented by the different MSs'. According to CAs and industry members interviewed, the regulations are subject to the interpretation of the different CAs, which for myriad reasons - *inter alia*, culture, language, existing national regulatory framework, available resources and so forth – vary (the root causes underlying the problem driver "differences in supervisory approaches" are discussed in section 6.2.3). The resulting **variations in standardisation levels**, as evidenced by the results of EASA standardisation referred above, incentivises

companies/operators to 'shop around' for certificates in countries known to be 'less standardised' (i.e., with lower oversight/apply less strict standards) and with lower oversight costs. Five out of sixteen CAs interviewed and one industry association representative expressed concern regarding the lower quality requirements in some States, for example easier personnel licensing exams or less strict inspectors. It was not possible to measure the extent and magnitude of 'shopping around', by other means than interviews. Quantification issues notwithstanding, it can be expected that these differences in the levels of (and associated costs with) standardisation resulting from the uneven interpretation and implementation of the regulations will create an unequal level playing field for industries of different Member States, as well as potential safety risks if not duly corrected and properly enforced. The second aspect relates to the differences in CA approaches to calculating charging fees for certification. In some countries, governments set the cost for certification lower, making the certification procedure cheaper for industry in that country. As a result, industry is expected to cross borders for certification in countries where it is offered at a lower price. This has been mentioned in five CA interviews, covering both fully industry-funded and fully government-funded CAs, as well as large (3) and small (2) authorities. Thus, variations in the level and quality of standardisation, together with the fact that some governments charge less for certification has a negative impact on the level playing field.

The following sub-sections examine the problem drivers and root causes to these high level problems.

6.3 Main Problem Drivers and Root Causes

Four main problem drivers have been identified, the evidence of which is presented in sections 6.3.1 – 6.3.4). These 4 drivers are:

- The **insufficient and inefficient deployment of resources compared to workload.** This imbalance between an increasing workload and stable or decreasing resources is causally linked to the potential future safety risks and industry bottleneck, as well as the differences in supervisory approaches implemented by the different EU/EFTA MS. Eleven root causes are identified in relation to "resources-workload imbalance" problem driver;
- Another finding of this analysis is the fact that the **qualification level of the staff** of some CAs has been reported by CAs and industry representatives alike, and confirmed by the findings of the Annual Standardisation Reports of EASA, to be suboptimal. This is particularly the case in smaller CAs facing extremely high resource-workload constraints as well as those characterised by a relatively larger ageing workforce. This contributes to the unpredictable future safety situation as it causes an underperformance of these authorities and is linked with seven root causes;
- Among the 32 MS of EASA, significant **differences in supervisory approaches** can be met. This means that the way industry oversight is performed in the EU/EFTA MS can differ significantly in terms of the uniform level of implementation of EU regulations, either administratively or even technically, despite the common regulatory system and the standardisation effort. This is confirmed by the uneven implementation of EU regulations, particularly in the domains marked by less 'maturity' (i.e., OPS, FCL, ATM/ANS). These differences are a source of mistrust between specific CAs as they create potential safety risks and contribute to the unequal playing field for

industry. Six root causes are linked with the differences in supervisory approaches as problem driver;

- Finally, there are significant **differences in the national charging structures** imposed on industry by the CAs in the 32 EASA Member States. These differences are a cause for the unequal playing field for industry, potentially undermining the system. One root cause is linked to this problem driver.

The following sub-sections describe the baseline trends observed for each problem driver and their main root causes.

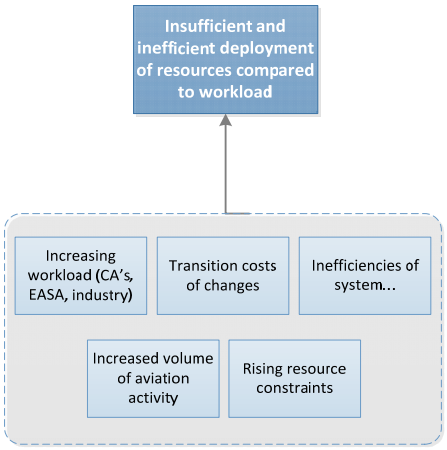
6.3.1 Insufficient and inefficient deployment of resources compared to workload

The establishment of the EASA system in 2003 and the incremental transfer of competencies from JAA and the CAs to the Agency as defined initially under Regulation (EC) No 1592/2002, and subsequently modified under the first and second extensions of the EASA scope has led to an increase in workload for the Agency as well as for the CAs. The same is true of the development in the level of resources available to CAs and EASA over the last decade, though with variations across the domains. Among the larger domains, OPS and PEL technical staffing levels experienced an initial increase between 2003 and 2008 followed by decreases from 2008 to 2013, while AIR followed the opposite pattern. By contrast, in those domains confronted by new regulations, such as ANS, Aerodromes, SAFA and Safety Analysis & Research, staff levels increased significantly throughout the decade. The results of the quantitative analysis as presented in the previous chapters however reveals that workload increases have generally outpaced resource increases, with variations observed between the MS and per domain. The overall conclusion therefore is that the workload-resource situation has, on balance, deteriorated over the 10-year period under study.

The combined effect of the trends presented in terms of resources available to EASA and CAs and increasing workload of both is understood as the first problem driver: “Insufficient aviation safety resources compared to workload”. This finding is confirmed in the Standardisation Annual Report 2013 of EASA, which identifies the insufficient availability of qualified inspectors in a number of CA’s as one of the two main problems facing CAs today. One could argue that the fact that some CAs encounter shortages in terms of qualified inspectors might be offset against the possibility that other CAs have excess capacity in terms of inspectors. Our interview programme with 16 CAs however, did not provide any indication for this.

We have identified five underlying factors (root causes) that are causally linked to this problem driver as presented in figure 6.2. The causal links are discussed below.

Figure 6-2: Root causes to the problem driver of insufficient and inefficient deployment of resources compared to workload



Underlying root causes

Transition costs of changes

Overall, changes from one system to another, however smoothly or efficiently implemented, come hand-in-hand with an unavoidable **transition cost** to make the new system functional. This has been the case in particular for the period after the establishment of EASA in 2003 until the first extension of the Basic Regulation in 2008. The most significant transition costs in this regard are those pertaining to (i) the overall increase in requirements on the CAs stemming from the new European regulations and (ii) the increasing complexity in the new regulations. Thirteen of the sixteen CAs interviewed, and three industry representatives confirmed the importance of this underlying root cause, the insufficient resources compared to workload problem.

For many CAs, EU regulations brought additional requirements, causing initially a burden due to the overlap with the previous system. For example, it was mentioned by one [large] CA that the requirement for a common management structure has meant that the CA in question must abandon the previous management system, resulting in additional workload. In another example, a CA estimates that 75% of the increase in workload is attributed to the creation of EASA and transition to the new system therein. Where the CA had previously outsourced a number of tasks to the industry, according to the Basic Regulation, these tasks had to be returned to the CA under the EASA system, thus further adding to workload. On the other hand is the introduction of European regulations on subjects which were not previously regulated at the national level. For instance, one CA noted that prior to its accession to the EU in 2004, the MS did not have national regulations in place regulating the areas of ATM and Aerodromes (other than the adoption of ICAO annexes); another CA did not previously have national regulations on CAMO, while a further two CAs did not previously have regulations on type certification (TC). In all of these cases, the interviewed CAs reported that the new regulations created additional workload burden

to the CAs, as well as the need for additional resources to compensate. Another CA, which joined the EASA system in 2007, estimates that, since joining, workload has increased by approximately 30% across the whole CA and for all personnel due to the increase in regulatory requirements that the CA must oversee. It should also be noted the simple fact that with the creation of the EASA system, enforcement and implementation started to be taken more seriously by the CAs than under the JAA system. Given that the EASA system has just recently started to stabilise since the latest scope expansion in 2009, the effects of the transition costs have not yet faded out and are still borne by these CAs. Moreover, for as long as the EASA remit continues to expand, CAs have and will have to invest resources into adjusting to the new system. For example, the UK CAA estimates that such transition costs amounted to £0.7m in 2013 and £0.6m in 2014. The UK CAA finances these transition costs from its existing reserves.[40]

As was previously mentioned, workload, as perceived by the interviewees, is generally understood to include the work stemming from the effort to read and understand the regulation itself. Therefore, related to the abovementioned transition costs are issues stemming from the pace and rate at which regulations are introduced and revised, respectively. In the past, new EU regulations for the different domains have been introduced too fast for CAs to keep up with the effort needed to understand and adjust to the new requirements. This is particularly the case for smaller CAs, where it is more difficult to retain expertise across all areas of required activity. Additionally, the amount of regulation revisions is high, leading to a constant need for effort on the part of CAs to study the revised regulations and to implement them. Part of this aspect is the process and volume of substantial NPA documents, that in itself again require effort to grasp and comment on. It is acknowledged that this is the step prior to the adoption or revision of a regulation and not part of the application of a (revised) regulation, however all representatives of CAs interviewed for this study perceive this step to be part of the regulatory process. These issues were raised in ten interviews with CAs, and in three interviews with industry representatives. Moreover, the increase in the complexity of the regulations is an additional burden with respect to implementing the new requirements. Examples given by the CAs are the difference in complexity between ESARRs in ATM and the current ATM rules, complex cross-border arrangements and the many options in AMCs. Related to this is the increase in the number of authority requirements set in existing regulations leading to an increase in workload and an increase in staff necessary at the CAs, both in terms of absolute numbers as well as in required competences.

Increased workload from standardisation activities

The transition to the common system, as was meant with the creation of EASA, has called for an increased effort to standardise the way in which national authorities perform their oversight activities. In the new structure, EASA performs standardisation inspections on CAs to ensure that their working processes are in line with the standardisation requirements. Compared to the pre-EASA situation in which standardisation was sought via the looser JAA agreements, the new structure has **increased standardisation requirements**, in terms of the amount/frequency, intensity and scope, imposing additional workload to CAs. Data related to workload deriving from standardisation inspections of EASA was not explicitly addressed in the questionnaires, but was addressed during the interviews with CAs and EASA.

[40] UK CAA Annual Report & Accounts 2014, page 59.

In particular, the need for extensive documentation of all processes and in more detail has added to the workload of CAs and is therefore more resource-demanding for the CAs. This was confirmed in interviews with 10 CAs – both large (5) and small (5). One CA estimates that workload has increased to need between 2,5 to 3 staff members to supervise the industry for every 1 staff member that was previously used. This is because of the focus of the current system on administrative procedures and documentation. For example, under the current framework, additional costs produced for an average sailplane / balloon / piston engine include: the CAMO certificate, the inspection certificate – with CAMO certificate approval - and approval of the maintenance plan as well as the inherent workload required for preparing the CAMO and maintenance orders. The increase in intensity of documentation for all processes was further confirmed in the interviews with industry representatives. Of the industry groups interviewed, three highlighted that disproportionate regulation affects especially smaller companies which are less able than large industry to divide the cost amongst the different categories of certificates (e.g., CAMO certificate, inspection certificate, approval of maintenance plan, workload for preparing CAMO and maintenance order). Finally, it is also the case that the remit of CAs' standardisation inspections has expanded compared to that during the times of the JAA, which also creates additional workload. The sum effect is that more effort is required to be put into standardisation practices by CAs.

Another characteristic of the standardisation activities adding to the workload generated for CAs is the increased requirements for **cooperation with EASA** in relation to the standardisation activities. This includes, for example, technical meetings, advisory groups and participation in standardisation teams and attendance at standardisation meetings (Box 6.1). All these forms of cooperation are meant to increase the uniformity of the common system, however the requirement for CAs to devote resources to these activities still adds to the overall effort required and subsequent need for additional resources.

Box 6.1. Cooperation with EASA. Similar to CAs' participation in standardisation inspection teams (see 6.3.2), Standardisation meetings are intended as a tool towards fostering a higher level of common understanding and interpretation of the applicable requirements. In 2013, the Agency held a total of 13 Standardisation meetings that were attended by 610 experts from the different States' CAs; in 2011, just 9 meetings were held with a total of 442 participants. It is worth noting, however, that despite an increase in the number of meetings held in 2013 compared to 12 meetings in 2012, the total number of participants declined by slightly more than 10% compared with attendance; in 2012, the number of participants totalled 688.

Inefficiencies of the current framework

While the increased workload for the CAs arising from the standardisation tasks and the cooperation requirements are a natural consequence of the transition to the new EASA system, there are also a number of inefficiencies built into the new system adding to workload that could potentially be prevented. First is the fact that CAs have to deal with both **ICAO and EASA audits and inspections** covering the same remit. This leads to a duplication of workload and inefficiency in resource deployment. In particular, this appears to be an issue among 'smaller' CAs, where it was mentioned by four CAs as creating duplication of effort. There is also a perceived lack of clarity among some CAs regarding the roles and sharing of responsibility between **EASA and Eurocontrol**, which similarly creates double work and inefficient use of resources,

especially related to reporting requirements. Although this might just be a matter of sending the same information both to EASA and Eurocontrol, this creates inefficiencies and confusion for the CAs as they must report to both, and could potentially lead to unresponsiveness. Nine CAs in total raised this issue during interviews – both large (2) and small (7).

Another, related issue pertains to the division of responsibilities between EASA and CAs. While nearly all CAs reported that the division of responsibilities is clear from the perspective of the CAs themselves, the majority of interviewees reported that the division is **not always sufficiently clear to industry** (e.g., small operators are not always able to identify what needs to be done and by whom, etc.,) and questions are often not directed to the proper organisation. This issue was raised in 8 interviews with CAs – including 5 large and 3 small CAs - and further confirmed by all industry representatives interviewed. Specifically, the interviewees stated that the absence of an EASA level mechanism/body dedicated to supporting industry with regulatory questions leads to a situation in which an increasing number of questions are directed to the CAs, further adding to their workload burden. While several EASA initiatives have been launched aimed at solving this capacity crunch and addressing industry questions, for example the EASA-established SSCC and various workshops and seminars, the benefits of such initiatives have not sufficiently reach industry and the CAs.

Finally, six CAs experience inefficiencies in the deployment of their available resources due to the 'uniform-applicability' nature of the current regulatory structure. What this means is that each Member State is required to provide the necessary expertise and services in all domains regardless of the size of its aviation sector, even if, for example, a certain industry activity is very low in a country. As a result, smaller authorities have reported inefficiencies in the requirement to develop idle or unnecessary services and/or expertise to serve a limited industry sector. This was explicitly indicated by nine of the CAs interviewed, including both large (3) and small (6) authorities. Examples given by the CAs are the areas of GA as well as the exclusion of Annex II from the EASA scope, where the regulation mandates that for both all CAs have qualified staff active in licensing and inspections for all relevant types of aircrafts, even if the level of industry activity is very low in their country. In one CA, an estimated 0.2 FTE / year could be saved from the inclusion of Annex II under the BR. Another CA noted that balloons are not a traditional part of their landscape, and therefore this activity was not previously regulated. However, due to EASA rules on the activity, a certain degree of effort has been required of the CA to develop and implement the new EU regulations on balloons. Consequently, resources are not deployed in the most efficient way. This relates also the first root cause regarding the introduction of regulation for areas not previously regulated.

Growth of air transport industry

Additional to all the other factors contributing to the increase of workload for the aviation safety industry is the continuing and expected growth of the air transport industry itself. Global air transport forecasts indicate an expected 5% annual growth rate until 2030 while the number of commercial aircraft in operation is anticipated to double by 2031. [41] The latter in particular implies that a growing demand will occur for

[41] EASA *Article 62 Panel Evaluation Final Report*, p. 10.

highly qualified and trained personnel to fly and maintain the new aircraft fleet. Citing an estimate prepared by one of Europe's major manufacturers, approximately one million new staff will be required at a global level over the next 20 years, with Europe requiring around 25% of this number.[42] In addition to the growth in transport volumes and market demand, the differentiation of the industry itself is growing, with an increase in the number of service providers (e.g., while there has been a slight decrease in the number of AOC holders over the three periods under study (~-2%), the number of certified organisations in the airworthiness domain increased by 53% over period 1 while the number of (approved) flight training organisation increased by 33%), the differentiation of their business models and the extended use of diversified technologies in aviation. This all entails increasingly complex oversight mechanisms and procedures in place to oversee them. These issues were raised during 8 interviews with CAs, including 3 large authorities and 5 small authorities.

Increasing resources constraints

Finally, beyond the objective of an efficient deployment of resources, a more important goal is their overall sufficiency. Focusing on the other side of the workload-resources imbalance, until 2008 the CAs countered the increase in their workload with a slight increase of their resources. However, in the period following the outbreak of the financial crisis in 2008, **CA budget constraints** (Box 6.2) made the continuation of this approach impossible as many CAs have introduced policies of no-hire, achieving an overall decrease in resources at CAs despite the on-going increase in their workload. The unavailability of funds to hire new employees to cope with the continuously increasing workload, or even just to replace the retiring personnel is probably the most significant root cause contributing to the insufficiency of resources compared to the workload. This is confirmed in the Standardisation Annual Reports in the years following 2008; in 2011, the report raises serious concern over issues pertaining to insufficient staffing levels observed in several cases in relation to the size, scope and complexity of the aviation industry is further aggravated by the "current economic downturn affecting most European States […], triggering a concerning trend where governments may be tempted to cut resources in areas where staffing levels are already thing."[43]

Box 6.2. Budget constraints. Among the primary problems cited by nearly all Member States' CAs is the imbalance created by an increase in workload alongside decreasing budgets in the aftermath of the economic crisis of 2008. Considerable variations in the size of CAs' budgets exist between the Member States, with larger Member States having relatively larger budgets than their smaller Member State counterparts on account of the relative size of their respective workloads. In addition to this, however, a number of Member States' CAs have recorded extremely low budgets which may be indicative of an even greater imbalance between the Member States. For example, in the larger Member States CA budgets range from 40€ – 61€ million, while in certain smaller Member States, budgets range from 5€ million to as low as 1.1€ million. While the latter group may have a smaller workload than the former, the workload-budget imbalance appears to be considerably greater for these small CAs relative to the larger ones.

42 Ibid.

43 EASA Standardisation Annual Report 2011, p. 15.

A declining trend in available resources is also evident in the participation rate of MS CAs in EASA Annual Standardisation Inspections. In 2013, the participation of seconded Competent Authorities' inspectors in the Agency's inspection teams dropped by 5.4% compared to 2012, with a total of 104 seconded CA Team Members accounting for 44.6% of the total Team Members; in 2012, 134 seconded CAs' inspectors were provided, representing 50% if the total team members, while in 2011, 58% of team members were provided by Competent Authorities. The decline in the number of seconded Competent Authorities' inspectors provided by the Member States in 2013 is attributed to the overall shortage of available inspectors across Europe (Box 6.1) and is particularly evident in the OPS (down by 12% since 2011) and ATM/ANS domains.

EASA was not spared from the impacts of the economic crisis. Despite the recent expansion of its remit and the need to prepare for the introduction of new technologies (RPAS) the additional staff for these has still to be hired. This is a consequence of the **budget constraints for EASA** following the economic downturn in the EU. As a result, according to its Multiannual Staff Policy Plan (MSPP) 2015-2017, the staffing level of EASA falls approximately 40-50 FTE short of fulfilling its needs for staff to sufficiently respond to the responsibilities it is assigned.[44] This apparent under-staffing was confirmed by EASA during interviews and is discussed in further detail in the description of the baseline scenario in chapter 7.

Although all the root causes as sketched above have contributed to the problem driver, gains could still be achieved if an effective cooperation framework was built into the system to more efficiently deploy resources to match supply and demand. Some CAs attempt to deal with this on a bilateral basis to exploit any "slack" they may jointly have by engaging in exchanges of resources, most importantly concerning cooperative / joint oversight. Although successful examples of this practice can be encountered (see Box 6.3), the attempt of EASA to set up a common pool of flight operations inspectors (see Box 6.4) has remained under-utilised by CAs. In the absence of a cooperation framework, CAs are hesitant to outsource tasks between themselves. This issue was raised in nine interviews with CAs – including 3 large and 5 small authorities. The three most cited reasons for this hesitation are (i) cultural differences, linguistic barriers and proximity, (ii) financing concerns, (iii) and the fact that liability remains with the original CA. Any EU cooperation framework for the sharing of resources and expertise should find procedures and methods for effectively addressing these practical concerns. For an example of what such a framework might look like in practice, see policy option 2 in chapter 7.

Box 6.3. Cooperative Oversight in selected Member States. The most cited example of successful cooperative oversight is that of the arrangement between Denmark, Norway and Sweden for the cooperation on oversight of Scandinavian Airlines (SAS), the national airline of the Scandinavian States, The cooperation arrangement dates back to the 1950s when national airlines of Sweden, Denmark and Norway, formed the SAS consortium. SAS operates from three primary hubs, located at Copenhagen-Kastrup Airport, Stockholm-Arlanda Airport and Oslo Gardermoen Airport.

[44] EASA, *Multiannual Staff Policy Plan 2015-2017*, Volume 4, February 2014.

There is a common AOC document signed by the 3 Director Generals. The arrangement allows for the sharing of oversight tasks. Tasks are split as follows: Denmark controls safety oversight of Airworthiness, Part 145; Norway controls safety oversight of Airworthiness, Part M; Sweden controls safety oversight of Operations. The CAs participate in each others' audits and have access to all information. The three CAs are, however, equally responsible in terms of oversight authority.

There is a consensus among the participating CAs that such an approach is made difficult due to different views and different laws - e.g. those governing the delegation of responsibility - in each of the countries. For example, the Danish CA reported that it is not possible to delegate the responsibility over an oversight task under the State's Basic Law, but rather the task. Similarly, in Germany, where cooperative oversight is conducted, it is regulated as an exchange of information between the CAs involved. Outsourcing, however is done to a limited extent as the CA remains responsible at all times and therefore, liability issues prevent this practice. In addition, cultural similarities arising from shared borders are considered extremely important for the successful execution of such an arrangement.

In addition to the example of SAS Airlines, the Austrian CA is another example of a Member State engaging in bilateral cooperative oversight practices and experience exchange in a number of domains with several smaller authorities which have not yet developed the need (based on their workload) or the necessary resources independently. For example, cooperation based oversight is performed with Croatia and Slovenia regarding operations inspections for certain common a/c types as well as for inspections of maintenance organisations with line stations in these other countries. Additionally, the Austrian CA trains SAFA inspectors of Slovakia and Croatia. A cost recovery arrangement has been set up for these two cooperation practices. While it is recognised by Austrian CA that such cooperation is not possible for all domains and that it can occur only on a voluntary basis, making use of cooperative oversight to share resources is a practice that allows efficient use of staff and sharing of expert resources. Another two examples of emerging CA cooperative oversight initiatives have been identified between the CA Netherlands and CA Belgium, as well the Nordic CAs, respectively. In both cases, the involved CAs are currently exploring the possibility to create common pools of resources at a regional level.

Box 6.4. EASA pool of flight inspectors. The EASA-established pool of flight inspectors as a mechanism to optimise the use of resources in the current system by pooling resources at the EU level without re-attribution of responsibilities. This approach is supported by a number of CAs for the potential efficiency gain it may provide, in particular to smaller CAs, in terms of available resources. Several CAs also expressed an interest in offering resources to a central pool managed by EASA on a cost-recovery basis. In practice, however, the EASA pool of flight inspectors has been under-utilised by the CAs. The interview sessions with CAs revealed three primary reasons for this under-utilisation: (1) lack of awareness; (2) cost, and; (3) language differences. Regarding the first point, many CAs indicated a lack of awareness that such a pool exists. Second, it is noted that, while such a pool is a good idea in scenarios where a CA lacks competence in a specific area, it will be too costly to use on an on-going basis. Finally, the circumstances of resource-pooling are important. This form of cooperation is established and implemented more organically between neighbouring states

with cultural similarities. Language differences in particular are a barrier to pooling resources at the EU level.

6.3.2 Sub-optimal qualification level of staff

A second problem driver pertains to the structure and character of the workforce, and more specifically, the suboptimal qualification level of some staff employed in the European aviation safety regulatory system. The interviews sessions revealed that maintaining an adequate qualification level of their staff is an increasing concern for CAs. This problem was mentioned by 11 CAs – both large (5) and small (6) - during interviews. This issue reinforces the resources-workload imbalance identified as the first problem driver (see above) and is a causal factor contributing to the third problem driver, "differences in supervisory approaches". The concerns are validated by the findings of the Annual Standardisation Reports of EASA (2012, 2013), which identify the insufficient training and qualification of technical staff, particularly in the fields of OPS and ATM/ANS and FCL (Aircrew) as one of the main reasons for the inadequate oversight in these domains. The main issues pertaining to the qualification levels of staff per domain are summarised in the following table:

Table 6-4 Summary of EASA Standardisation report findings and issues raised (2013)

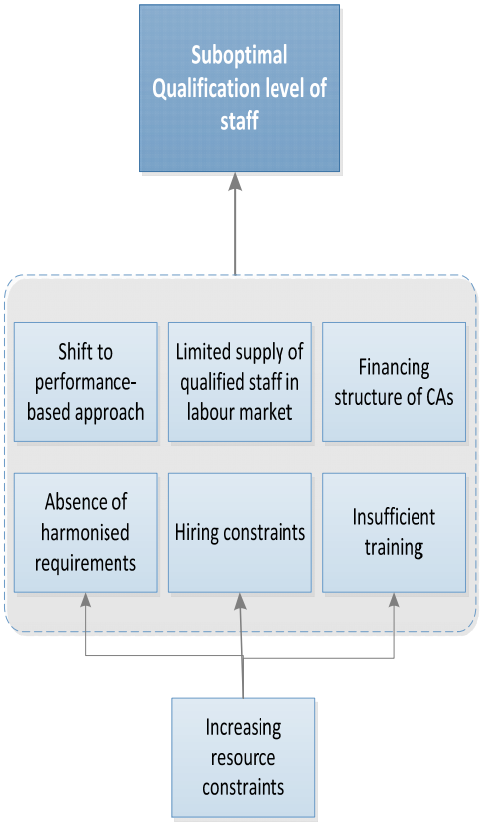
Domain	Qualification issues raised in Standardisation report (2013)
AIR	The most critical findings pertained to the issuance of approvals and the robustness of the continued oversight process. The report states: *"As availability of inspecting staff [in terms overall numbers] seems not to be a problem, the reason for the above [findings] can be attributed to the level of qualification of technical personnel."* (2013, p. 32). More specifically, the report refers to *"the **level of understanding** of EU regulation, the **lack of experience**, the **incomplete training** and the inability to demonstrate all received training."* (ibid, 29). These findings account for 3% of total amount and are due to budget cuts and insufficient investment in sufficient and adequate training.
OPS	The higher proportion of Class (D) findings raised under CE-7 ("Surveillance Obligations") in 2013 is considered to be a serious concern, *"further aggravated by **insufficiently trained and qualified staff,** or even by its insufficient availability. In these cases, the Competent Authority is **not capable of ensuring the necessary oversight in terms of quantity and quality."*** (2013, p. 32). These findings are in line with those of the previous year. Specific to CE-4 ("Technical personnel qualification and training"), all of the seven findings raised "*indicated that the initial and recurrent training was either inadequate or not followed, as well as inspectors **performing certification and oversight activities without being suitably qualified** for that activity."* (2013, p. 55).
PEL/FCL	While the level of CAs' staff working in this domain is generally considered to be quite high, experienced and knowledge, CE-4 findings indicated that *"the recurrent training planned by some Authorities was not conducted in its entirety. Consequently, the necessary knowledge about the content of the applicable regulations should be improved."* (2013, p. 64).

Domain	Qualification issues raised in Standardisation report (2013)
ATM/ANS	The most significant number of findings in ATM/ANS pertained to CE-6 ("Licensing, certification, authorisation and approvals obligations") and CE-7. The report states that, *"the issue repeated across many of the authorities was related to staffing, not only in terms of numbers but in some cases, regarding the* ***competence of individuals*** *to undertake the tasks they are assigned with. It makes it very difficult for them to meet all the requirements of what is an extremely broad regulatory package."* (2013, p. 33). Specific to CE-4, the main issue cited pertains to the in **low priority afforded to the training** of staff, *"as there is insufficient time available to conduct this activity as in many cases the already tight staffing levels are struggling to meet the core oversight tasks."* (ibid, p. 78).
FSTD	The most significant findings in FSTD pertained to CE-6 and CE-4. According to the report, *"this appears to be due to the recent extension of the standardisation process in FSTD and the insufficient competencies available at the Competent Authorities."* (2013, p.33).

No major issues were raised in relation to qualification and training of staff in the domains of SAFA and MED.

Based on the interviews conducted with CAs and with industry as well as desk research, we have been able to identify six direct root causes as contributing to the difficulty faced by CAs to retain the desired level of qualification of their staff members. This is presented in Figure 6 3 and analysed underneath.

Figure 6-3 Root causes to the problem driver of staff qualification level



Underlying root causes

Insufficient training of technical staff and absence of harmonised training requirements

Although all CAs strive for keeping their personnel at the highest level of expertise, this is not always possible to achieve. The first root cause driving the suboptimal qualification levels of staff in some CAs is the **insufficient training of technical staff** at some CAs. According to the findings presented in the EASA Annual Standardisation Report 2013, the insufficient training of staff is most evident in the domains of OPS, FCL and ATM/ANS. In the OPS domain, seven findings in the area of CE-4 ("Technical personnel qualification and training") were raised in 2013 from 3 Member States and one Country operating under a Working Arrangement. The inspections found that all seven findings are due to inadequate or non-existent initial and/or recurrent training, as well inspectors performing certification and oversight activities without being appropriately qualified for that activity. In the ATM/ANS domain, several CE-4 findings were raised in 2013 pertaining to the training of staff. Where insufficient training of staff has been identified by EASA, this is often due to the fact that training is assigned a low priority by the CA due to the already tight budget resources and staff levels to meet existing oversight tasks. As a result of these circumstances, fewer training opportunities of technical staff are available. Moreover, in the **absence of common training** and qualification requirements for staff, there is no standardised training provided to train the staff in accordance with the EU requirements.

On the other hand, despite the higher maturity of the AIR domain (and relative stability of the regulatory framework) as evidenced by the finding of satisfactory levels of uniform implementation of EU Regulations, safety relevant findings (Class D) account for 15% of all non-compliance findings and AIR accounts for 31.74% of total findings overall (See Table 6-2). Given that availability of inspecting staff is not considered to be a problem in the AIR domain, these findings are attributed by EASA to the level of qualification of technical personnel.

Insufficient replacement and recruitment of staff

In addition to the insufficient training and qualification of staff, many CAs are facing **difficult hiring situations** to either replace an ageing workforce or to recruit additional expertise needed. Currently, six of the CAs interviewed are operating under either a hiring freeze or lack of available funding to hire additional staff. In one large CA, a 2011 evaluation revealed a shortage of 250 staff, only 30 openings have been approved and budgeted despite the recognised shortage. In another large CA, as a result of budget cuts, budget for staff has been reduced by around 30%, which has been primarily absorbed by not replacing staff that leaves the CA, despite an increase in workload. Result is staff routinely work overtime in order to fulfil the required duties. In the same CA, however, an exemption to the hiring ban was made for the area of flight operations because of insufficient fulfilment of duties. They were able to recruit 25 additional staff. An intermediate solution they applied was to take over temporarily some pilots from the air force with proper ratings that were deployed as flight inspectors following some training. Finally, in another CA it was reported that for the last two years only one out of every three employees is replaced due to the financial and economic crisis. In all of the instances raised during the interviews, the lack of resources and available budget for the CAs has resulted in bad audits, for two, inability to close the related findings (where relevant). Related to this is the fact that in some CAs, retiring staff is depriving the CA of specific skills that are not anymore available. This becomes an immediate problem in those CAs where there is a hiring stop due to budgetary pressures. This means that retiring staff is often not replaced, and when staff is replaced, the level of experience of the newly recruited staff will in most cases be lower than the out-going staff. This was explicitly mentioned in two CAs interviewed, one of which indicated that the authority bridges the gap by outsourcing, however it is expensive and therefore unsustainable in the long-term.

Increasing resources constraints

Related to this is the inadequate recruitment of new/needed expertise to cover knowledge gaps in the current staff. As mentioned in the previous sub-chapter, the regulatory framework requires CAs to provide staff members for all possible services, even in areas where there is limited industry activity in their country. This means many CAs have been/are required to develop and cover new areas of expertise for which current personnel is ill-equipped (or not sufficiently equipped). Retaining this niche expertise is a costly process and, in the context of **budget constraints**, two CAs have indicated that they resort to using experts in a more flexible way to cover more expertise areas. In one instance, the CA implemented an initiative to have inspectors qualified for inspecting duties in different domains so that they can step in domains where there are peaks, such as airworthiness, production and maintenance oversight. Another approach used is to utilise the resources from the five regional offices which exist in the MS as flexibly as possible.

On the one hand, such practices enable flexibility to CAs to fulfil their requirements under the regulations, however the consequence is that the staff used are not always highly specialised in the fields they are called to cover. Moreover, while this practice is mentioned explicitly only by the two CAs, given the ongoing resource constraints of CAs (discussed in section 5.3.1 above) to carry out an increasing workload, it is expected that similar practices are implemented in other MS CAs For example, in 2013, six unqualified CAs' inspectors were deployed in the area of ATM/ANS to take part in the Agency's Standardisation Inspections.[45] Therefore the inadequate replacement of the ageing workforce and insufficient recruitment of necessary expertise both have direct causal effects on the qualification level of staff at CAs.

Limited supply of qualified staff in the labour market

Another issue is the ability to attract qualified staff, which decreases as a consequence of the restrictive **financing structures of many CAs –** (Box 6.5) particularly those which are fully financed by a state budget **– and the limited supply of qualified staff in the labour market (Box 6.x).** Regarding the latter, the Article 62 Panel Evaluation (2013) notes that due to the growing technological complexity of an increasing number of aspects of both present and future developments in the air transport sector, the ability to recruit the required level of expertise – both at the national and international levels – will become increasingly difficult.[46] As such, it can be expected that a limited supply of available labour force will have a causal effect on the ability of CAs and EASA alike to recruit adequately qualified staff.

Box 6.5 Pro-active standardisation. In addition, according to the Annual Standardisation Report 2013 the shortage of available seconded CA inspectors in the Standardisation Team Members' pool (accounting for 44% in 2013, down from 50% in 2012) was particularly evident in the areas of OPS and ATM/ANS. This is due to the overall shortage of qualified OPS inspectors in the former case, and the "ramp-up" effect in the latter case, where the Team Members still need to be trained and qualified. Moreover, the contributions by Member States to EASA standardisation are not evenly distributed, with large CAs unsurprising providing a larger number of inspectors relative to their small CA counterparts. It is also the case that the larger CAs generally provide inspectors for at least 5 of the 6 domains, whereas smaller CAs generally provide inspectors for no more than three domains.

Different financing structures of CAs

In addition to this, for some CAs, too low expert salaries/wages in relation to the market/industry salary thresholds add to the existing difficulties of obtaining high quality personnel, especially considering the increasing competition for the limited supply of qualified staff in the labour market. Many of the CAs are funded from the general budget, in total or in part. In many cases wage levels fit within the general frame of wage structures of the government. It can be expected that the issue is more pressing for CAs which are financed by a state budget than for those CAs which transfer the costs fully to industry as the latter category can more easily offer higher wages to attract new labour by passing the cost to industry. Nonetheless, three CAs

45 EASA, *Standardisation Annual Report 2013*, EASA Standardisation Department: Köln, Germany, March 2014, p. 10.

46 EASA Article 62 Panel Evaluation Final Report, p. 20.

interviewed which are either partly or fully industry-funded experience similar inflexibility to define their fees or the salaries of their personnel and in some cases not even to hire without governmental approval - a usually lengthy process. Therefore it is also possible in some cases that internal employment rules are responsible for salaries/wages of personnel.

Box 6.6. Administrative autonomy. A number of CAs depend on state budget for their financing, but even in case they are extensively or exclusively industry-funded, the majority of them depend on the central government for their hiring processes. The impact is a considerable delay of the hiring process as a case has to be defended to the central government to approve the creation of the new posts, while the posts created may be subject to salary level restrictions. The consequence is a reduced responsiveness of the CAs to cover their needs. On the other hand, CA UK has a greater level of administrative autonomy allowing it to hire staff when needed and having a greater flexibility in the wages offered to hire experts. This allows CA UK to respond faster to its needs for staff while creating the potential to attract staff with higher qualifications.

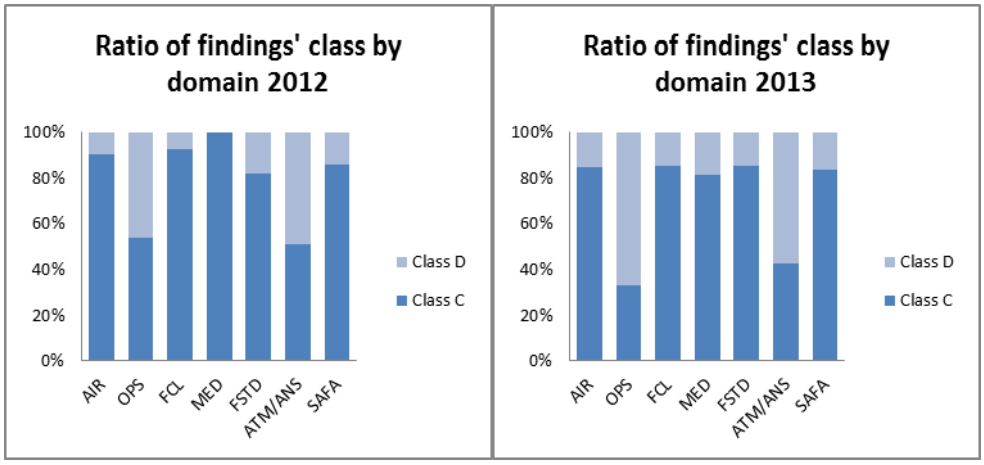
Shift to risk-based/performance-based oversight approach

Finally, the **shift to a risk-based oversight/performance based approach** for certain domains has an impact to the qualification level of staff in that it entails additional knowledge and expertise requirements that current workforce may not adequately possess at present. In general, CAs recognize the expected mid- to long-term (especially) safety benefits of risk-based oversight, however the majority of those interviewed point to the inherent increase in workload and effort required of the CAs in the process of this transition as well as current gaps in required expertise. The shift to risk-based oversight therefore requires substantial investment in the training of personnel in order to achieve adequate levels of expertise and qualification.

6.3.3 Differences in supervisory approaches

Another very important problem driver is the differences in supervisory approaches amongst CAs. This refers to the way in which EU regulations in general, and standardisation in particular has been implemented since the entry into force of the respective Implementing Regulations. On the one hand, the findings provided in the Standardisation reports support the expectation that varying levels of maturity among the different domains can be found based mainly on the amount of time that has elapsed since the associated Implementing Regulations have been in force. This is the case in the areas of Airworthiness, SAFA and Medical, as can be seen in **Figure 6-4** by the decreasing proportion of safety-relevant (Class D) findings (i.e., evidence of **significant** deficiencies raising safety concerns if not duly corrected), in 2013 compared to 2012, particularly in contrast to OPS and ATM/ANS, both of which became applicable in the last 2 years. On the other hand, there is a clear trend towards an overall increase in the proportion of Class (D) findings relative to Class (C) findings since 2008, as shown in section 6.2.1 above.

Figure 6-4 Ratio of findings' class per domain 2012, 2013



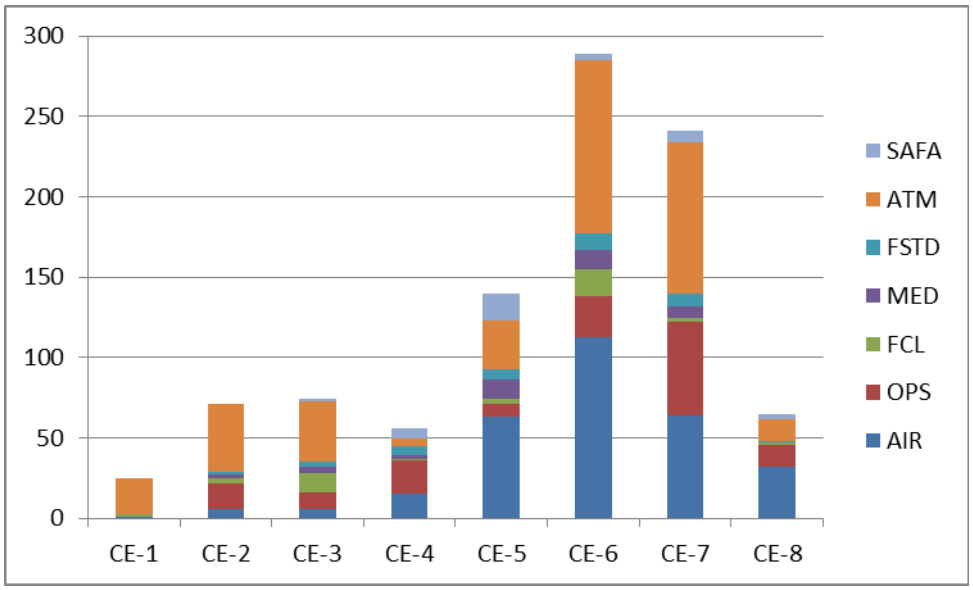
Source: EASA, Standardisation Annual Report 2012, 2013.

Despite the common regulatory system and the standardisation efforts of CAs to converge the approaches of all MS, nearly three-quarters of those interviewed (12) have reported that several MS have insufficient resources to perform adequately their oversight responsibilities. As a result, the way industry oversight is performed in EU/EFTA MSs can differ significantly from one state to another, either administratively or even technically. In many cases, the CAs reportedly continue to apply different internal working processes, especially in relation to their administrative tasks and procedures, leading to varying degrees of differentiation, and therefore implementation of the EU regulations on oversight. This issue was raised in the majority of the interviews held with CAs and is evidenced by the stable rate of NCFs (i.e., class (C) and (D) findings) relative to the total number of findings raised (i.e., all classes) (~96%) in the last three years.[47] A contributing factor to this is that there are no normative values for certain tasks, such as a prescribed number of hours per inspection.

In all domains but SAFA, the main difficulties related to CE-6 and CE-7. This distribution of non-compliance findings by ICAO CE standards in 2013 is shown in Figure 6-5.

[47] This figure refers to the proportion of total C and D class findings relative to the total number of findings.

Figure 6-5 Distribution of non-compliance findings by domain and ICAO Critical Element, 2013[48]



Note: The categorisation refers to the eight ICAO Critical Elements used to classify the key findings raised during EASA Standardisation inspections. These are as follows:

CE 1 – Primary aviation legislation;

CE 2 – Specific operating regulations;

CE 3 – State civil aviation system and safety oversight functions;

CE 4 – Technical personnel qualification and training;

CE 5 – Technical guidance, tools and the provision of safety critical information;

CE 6 – Licensing, certification, authorisation and approvals obligations;

CE 7 – Surveillance obligations;

CE 8 – Resolution of safety concerns.

This figure shows that in nearly all technical domains, the majority of non-compliance findings are related to both the initial approval (CE-6, "Licensing, certification, authorisation and approvals obligations) and the continued surveillance processes (CE-7, "Surveillance obligations"), representing more than 2/3 of the findings raised. This is the case even in those domains marked by a higher degree of maturity and uniform implementation of the EU regulations, such as AIR. Similar to previous years, initial approval and continued surveillance are the most critical areas in the Airworthiness domain. In the area of OPS, the results similarly continue the trend of recent years, indicating that CAs' oversight of Operations is insufficient. This is evidenced by the higher proportion of Class D findings raised under CE-7. Indeed, the report confirms that this growing proportion of Class D findings raised under CE-7, (and in particularly when compared with 2011 and 2012), is further aggravated and reinforced by the insufficiently trained and qualified staff. Where this is the case, the CA is incapable of providing the necessary oversight in terms of quality and quantity. The inspections performed in the FCL domain assessed the status of implementation of the new EASA Implementing Rules, which became applicable in April 2013. The results revealed that

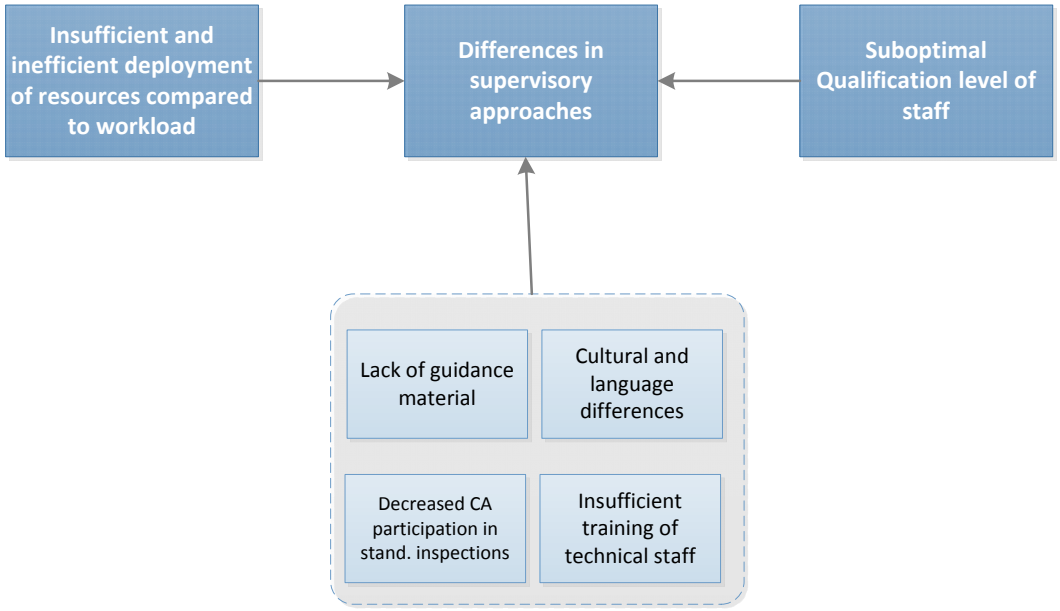
[48] Adapted from EASA Annual Standardisation Report 2013.

States continue to be non-compliant despite the expiry of the opt-out period in April, with an insufficient level of implementation of the new rules in several Member States. Issues were also identified in relation to ICAO CE-3 ("State civil aviation system and safety oversight functions") associated with inadequate application of the Parts ARA and ORA requirements (Regulation (EU) No 1178/2011). Similar to the other domains, the most critical findings in the field of ATM/ANS were related to ICAO CE-6 and CE-7.

In sum, these differences create potential safety risks and are a source of mistrust between specific CAs. In four interviews it was explicitly stated that some CAs do not accept directly the certificates issued by other CAs due to their lack of trust in others' compliance and safety levels; instead they impose additional requirements to "approve" licenses issued elsewhere. Moreover, a further seven interviewees, together with the four above, confirmed that not only do differences in the level and quality of oversight with respect to standardisation exist across the different MS, but that these differences negatively impact the level playing field in the internal market and incentivize regulatory shopping, which may create safety risks.

The main root causes for this problem driver have been identified as presented in Figure 6-6 and described underneath.

Figure 6-6: Root causes to the problem driver of differences in supervisory approaches



Underlying root causes

Firstly, the effort required of CAs to arrive at a harmonised supervisory approach entails an increase in both workload and resources needed. It is logical to expect that the degree of harmonisation will vary depending on the resource capacity and constraints facing CAs. Where resources are particularly scant, and in the context of an increasing workload overall, the ability of CAs to properly carry out the task in an optimal and standard way is reduced. Therefore the **workload-resource imbalance** is directly causally linked with the differences in approaches identified. This has been confirmed in the results of the EASA Standardisation Reports, where it was found that

CE-7 findings, for example in the domain of ATM/ANS, are further aggravated by the insufficient availability of technical staff to carry out the workload, causing uneven implementation of EU requirements. A further three CAs have pointed to increased difficulties to retain certain expertise due to **decreased participation in tasks** that have since been centralised to EASA (i.e., certification,).

In addition CAs encounter difficulties in terms of the correct way to interpret new legislation and the **guidance material provided by EASA to the CAs** – in terms of guidelines, explanatory notes, work packages for procedures, templates, document structures, European checklists, examples of best practices, etc. – is considered insufficient. Overall, five CAs reported these problems in interviews. This leads to a situation in which rules are subject to various interpretation. In that respect, CAs usually adopt a reactive approach to learning as to what is the appropriate way of performing their tasks by learning from the findings of the EASA standardisation inspections. As mentioned during one of the interviews, *'it is only up to the first standardisation audit when you hear something about the way you should have implemented the new regulations – especially when you have done it wrong'*. These variations may make some CAs "more standardised" than others. This observation is in line with the Agency's conclusions in the 2013 Standardisation report, where EASA observes confirms that "[a] system to manage and share the Agency's positions and interpretations on specific requirements with the whole aviation community, going beyond the existing 'Frequently Asked Questions', would allow the Agency to communicate clearly on thematic and specialised subjects, which in turn would have significant benefit in terms of pro-active standardisation."[49] Additionally, the absence of standardised training**,** as explained under Point 6.3.2, for further undermines the development of harmonised working patterns amongst CAs.

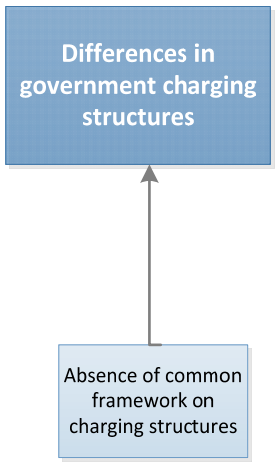
A fourth factor contributing to differences in the supervisory approaches is that of the **cultural and language differences** between CAs. Linguistic interpretations of rules, previous working processes, cultural background etc. can have an impact on the way rules are interpreted and to the strictness of their application by different CAs, leading to differences in supervisory approaches.

6.3.4 Differences in charging structures

Lastly, the problem driver of the differentiated CA charging structures is caused, as shown in **Figure 6-7** by the absence of a common framework on charging structures.

[49] EASA Standardisation Annual Report 2013, p. 27.

Figure 6-7: Root causes to the problem driver of differences in CA charging structures



Underlying root causes

The existing **absence of a common framework on charging structures** is considered to be the primary root cause for the different charging schemes that can be found across Europe. This differs from other areas, such as Airports[50] and ATM/ANS[51] where a common framework has been established for charges by operators.

The reason that no common framework on charging structures exists stems from the fact that aviation authority financing is closely related to budget issues, and therefore remains a sovereign State competence. Hence, the 32 different governmental budget systems are a critical factor here. These differences depend on diverse national models behind the definition of the fees applied to the aviation industry in each country and the political context within which they are defined. Schemes in which fees are fixed and negotiated with industry are particularly influenced by a political context.

6.4 Synthesis

The following table provides an overview of the causal links between the problem drivers and underlying root causes accounting also for the significance of each root cause, with XXX as a strong contributor to the problem driver and X as a relatively minor contributor. The root causes are further explained in the next sections.

[50] Directive 2009/12/EC of the European Parliament and of the Council of 11 March 2009 on airport charges.

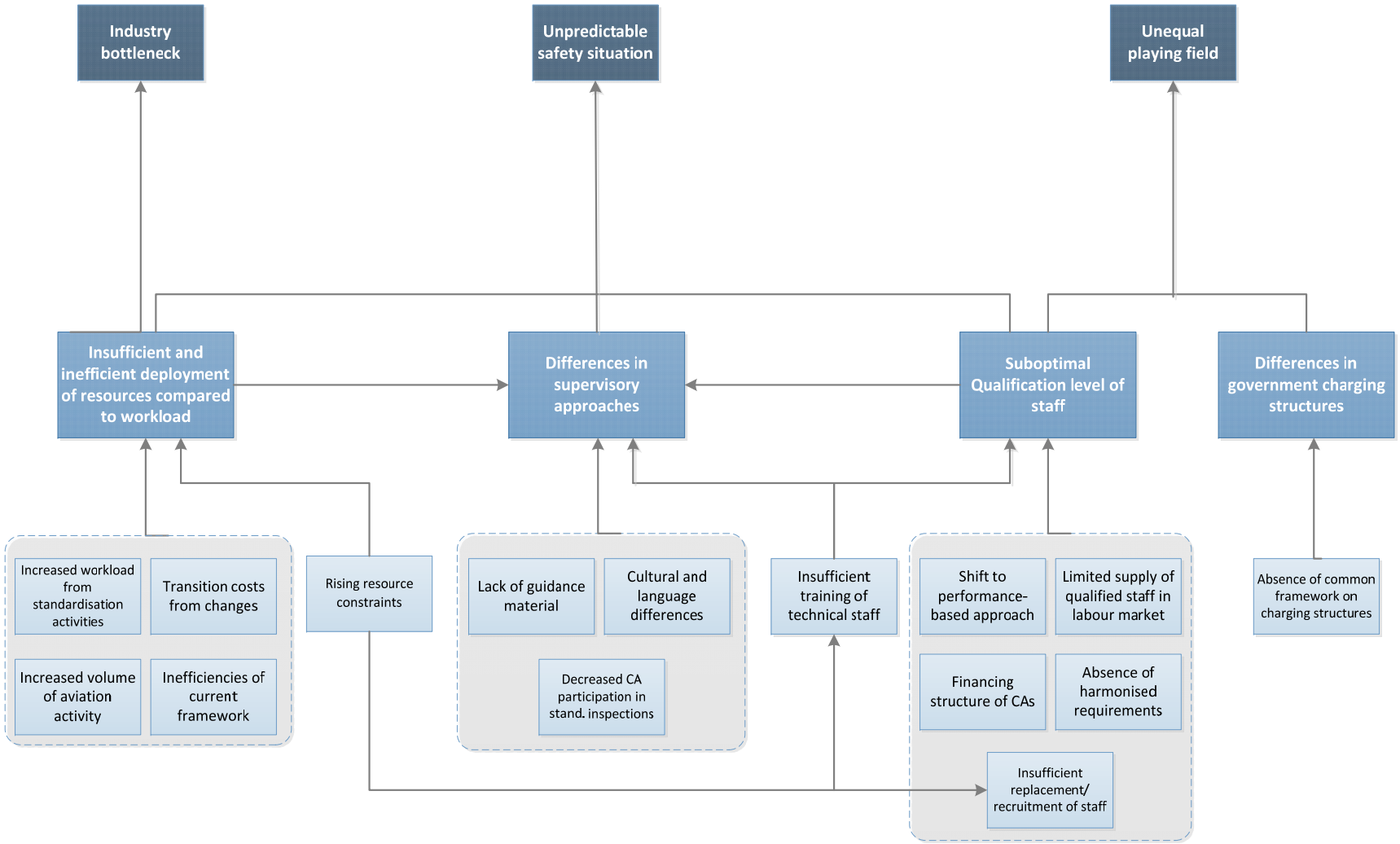
[51] Commission Regulation (EC) No 1794/2006 of 6 December 2006 laying down a common charging scheme for air navigation services.

Table 6-5: Problem drivers and root causes

Problem drivers: / Root causes:	Differences in CA charging structures	Differences in supervisory approaches	Qualification level of staff	Insufficient and inefficient deployment of resources compared to workload
Insufficient and inefficient deployment of resources compared to workload		XX		
Transition costs of changes				XXX
Increased workload from standardisation activities				XX
Increased volume of aviation activity				XX
Inefficiencies of current system				X
Rising resource constraints			XX	XXX
Sub-optimal qualification level of staff		XXX		
Insufficient training of technical staff		XX	XXX	
Insufficient replacement/ recruitment of staff			XX	
Lack of qualified staff in the labour market			XX	
Absence of harmonised financing structure of CA's	XXX		XX	
Shift to performance based approach			X	
Lack of guidance material		XX		
Cultural and language differences		XXX		
Decreased CA participation in standardisation inspections		X		
Absence of common framework on charging structures	XXX			

Combining all the above results in the aggregated problem tree of **Figure 6-8**.

Figure 6-8: Aggregated problem tree



7 Policy options

7.1 Introduction

The previous sections have demonstrated that there is room for improvement in the area of resources deployed on aviation safety in Europe and the related workload. In this section, a set of policy options is developed to address these shortcomings as well as to reinforce positive developments.

For each of the options that have been developed, there are a number of elements considered:

- Standardisation, oversight and enforcement;
- Forms of cooperation;
- Training and qualification of staff;
- Financing of authorities;
- Other relevant elements for the option.

These are briefly described for the level of the European Union, the EASA member states and regulated entities (industry). Regarding the baseline option, we have included an analysis on the anticipated autonomous development in air transport and the air transport regulatory and oversight system.

7.2 Option 1: Baseline option

7.2.1 External trends

There are a number of external trends that are expected to drive the baseline Option. We have briefly described the most apparent trends and its consequences for the baseline Option.

Economic developments and air transport demand

Current economic trends point to significant growth in air traffic across Europe over the next two decades. Following an economic crisis in 2009 which saw a slow recovery from a significant decrease in air traffic across Europe, the 2008 peak in air traffic of 10.1 million flights is forecasted to be reached again by 2016. This is expected to increase by 50% in the next 10 to 20 years, growing to 11 million flights in 2018 – a 16% increase over its 2011 flight total.[52] By mid-2013, nearly 9.5 million flights were crossing the European airspace yearly, 80% of which are operated within the EU. Studies predict at the European level, traffic growth rates of 2.7%- 3.9% per year, on

[52] Eurocontrol, *Challenges of Growth 2013: Summary report*, June 2013.

average over the next 10 to 20 years[53]. Air passenger traffic within Europe is forecast to grow at 3.2% per annum, while inter-regional traffic is expected to grow at 4.1% per annum, mainly driven by demand to and from emerging markets (2013-2033 CAGR). [54] As air transport and air traffic grows, the industry will grow, which will in turn influence the level of oversight activities to be undertaken by CAs in order to ensure a stable safety level compared to today.

The air transport market for manufacturing similarly faces significant demand and growth prospects. Major aircraft manufacturers have estimated that by 2031, the total number of commercial aircraft will double. Such a development in the global fleet of aircraft implies parallel demand for highly qualified and trained personnel, both to fly and maintain airplanes. Citing an estimate prepared by one of Europe's major manufacturers, approximately one million new staff will be required at a global level over the next 20 years, with Europe requiring around 25% of this number.[55]

Technical developments

In addition to traffic growth forecasts, new technology developments are emerging which have implications for the workload of both EASA and CAs. A particular case is the proliferation of remotely piloted aircraft systems (RPAS) – or the civil use of drones – which form part of the wider category of Unmanned Aircraft Systems (UAS) that also include aircraft that are capable of being programmed to fly autonomously without the involvement of a pilot. RPAS technology has developed rapidly in recent years and is increasingly being used for civil purposes. The European Summit of 19 December 2013 and the subsequent Commission Communication from 2014 call for action to enable the integration of civil RPAS among 'normally piloted' aircraft and to be integrated into civil airspace in the next 15 years.[56]

The current regulatory framework is divided between Member States and EU. UAS, including in particular RPAS, when used for civil applications and with an operating mass of more than 150 kg fall into the scope of Regulation (EC) No 216/2008. Civil RPAS below 150 kg are regulated by Member States. The Agency supports the European Commission in implementing the Commission Communication COM(2014)207 with a view to working towards the safe integration of RPAS into the European aviation system by 2016. The specific role of EASA is to assist the Commission in the impact assessment process and to develop the required detailed safety rules, to the maximum possible extent on the basis of a global consensus. In

[53] Eurocontrol https://www.eurocontrol.int/sites/default/files/content/documents/official-documents/forecasts/seven-year-flights-service-units-forecast-2014-2020-feb2014.pdf; Airbus, Flying on demand 2014-2033 – Global Market Forecast.

[54] Airbus, Flying on demand 2014-2033 – Global Market Forecast.

[55] EASA *Article 62 Panel Evaluation Final Report*, p. 10.

[56] Commission communication COM (2014) 207, A new era for aviation – opening the aviation market to the civil use of remotely piloted aircraft systems in a safe and sustainable manner; .European summit.

this context, the Commission Communication calls on EASA to engage in JARUS[57], which is currently developing recommended requirements on:

- Licensing of remote pilots;
- RPAS operations in Visual Line-of-Sight (VLOS) and beyond (BVLOS);
- Civil RPAS operators and Approved Training Organisations for remote pilots (JARUS-ORG);
- Certification specifications for light unmanned rotorcraft (CS-LURS) and aeroplanes (CS-LURS) below 600 Kg;
- Performance requirements for 'detect and avoid' to maintain the risk of mid-aid collision below a tolerable level of safety (TLS) and taking into account all actors in the total aviation system;
- Performance requirements for command and control data link, whether in direct radio line-of-sight (RLOS) or beyond (BRLOS) and in the latter case supported by a Communication Service Provider (COM SP);
- Safety objectives for airworthiness of RPAS ('1309') to minimize the risk of injuries to people on the ground; and
- Processes for airworthiness.[58]

Multiple forecasts project global UAS markets will experience strong growth over the coming decade, with estimates of demand and total global spending over the next decade ranging from $70.9 billion (of which Europe is slated to spend $5.7 billion) to $89.1 billion until 2022.[59] The development of the RPAS market is expected to have important implications for the workload required of both EASA and CAs, including rulemaking tasks, additional responsibilities in the field of airworthiness (i.e. certification and approvals), pilot licensing and operator licensing. It also entails additional oversight and standardisation tasks, etc.

The Single European Sky ATM Research Programme (SESAR) is the technological arm of the Single European Sky (SES), an initiative launched by the Commission in 2004 to reform European ATM through an approach that addresses all components of the European air transport system. SESAR involves the development of a new ATM system, based on new technologies and procedures, to handle more traffic with enhanced safety and at a lower cost. With regard to safety, the SESAR objective, in a first step, is to decrease the probability of ATM related accidents by 40% by flight hour. The main output of the SESAR definition phase is the European ATM Master plan, which constitutes the commonly developed roadmap to achieve deployment of this new system within the next 10 -15 years. The operational concept of the

[57] The Joint Authorities for Rulemaking on Unmanned System (JARUS) is a group of national Civil Aviation Authorities whose aim is to draft harmonized regulations covering all aspects of RPAS operations. See: http://www.jarus-rpas.org/.

[58] EASA website, https://www.easa.europa.eu/unmanned-aircraft-systems-uas-and-remotely-piloted-aircraft-systems-rpas.

[59] Teal Group, World Unmanned Aerial Vehicle Systems: Market Profile and Forecast, 2012 Edition; Forecast International, UAS Market Heading for New Heights, September 25, 2012 (summarized in the December 31, 2012, edition of Aviation Week and Space Technology; RPAS Yearbook 2013.

programme aims at moving from the current airspace based trajectories to the time based operations (4-D trajectories), in which all stakeholders have access to constantly updated and precise information through the System Wide Information Management (SWIM). The roles ascribed to EASA include rulemaking, safety oversight and promotion, and assisting the Commission on certification of new technologies and procedures. The National Supervisory Authorities are responsible for oversight and certification of air navigation service providers (ANSP) and monitoring compliance with the SES and EASA Regulations; they are also responsible for implementing the relevant common requirements for the provision of air navigation services (ANS). Moreover, SESAR must be interoperable with local or regional ATM systems within Europe and worldwide. This could imply the creation of new cooperative arrangements between regulators in order to ensure proper safety oversight.

Internationalisation of actors

A third trend is the emergence of new business models in the air transport sector. One such example is the emergence of multi-hub, multi-national airline networks, which consist of networks of multiple hubs belonging to the same airline. There are three major multi-hub networks in Europe: the Air France-KLM network, centred around Paris CDG and Amsterdam; the IAG network around Heathrow, Madrid and Barcelona; and the Lufthansa Group, which uses various hubs around Europe.[60] The emergence of such cross-border arrangements between airlines and hubs may have a profound impact on the regulatory approach to ensuring safety oversight for flight operations in terms of the complexity of cross-border arrangements, and on how responsible authorities work together to oversee this new structure. In order to oversee such structures, increased cross-border coordination and agreements between CAs will be needed. Related to this is that the concentration of the airline industry leads to the combination of airlines from different member states within single airline corporations. Air France-KLM is a prominent example, but also Lufthansa group consists of multinational airlines, amongst other Lufthansa (DE), Austrian Airlines (AT) and Swiss International Airlines (SW).

Related to the above, is the continued trend of low cost airlines that operate with an increasing number of AOCs from different member states in their company. RyanAir for example recently applied for a Cypriote AOC, Easyjet operates under a UK and Swiss AOC, and Norwegian holds three AOCs: two AOCs granted by the Civil Aviation Authority in Norway (one for Norwegian Air Norway, which operates from the company's Scandinavian bases, while the other is for Norwegian Air Shuttle) and one Irish AOC for its subsidiary Norwegian Air International Limited (NAI), which is based in Dublin.

Also in the area of air traffic management, there is an internationalisation of actors. This is due to the Single European Sky legislation, in which the objective to arrive at Functional Airspace Blocks (FABs) has been set. FABs are intended to combat fragmentation of the airspace by establishing co-operation between ANSPs, optimising the organisation and use of airspace through design of optimal control sectors and routes over larger areas and hence achieving overall synergies through economies of

[60] Guillaume Burghouwt (2013). "Airport capacity expansion strategies in the era of airline multi-hub networks." OECD/ITF, Discussion Paper 2013-5. http://www.internationaltransportforum.org/jtrc/DiscussionPapers/DP201305.pdf.

scale. In its SES2+ policy package the Commission is proposing to further develop the FAB concept so that it becomes a more performance driven and flexible tool for ANSPs, based on industrial partnerships, to achieve the targets set by the SES performance scheme. In any way, there is a need for cooperation among CAs (NSAs) to arrange the oversight procedures on FABs as efficiently as possible and avoid potential duplication and/or inconsistency of oversight requests from CAs in respect to cases of multinational service providers.

7.2.2 Main consequence for baseline

In chapter 6 the problem analysis has been described, including an assessment of the main root causes underlying the problems. This problem analysis mainly reflects the current situation. The external trends described above are likely to influence this baseline. In the sections below the baseline scenario is described by looking forward and assessing how the problems in the current situation would evolve over time. In the following table we have briefly analysed this influence.

Table 7-1: Influence of main trends to baseline scenario

Main trend	Influence on baseline
Economic developments	Post-crisis growth, modest increase in budgetary resources available to CAs.
Increasing air transport demand	Increased level of oversight activities required by CAs.
Rapid growth of RPAS industry	Central rulemaking and certification activities on certain categories/weight thresholds of RPAS required to facilitate the growth of industry.
New technologies in ATM (SESAR)	Certification of new technologies required. Increased complexity due to integration with current local ground systems for which no certification scheme exists.
Multinational airline corporations	Increased coordination and agreements needed between the CAs that oversee these airlines. Risk of inconsistent approaches and duplication of work.
Multi-AOC airlines, increasing share of multi-AOC low fare airlines	Increased coordination and agreements needed between the CAs that oversee these airlines. Risk of inconsistent approaches and duplication of work.
FAB development	Increased coordination and agreements needed between the CAs that oversee these ANS providers that cooperate in FAB. Risk of inconsistent approaches and duplication of work.

7.2.3 Internal trends and developments in the baseline

The baseline must also take account of existing resources available to CAs and EASA and expected workload developments in order to make a projection of the impact of a 'no-change / baseline scenario' policy option on the future development over time of resource needs and workload for all the relevant actors.

In Chapter 3 of this report we have presented the quantitative (and qualitative) development of the Agency's staff resource and workload since it was established in 2003. The main conclusions found that EASA has experienced a steady increase in workload in nearly every area of the Agency's activity, while the same is true for the number of staff employed (See **Table 3-4**, **Table 3-8** for an overview of EASA workload and resources development). Moreover, the EASA staff contribution to certification has steadily increased from 5% in 2004 to 80% in 2013, replacing the majority of MS staff involved in certification activities. In terms of resources, EASA has grown from its inception in 2003 to employing 452 Temporary Agents (TA) by 2008, and with the implementation of the second extension of the EASA scope being underway, EASA identifies just over 500 deployed in the technical departments, out of a total of 647 Temporary Agents. According to the most recent Staff Policy Plan of EASA (2015-2017) [61], total Agency staff employed as of 31 December 2013 was 648, approximately TAs, approximately 44 FTE lower than the requested 692 posts as proposed in the MSPP 2013. In order to achieve the MSPP goal, the agency will need to employ approximately 50 FTE extra by end of year 2017 (698 FTE proposed in MSPP 2017).

As has been demonstrated in chapter 4 of this report, CAs experienced an initial increase in resources with establishment of EASA to deal with the new regulation and requirements, followed by stabilisation/decrease in the majority of domains. In some cases this is due to a decrease in workload (e.g., certification), but for the most part due to budget constraints, as has been put forward by the majority of interviewed CAs. However, in terms of workload the general trend is that of an increase on the whole, especially over the last 5 years, and workload increases have generally outpaced the increase in resources of CAs.

7.2.4 Gap analysis

In order to make an estimation of future growth in workload and resource requirements in a continuation of the baseline scenario, we have conducted an analysis of the relationship between a number of indicators related to the level of industry activity, the level of workload of CAs and the associated number of staff resources, respectively. The relationship was assessed for three different years – 2003, 2008 and 2013 – in order to provide a view of the growth trends for the measures assessed for the years 2020 and 2030. Development in the size of the industry is measured by means of the total amount of aircraft on national register and the total volume in IFR flights; to measure workload, we use the total number of AOC holders, and for CA resources, we focussed on the technical staff in the three largest domains, airworthiness (AIR), operations (OPS) and personnel licensing (PEL). For EASA, we assume that the Agency Multiannual Staffing Plans are not implemented, thus there remains a gap of 50 FTE in 2020 and 2030 (see 7.2.3 above).

It is expected that a growth in the level of industry activity will increase the workload in the CAs. As workload increases, so too will the resources required of CAs. On the other hand, it is clear from the analysis conducted in previous chapters that CA budget constraints are considered among the most important causal factors in relation to staffing levels. Because of the limited number of states with data available across all three periods, we look only at the year 2013, for which most Member States (18 total) provided data. An average is taken of the total budget amount of the 18 states, and

[61] EASA, *Multiannual Staff Policy Plan, 2015-2017*. V 5.0, February 2014.

then multiplied by 31 to provide an estimate from which to predict the baseline trend and future scenario. We then estimate, for each change in the level of industry activity for the years 2020 and 2030, future resources needs, assuming a continuation of the baseline scenario. This is calculated based on an elasticity approach to the industry activity and resource variables as explained below.

The development in the size of the industry measured by means of the total amount of aircraft on national register and the volume of IFR flight in Europe both indicate *an increase*. Regarding aircraft on national register, the total number of aircraft on register of all states that submitted data grew from 75,554 in 2003, to 79,620 in 2008 and 88,057 in 2013. This represents an overall increase of 16,5% over the 10 year period. Regarding IFR traffic, the number of flights grew from approximately 8.5 million in 2003, to 10.1 million in 2008. However due to the economic crisis, air traffic has seen a slow recovery, reaching approximately 9.447 million flights in 2013 – an 11% increase over 2003 levels, though nearly a 6,5% decrease over traffic in 2008. According to Eurocontrol's latest *Challenges of Growth* forecast, traffic will reach the 2008 peak again by 2016 and grow by approximately 1,8% annually over currently levels by 2030, with faster growth expected in the initial years between 2015-2020 (approximately 2,5% annually until 2020).[62] .

In terms of workload, it is expected that the number of AOCs – taken as a proxy measure for workload in CAs, will be affected by the growth in industry activity levels. While the results of the analysis show a strong, positive linear correlation between the variables for passengers and the number of AOCs for each of the periods, the trend in the number of AOCs held shows an increase from 1221 in 2003 to 1304 in 2008, followed by a decrease to 1201 AOC holders in 2013. Thus the total period experienced an overall decrease of 2,4% with respect to 2003. No clear explanation could be found for this trend other than the economic downturn since 2008. Notwithstanding this finding, we expect that all else being equal, an improved economic climate would have the effect of reversing the trend; therefore, we continue to expect an increase in the overall workload, while turning our focus to the level of industry activity as predictor of resource needs.

Summing the total technical staff of the three largest domains (that is OPS, PEL and AIR) for all States that submitted data, provides totals of 1573 in 2003, 1728 in 2008 and 1659 in 2013. Hence the trend is initially an increase of 9,9%, followed by a decrease of 11%. With respect to period 2003, 2013 shows an increase of 5,5%. Regarding budget, the total of the 18 States that provided data for 2013 was **€** 581,464,245. This means an average of €32,303,569 per CA. Multiplying this figure by 31 gives an estimate of the total amount of €1 billion. Including the budget of EASA an estimate of the total budget is €1,13 billion. These trends are presented in **Table 7-2** below.

[62] Eurocontrol, *Challenges to growth 2004 Report*. Eurocontrol, Brussels: 2004. Eurocontrol *Challenges of Growth 2013: Summary report*, June 2013. Eurocontrol Se*ven-Year Forecast - Flight Movements and Service Units 2014-2020*, September 2014.

Table 7-2 Baseline trends, 2003-2013

Baseline	2003	2008	2013	% change, 2003 - 2013
Total technical staff CAs (AIR, OPS, PEL only)	1573	1728	1659	5,5%
Total staff CAs	n/a	n/a	5,100	n/a
Total Budget CAs	n/a	n/a	€1 billion	n/a
Total Budget CAs + EASA	n/a	n/a	€1,13 billion	n/a
AOCs held	1221	1304	1201	-2,4%
Aircraft	75,554	79,620	88,057	16,5%
IFR traffic	8,5 million	10,1 million	9,447 million	11,1%

Looking forward, a number of studies[63] have been consulted to make a prediction on future growth. For the number of aircraft on register, an annual growth of 3% is estimate across Europe until 2033; and a growth rate of 2.5% per annum in IFR flights until 2020, followed by slower growth until 2030. For the latter, we use the 1.8% average annual growth over the whole period (2014-2030) to estimate the IFR flights in 2030. Based on the figures collected for 2013, total aircraft on register is estimated to reach 108,000 by 2020 and 145,000 by 2030. This represents an increase of 23% by 2020, and an increase of 65% by 2030. Regarding IFR traffic, total growth is estimated to reach 11,2 million in 2020, and 12,8 million in 2030, an increase of 19% and 35%over the 2013 figures, respectively. See **Table 7-3** for an overview of these estimates.

[63] Airbus, *Global Market Forecast 2014-2033, Flying on Demand*, 2014; Airbus, *GMF book 2014-2022*, 2014.

Table 7-3 Gap assessment

Industry growth	2020 total	2020 / 2013 - % change	2030 total	2030 / 2013 - % change
Aircraft on register	108,000	23.0%	145,000	65.3%
IFR traffic growth	11.2 million	18.9%	12.8 million	35.4%
Estimated resource growth needed	**2020 total**	**2020 / 2013 - % change**	**2030 total**	**2030 / 2013 - % change**
Total EASA staff	698	7%	No additional change	No additional change
Total CA staff	5487-5572	7.6% – 9.3%	5,987 – 6,200	17.4% - 21.6%
Total CA Budget	€ 1,021 billion– € 1,026 billion	2.1% - 2.6%	€ 1,049 billion - € 1,061 billion	4.9% - 6.1%

Taking the above industry growth rate estimates for the years 2020 and 2030, together with rate of change in the number of CA staff from 2003 to 2013, we conducted an indicative elasticity analysis to assess the potential proportional change in the number of CA staff for a proportional change in industry level activity. It should be noted that the results are to be interpreted with caution, as there are clearly many other indicators that influence workload. Based on the total staff and industry growth rates calculated during the last decade, combined with the estimates for future industry growth provided above, we predict that the need for additional staff to carry out the workload will increase by roughly 7.6 – 9.3% by the year 2020 of the base figure of around 5,100 total CA staff in 2013, amounting to between 5,487 to 5,572 total staff needed. By 2030, total staff needed will increase by between 17.4 – 21.6% over the current level, which represents between 5,987 to 6,200 individuals. The above mentioned increases can be considered somewhat conservative, as from the problem analysis in chapter 6 it became clear that there are currently shortages in staff in certain CAs. As such, the current figure of 5,100 total staff that served as the basis for the assessment does not reflect the actual need of resources at CAs at present. The increase in staff necessary at EASA is based on analysis of the EASA Annual Staffing Plans, which call for approximately 698 additional staff by the end of 2017 (up from 638 at the end of 2013). Taking into consideration political intent to reduce the number of additional staff required as foreseen in the Staffing Plans, we expect the current gap of 50 FTE is maintained in 2020 and 2030. As a comparison, the FAA forecasts that it will need a staff increase for its AVS workforce (see chapter 5) of 11% in 2023 compared to 2013[64].

This increase in required staff implies an increase in the budget of CAs as well. This increase in resources as described above (measured in FTE) has been valued in monetary terms by multiplying it with the average wage level of CA staff in Europe. See section 8.1 for more details on that. The total CA budget needs in 2020 will amount to € 1,021 billion to € 1,026 billion, and between € 1,049 billion and € 1,061 billion in 2030. Thus, the projected gap in CA budget resources compared to the

64 FAA, Aviation safety FY2014 Workplan.

current budget levels of approximately € 1 billion is estimated to be between € 21 - 26 million in 2020 and € 49 – 61 million in 2030 (annually).

Again, these figures are indicative, as an overall resource forecast model in this area does not exist. Nevertheless, it is clear that if industry activity and associated demand for new aircraft (types) will grow according to forecasts, this will certainly impact CAs in the workload increase. These estimates do not factor in the impact of the transition to risk based approach.

7.2.5 Option 1 Baseline

As per the Impact Assessment Guidelines of the Commission, any policy action must be compared with a baseline option that reflects a situation of no additional EU action. For this study, this implies that the Basic Regulation and associated Implementing Rules will not be revised, with the exception of the limited changes expected to be introduced through the SES 2+ policy package. Concretely the option means that:

- The distribution of roles and responsibilities between EASA and the CAs of the EASA Members States remain as they are to date. The same applies as to the distribution of roles and responsibilities between EASA, ICAO and Eurocontrol;
- Cooperation mechanisms and levels between CAs do not change in comparison to what they are today;
- The system evolves on the basis of existing mechanisms of interaction between MS and EASA.

This is characterised in the following table.

Table 7-4 Measures under Option 1

	EU level	EASA member states level	Regulated entities level	Implementation issues
Standardisation, oversight and enforcement	▪ Development of guidance material on assessment of SMS maturity.	▪ To start oversight of management systems of regulated entities.	▪ To start implementing management system requirements.	
Forms of cooperation	▪ No change.	▪ No change.	▪ No change.	
Training and qualification of staff	▪ EASA rulemaking task 0516/0517 on inspector qualifications for OPS certification.	▪ No change.	▪ N.a Qualification of industry personnel.	▪ Voluntary training mechanisms offered to CAs and industry (e.g., EASA virtual training academy).
Financing of authorities	▪ No change.	▪ No change.	▪ No change.	▪ EASA financed through EU contribution (currently 1/3) and fees levied on regulated entities (currently 2/3); ▪ Differing funding of CAs (mix between industry funded and government funded).
Other:	▪ Synchronisation with ICAO.	▪ Relationship with ICAO continued to be built (filing of differences, synchronisation between EASA standardisation and USOAP).	▪ N.a.	

In this option, the current problems with the inadequacy of resources, financing and cooperation – both between MS and between MS and EASA – would continue, for the most part, and might even worsen if the workload of CAs increases under increased industry activity levels as sketched above. Inadequate resourcing continues to be a barrier to full and effective operation of CAs as well as EASA, not only in terms of overall resources available but also in terms of technical expertise, in particular in the areas of OPS and ATM/ANS. Continued budgetary pressure in some CAs will create limitations to resolving the resourcing issues in spite of EASA audits and required corrective action mandates.

The insufficient resources and staff training/qualification deficits continue as the dominant issues, with significant shortages of both having been reported. The manpower issue can, in certain cases, be solved by recourse to the EASA pool of experts and/or cooperative oversight practices, but both inevitably represent high-cost, temporary solutions. While these practices ensure that CA are technically capable of meeting supervisory responsibilities, they also have the capacity to weaken the long-term independence of the CA. Moreover, the differences in the liability legal frameworks and the absence of a cost-recovery financing structure continue to place obstacles on the use of these cooperation practices. For these reasons, cooperative oversight and expert pools will continue to be underused by the relevant authorities.

Regarding the qualification issue and technical expertise of CA staff, the Standardisation Report 2013 indicates a significant deficit in training capacity for CA functions, particularly in ATM/ANS and OPS. While this may be a temporary problem in light of the recent applicability of new implementing rules in both domains, it nevertheless demands urgent attention. In the baseline, training and qualifications are covered by standardisation through generic common requirements (ARO.GEN,200) and limited training guidance. Resource constraints of the Agency will continue to limit the ability of the Agency to expand its effort in this respect. EASA has a Virtual Training Academy initiative, however the voluntary nature means that it requires the cooperation of Member States to participate, which may be constrained by limited budget and staffing resources. On the other hand, the Rulemaking task 0516/0517[65] is expected to produce more precise AMC/GM on inspector qualifications needed to certify and oversee Air Operations. The RMT foresees the inclusion of a Flight Operations Inspector (FOI) competency matrix in AMC or GM, which may help to reduce the implementation difficulties that have been found relating to the qualification and training of inspectors for the oversight of Air Operator Certificate (AOC) holders. Moreover, in the baseline, there exist qualification and training requirements for SAFA inspectors.

With respect to oversight approaches, the current process of Member States moving towards an EU Safety Management System (SMS) and evolution of EASA standardisation into a Continuous Monitoring Approach based on risk will continue in the baseline. To support this transition, guidance material assessing SMS maturity is developed. This could include setting up a joint assessment of the authorities' management systems, an initiative recently announced by EASA. This means that the authority's management system will be fully screened by a joint team of EASA Standardisation staff with expertise in the different domains. Funding for Big Data

[65] RMT .0516 and RMT .0517 on Updating Air OPS Regulation (EU) No 965/2012 Implementing Rules and related Acceptable Means of Compliance (AMC) & Guidance Material (GM). Issue 2, 6 October 2014.

initiative, however, has not yet been secured. The first EASA authority and organisation requirements, including management system requirements, have been adopted with Regulation 290/2012 for flight and cabin crew, and Regulation 965/2012 for air operations. These measures can address some of the issues pertaining to overall inefficiency of oversight by reducing both enforcement- and inspection-related costs for all actors and involved, and allowing the relevant actors to focus on the issues, areas or organisations where there are higher risks for safety. This also can produce safety gains. However, the transition to PBR continues uncoordinated between the different MS in the absence of an EU-level regulation mandating its implementation. As a result, differences in supervisory approaches are maintained in this respect. Implementation of new oversight requirements will be further hampered by the strained resources of CAs, while implementation of new rules by industry remains difficult absent additional guidance. In addition, the further synchronisation with ICAO standardisation that is anticipated in the baseline should address some of the challenges related to the overlap between EASA and ICAO, as well as reduce any existing duplication of work imposed on CAs as a result of the prior overlap mentioned.

The situation pertaining to the financing of authorities remains unchanged in the baseline option. For EASA, this means being financed through both EU contribution (currently 1/3) and fees levied on regulated entities (currently 2/3). For CAs, it means that financing structures across the different Member States differ, ranging from fully government funded to fully funded by fees & charges from industry, and some with a mix of both. Meanwhile, for industry this means facing different charging systems in different EASA Member States and concerns over the lack of level playing field continue unaddressed. Moreover, limited use of industry standards remains the norm, implying higher workload for rulemaking.

7.3 Option 2 Enhanced cooperation within the system

This option is comprised of a set of individual actions that contribute to addressing a number of the core problem drivers, such as “insufficient resources compared to workload” and “differences in implementation of supervisory approaches”, however without changing fundamentally the structure of the system nor requiring any significant alterations to the existing legal framework. This option would focus on creating closer relations among the relevant actors in the system and on encouraging exchange of best practices through common forums under EASA auspices, and further development of the pool of experts. The measures included in this option are summarised in **Table 7-5**.

Table 7-5 Measures under Option 2

	EU level	EASA member states level	Regulated entities level	Implementation issues
Standardisation, oversight and enforcement	▪ Introduction of Performance Based Regulation in the Basic Regulation, including mandating SSP in the Basic Regulation; ▪ Further promoting the use of risk and performance based oversight methods; ▪ Establishing central repositories of licences and approvals.	▪ Implement SSP; ▪ Implement risk and performanc e based approach to oversight; ▪ Provide support to organisation s to implement SMS.	▪ Shifting more workload to competent user organisation s in the GA sector.	▪ Amendment of definition of Qualified Entity in EASA Basic Regulation.
Forms of cooperation	▪ Further develop and promote the pool of experts; ▪ Develop best practices and guidance material on cooperative oversight.		▪ No change.	▪ Possible implementatio n: via EASA coordinated Call for experts among CAs on annual basis. If certain domains are not covered, experts from the market could be recruited via secondments or framework contracts; ▪ Charging on cost-price basis.
Training and qualification of staff	▪ More detailed guidance material; ▪ Promoting exchange of	▪ No change.		▪ Training academy could include involvement of industry in

	EU level	EASA member states level	Regulated entities level	Implementation issues
	best practice between MS; ▪ Further development of the virtual training academy.			training of authority staff (including exchanges); ▪ A scheme of a monthly or quarterly industry training scheme could be set-up, coordinated by EASA or volunteering CAs.
Financing of authorities	▪ Common charging framework developed for pool of experts.	▪ Authorities charge at cost-price for supplying resources to pool of experts.	▪ No change.	▪ Average costing of hourly rate for different experts can be calculated, either per MS or overall for system; ▪ Alternatively, each participating CA in the pool be asked for hourly rate quotation.
Other	▪ Communication framework introduced; ▪ Proactive alignment with ICAO; ▪ Increase reliance on and promotion of industry standards.	▪ No change.	▪ No change.	

Measures targeting standardisation, oversight and enforcement at the EU level include the introduction of performance based oversight, mandating SSP and EASp in the Basic Regulation and further promoting the use of risk and performance based oversight methods. The latter entails further development of guidance material and tools for authorities, and the exchange of safety information. The introduction of a central repository of licenses and approvals will also be developed. The MS national

repositories of licenses are still maintained and feed into the central repository. At the EASA Member State level, measures entail the implementation of SSP, as mandated in the Basic Regulation, to provide input into the European Aviation safety plan and promote the sharing of information between CAs; implementation of risk and performance based approaches to oversight, and; improved provision of guidance and support to industry organisations to enable their implementation of effectively functioning SMS. The inherent investment requirements of such measures (e.g. infrastructure and transition costs, expertise development) may be difficult to make, however, due to limited resources. For regulated entities, the measures entail the shifting of more workload to competent user organisations in the GA sector. This will require, however, an amendment of the concept of 'Qualified Entity' in the EASA Basic Regulation.

Regarding forms of cooperation, EASA would further develop and facilitate a pool of experts, including through Member State contributions of experts, where CAs could source experts for less frequent tasks. The pool would be populated on a voluntary basis, filled by resources from CAs and EASA. The use of experts from the pool is charged on a cost-price basis. For this purpose a common charging framework for the pool of experts would be introduced in order to help to reduce the financial costs currently associated with the use of the pool. The pool focuses on resources that: (a) are generally scarce in Europe while at the same time require a high level of expertise and associated training costs (e.g. flight operations inspectors); (b) cover a domain for which the industry level in Member States varies significant (e.g. helicopter operations, corporate aviation activities). Cooperation between States through the exchange and/or pooling of personnel has the potential to be an effective and efficient mechanism for dealing with resource constraints in some CAs. It can also greatly assist cooperative learning and "pro-active standardisation" through exchanges of information and best practice between Member States' CAs. This may also contribute to reducing the issues pertaining to sub-optimal qualification and training of staff by increasing their skills in the process.

Undertaking such cooperation, however, also brings some practical challenges which may hamper the effectiveness of the proposed measures. The external support provided must operate within national legal frameworks and systems and linguistic barriers must be overcome. An annual call for experts coordinated by EASA could be an implementation mode, complemented with framework contract type of procurement from the market for gap filling of certain expertise in the pool.

Measures are also introduced by EASA and in conjunction with CAs to promote clearer and consistent communication activities with industry on the division of roles and responsibilities between EASA and CAs, as well as improved communication in response to questions from industry with regards to the content of legislation. This measure includes the establishment of permanent, dedicated contact at EASA responsible for clarifying such questions and ambiguities that arise. Similarly, EASA will proactively work with MS to eliminate duplication of work with regard to filing of differences with ICAO.

A final measure calls for EASA to develop best practices and guidance material on cooperative oversight to promote more proactively the use of cooperative oversight practices among the Member States' CAs. The sum of these measures may in certain cases increase the use of the pool of experts and cooperative oversight practices by

States' CAs (and therefore contribute to reducing some of the manpower and technical expertise deficits reported), the measures continue to rely to a large extent on the voluntary cooperation of participating actors for effectively sharing resources, which in turn depends on their financial and human resources available. The latter is not tackled under the set of measures proposed.

While the qualification and training deficits of both EASA and CA staff, is not systematically dealt with under this policy option, the deficit in training capacity for CA functions can, in certain cases, be solved by increased industry involvement in training of authority staff, including through expert exchanges. Measures targeting the training and qualification of staff at the EASA level include the development of more comprehensive and detailed guidance material on the training and qualification of staff, promoting exchange of best practices between MS and further development of the virtual training academy, e.g. through increased marketing and advertisement of training courses throughout the Member States. The voluntary nature of the virtual academy – as well as the use of and contribution to the pool of experts - however, makes its success dependent on the voluntary participation of CAs, which may be difficult to achieve in times of budgetary pressure and resource constraints.

Overall, the measures under this policy option lay the initial groundwork towards addressing the most pressing issues facing EASA in particular, and to a lesser extent the CAs. The current problems regarding inadequate resourcing and budgetary pressure continue to be a problem to the full and effective operation of CAs and EASA alike. As stated above, the incoherent development of the authorities' financing structures is not dealt with in any systematic way under this policy option. In this regard, the situation facing both MS and industry continues unchanged. Moreover, budgetary issues and manpower resource deficits are not structurally tackled to ensure more efficient and effective deployment of available resources across the system.

Box 7.1. Shifting more workload to competent user organisations in the GA sector. A number of CAs were already delegating part of their workload to user organisations or aeroclubs prior to the creation of EASA. However, this trend has been reversed according to the provision of the EASA Basic Regulations which allocates responsibility for oversight to the CAs. This practise has been revived by CA AT recently with the delegation of the responsibility to oversee ultralight aircrafts, parachutes and other Annex II light aircraft, to aeroclubs.

7.4 Option 3 A joint oversight system with voluntary or mandatory transfer of responsibilities

Under this third option EASA and competent authorities of EU Member States retain their status of separate organisational entities but work closely together as a joint system. A legal framework is created to facilitate the delegation of responsibilities or allocation of specific oversight tasks on an ad hoc basis. Member States have the possibility to delegate responsibilities to EASA. This is referred to as the option 3a for the voluntary transfer of responsibility. The sharing of work is facilitated by common quality standards ensured through system-wide allocation of certain certification tasks for a specified period of time to a selection of qualified (accredited) CAs with resources available, and standardisation mechanisms which cover also common training and qualification requirements for staff. Alternatively this option could also envisage that

for certain types of organisations or tasks or in certain situations of underperformance the transfer of responsibilities from national to EU level would be mandatory. In this case, we refer to an option 3b for Mandatory transfer of responsibilities. The measures provided for under the option 3 are summarised in **Table 7-6**.

Table 7-6 Measures under Option 3

	EU level	EASA member states level	Regulated entities level	Implementation issues
	Same as option 2, plus:	**Same as option 2, plus:**	**Same as option 2, plus:**	
Standardisation, oversight and enforcement	▪ Standardisation of requirements on qualification and training of staff.	▪ Implementation of the EU requirements on qualification and training of staff.	▪ No change.	
Forms of cooperation	<u>Sub option 3a</u> ▪ Creation of a legal basis for delegation of responsibilities between MS and MS and EASA; ▪ Further clarification of the provisions on cooperative oversight; ▪ Enabling system-wide allocation of certification tasks. <u>Sub-option 3b</u> ▪ Identification of tasks for which mandatory centralisation would bring greatest efficiencies; ▪ Mandatory transfer of responsibilities to EASA in case of persistent shortcoming in	▪ No change.	▪ No change.	<u>Sub option 3a:</u> ▪ EU law should allow for delegation of responsibilities . Could include the concept of EU AOC; ▪ If requested by a MS/CA, the Agency may ensure provision of oversight; legal basis could also be given to allow the formation of a grouping of MS/CAs (e.g. along regional lines) to provide oversight; ▪ System-wide allocation of tasks for, e.g., 5-year periods, prior to which a planning of certification demand is undertaken for

	EU level	EASA member states level	Regulated entities level	Implementation issues
	oversight of a MS.			that period. Based on estimated resource capacity and qualifications of different entities, certification tasks are allocated to demand. <u>Sub-option 3b:</u> ▪ Starting point for mandatory centralisation is complex multinational service provider in all domains. Examples are FABs, multi-AOC airlines, multinational maintenance organisations; ▪ Measures in both 3a and 3b would entail a revision in the BR.
Training and qualification of staff	▪ Common EU requirements on qualification and training of competent staff.	▪ Implementation of EU requirements.	▪ Same as option 2.	
Financing of authorities	▪ Common funding and charging framework developed for EASA for cooperation activities under this option based on	▪ Compliance requirements with the common funding framework of EASA; ▪ Common charging framework	▪ No change.	▪ Funding framework of EASA based on user-pays principle; ▪ Common charging framework possible implementatio

	EU level	EASA member states level	Regulated entities level	Implementation issues
	activity based costing.	developed for authorities for cooperation activities under this option based on activity based costing.		n: Average costing of hourly/monthly rate for different activities can be calculated, either per MS or overall system.
Other	▪ No change.	▪ No change.	▪ No change.	

The training and qualification deficits reported above would be, to a large extent, solved under this policy option through the introduction of standardized, common EU requirements on qualification and training of staff. This would reduce the existing issues with respect to disparity between Member States on the level of qualification of current staff, while not necessarily addressing the overall manpower deficit.

In terms of forms of cooperation, two sub-options are proposed. Under Sub-option 3a, Member States have the option to delegate responsibilities to EASA. Moreover, the issues related to liability and financing risks associated with the various forms of cooperation available to CAs and EASA are significantly reduced, e.g. by creating a legal basis in EU law for the delegation of responsibilities between MS and between MS and EASA, including through the creation of a concept of an EU AOC, and further clarifying the provisions on cooperative oversight to include, for example, clear provisions with respect to responsibility arrangements and cost-recovery mechanisms. Additionally, a measure is introduced to enable system-wide allocation of certification tasks, possibly through the expansion of accreditation options.

Under sub-option 3b, activities for which mandatory centralization would bring greatest efficiencies are also identified. The starting point for this are complex multinational service providers in all domains. Examples include FABS, multi-AOC airlines and multinational maintenance organisations. Additional further centralisation of tasks could be undertaken with respect to rulemaking and certification on RPAS; responsibility for the safety aspects of security measures and EU ground handling measures; the establishment of a European AOC; or the establishment of common, centralised IT-solutions such as a common license register, AOC register, exam register, etc., all of which would have the effect of making the system more efficient and lessen the administrative burden to CAs. The mandatory transfer of responsibilities to EASA in case of persistent shortcomings in oversight of a MS is also introduced under this policy option.

In terms of the financing structures under policy option 3, at both the EU and Member State levels, a common funding and charging framework is developed for the Agency's and authorities' engagement in cooperation activities under this option (e.g. delegation of responsibilities /cooperative oversight practices) based on activity-based costing. Such a common funding framework of EASA could be based on a user-pays principle, whereby the CA or industry, etc. that benefits from the system (ultimately

the passenger) would pay the full costs. In terms of a common charging framework based on activity-based costing, the average costing of hourly/monthly rates for different activities can be calculated, either per MS or for the overall system. The same can be applied to EASA.

7.5 Option 4 Single European Competent Aviation Authority (ECAA)

Under this option EASA becomes the competent authority for aviation safety in the EU. All responsibilities for regulation and oversight in all domains are set on European level, while the European competent authority allocates tasks to National Authorities, which act as local implementation offices. This would only occur if these National Authorities are capable to exercise the tasks up to the required standard. Under this option ECAA fully controls the work of National Authorities (where they act within the scope of the ECAA system) and allocates the tasks to them based on the actual demand for certification and oversight work in the system. ECAA sets minimum number of hours required for inspections, the requirements for competent staff in terms of training and qualifications, and trains the inspectors. Standardisation mechanisms are replaced by internal quality mechanism of ECAA which covers also the National Authorities.

This Option also includes the transition to performance- / risk-based regulation and a performance- / risk-based approach for oversight activities as discussed in Option 2.

Table 7-7 Measures under Option 4

	EU level	EASA member states level	Regulated entities level	Implementation issues
	Risk-based elements from option 2, plus:	**Risk-based elements from option 2, plus:**	**Risk-based elements from option 2, plus:**	
Standardisation, oversight and enforcement	▪ Changes in the Basic Regulation to accommodate a single European Competent Authority; ▪ ECAA sets working approaches and norm hours. Standardisation is made inherent in system as such.	▪ National Aviation Authorities may be delegated responsibilities if capable.	▪ Regulated entities always deal with the closest local office in the vicinity.	▪ Transition path to be determined based on domains that are transferred to ECAA?

	EU level	EASA member states level	Regulated entities level	Implementation issues
Forms of cooperation	▪ N.a.	▪ N.a.	▪ N.a.	
Training and qualification of staff	▪ Same as option 3, plus; ▪ Setting-up of an ECAA training organisation.	▪ Reduction in the number of trainings at national level; ▪ Organisation of trainings for national authorities staff according to the programme of ECAA.	▪ Industry Staff joins ECAA training programme.	▪ Training organisation to target (i) ECAA staff and (ii) industry staff, with a focus on interpretation of regulations and standardising the implementation. A scheme of a monthly or quarterly industry training scheme could be set-up. Training of new ECAA staff could be coordinated formally through ECAA; alternatively, a peer review framework could be set up for sharing of best practices.
Financing of authorities	▪ Common charging system, based on activity-based costing for all activities except rulemaking, safety analysis and international cooperation.	▪ National Authorities fall under Common charging scheme.	▪ Industry is charged for services of ECAA.	▪ ECAA funds national authorities for services provided under delegation; ▪ Charges are based on activity based costing assessments for the different activities.
Other	▪ N.a.	▪ N.a.	▪ N.a.	

While national authorities may still have independent functions outside the scope of the ECAA system, under this option ECAA fully controls the work of National Authorities where they act within the scope of the ECAA system. The allocation of

tasks based on actual demand effectively addresses a significant portion of the current problem related to inefficient deployment of staff resources by reducing the amount of unnecessary and/or idle positions and workload imposed on CAs.

In practice, there is almost no policy setting carried out at the national level beyond transposing European regulations into locally applied procedures for use by CA personnel. This would ensure that application of ECAA operations and activities would be standardised to a detailed level by means of central direction, addressing to a large extent the issues stemming from the varying interpretations, and thus implementation of the regulations reported in the Annual Standardisation reports. Moreover, ECAA sets the requirements for competent staff in terms of training and qualifications, and trains the inspectors. This tackles the issue of training and qualification deficits by ensuring system-wide training and qualification from the top level down. An ECAA training organisation is established that focuses on the implementation of regulations and targets (a) ECAA staff and (b) industry staff. Standardisation mechanisms are replaced by internal quality mechanism of ECAA which covers also the National Authorities.

7.6 Linking options to the problem tree

In the table below, it has been indicated which policy options are considered to address the specific problem drivers and underlying root causes in some way. Some root causes influence multiple problem drivers, and have been included twice in the table for completeness. We have not indicated the effectiveness of the options on the root causes on a scale. This will be done after the assessment of impacts in chapter 8.

Table 7-8: problem drivers and root causes versus the policy options

Drivers / Root causes	Option 1	Option 2	Option 3	Option 4
PD1: Insufficient and inefficient deployment of resources compared to workload				
Transition costs of changes	x			
Increased workload from standardisation activities		x	x	x
Inefficiencies of current system		x	x	x
Increased volume of aviation activity				
Rising resource constraints			x	x
PD2: Qualification level of staff				
Insufficient training of technical staff	x	x	x	x
Lack of harmonised requirements on qualifications			x	x
Insufficient replacement / recruitment of staff				
Financing structure of CA's			x	x

Drivers / Root causes	Option 1	Option 2	Option 3	Option 4
Lack of qualified staff in the labour market				x
Shift to performance based approach		x	x	x
PD3: Differences in supervisory approaches				
Lack of guidance material	x	x	x	x
Cultural and language differences				x
Decreased CA participation in standardisation inspections			x	x
PD4: Differences in CA charging structures				
Absence of common framework on charging structures			x	x

8 Impacts of options

8.1 Introduction

In this section, the impacts of the different policy options proposed in chapter 7 are presented relative to the do-nothing/business-as-usual scenario/option (baseline). For each of the options, an assessment of the positive and negative impacts is given. The impacts are assessed in a qualitative manner. Quantitative assessments of the impacts are added where possible. Finally, the impacts of the different options are presented in sections 8.2- 8.5.

The following impacts are studied:

- Safety impacts:
  - Impact on key factor interfaces;
  - Impact on key factor available knowledge;
  - Impact on key factor changes;
  - Impact on key factor conflicts of interests.

These 4 key factors with influence on safety can be described as follows[66]:

Impact on interfaces

In general air transport may be regarded as a large system which is composed of several elements and processes. Safety in this system depends on the way that the elements and processes are able to communicate with each other. In this respect, the system is to be considered as a chain whereas the safety is determined by the weakest link in the chain. Any interface in the system is a risk that requires additional coordination. Accidents or incidents may occur when interfaces are not properly managed.

Interface deficiencies may occur within a single organisation, as well as between multiple organisations. However they are more likely to occur between multiple organisations. Particularly when separate organisations represent different disciplines, interface deficiencies may emerge.

For the assessment with respect to impact on safety, for each of the policy options it is judged whether the option will result in an increase or a decrease of the number of interfaces.

[66] The approach has been earlier applied, e.g. in Ecorys/NLR, Impact Assessment on the extension of EASA competences to ANS, ATM and Airports, Final report, 2005.

Impact on available knowledge

Aviation has always been at the forefront of development of safety measures and practices. Therefore the required level of knowledge within the organisations that are active in the aviation community is necessarily high. This high knowledge level is required within all kinds of disciplines and organisations within the community. It concerns not only technical knowledge, but also knowledge in the areas of operation, organisation, safety management and regulation, which all together allow the aviation community to move on and succeed.

This level of knowledge requires continuous attention, as any degradation in any part of the system may lead to safety hazards.

For the assessment with respect to impact on safety, for each of the policy options it is judged whether the option will result in a change in the level of available knowledge within the relevant organisations.

Impact on changes

The aviation community is changing constantly, not only because of technological advances, but also because the community is embedded in a dynamic society. Maintaining or improving safety is only possible if the system of aviation is continuously adapted and improved. It is necessary that these changes are made timely. However, history also shows that safety can be compromised when different parts of the aviation system change at different rates. This is most likely to occur when one part of the system changes disproportionally over a relatively short period of time.

For the assessment with respect to impact on safety, for each of the policy options it is judged whether the option would introduce changes that are considered necessary to further improve the level of safety of aviation in Europe. Also it is judged whether the pace at which these changes are introduced is sufficiently balanced and whether the policy option allows management of change.

Impact on conflicts of interest

Originating from the days of Baron de Montesquieu, it is recognized that sufficient separation should exist between a regulatory body and an executive body in order to prevent conflict of interest. Such conflict of interests may prevent either the regulatory body or the executive body to decisively fulfil their task. For example a conflict might exist between new standards and the cost implications of implementing them, between capacity of airspace or airports and safety standards for operation and separation, or between the safety benefits of enforcement measures (for instance the withdrawal of an AOC) and the societal costs of these measures.

For the assessment with respect to impact on safety, for each of the policy options it is judged whether the option could contain or introduce mixed interests between regulatory and executive entities.

- Economic impacts:
  - Impact on regulatory compliance costs, this category can be further distinguished into:
    - regulatory compliance costs for regulated entities[67]; and
    - regulatory compliance costs for public authorities.[68]
  - Impact on functioning of the system;
  - Impact on competitiveness/industry growth;
  - Impact on innovation.
- Social impacts:
  - Employment conditions / job quality;
  - Direct employment / job creation;
  - Qualification / skill level.
- Environmental impacts.

All impacts have been assessed on a per option basis compared to the baseline. Interdependencies between options, or synergetic effects between options have not been taken into account in determining the impact, but have been mentioned where applicable.

Economic impacts have been expressed in annual terms, but also in net present value terms (NPV) covering a 2016-2030 time period. In a net present value calculation, one discounts costs and benefits arising at different times during this time period to take into account that costs and benefits that occur immediate are valued higher than these that occur later. See the annexes to the European Commission Guidelines for further explanation[69]. In these cases where there are only costs occurring in a time frame and no benefits, we speak about the present value (i.e. without the word 'net')

The following generic key figures have been used when quantifying the economic impacts.

Item	Value	Source
Average labour costs (cost of employment) EASA and EC per	€ 95,000	http://easa.europa.eu/system/files/dfu/Working-for-us.pdf. Assumed to be average of grades of highest function group.

[67] Refers to the costs incurred by industry to comply with the regulation as well as the the costs for MS and the EU, i.e., for both the CAs and for the EASA budget.

[68] Refers to the costs for MS and the EU, i.e., for both the CAs and for the EASA budget.

[69] European Commission, 2009, Part III: Annexes to impact assessment guidelines. Chapter 11.6.

Item	Value	Source
man-year		
Average labour costs CAs per man-year	€ 55,000	Average of Germany, Netherlands, UK, adapted to average EU/EFTA MS level based on Purchasing Power Parity estimate. This excludes overheads and staff related expenditures of CAs on e.g. training.
Discount rate for calculating NPV	4%	EC, Annexes to Impact assessment Guidelines.

8.2 Option 1 Baseline scenario: Expected impacts

As was elaborated in chapter 7, the first policy option assumes that, with the exception of the limited changes expected to be introduced through the SES2+ policy package, the Basic Regulation will not be revised. This means that the current distribution of roles and responsibilities remains as they are today. Moreover, cooperation mechanisms between CAs, between CAs and EASA and between regulatory bodies and the industry (industry standards, cooperative oversight, pool of experts, delegation of GA oversight to user organisations etc.) remain on their current form and mainly on a voluntary basis while training opportunities (virtual academy, guidance material) and qualification requirements for staff remain unchanged, coordinated through generic common requirements (e.g., ARO.GEN.200) and limited training guidance from EASA.

Under this option the slowing down of changes leads the system closer to stabilisation and allows it to eventually enjoy the efficiency gains of the existing structure, such as the centralisation of certification being undertaken under one authority, which is positive. Having established one Certificate that is mutually recognised by all EU/EFTA MS also has the effect of lowering the administrative burden to CAs associated with recognising other States' certificates. Additionally, the transition to risk-based oversight approach will, in the long-term, bring efficiency gains to CAs and industry alike by reducing enforcement costs for authorities, reducing inspection-related costs for well performing operators/entities, and allowing the relevant actors to focus on the issues, areas or organisations where there are higher risks for safety. However, on the other hand, the current process of Member States moving towards an EU Safety Management System (SMS) in the absence of detailed EU level technical guidance on SMS oversight means that the resulting SMS approaches implemented by the different MS will not be harmonised. Thus, the effectiveness of standardisation efforts is reduced, all of which contributes to further undermining the common market and competitiveness of the system.

However, the major issues facing CAs, EASA and industry as sketched in the problem analysis in chapter 6 are all not addressed. Ongoing budgetary pressures form a key barrier to adequate resourcing in many CAs and affect an efficient and effective system operation overall. The resource-workload imbalance on the CAs' side is expected to be amplified by an increasing aviation activity in the future and an increasing insufficiency of technical skills available that will be required to carry out

their workload. This is particularly the case in the short term given the recent applicability of the new Implementing Regulations on ATM/ANS and the on-going shift to a risk/performance based oversight approach. Regarding the former, the Standardisation Annual Report of 2013 indicates a high level insufficient competence in the ATM/ANS domain found across Member States, while the latter inevitably requires a certain skill-set and expertise that many CA's reportedly lack[70]. At the same time, new technologies in the area of RPAS and ATM are upcoming and need to be addressed by the system in an efficient manner. Furthermore, the aviation industry that is to be overseen develops, creating more complex structures to be overseen, such as the emergence of multinational service providers in ATM and air operations.

In addition to the above, the lack of participation incentives together with the absence of clear framework conditions for using the existing cooperation mechanisms (e.g., liability legal frameworks and cost-recovering financing structures) leads to their sub-optimal utilisation. In addition, the Virtual Training Academy initiative of EASA continues in the baseline, however the fact that it is offered on a voluntary basis and that it is hardly known and visible means that there is little incentive for CAs to utilise the initiative, particularly in the context of budgetary constraints.

Overall, the system is not fine-tuned to address the different structures and background conditions of CAs. This leads to disproportionate burdens to smaller CAs, that are required to commit significant resources to fields of limited industry activity, and CAs with less flexible financing structures that cannot easily adjust resource levels to industry needs and fee charges to actual costs.

Below we have summarised the development in the main impact categories that will be addressed in the analysis of impacts of the options in the sections below.

Safety impacts

The impact on safety of option 1 can be described by means of the 4 key factors addressed in paragraph 8.1:

Interfaces:

In option 1, the baseline scenario, the number of interfaces will remain identical to the current situation.

Available knowledge:

Under option 1, knowledge is difficult to secure. In terms of training and qualification of staff there are no common requirements and there is only limited guidance available. The subject of training and qualification is covered by the standardisation work of EASA only in a very generic way, and there is little incentive for CAs to utilise the initiative of the virtual training academy of EASA. Hence, not all states have a comparable level of knowledge available, both at the level of the CA as on the level of

[70] As reported in the interview consultations. See also EASA, *Standardisation Annual Report* 2012, 2013.

the industry. While some States and industry organisations are building up their knowledge level on their own initiative, this will not be done in an equal, comparable way across Europe, and this is considered to be a necessity given the changes implemented in the latest regulations. All, but especially the smaller states, will be confronted with difficulties to keep this knowledge internally available for longer periods of time given the consequences of the budget constraints for the work conditions offered. When economic circumstances are improving again staff members might choose to continue their career in the industry. In addition, the different forms of cooperation currently available (pools of experts, cooperative oversight) are hardly used.

Changes

Option 1 does not include any regulatory changes except the limited changes expected to be introduced through the SES2+ policy package and the introduction of the SESAR system. This section examines only the changes in the organisation of the aviation safety system oversight (i.e. allocation of responsibilities, regulations, processes, etc.) and there the impact of these changes is expected to be minimal. After a decade of change, some consolidation in this respect is considered to have a positive, effect on safety. Attention can now for instance be paid to standardisation, oversight and enforcement issues. The development of guidance material on the assessment of SMS, the evolution of EASA standardisation work into a CMA approach based on risk, and oversight primarily focusing on the implementation and the realised maturity level of SMS within the industry will all contribute to this positive effect. The absence of changes has a positive influence on the problem drivers “differences in supervisory approaches” and on the “insufficient and inefficient deployment of resources compared to workload” and as such a positive influence on the unpredictable safety situation.

Conflict of interest

In the present situation, the availability of specific expertise in one country or another could be that limited that this expertise or knowledge is used for more than one purpose. As an example, imagine the situation that a country only has a few flight operations inspectors, rated for a limited number of aircraft types. The probability that one inspector will inspect and will keep his (or her) license valid by executing flights for the same company will increase. The same is applicable when a CA (wants to maintain the competences of their ANSP inspectors. Almost the only way they can do that is to allow their staff to work for the ANSP as well. Within Europe it also still exists that some CAs are not only responsible for certain oversight tasks, but are also involved in providing certain services (air navigation services, aerodrome operation). This could lead to possible conflicts of interest as well.

Economic impacts

Table 8-1: Economic impacts of Option 1

Impacts	European level	CA level	Industry level
Impacts on regulatory compliance costs for public authorities	▪ Effort increase to develop GMs (SMS maturity) **(from current budget);** ▪ Cost to synchronise with ICAO standardisation (USOAP) **(from current budget);** ▪ Costs to maintain pool of ops inspectors **(from current budget);** ▪ Cost for operating virtual academy **(from current budget).**	▪ CA budgets assumed to grow in accordance with industry activity and maintaining the same level of resources gap (see 7.2.4); ▪ Slight reduction in costs as system is left to rest and stabilises over time **(transition costs);** ▪ Initial cost increase for establishment of structures / mechanisms for oversight of management systems (regulated entities) and related **(management costs);** ▪ Training costs for voluntary participation to the virtual academy for CA staff **(training costs);** ▪ Structural cost changes to deal with regulatory requirements and administrative burden of new oversight tasks; **(oversight costs);** ▪ Initial cost increase in some CAs moving towards	N/A.

Impacts	European level	CA level	Industry level
		risk/performance based system (in some areas); **(transition costs);** ▪ No cost changes related to charging systems **(service fees).**	
Impact on regulatory compliance costs for regulated entities	N/A.	N/A.	▪ Initial cost increase for establishment of structures and training costs to start implementation of management system requirements; **(training and administration costs);** ▪ No change with respect to charging systems **(service fees);** ▪ Structural administrative burden to implement management system approach **(administration costs);** ▪ Administrative burden/costs due to lack of clarity on EU regulatory requirements and responsibilities. **(compliance costs).**
Functioning of the system	▪ Slight increase in efficiency vis-à-vis synchronisation of EASA and USOAP standardisation; ▪ Long-term gains in the functioning of the system	▪ Slight gains in the functioning of the system as system is left to rest and stabilise over time; ▪ Very limited gains from the limited use of the pool of	▪ Prescriptive safety rules create complex regulatory requirements for industry which are difficult to constantly follow (overregulation);

Impacts	European level	CA level	Industry level
	through shift to a performance-/ risk-based approach – more efficient use of resources reduces workload; ▪ System not sufficiently standardised; ▪ System inefficiencies continue as distribution of roles remain unchanged.	experts and cooperative oversight; ▪ Small CAs need to maintain resources that do not match the profile of their national industry; ▪ Limited impact on the functioning of the system. No change to: • Workload-resource imbalance deteriorates due to industry growth; • Inefficient distribution of tasks and responsibilities between EASA and CAs; • Lack of capability to efficiently address multinational business models.	▪ Varying charging schemes and standardisation levels reduce clarity and increase opportunistic behaviour ("shopping around"); ▪ Continuation of disproportionate burden to specific areas; ▪ Duplication / inconsistent oversight requests from CAs in case of multinational service providers; ▪ Uneven playing field remains due to: • Differences in interpretation of regulations; • Different charging schemes.
Industry growth/ competitiveness	N/A.	N/A.	▪ Industry bottleneck remains and decreases competitiveness.
Innovation	N/A.	N/A.	▪ Minimal impact system unfavourable to acceptance of new technologies.

Costs of filling the gap in terms of resources

In section 7.2.3 and 7.2.4 we have carried out a gap analysis between current levels of resources (staff/personnel and budgets) in relation to current workload and industry activity levels, and what will be needed in the future (2020 and 2030) based on market growth forecasts and the expected impact of this growth on workload levels of EASA and CAs.. The costs of filling this anticipated 'resources gap' are presented below and constitute an assumption as to the resources that would be needed "in an ideal world" to

fill the gap between the situation that we have today and the situation that we may have in the next 15 years, all other things, such as working methods, remaining the same. The impact assessment for policy options 2-4 will subsequently demonstrate how each of the policy options contributes to the reduction of this 'resources gap' . In summary, this 'resources gap' analysis indicated that:

- The budget for EASA would need to increase to cover the anticipated growth in resources (see section 7.2.3) of 50 FTE until 2017. After that it is assumed to be constant. This amounts to € 4.8 million (50 FTE * € 95,000). This falls in the impact category of regulatory compliance costs for public authorities on EU level. The present value amounts to € 52 million (2016-2030, 4% discount rate);
- The budget for CAs would annually need to be on a higher level compared to the current (2013) level of € 1 billion. This increase has been estimated at € 21 - 26 million by 2020, increasing to € 49 – 61 million by 2030 to match the projected gap in resources (development of regulatory compliance costs for public authorities on EU level) in 2020 and 2030, respectively. This falls in the impact category of regulatory compliance costs for public authorities on national level. The present value of this increase amounts to € 290 – 360 million (2016-2030, 4% discount rate).

Social impacts

Table 8-2: Social impacts of Option 1

	European level	CA level	Industry level
Employment conditions	▪ No impact.	▪ Conditions to depend on the workload-resource ratio. They are expected to deteriorate should the employment gap pertain.	▪ Remaining inefficiencies of EASA and CA working patterns impact the industry and they grow to be the industry's bottleneck.
Employment / job creation	▪ Increase in employment levels to implement planned new posts and reach the goals of the staff policy plans (+50 FTE) if assumed that these posts are completely filled in to fill the gap.	▪ Increased employment to bridge the anticipated gap (+100-360 FTE in 2030, see 7.2.4); ▪ All CAs, but especially the smaller ones, will be confronted with difficulties to keep this knowledge internally available for longer periods of time given	▪ Slight increase in employment in user organisations in some MS to facilitate the transfer of GA oversight.

	European level	CA level	Industry level
		the consequences of the budget constraints for the work conditions offered.	
Qualification / skill level	▪ Qualification levels remain unchanged	▪ Insufficient overall and diverging qualification levels in CAs due to the lack of standardised qualification requirements and inefficiency in funding for some CAs; ▪ Brain drain towards the industry and EASA due to uncompetitive salaries.	▪ Higher qualification level for user organisation staff that will be dealing with GA oversight will be required.

Environmental impacts

Table 8-3: Environmental impacts of Option 1

	European level
Environmental impacts	▪ No specific environmental impacts expected.

8.3 Option 2 Enhanced cooperation within the system

Option 2 encompasses a series of “soft-measures” with relatively small budgetary impact that facilitate cooperation across all levels of the aviation safety system. This option aims at improving the performance of the system without fundamentally altering the existing structure but rather by establishing a smart framework for achieving an improved allocation of resources. Further, it pursues improved clarity in the system, alignment of the different actors' activities along the same standards and avoidance of duplication of effort. The measures included in this option require no significant alterations to the legal framework and would improve the overall system performance and efficiency already in the short term.

The production and distribution to CAs of guidance material as well as the communication of best practices for cooperative oversight and the further development and promotion of the virtual academy will assist the convergence of working practices across the system. These actions combined with clearer communication to the industry regarding questions of interpretation in relation to the new regulations as well as the division of roles and responsibilities – i.e., between different national authorities and EASA, as well as other organisations such as ICAO and Eurocontrol – increase clarity across the system for all actors and by tackling the current uncertainty, increase efficiency of operations.

The measures on expanding the pool of experts, establishment of a central repository of licences and certificates/approvals and the promotion of best cooperative oversight practices all contribute to increasing the level of cross-border cooperation on a voluntary basis. In terms of expected benefits, the pool of experts will contribute to increasing the level of knowledge and skills of CA staff through knowledge sharing and will increase efficiency of resources deployed through time and investment costs saved that can be diverted to other functions. Regarding the central repository of licenses, the MS’ national repositories of licenses are still maintained and feed into the central repository. This has the effect of reducing the need for coordination between the CAs in this respect, thus lowering administrative burdens. This facilitation of cross-border cooperation increases efficiency of operations in an increasingly internationalised industry context, such as FABs and multinational airlines.

In addition, the delegation of GA oversight to user organisations, the avoidance of duplication with ICAO and the promotion of industry standards contribute to a more efficient allocation of resources and the better distribution of workload across the system, in line with the risk based approach. These enhance employment conditions and partly alleviate the industry bottleneck created by the regulatory organisations leading to further efficiency and competitiveness gains for the industry. Especially the delegation of GA oversight to user organisations is expected to remove a substantial part of the burden currently placed on the smaller organisations functioning in this section of the industry.

Finally the promotion of the use of performance-/risk-based approaches, despite an unavoidable transition cost, create the context to stimulate industrial innovation and further increase the qualification level of relevant industry and CA employees.

Box 8-1 Canada and performance based regulation

The impact on resource needs of CAs as a result of performance based regulation and oversight are difficult to predict. Canada has interesting experiences in transitioning to a risk based approach. The (limited) lessons learned from that in terms of the use of resources and the impact of the availability of resources on execution of surveillance plans are worthwhile to mention here. While the Canadian regulator Transport Canada moved to a performance based approach some years ago (<2008), they are facing a significant staff shortage. In an external review, the Auditor General of Canada concluded "Transport Canada has not adequately planned the human resources it will need to deliver its civil aviation safety program. It has developed a national human resources plan and made progress in implementing key human resource strategies, but it has not identified how many inspectors and engineers are needed to oversee civil aviation safety"[71]. The conclusion that can be drawn from the Auditor report is that the move to performance based oversight has been done without a human resources strategy and vision on the number of staff they would be in the new system.

Nevertheless, this option does not deal with the fundamental problems of the system, as the budgetary constraints are not structurally tackled to ensure efficient and sufficient deployment of resources across the system. Most of the measures rely to a large extent on voluntary cooperation of the participating actors for effectively sharing resources and standardising their approaches. This participation of the actors, which is key to the success of this Option, in turn depends on their financial and human resources availability which is an issue not sufficiently tackled. Finally, the incoherent development of financing structures and working approaches amongst CAs is also not consistently dealt with, a fact that does not actively promote the single market concept.

The above described causal chain of impact mechanisms has been further expressed in detailed impacts, for the main categories as requested in the terms of reference for this study: safety, economic, social and environmental impacts.

Safety impacts

The safety impact of option 2 is described by means of the 4 key factors again:

Interfaces:

As the structure of the system is not fundamentally changed compared to option 1, the number of interfaces will not change either. Hence, the influence on safety of the number of interfaces under option 2 is assessed to be identical to that under option 1: "neutral" or "0".

[71] Office of the Auditor General of Canada, 2012, Report of the Auditor General of Canada to the House of Commons, Chapter 5: Oversight of Civil Aviation—Transport Canada.

Available knowledge:

Option 2 will slightly improve the situation related to available knowledge compared to option 1 because of closer cross-border cooperation and the further development and promotion of the Virtual Training Academy. However, the initiatives are for a large part voluntary, and the effects of voluntary initiatives are usually limited. Therefore, the overall impact of Option 2 is assessed as being rather limited or "+" in terms of influence on safety compared to the baseline scenario.

Changes:

The number of changes is limited as the structure is not fundamentally changed, and the elements of option 2 have a strong voluntary component, are focussed on setting the right priorities (oversight based on assumed risk) or delegate certain parts of regulatory oversight to highly specialised General Aviation organisations. The latter could be considered a significant change. However, as the knowledge of the GA sector is normally higher within those kind of branch organisations and the authority resources would be shifted to higher risk commercial aviation, it is assumed that the positive influence on safety of the - still - limited number of changes remains unchanged. Hence, the influence on safety is overall considered to be positive, "++", under this Option.

Conflict of interest:

Option 2 could make a small difference compared to option 1, for instance in relation to flight operations inspections, when pools of experts are indeed formed and used. Related to the main issue of oversight and service provision in (more or less) one hand nothing will really change when option 2 is implemented except for the fact that some kind of oversight arrangement has to be found to manage the conflict of interest of delegating GA oversight responsibility to GA organisations. All together the situation will slightly improve to "+" compared to Option 1.

When all the 4 key factors are taken into consideration together, the overall effect on safety of option 2 is slightly positive "+" compared to option 1.

Economic impacts

Table 8-4: Economic impacts of Option 2

	European level	CA level	Industry level
Impact on regulatory compliance costs for public authorities Overall score: **-**	▪ Short-term: Cost of preparing the system for a performance-/risk- based approach **(rulemaking costs);** ▪ Long-term: Stabilisation of regulatory compliance costs for public authorities for a performance-/risk- based approach **(rulemaking costs);** ▪ Cost of setting up and maintaining a licence and approval repository **(IT and regulatory compliance costs for regulated entities);** ▪ Cost of operating the created pools of experts **(IT and regulatory compliance costs for regulated entities);** ▪ Preparation of guidance material and communication activities **(personnel costs);** ▪ Cost of the further development of the virtual academy **(IT costs);**	▪ Preparation of SSPs for MS that do not yet have one **(SSP preparation costs);** ▪ Short-term: Cost of adjusting to a performance-/risk- based approach **(training costs);** ▪ Long-term: Stabilisation of oversight costs for a performance-/risk- based approach **(oversight costs);** ▪ Effort needed to guide and support the industry in applying SMS **(industry support costs);** ▪ Reduced effort for coordination with other CAs on cross-border oversight due to the introduction of the central repository **(oversight costs);** ▪ Reduced effort in GA oversight due to transfer of task to users organisations, but need to produce and implement an audit scheme **(oversight and standardisation costs);** ▪ Pool of experts reduces need	N/A

	European level	CA level	Industry level
	▪ Industry standards promotion will reduce certification/ rulemaking effort for EASA **(rulemaking costs);** ▪ Cost to synchronise with ICAO standardisation (USOAP) (from current budget).	to hire and train personnel for specialisations with low industry activity **(oversight costs);** ▪ Elimination of duplication with regard to audits between EASA and ICAO results in reduced workload for the CAs **(standardisation costs);** ▪ Costs of trainings in the virtual academy **(training costs);** ▪ One-off investment to produce a charging framework for the experts offered to the pool **(management cost).**	
Impact on regulatory compliance costs for regulated entities Overall score: **-**	N/A.	N/A.	▪ Reduced GA oversight effort and costs after transfer of responsibility to user organisations in some MS, **(oversight and standardisation costs);** ▪ Transition to performance-/risk-based approach to reduce costs for better performing organisations and increase workload for underperformers **(all in all change in distribution of costs to comply with**

	European level	CA level	Industry level
			regulation); ▪ Additional resources needed to prepare and implement SMS for those not having an SMS yet **(personnel costs);** ▪ Reduced GA oversight effort and costs after transfer of responsibility to user organisations, but need to hire specialised personnel and receive audits from CAs **(overall decrease in oversight and standardisation costs);** ▪ Promotion of industry standards will decrease certification effort **(certification costs);** ▪ Reduction of regulatory compliance costs for regulated entities due to efficiency gains **(see underneath).**
Functioning of the system Overall score: 0/**+**	▪ Improvement of CAs understanding of EASA requirements (guidance material and virtual academy) reduces audit findings and increases standardisation effort efficiency; ▪ Promotion of industry	▪ Guidance material and virtual training increase common understanding of requirements and facilitates faster and more efficient adaptation; ▪ Central repository increases cross-border oversight	▪ Transfer of GA oversight to user organisations improves the functioning of the system with the utilisation of locally deployed resources; ▪ In some MS, GA workload becomes less demanding due to the delegation of oversight

	European level	CA level	Industry level
	standards will reduce overall system workload and avoid duplication of effort.	efficiency by facilitating information exchange and preventing fraud; ▪ Cooperative oversight best practices and pools of experts improve the functioning of the system and use of spare capacity.	to users organisations; ▪ The communication activities of EASA to the industry will decrease current uncertainty levels; ▪ Adoption of industry standards will increase the efficiency of the certification effort; ▪ No significant impact on the level playing field is expected.
Industry growth/ competitiveness Overall score: 0/**+**	N/A.	N/A.	▪ With the removal of the disproportional requirements to the GA, the competitiveness of the industry is expected to grow as the entry barrier for users is decreasing; ▪ The additional flexibility in the use of CA resources will increase the speed of services to the industry, increasing its competitiveness.
Innovation Overall score: +	N/A.	N/A.	Performance-/risk-based approach in oversight is expected to stimulate innovation in the industry both technological as well as regarding the business models applied.

Costs of option

The impacts on the regulatory compliance costs for public authorities on European level and national level have been described above, as well as the impact on regulatory compliance costs for regulated entities for industry and users. In the following tables these costs have been quantified, based on data from interviews, key figures, literature data and team analysis.

The tables outline the cost items, whether it is a one-off cost which is incurred only once, or whether these costs are incurred annually. Also a further explanation is provided. If the costs are negative, it is to be considered as a cost reduction. In some cases however, the costs are not known or difficult to estimate, and these have been marked as N.K (Not Known).

Table 8-5 Regulatory compliance costs for public authorities (European level) of option 2 (compared to option 1)

Item	European level	One-off / annually	Explanation	Calculation / justification / source
Cost of preparing the system for a performance-/risk- based approach (rulemaking costs)	N.K Performance based study	One-off	There will certainly be costs, but these depend highly on the expected modality of the new system. Further estimation is done in the parallel performance based study.	
Stabilisation of regulatory compliance costs for public authorities for a performance-/risk-based approach	N.K Performance based study	Annually	There will certainly be costs, but these depend highly on the expected modality of the new system. Further estimation is done in the parallel performance based study.	
Cost of setting up a licence and approval repository	1.190.000	One-off	Estimated at some 2 man-years involvement of EASA staff, plus approximately EUR 1 million procurement of IT services	2 * € 95,000 (see 8.1) + € 1 million Expert judgement

Item	European level	One-off / annually	Explanation	Calculation / justification / source
Cost of maintaining a licence and approval repository	500.000	Annually	Parallel drawn with annual maintenance of ECCAIRS.	http://www.publictenders.net/tender/1182898
Setting up pool of experts and its charging system	440.000	One off	Estimated at 2 man-years of EASA plus EUR 250k of external advisory/auditor services	2 * € 95,000 + € 250,000 Expert judgement One man-year to set up structure for pool and requirements. One man-year to set up requirements for charging structure and manage external advisory.
Cost of operating the created pools of experts	95.000	Annually	Estimated at annually 1 man-year	1 * € 95,000 Expert judgement. Requires annual call for experts and associated evaluation of call results. Management of demand for experts from pool.
Preparation of guidance material and communication activities	190.000	Annually	Estimated at annually 2 man-years	2 * € 95,000 Expert judgement, based on current expenditures on item from EASA Business Plan
Development of virtual training academy	95.000	One-off	Estimated at annually 1 man-year to develop curriculum	1 * € 95,000 Expert judgement, validated with training expert
Total one-off costs (€)	**1.725.000**	**+N.K**		
Total annual costs (€)	**785.000**	**+N.K**		
Present value additional costs 2016-2030 (€)	**9.6 million**	**+ N.K.**		

Table 8-6 Regulatory compliance costs for public authorities (National level – total all CAs) of option 2 (compared to option 1)

Item	National level	One-off / annually	Explanation	Calculation / justification / source
Preparation of SSPs for MS that do not yet have one	N.K Performance based study	One-off	There will certainly be costs, but these depend highly on the expected modality of the new system. Further estimation is done in the parallel performance based study.	
Cost of adjusting to a performance-/risk-based approach	N.K Performance based study	One-off	idem	
Stabilisation of oversight costs for a performance-/risk- based approach	N.K Performance based study	Annually	idem	
Effort needed to guide and support the industry in applying SMS	440.000	Annually	Estimated at 0.25 FTE per CA per MS	0.25 * € 55,000 * 32 Based on interview programme
Reduced effort for coordination with other CAs due to the introduction of the central repository	-145.000	Annually	Estimated to reduce with 1 person-month per CA per MS	0.083 * € 55,000 * 32 Expert judgement
Reduced effort in GA oversight due to transfer of task to users organisations	N.K (-)	Annually	It is likely to decrease, but the an indication of the amount of effort to GA is lacking	
Set-up oversight programme for user organisations in GA	1.760.000	One-off	Estimated at 1 FTE per CA per MS	1 * € 55,000 * 32 Based on interview programme
Pool of experts reduces need to hire and train personnel for specialisations with low industry activity	N.K (-)	Annually	Uniform applicability of rules (see chapter 6), amongst other on this area, was considered an issue in interviews. However, quantified magnitude of 'market for pool	

Item	National level	One-off / annually	Explanation	Calculation / justification / source
			staff' is unclear.	
Elimination of duplication between EASA and ICAO results in reduced workload for the CAs	-295.000	Annually	Estimated to be 1 audit saved per 3 years per CA, of 0.5 man-year for CA	(0.5 * € 55,000 * 32) / 3 Based on interview programme. Expert judgement calculation.
Costs of trainings in the virtual academy	320.000	Annually	Estimated that 5% of technical workforce of CA will have one week training per year in virtual academy	3,200 * 5% * 5 days * € 400 Expert judgement, based on EASA Training catalogue
Total one-off costs	**1,760.000**	**+N.K**		
Total annual costs	**320.000**	**+N.K**		
Net present value additional costs 2016-2030 (€)	**4.9 million**			

Simulation of the functioning of the pool of experts

We envisage the proposed pool of experts to function in the step-wise approach described hereunder:

1. EASA calls CAs to declare their estimation of available expert resources for a set period. They also provide a cost-based daily fee for each of the offered experts;
2. An inventory is filled with the availability of the specific experts across Europe per field of expertise. This inventory will contain also other relevant information like the linguistic skills of the experts as well as his (if any) international experience;
3. A forecast is then made of the average cost (charge) for each type of service provided by the experts is estimated based on the average fee of the pool experts, the duration of the service and other relevant fixed costs (trip and accommodation costs, travel allowance etc.). The price list that derives from these calculations is then announced to the CAs;
4. CAs are then requested to plan their needs for specific expertise over the set period of time;
5. Finally demand and supply of expertise are matched. The methodology for making the match can be based on a number of criteria that need to be agreed on between the participating CAs and EASA. Such criteria can be: linguistic skills, geographic vicinity, minimisation of total expert fees, prior country experience of expert or an attempt to balance the use of experts from the various CAs offering capacity;
6. The selection of experts to perform each service is then announced to the sending and receiving CAs;

7. EASA covers the expenses related to the service and is then responsible for collecting the service charges from the CAs that use the pool experts and distributes the expert fees to the participating CAs according to their experts' contribution.

As mentioned above, it is important to achieve an agreement between the participating CAs on the exact process that matches demand and supply. According to the requirements of the participating CAs, the selected process can differ significantly.

Table 8-7 Regulatory compliance costs for regulated entities of option 2 (compared to option 1)

Item	Industry level	One-off / annually	Explanation	Calculation / justification / source
Transition to performance-/risk-based approach to reduce costs for better performing organisations and increase workload for underperformers	N.K Performance based study	One-off / annually	Might balance between over performers and underperformers, but depends on exact modality of PBA/PBS. Will be estimated in Performance study.	
Reduced GA oversight effort and costs after transfer of responsibility to user organisations, but need to hire specialised personnel and receive standardisation audits from CAs	N.K	Annually	Likely to decrease on a balance, otherwise user organisations would not be willing to take up that role. Difficult to quantify due to lack of data on actual effort for GA users.	
Efficiency gain for industry from more clarity on roles and responsibilities, and more effective oversight	N.K	Annually	The improved effectiveness and efficiency at national CA level, would benefit industry in some efficiency gains (see also under the functioning of the system).	
Total one-off costs	**N.K**			
Total annual costs	**N.K**			

Impact on the cost of filling the gap in terms of resources

The measures described under Option 2 on one hand improve the allocation of resources to meet workload requirements (i.e. by the promotion of forms of cooperation) while on the other hand, target at bridging the differences in supervisory approaches (i.e. through the increased standardisation oversight and enforcement and the increased offer of opportunities for training and qualification of staff).

The measures aiming at establishing improved forms of cooperation can potentially lead to a more efficient utilisation of resources by better allocating the spare capacity of the European aviation safety system. However, as the current circumstances have been analysed through the interviews with the CAs, there seems to be limited spare capacity available on the system overall. Therefore, considering the current allocation of resources, there seems to be limited net efficiency gain to harvest through the development of cooperation forms. This limited efficiency gain, will most probably be absorbed by the additional resources required for applying the other measures described in Option 2, such as the offer of increased training and qualification opportunities or the increased level of standardisation, oversight and enforcement.

Altogether the impact of Option 2 on the resources gap (see 7.2.4) is expected to be minimal and Option 2 is therefore considered a neutral option in relation to the existing gap in resources.

Social impacts

Table 8-8: Social impacts of Option 2

	European level	CA level	Industry level
Employment conditions Overall score: 0/+		Better use of spare capacity (pool of experts/best practices of cooperative oversight), and delegation of GA oversight lead to an increased system flexibility, capacity and improved employment conditions, as workload/resource balance will improve; Limited improvement in some MS after the delegation of GA oversight.	Reduced paperwork for GA oversight as well as due to the introduction of performance-/risk-based approach will release resources for more “meaningful” jobs and reduce workload.

	European level	CA level	Industry level
Employment / job creation Overall score: +	Very slight increase in EASA employment expected, to expand the virtual academy, manage the pools of experts, further prepare performance-/risk-based oversight and prepare guidance material: +8 FTE.	No significant change expected.	Slight increase in employment in user organisations to facilitate the transfer of GA oversight.
Qualification / skill level Overall score +	Development of competencies for performance-/risk-based oversight rulemaking (and standardisation).	Development of competencies for performance-/risk-based oversight; Increased regional specialisation due to the pool of experts and facilitation of cooperative oversight; Moderate improvements due to increase in GMs and measures to enhance MS-MS cooperation; Slight impact due to the increased use of the Virtual Academy; Industry involvement in training of staff will increase their hands-on competencies.	Higher qualification level required in user organisations to perform GA oversight.

Environmental impacts

Table 8-9: Environmental impacts of Option 2

	European level
Environmental impacts Overall score: 0/+	Small impact on emissions and noise expected in case industry growth is facilitated; New, environmentally friendly technologies might be more rapidly introduced.

8.4 Option 3 A joint oversight system with voluntary or mandatory transfer of responsibilities

The intention of this 3rd option is to go beyond the light measures of Option 2 and create a joint European integrated oversight system that will function more harmonised and efficiently than in the current setup. Creating a legal framework for regulating the delegation of tasks and associated funding in between CAs and between CAs and EASA will facilitate cooperative oversight and a more efficient allocation of resources. Regional specialisation of resources and removal of redundancies as well as a better match of resources and workload will also increase the overall capacity of the system, helping to deal with the peaks in demand and subsequently improving the working conditions for employees.

Additionally, creating a framework for delegation of oversight responsibilities for complex/ multinational organisations (in option 3a) will relieve especially the smaller CAs from tasks of higher complexity that they might not be well equipped to perform. Assigning these tasks to EASA will most probably increase the efficiency of the oversight of such organisations by eliminating the need for CAs to develop idle or unnecessary competences/expertise to cover a limited industry domain (in certain cases, e.g. balloons and gliders), while the industry will also benefit by dealing with a single/central competent authority. On the other hand, tasks performed by EASA which have a strong local element, such as some certification tasks, can be performed by accredited members of the CAs. This will simplify certification and reduce its cost for industrial actors that will be facing a local organisation for this activity. Both these measures are expected to impact the competitiveness of the aviation safety system positively.

The sharing of work, as described above, is facilitated by common quality standards ensured through system-wide allocation of certification tasks and standardisation mechanisms which cover also common training and qualification requirements for staff. These will further improve the qualification level of staff and also promote the harmonised functioning of the system increasing clarity on requirements both to the industry and the different CAs. Finally, the introduction of a common funding and charging framework where harmonised charging principles are applied for all similar services provided to the industry across Europe (i.e. full-cost recovery based charging) will contribute to ensuring a level playing as well as a more reliable source of funding for resources where they are currently lacking.

Alternatively this option could also envisage that for certain types of organisations or tasks the transfer of responsibilities from national to EU level would be mandatory (option 3b Mandatory transfer of responsibilities), amplifying the relevant impacts. Especially in the case of persistent shortcomings of a CA to fulfil its oversight obligations according to EASA Standardisation Inspections findings, EASA would be able to take over oversight responsibilities, until the time the CA develops the necessary oversight capabilities. This affects the system's effectiveness significantly, as one would be able to 'repair' the weakest link in the chain. The standardisation of supervisory approaches would be affected significantly in this case, and also the overall output of the joint competent authorities would significantly improve. After all, if a persistent shortage of resources for certain tasks is detected, with a clear negative impact on the system's output, EASA would be able to overcome this, by stepping in,

and assuring the tasks of that competent authority would be carried out according to standard.

The above described causal chain of impact mechanisms has been further expressed in detailed impacts, for the main categories as requested in the terms of reference for this study: safety, economic, social and environmental impacts.

Safety impacts

The impact of option 3 (a and b) on the 4 key areas is as follows:

Interfaces:

The situation after implementation of option 3 is highly complex. A distinction can be made between the delegation of the responsibility and the delegation of the execution of the task(s)., Arrangements can be made public, but in the end the situation in which some states delegated their responsibility and/or the execution of particular tasks - or are forced to do so - while other states are not, increases the complexity of interfaces significantly, as different interfaces might apply for each MS (depending on whether they have delegated responsibilities, to whom and to what extend)and it may become overall unclear who (which organisation) is responsible for doing what across Europe since there is going to be an extensive lack of uniformity. Limiting transfers of responsibility to only vertical ones might bring in a small improvement to the situation however this will not be utterly solved unless transfers are mandatory and applied to all MS. This has serious negative influences on solving problems related to interfaces, and given the number of variations possible (32 different states with responsibilities in almost all different aviation domains) makes it very difficult to mitigate this risk. Therefore, the influence on safety is assessed to be very negative, “--“.

Availability of knowledge:

The availability of information / knowledge and the possibility of securing knowledge improves because action will be taken towards standardisation with respect to common EU requirements on qualification and training of staff, and it is even possible to intervene (option 3b). Mandatory standardisation of certain tasks is under consideration under option 3, as well as mandatory transfer of responsibilities. Hence, the influence on safety of the availability of knowledge under option 3 is assessed to be positive, “+”.

Changes:

Option 3, both a and b, involve significant and complicated changes. In case of changes it is important that it is clear to all involved who is responsible for what. And that is, as already being addressed, difficult in this option 3. Moreover, because of the complexity of the changes, the positive influence of option 1 and 2 on the unpredictable safety situation is no longer present, while the positive influence of mandatory standardisation of certain tasks and - under 3 b - possibly a mandatory transfer of responsibilities only partially compensates the negative influence of this complexity on the unpredictable safety situation. Therefore, the influence on safety of changes under option 3 a and b is assessed to be very negative, “--“.

Conflict of interest:

Option 3 (a) could be a solution for instance when a smaller CA is confronted with one or more (very) strong companies. In that case a conflict of interest can appear to the CAs when they come across the dilemma of strictly enforcing the regulation (and relevant penalties) on one hand and risking the societal impact of the transfer of activities of these larger companies to other MS on the other hand. When that CA delegates its responsibility, voluntarily, to a larger, stronger CA or a central European authority with also more (financial) means, the power balance between regulatory and regulated entities is restored. The influence of maintaining this balance is considered to be positive, "+" on safety.

Summarized, when taking all 4 key factors into account, the total effect of option 3 is "negative, "--"

Economic impacts

All impacts refer to the Option 3a unless otherwise specified.

Table 8-10: Economic impacts of Option 3

	European level	CA level	Industry level
	Impacts of option 2, plus:		
Impact on regulatory compliance costs for public authorities Overall score: --	Option 3a ▪ Cost for the preparation of the legal framework for delegation of responsibilities including charging framework **(rulemaking costs);** ▪ Cost for the developing common training and staff qualification requirements **(rulemaking costs);** ▪ Costs for performing the oversight tasks delegated to EASA by other MS funded by charges **(oversight costs);** ▪ Costs for producing a charging framework for offering services to other MS / industry on activity-based charging principles **(management costs).** <u>Option 3b:</u> ▪ Costs for performing the	▪ Cooperative oversight reduces need to hire and train personnel for specialisations with low industry activity **(oversight costs);** ▪ Decreased costs for the oversight of responsibilities (voluntarily) delegated to the EU-level or other MS **(oversight costs);** ▪ Increased costs overall for responding to the increased training and qualification requirements **(training costs).** <u>Option 3b:</u> ▪ Decreased oversight costs as more responsibilities to delegated to EASA **in case of multinational service providers (oversight costs);**	N/A

	European level	CA level	Industry level
	oversight tasks delegated to EASA of multinational service providers (e.g. FABs) funded by charges to industry **(oversight costs);** ▪ Costs for performing oversight tasks transferred to EASA in case of persistent shortcoming of CAs, funded by charges **(oversight costs).**	▪ Increased oversight costs in case of transfer of tasks to EASA as result of persistent shortcomings of CAs **(oversight costs).**	
Impact on regulatory compliance costs for regulated entities Overall score: **-**	N/A.	N/A.	▪ Decrease in costs when oversight of multi-national activities is delegated to and aggregated at EASA **(oversight costs).** Additionally increase of costs may occur in case service provider is charged above the activity-based fee in baseline. **(oversight costs);** ▪ System wide allocation of certification tasks may reduce industry effort if allocation is done on vicinity basis **(certification costs);** ▪ Reduction of regulatory compliance costs for regulated entities due to efficiency gains **(see underneath).**

	European level	CA level	Industry level
Functioning of the system Overall score3a: + Overall score 3b: ++	▪ Improves the functioning of the system / harmonisation through the adoption of common standards for trainings and qualifications; ▪ Increased efficiency through utilisation of the cooperative oversight framework to better utilise existing capacity; ▪ Increased efficiency when some certification tasks can be locally performed; ▪ Improves the functioning of the system through the voluntary delegation of task to EASA, especially when related to cross-border activities. <u>Option 3b</u> ▪ Increased system performance if CA underperformers are taken off their task; ▪ Improves the functioning of the system through the delegation of task to EASA, especially when related to cross-border activities.	Increased efficiency through the utilisation of the cooperative oversight framework to better utilise the existing capacity	▪ Increase in the efficiency of services for cross-border operators when provided at an EU level; ▪ Improves the functioning of the system when some certification tasks can be locally performed; ▪ With more services being taken up at a central level, the charging of this services becomes more harmonised. This boosts the creation of a level playing field. <u>Option 3b:</u> ▪ Further increase in the efficiency of services for cross-border operators when provided at an EU level; ▪ With the mandatory vertical transfer of responsibility, the level playing field is even more boosted compared to Option 3a.

	European level	CA level	Industry level
Industry growth/ competitiveness Overall score: +			The additional flexibility in the use of CA resources will increase the speed of services to the industry, increasing its competitiveness.
Innovation Overall score: +	N/A.	N/A.	Performance-/risk-based approach in oversight is expected to stimulate innovation in the industry both technological as well as regarding the business models applied.

Cost of option

The impact on the regulatory compliance costs for public authorities and regulatory compliance costs for regulated entities as described above have been further detailed in the tables below. Again the impacts on regulatory compliance costs for public authorities have been estimated for the European level and the national level. The costs as sketched here are relative to the baseline option 1. It is reminded that option 3 also includes the elements of option 2. The costs for these option 2 elements have been sketched above, and are included in the bottom of the tables for completeness.

Table 8-11 Regulatory compliance costs for public authorities (European level) of option 3 (compared to option 1)

Item	European level	One-off / annually	Explanation	Calculation / justification / source
Costs for the preparation of the legal framework for delegation of responsibilities incl. charging framework	690.000	One-off	Estimated at 2 man-years to prepare this, plus € 500k external advisory / auditor services.	2 * € 95,000 + € 500,000 Expert judgement
Costs for developing common training and staff qualification requirements	285.000	One-off	Estimated at 3 man-years to prepare this.	3* € 95,000 Expert judgement
Costs for performing the oversight tasks	0	Annually	The option contains an element for	

Item	European level	One-off / annually	Explanation	Calculation / justification / source
delegated to EASA, funded by charges (3a)			a charging framework. It is assumed to have a cost recovery character.	
Costs for performing the oversight tasks delegated to EASA of multinational service providers funded by charges to industry (3b)	0	Annually	The option contains an element for a charging framework. It is assumed to have a cost recovery character.	
Costs for performing oversight tasks transferred to EASA in case of persistent shortcoming of CAs, funded by charges (3b)	0	Annually	The option contains an element for a charging framework. It is assumed to have a cost recovery character.	
Total one-off costs new elements option 3	**975.000**			
Total annual costs new elements option 3	**0**			
Total one-off costs elements from option 2	**1.725.000**	**+N.K**		
Total annual costs elements from option 2	**785.000**	**+N.K**		
Present value additional costs 2016-2030 (€)	**10.6 million**			

Table 8-12 Regulatory compliance costs for public authorities (national level) of option 3 (compared to option 1)

Item	National level	One-off / annually	Explanation	Calculation / justification / source
Cooperative oversight reduces need to hire and train personnel for specialisations with low industry activity	N.K	Annually	Economies of scale incurred among CAs. However, difficult to estimate the success of the element, and how widespread it will be used.	
Decreased costs for the oversight of responsibilities (voluntarily) delegated to the EU-level or other MS	N.K	Annually	Economically, CAs will only use this option if it is cheaper for them rather than having staff on their own payroll. However, the extent to which this will be used is difficult to quantify[72].	
Increased costs overall for responding to the increased training and qualification requirements	3.200.000	Annually	Might be addressed by recruiting more qualified staff or via training. For costs estimate, assumed that annually 25% of technical CA staff will have 2 week training.	3,200 inspectors * 25% * 10 days * EUR 400 Based on EASA Training catalogue
Costs for producing a charging framework for offering services to other MS on activity-based charging principles	88.000	One-off	Assume 20% of CAs willing to take up responsibilities from other MS. Need to assess their costs for charges. 0.25 man-year per CA.	32 CAs * 20% * 0.25 * € 55,000 Expert judgement

[72] The efficiency that may be gained by a CA depends heavily on the activities that will be delegated, As an illustrative example, based on our interview programme. A small CA needs to have qualified expertise on a certain a/c type that is used only very limitedly in its country. It has chosen to have one inspector fully qualified to oversee this industry activity, against full costs on the payroll. Another CA chose to delegate the oversight activities (e.g. handbook review) on a certain a/c type to a colleague CA with large deal of expertise. This CA needs only to review conclusions drawn of the oversight report of the colleague-CA. It saves conservatively 0.8 FTE compared to having one trained inspector dedicated to this a/c type.

Item	National level	One-off / annually	Explanation	Calculation / justification / source
Decreased oversight costs as more responsibilities are delegated to EASA in case of multinational service providers	N.K	Annually	On total system level overlaps/duplications are addressed. Overall magnitude of number of potential service providers that fall under this new regime difficult to estimate. Seems substantial saving.	
Increased oversight costs in case of transfer of tasks to EASA as result of persistent shortcomings of CAs	N.K	Annually	CAs would be charged by EASA, but would not immediately restructure as transfer could be temporary. As such, annual costs increase during period that EASA takes over the tasks.	
Total one-off costs new elements option 3	**88.000**			
Total annual costs new elements option 3	**3.200.000**	**+N.K**		
Total one-off costs elements option 2	**1.760.000**	**+N.K**		
Total annual costs elements option 2	**320.000**	**+N.K**		
Net present value additional costs 2016-2030 (€)	**37.5 million**			

Table 8-13 Regulatory compliance costs for regulated entities of option 3 (compared to option 1)

Item	Industry level	One-off / annually	Explanation	Calculation / justification / source
Decrease in costs when oversight of multi-national activities is delegated to and aggregated at EASA. Additionally increase of costs may occur in case service provider is charged below the activity-based fee in baseline.	N.K	Annually	Single CA for multinational service provides removes inefficiency in oversight approach. This is beneficial for industry. This might be offset by being charged for the CA activities, while in some member states that is currently not the case.	
Efficiency gain for industry from more clarity on roles and responsibilities, and more effective oversight	N.K	Annually	The improved effectiveness and efficiency at national CA level, would benefit industry in some efficiency gains (see also under functioning of the system).	
Total one-off costs new elements option 3	**0**			
Total annual costs new elements option 3	**N.K**			
Total one-off costs elements option 2	**N.K**			
Total annual costs elements option 2	**N.K**			

Impact on the cost of filling the gap in terms of resources

In section 7.2.4 an estimate on the gap of resources towards 2020 and 2030 has been presented. In this section we provide an indication of the possible impact of the option on the gap.

Option 3 follows up from the measures of Option 2 to enhance the function of the separate organisational entities, within the European aviation safety system, as a joint system. The measures of Option 3a enables the allocation of tasks system-wide to take advantage of the regional specialisation of resources. Further Option 3b, suggests a mandatory centralisation of tasks when this is assessed as contribution to a system optimum resources allocation.

The impact of Option 3a on the gap of resources, will probably be significantly lesser to that of Option 3b, due to the voluntary nature of the measures and the inherent reluctance of CAs to delegate responsibility. However, **Option 3a** is expected to achieve a certain reduction in the resources gap by a reallocation of tasks from CAs that are less specialised in performing them, to others that are more specialised in doing so.

In order to estimate the impact on the resources gap from Option 3a. we have as an indication estimated for one domain (OPS) a transfer of tasks from less specialised CAs to relatively highly specialised CAs. For this estimate, we assume that CAs with the least in-house expertise in OPS delegate this tasks to the CAs with most in house expertise in the same domain.

The impact of this reallocation is estimated by

1. Identifying the 6 out of 28 CAs (that have provided relevant data), with the least experts in OPS, as well as the 6 CAs with the most experts in OPS.

2. Calculating the average staff /AOC ratio for each of the 2 identified groups, which results in the following:

   ⇒ 'Larger OPS CA' average ratio: 0,60 (4 out of 6 of them are within the range 0.27-0.94)

   ⇒ 'Smaller OPS CA' ratio: 0.97

3. Estimating the decrease in resources if the OPS operations of the 'smaller OPS CAs', were performed by the 'larger OPS CAs'. To do this, we calculate the staff that would be needed (on average) to produce the same amount of output by assigning the AOCs of the 'smaller OPS CAs' to the 'larger OPS CAs', which results in the following:

   ⇒ AOCs issued by the 6 'smaller OPS CAs': 51

   ⇒ Staff needed for the AOCs issued by the 6 'smaller OPS CAs': 49,25

   ⇒ Staff needed if these AOCs where produced by the 'larger OPS CAs' (high estimate): 51*0,27 = 13.88

   ⇒ Staff needed if these AOCs where produced by the 'larger OPS CAs' (low estimate): 51*0,598 = 30.52

Resources gap reduction in 2013 (assuming instant implementation): approx. 19-35. FTEs

4. This resources gap reduction concerns year 2013. By 2020, the need for resources is expected to grow by 8.45% (average of 7.6% – 9.3% band) and therefore the reduction in the resources gap due to this option is expected to grow proportionally to 20-38 FTEs. By 2030, the need for resources is expected to grow by 19,5% (average of 17.4% – 21.6% band) and therefore the

reduction in the resources gap due to this option is expected to grow proportionally to 24-46 FTEs.

5. This corresponds to a reduction in the budget required to fill the resources gap of about € 1.0-2.0 mln/year (2013), about € 1.1-2.1 mln/year (2020) and about € 1.3-2.5 mln/year (2030). This is valued by applying the average wage costs as presented in chapter 8.1 to the required resources in FTE. As indicated earlier, these are 'plain' wages costs and exclude overheads and employee related costs as training. The present value of this during the entire 2016-2030 time frame amounts to €13.0-24.6 million.

As indicated above, this is a global estimate of the potential impact on reducing the resources gap. The actual impact depends on the actual number of CAs that would voluntary transfer tasks as well as the number of tasks that they would transfer.

In order to estimate the impact on the resources gap from **Option 3b**, we go a step further. The options allows for a mandatory transfer of tasks in case of non-performance. Again, the actual impact on resources depends on many variables, including the number of CAs from which tasks would be taken away, as well as the domains that would be affected. The centralisation would in this case be expected to happen to all domains but not to a full extent. Rather we assume centralisation to affect 20-40% of the resources of CAs. As an indication of the magnitude of the overall impact, we first assume that the Operations oversight activity is mandatorily centralised when deemed necessary in its entirety, producing a resources benefit similar to that created by the centralisation of the aircraft certification activity by the creation of EASA, before applying the 20-40% centralisation ratio.

1. The centralisation of the aircraft certification activity led the transition from approx.784 part-time employees, locally deployed in aircraft certification activities (392 FTEs assuming an average of 0,5 FTE per expert devoted in aircraft certification activities), to a total of approx. 220 FTEs deployed in aircraft certification in EASA. Taking into account the fact that CAs still employ a sum of approx. 50 staff in aircraft certification. We can estimate a total of 245 FTEs currently employed in aircraft certification.

2. This consists in an efficiency of centralisation rate of = 245/392 = 0.625

3. If efficiency gain is applied to the whole of OPS, it can be expected to lead to a resources gap reduction of: (1-0.625)*469 = 176 FTE

4. As it is more realistic to assume that the whole of the OPS resources will not be affected by the centralisation, we assume that this reduction in the resources gap is only going to be applied to 20-40% of OPS resources. This would lead to a reduction of future demand for OPS staff of between 35.2 (20%*469*(1-0.625)) and 70.3 (40%*469*(1-0.625))FTE. Overall, under the above assumptions, we estimate a resources gap reduction for OPS staff from 469 to about 433.8-398.9.

In any case, in order to catch the effect of centralisation in all domains, we assume that the centralisation of activities in all domains can lead to a maximum gap reduction equal to the maximum estimated effect to the whole of OPS, while the minimum possible reduction is equal to half of that.

6. This is a reduction in the resource gap (2013) by about 88-176 FTEs

7. This resources gap reduction concerns year 2013. By 2020, the need for resources is expected to grow by 8.45% (average of 7.6% – 9.3% band) and therefore the reduction in the resources gap due to this option is expected to grow proportionally to 95-191 FTEs.By 2030, the need for resources is expected to grow by 19,5% (average of 17.4% – 21.6% band) and therefore the reduction in the resources gap due to this option is expected to grow proportionally to 114-228 FTEs.

8. This corresponds to a reduction in the budget required to fill the resources gap of about € 4.8-9.7 mln/year (2013), about € 5.2-10.5 mln/year (2020) and about € 6.3-12.5 mln/year (2030). This is valued by applying the average wage costs as presented in chapter 8.1 to the required resources in FTE. As indicated earlier, these are 'plain' wages costs and exclude overheads and employee related costs as training. The present value of this during the entire 2016-2030 time frame amounts to € 61-122 million

It should be noted, that compared to aircraft certification, the total centralisation of OPS should prove less effective, while additionally the efficiency gain would not apply to the sum of the OPS staff. These two issues indicate that the estimation of 210 FTEs of resources gap reduction for 2013 would be an estimation on the high side. On the other hand, this gap reduction concerns only the impact of the centralisation of OPS. Additional efficiency benefits would be expected from the centralisation of tasks in other domains. All that said, we assess that a reduction of 105-210 FTEs is a reasonable approximation of the resources gap reduction that could be achieved from the mandatory centralisation of tasks under Option 3(b).

Social impacts

Table 8-14: Social impacts of Option 3

	European level	CA level	Industry level
	A Impacts of a transition to a performance-/ risk-based approach as described in Option 2, plus:		
Employment conditions Overall score: +		Improvement of working conditions, with the better utilisation of resources system-wide (cooperative oversight, local certification etc.).	
Employment / job creation Overall score: +	Increase in the employment in EASA due to setting up framework and common requirements framework: + 5 FTE; Increase in the employment in EASA due to the delegation of tasks from MS.	Decrease in employment due to the delegation of tasks to EASA or other MS if it is structural.	
Qualification / skill level Overall score: +		Improvement of qualifications through the common qualifications and training standards and standardise application; Increased regional specialisation due to increased opportunities to form regional groupings for delegated oversight tasks (from other CAs) and allocation of tasks system-wide.	Slight positive impact due to more training opportunities.

Environmental impacts

Table 8-15: Environmental impacts of Option 3

	European level
Environmental impacts Overall score: 0/+	Small impact on emissions and noise expected in case industry growth is facilitated; New, environmentally friendly technologies might be more rapidly introduced.

8.5 Option 4 Single European Competent Aviation Authority (ECAA)

This option envisages the evolution of EASA into the European Competent Aviation Authority (ECAA). All responsibilities for regulation and oversight in all domains are set on European level, and where the European competent authority may allocate tasks to national authorities. This would only occur if these national authorities are capable to take up this responsibility.

This option requires a substantial revision of the Basic Regulation and will cause higher transition costs than the other options. In the new situation, the overall workload for oversight and certification is centrally managed and allocated to the national offices pursuing the best possible match to the available resources.

Moreover, under Option 4, uniformity in application of requirements is ensured with internal quality mechanisms instead of standardisation inspections and audits and other continuous monitoring activities. Important contributors to a harmonised qualification of staff are the preparation of a common training program and the establishment of standard, high, requirements for training and qualification of staff.

Finally, the adoption of performance-/risk-based approaches to regulation and oversight, will similarly to Option 2, and despite the unavoidable transition costs, create the context to drive industrial innovation and further increase the qualification level of relevant industry employees.

The above described causal chain of impact mechanisms has been further expressed in detailed impacts, for the main categories as requested in the terms of reference for this study: safety, economic, social and environmental impacts.

Safety impacts

Also for option 4, the safety impact is assessed by means of the 4 key factors:

Interfaces:

When all the work is performed by 1 single organisation many interfaces, which are now external, become internal and as such fall under the responsibility of only one organisation. Hence, the main issue of managing interfaces, i.e. who is responsible, becomes clear for all relevant stakeholders. Therefore, the influence on safety is assessed to be very positive, “++”.

Available knowledge:

Local knowledge is available to the organisation by means of local offices, which fall under the responsibility of EASA. In case of any shortcomings in terms of knowledge, the organisation is able to focus recruitment or to focus training on these shortcomings. The influence on safety is assessed to be very positive, “++”.

Changes:

Implementation of option 4 is a major change. As such this has to be assessed as very negative, "--". However, when there is only 1 organisation left, the ability to act on changing circumstances becomes easier, and that can be assessed as positive, "+". The final result of "changes" of this option on safety is then negative, "-".

Conflict of interest:

As there is only one organisation left, there are also no conflicts of interest left as described above. For instance in case in which oversight and ANS or Aerodrome service provision is centralised within one CA in a certain member state, after implementation of option 4 the service provision is left to the member state, while safety oversight becomes the competence of EASA. The influence on safety can be assessed as very positive, "++".

The overall effect on safety is considered to be very positive, "+++++".

Economic impacts

Table 8-16: Economic impacts of Option 4

	European level	CA level	Industry level
	Impacts of a transition to a performance-/ risk-based approach as described in Option 2, plus:		
Impact on regulatory compliance costs for public authorities Overall score: ++	▪ Costs for transition to new organisation and designing of new processes **(restructuring costs);** ▪ Reduction of **standardisation** effort **(standardisation costs);** ▪ Creation of common requirements for qualifications and training framework**(management costs);** ▪ Development of Training academy **(management costs);** ▪ Increase of income from industry due to the updated activity-based charging scheme **(service fees).**	▪ Reduction of costs for standardisation and cooperation with EASA **(standardisation costs);** ▪ Decrease of staff costs on national level after optimal planning and allocation of resources over tasks by ECAA **(oversight costs);** ▪ Common experts reduces need to hire and train personnel for specialisations with low local industry activity **(oversight costs).**	N/A.
Impact on regulatory compliance costs for regulated entities Overall score: --	N/A.	N/A.	▪ Increased costs for participating in trainings **(training costs);** ▪ Activity based financing of the ECAA transfers larger part of financing responsibility to the industry **(service fees);**

	European level	CA level	Industry level
			▪ Reduction of regulatory compliance costs for regulated entities due to efficiency gains **(see underneath).**
Functioning of the system Overall score: +++	▪ Short-term: Decreased efficiency in adaptation to the new system structure; ▪ Most efficient allocation of resources for tasks performed centrally by the ECAA; ▪ Standardisation tasks internalised in processes to increase efficiency.	▪ Short-term: Decreased efficiency in adaptation to the new system structure; ▪ Most efficient distribution of workload regarding the availability of resource locally; ▪ Common training and qualification requirements increase system standardisation; ▪ Local specialisation of staff further promoted with the new framework.	▪ Short-term: Decreased efficiency in adaptation to the new system structure; ▪ Common framework improves clarity for the industry; ▪ Training services increase staff qualifications; ▪ More efficient allocation of tasks produces efficiency gain for the industry; ▪ Across the ECAA, industry competitiveness increases due to the creation of a level playing field.
Industry growth/ competitiveness Overall score: ++			▪ Common framework improves clarity for the industry and creates more standardised approaches and reduces industry uncertainty, promoting a “one system” approach that promotes competitiveness and assures level playing field; ▪ Overall efficiency gains for the industry (training, locally performed activities etc.)

	European level	CA level	Industry level
			improve its competitiveness in the long-term; ▪ Industry competitiveness in some MS, that are not applying a full cost -recovery based charging scheme, might be negatively effected. This is compensated by the increase in competitiveness of the industry players that were already paying for services on a cost recovery basis.
Innovation Overall score: ++			• Innovation in business models and the use of technologies might be promoted by the transition to a “one-system” framework. • Performance-/risk-based approach in oversight is expected to stimulate innovation in the industry both technological as well as regarding the business models applied.

Cost of option

The impact on regulatory compliance costs for public authorities and regulatory compliance costs for regulated entities have been described above. In the below tables, these are further detailed. The costs of the performance scheme elements of option 2, which are considered to be part of this option, have been excluded in the table, as these are unknown yet.

Table 8-17 Regulatory compliance costs for public authorities (European level) of option 4 (compared to option 1)

Item	European level	One-off / annually	Explanation	Calculation / justification / source
Costs for transition to one organisation and designing of new processes and task allocation	380.000	One-off	Assume 4 man-years additionally to current staff involved in change management to implement by EASA.	4 * € 95,000 Expert judgement
Reduction of standardisation effort	-304.000	Annually	In 2013, around 1600 man-days were spent on standardisation inspections on site. Half of these days may be saved under this option. On top of these days spent, also preparatory work and standardisation meetings are held, which are excluded in this calculation. This may offset the still required effort to make sure working processes in regional offices are aligned.	1600 days / 250 * € 95,000 / 2 EASA Standardisation report
Creation of common requirements for qualifications and training framework	95.000	One-off	Estimated at 3 man-year to prepare this.	3* € 95,000 Expert judgement
Development of training academy	190.000	One-off	Estimated at 1 man-year for curricula and 1 man-year for process and structure/ May draw on	2* € 95,000 Expert judgement, validated with training expert

Item	European level	One-off / annually	Explanation	Calculation / justification / source
			/ cooperate with JAA Training academy.	
Increase of staff costs at a European level after the transfer of responsibilities to the ECAA. These will primarily have a management role allocating tasks and responsibilities over national CAs.	950.000	Annually	Estimated at 10 man-years to carry out overall planning and allocation of tasks.	10 * € 95,000 Expert judgement
Increase of industry income due to the updated activity-based charging scheme	N.K	Annually	All oversight tasks would be charged to industry based on cost recovery. Currently only part of CAs applies this principle. Increase of charges income from industry.	
Total one-off costs	**855.000**			
Total annual costs	**646.000**	**+N.K**		
Net present value additional costs 2016-2030 (€)	**7.4 million**			

Table 8-18 Regulatory compliance costs for public authorities (national level) of option 4 (compared to option 1)

Item	National level	One-off / annually	Explanation	Calculation / justification / source
Decrease of staff costs on national level after optimal planning and allocation of resources over tasks by ECAA	8.800.000	Annually	Conservative estimate includes that the optimal planning and allocation of tasks by ECAA results in 5 FTE per CA to be gained in terms of efficiency.	5* € 55,000 * 32 Estimate based on interview programme
Reduction of costs for standardisation and cooperation with EASA	2.750.000	Annually	In 2013 around 100 standardisation audits have been carried out by EASA. Estimated per audit 10 staff 3 weeks involved, rounded 0.5 manyear.	100 audits * 0.5 manyear * € 55,000 EASA standardisation reports
Reduced effort for cross-border oversight due to the introduction of "one system"	N.K	Annually	Cross border oversight should be facilitated with an ECAA. The exact estimate on the current effort for it is difficult due to lack of data.	
Common experts reduces need to hire and train personnel for specialisations with low local industry activity	0	Annually	Included in the % efficiency gain of increased optimisation of planning and task allocation.	
Total one-off costs	**0**			
Total annual costs	**-11.550.000**	**+NK**		
Net present value additional costs 2016-2030 (€)	**-117,3 million**			

Table 8-19 Regulatory compliance costs for regulated entities of option 4 (compared to option 1)

Item	Industry level	One-off / annually	Explanation	Calculation / justification / source
Increased costs for participating in trainings	N.K	Annually	The new training academy of ECAA facilitates the training opportunities for industry in regulatory requirements. That would especially be relevant in case of a shift to a performance based approach. It is however difficult to estimate what the exact training need of industry is.	
Activity based financing of the ECAA transfers larger part of financing responsibility to the industry	400.000.000	Annually	The new common charging structure implies that all activities except rulemaking, international cooperation, safety analysis and research would be charged. Given the fact that at present, part of the activities is funded by national governments, this would mean an increase. This is difficult to exactly determine, as the current budget data of national CAs is very incomplete. Nevertheless, the current share of industry funding is currently around 50% (see chapter 4). The current budget in Europe is around € 1 billion (see chapter 5). Assume that 90% of ECAA and NAA budget concerns activities to be funded by industry (hence excluding safety	

Item	Industry level	One-off / annually	Explanation	Calculation / justification / source
			analysis, international cooperation, rulemaking), that around 40-percentpoint extra needs to come from industry, i.e. some € 400 million. *These 400 million would thus no longer be funded by national governments, and is thus a saving for them.* Another important aspect here is that not all costs at present are reflected in budgets. After all, in many CAs there are shortages. In a situation with cost recovery these shortages would no longer be the case, as it would be possible to charge this to industry.	
Efficiency gain for industry from more clarity on roles and responsibilities, and more effective oversight	N.K	Annually	The improved effectiveness and efficiency at national CA level, would benefit industry in some efficiency gains (see also under Functioning of the system).	
Total one-off costs	**0**			
Total annual costs	**400.000.000**	**+N.K**		
Net present value additional costs 2016-2030 (€)	**4.1 billion**			

Impact on the cost of filling the gap in terms of resources

Option 4 promotes the creation of a centralised ECAA. Under this structure we assume that scale efficiency benefits are to be achieved by this centralisation. Under this Option EASA is the competent authority for aviation safety in the EU and allocates tasks to the National authorities. We assume that at least for the 3 largest domains of oversight activity (AIR, OPS, PEL), the implementation of tasks, for each domain, will be reallocated from the least efficient CAs to those that achieving the highest performance quality.

This is different from the calculation approach proposed for Option 3A where the transfer is based on a voluntary basis and therefore we assumed the transfer to take place from smaller to larger CAs regardless of their efficiency.

In order to calculate this benefit the following steps are followed:

1. Creation of a basic resources/ output ratio for each of the 3 largest domains considering a representative indicator for the workload under each domain. The selected indicators for this exercise are (aircrafts in registry for AIR, AOCs issued for OPS and ATOs supervised for PEL).

2. Calculation, for each of the 3 domains of the average resources/output ratio for the 20% (6) most efficient, the 20% (6) least efficient CAs, as well as the average efficiency of the CAs with a good performance according to standardisation inspections[73].

3. Calculation of the sum of the output of the least efficient CAs (i.e. total aircraft on the register of these CAs, total AOCs and ATO approvals issued) and the sum of the resources needed for performing this output by i) the most efficient CAs and ii) the CAs with the best standardisation performance.

4. Estimation of the resources needed if this output was to be performed by the most efficient CAs or by an average efficiency rate of the most standardised CAs. The resources needed in each of these 2 cases are calculated by multiplying the output of the least efficient CAs with the resources/output ratio for the most efficient CAs and that of the most standardised CAs respectively for each of the domains examined. These figures are presented in the Table underneath (rounded-up).

	Ratio resources/output			Least efficient CAs resources needed				
	Most efficient	Least efficient	CAs with best performance	Least efficient CAs output	Actual	Performed by most efficient	Performed by CAs with best performance	Resources gap reduction (FTEs)
AIR	0.0063	0.0366	0.0116	2966 a/c	108.45	18. 541	34.41	74-90
OPS	0.2638	1.281	0.4323	226 AOCs	289.60	59.61	97.70	192-230
PEL	0.0735	1.070	0.0988	43 ATOs	46	3.16	4.25	42-43

[73] These is defined as the average efficiency rate of the CAs reported in the EASA standardization reports as having no supplementary Class C or D comments for 2012 and 2013.

	Total (2013)	**308 - 363**
	Total (2020) Growth 8,45%	**334-393**
	Total (2030) Growth 19,5%	**368-433**

5. We estimate the range of resources impact to be between the 2 calculated values as an indication that scale efficiency will be also achieved after the activities are allocated to the most standardised CAs.

6. This resources gap reduction concerns year 2013. By 2030, the need for resources is expected to grow by 8,45% by 2020 and by 19.5% by 2030 and therefore the reduction in the resources gap due to this option is expected to grow proportionally to 334-393 FTE by 2020 and to 368-433 FTEs by 2030.

7. This corresponds to a reduction in the budget required to fill the resources gap **by about € 16.9-19.9 mln/year** (2013), **about € 18.4-21.6 mln/year** (2020), **and about € 20.2-23.8 mln/year** (2030). This is valued by applying the average wage costs as presented in chapter 8.1 to the required resources in FTE. As indicated earlier, these are 'plain' wages costs and exclude overheads and employee related costs as training. The present value of this during the entire 2016-2030 time frame amounts to € 209-246 million.

Social impacts

Table 8-20: Social impacts of Option 4

	European level	CA level	Industry level
	Additional to the impacts of a transition to a performance-/ risk-based approach as described in Option 2		
Employment conditions Overall score: +	Activity-based costing creates flexibility to adjust staff levels to needs.	Activity-based costing creates flexibility to adjust staff levels to needs.	Improved clarity of the requirements increases working efficiency and decreases workload.
Employment / job creation Overall score: -	Jobs created at a European level due to the transfer of responsibilities from the CAs and the new responsibilities of the	Jobs at a local level reduced due to the rationalisation of the local performed tasks; -64 FTE	

	European level	CA level	Industry level
	ECAA: +25 FTE		
Qualification / skill level Overall score: +		▪ Local specialisation of staff further promoted according to distribution of tasks; ▪ Better allocation of tasks locally, increases the qualification level at regional offices; ▪ Qualification levels increased due to the creation of a common training programme.	Training services increase staff qualification level.

Environmental impacts

Table 8-21: Environmental impacts of Option 4

	European level
Environmental impacts Overall score: 0/+	▪ Small impact on emissions and noise expected in case industry growth is facilitated; ▪ New, environmentally friendly technologies might be more rapidly introduced; ▪ Decreased local pollution impacts due to increased safety (accident prevention and subsequent crash-site pollution).

9 Conclusions

9.1 Comparison of options

In the following table, the impacts of Options 2, 3a, 3b and 4 on each of the impact categories are summarised. The magnitude of the impacts intensifies as the interventions to the existing system become more significant moving from Option 2 towards Option 3 and Option 4. Clearly, Option 4 scores significantly well on both the safety impact and reduction in costs.

Table 9-1: Overall rating of options (score of options 2-4 is compared to option 1)

Impact	Option 2	Option 3a (Option 3b)	Option 4
Safety	+	--	++++
Regulatory compliance costs for public authorities (including government budget)	-	--	+++
Regulatory compliance costs for regulated entities	-	-	--
Functioning of the system	0/+	+ (++)	+++
Industry growth/competitiveness	0/+	+	++
Innovation	+	+	++
Employment conditions	0/+	0	+
Job creation	+	+	-
Qualification level	+	+	+
Environmental impacts	0/+	0/+	0/+

In addition to the qualitative assessment of the options, as summarised in the table above, quantitative estimates of the costs have been made. A summary is provided in the table below.

Table 9-2 Net present value, € mln, (4% discount rate), 2016-2030. Options 2-4 compared to Option 1[74]

	Option 2	Option 3a (Option 3b)	Option 4
NPV of regulatory compliance costs for public authorities (EU)	9.6	10.6	7.4
NPV of Regulatory compliance costs for public authorities (national)	4.9	37.5	-117.3
NPV of Regulatory compliance costs for regulated entities	N.K	N.K.	4,062.0
NPV of other impacts (national budgets)	0	0	-4,062.0
Total additional costs (NPV)	14.5	48.1	-109.9

Option 2 is likely to result in additional costs of €14.5 million over the period 2016-2030 (compared to option 1) while option 3 is expected to add around €48 million. Option 4 is expected to lead to a cost saving of around €110 million for the 2016-2030 period. In the table above, we have separately shown the shift of €4 billion (NPV 2016-2030 or €400 million per annum) from national budgets to industry as a result of moving towards a fully industry funded system. As explained in chapter 8, the costs that have been quantified are not the only costs. Additionally, there are some costs elements for which quantification was not possible. However, as also explained, there have been a series of benefits qualitatively described in chapter 8, and summarised in table 9.1, that represent as well a value. The safety benefits under option 2 and 4 are key in this respect.

Clearly the above values are estimates, and depend heavily on the chosen implementation mode of options and assumptions taken.

9.2 Conclusions

The establishment of EASA and the introduction of the EU aviation safety requirements aimed at creating a common aviation safety regulatory system for the countries of the EU/EEA. A decade after the introduction of the system and the subsequent extension of its initial remit, the EASA system heads towards consolidation. In this context this study has focused on identifying the impact of the introduction of the EASA system on the availability and sufficiency of human resources to address the existing workload.

[74] Positive values in these tables are 'extra costs', negative values are 'less costs', compared to the total costs of the baseline. The total costs of the baseline have not been calculated in this study. These values exclude the impact of options on decreasing the resources gap.

The quantitative analysis of data regarding the evolution of resources and workload for the European CAs, EASA, Eurocontrol and the JAA since the establishment of EASA revealed that both resources and workload have increased in this period. The increase of the workload was due to (amongst other) the aviation industry expansion, the standardisation requirements of the system and the increased amount of regulation. While new regulation is expected to have contributed to increasing the safety standards overall in Europe, the regulation was extensive in size and complexity, and subject to frequent changes. On the other hand, the resources increase occurred at a slower rate than the increase in the workload due to the budgetary and funding structure constraints in various CAs. All in all, the conclusion is that the resources – workload balance has deteriorated over the 10 years under study. This mismatch between resources and workload is intensified by a sub-optimal allocation of resources across the system and pressure on the qualification level of staff. Combined, these aspects prevent competent authorities from performing up to expectations. Additionally, the insufficient harmonisation of working approaches between CAs and the differences in charging schemes contribute to creating an uneven playing field, which undermines the common market in Europe, as well as to an unpredictable safety situation under conditions of a stable accident rate and increasing air traffic predictions.

Looking at EASA, the budget and resources of this Agency have increased over the past decade and EASA has shown a considerable output over these years.

The European aviation safety regulatory system that has been shaped in the past decade has brought substantial benefits. First and foremost, the European aviation safety track record is strong, as Europe is one of the world's safest regions to fly, with a very low accident rate. The system brought also significant benefits to industry as a result of the centralisation of certification.

A set of options have been examined in order to tackle the root causes of the problems of the current system and improve system performance to be ready for the coming decades, that will be characterised by new technologies that need to be incorporated into the system, as well as an increasing demand for air transport. The proposed options gradually develop the level of interventions starting from a series of light measures with minimal budget impact that do not require substantial legal amendments (Option 2). This option, including the development of a pool of experts, smoothens the negative impacts of the problem drivers and improves system performance without however structurally dealing with the essence of the problems. A more impactful intervention (Option 3a) requires the legal foundation of a cooperation framework to voluntarily delegate tasks between CAs and between CAs and EASA and an increased effort to harmonise the system, focusing on staff training and qualification levels. The effectiveness of this option is considerable especially when the delegation of tasks becomes mandatory (Option 3b) in case of persistent shortcoming of a national CA. Although it has not been possible to quantify, it should be noted that this sub-option addresses a shortage of resources in the core, as persistent shortages detected at a national CA allow EASA to take over oversight tasks and thus increase the output in terms of safety oversight in a certain country. The downside of this option is that the roles and responsibilities become more unclear as they may differ for certain domains between national and European level, with a negative effect on safety.

Finally, the transition towards a European Competent Aviation Authority (ECAA) encompasses a restructuring of the system in which all responsibilities for regulation and oversight in all domains are set at European level, and where the European competent authority may allocate tasks to national authorities, which act as local offices. This would only occur if these national authorities are capable to take up this responsibility. Option 4 also introduces a common charging framework. The option is expected to have a substantial positive effect on safety first of all. Additionally, it may result in regulatory compliance costs savings for public authorities, as the central allocation of tasks allows to optimise resources over the need to implement these tasks. The option can be expected to significantly improve the overall functioning of the system and facilitate technological and organisational innovation, positively affecting industry competitiveness. At the same time it would significantly increase the regulatory compliance costs for industry, as oversight would be nearly entirely financed through statutory fees and charges. This on the other hand would positively affect the intra-EU level playing field for industry.

9.3 Recommendations

Based on the analysis, the study team has developed the following recommendations.

It is recommended that the Commission at least implements policy option 2. This option is in our view a no-regret option: it has limited implementation costs. On the other hand, there are positive impacts on safety, system performance, innovation and qualification levels. On balance, this option is thus worthwhile to implement.

However, option 2 does not address the problems and their drivers to a large extent due to the voluntary nature of the option elements. Both option 3b and option 4 would contribute significantly to solving core problem drivers as resource shortages at national CAs and their differences in supervisory approaches. As option 4 scores on many criteria, such as implementation costs, safety, a common approach throughout Europe and optimal standardisation of approaches, better than option 3b, it is recommended that the Commission implements this option to contribute to achieving its policy objectives in the area of European aviation safety, given the challenges ahead in the coming two decades.

One of the elements of option 4 is the transition to an overall funding of the certification and oversight tasks in European aviation safety based on industry charging. It should be noted that the effects of option 4 as summarised above, may also be achieved if there would be sufficient funding from the traditional mix, i.e. funding from the general national budgets and industry funding. It is therefore recommended that the Commission includes the political feasibility of this option element in the trade-off for the final formulation of the option.

10 Annex 1: Summary of findings from stakeholder consultations

Interviews were conducted with a range of stakeholders with the objective to validate the findings of the desk study phase of our data collection regarding the evolution of resources and workload of EASA and of CAs in relation to the evolution of the scope of their respective responsibilities, as well as to obtain inputs on the pros and cons of the current situation, options for improvement and their expected impacts. Interviews were held with EASA representatives and other international plays, national civil aviation authorities, members of industry and industry associations. The main findings and identified trends are summarized below.

The following organisations have been interviewed by the study team.

Organisation	Country
Federal Ministry for Transport, Innovation and Technology	Austria
Federal Public Service Mobility and Transport	Belgium
Department of Civil Aviation of Cyprus	Cyprus
Civil Aviation Authority of the Czech Republic	Czech Republic
Danish Transport Authority	Denmark
Estonian Civil Aviation Authority	Estonia
Finnish Transport Safety Agency	Finland
Directorate General for Civil Aviation (DGAC)	France
Federal Office for Civil Aviation of German y (LBA)	Germany
Italian Civil Aviation Authority (ENAC)	Italy
Human Environment and Transport Inspectorate (ILT)	The Netherlands
Civil Aviation Authority of Norway	Norway
Civil Aviation Office of Poland	Poland
Romanian Civil Aeronautical Authority	Romania
Spanish Civil Aviation Authority	Spain
Civil Aviation Authority	UK
European Aviation Safety Agency (EASA)	
Eurocontrol	
SESAR JU	
Association of European Airlines (AEA)	
Aerospace & Defence Industries Association of Europe (ASD-Europe)	
European Business Aviation Association (EBAA)	
General Aviation Manufacturers Association (GAMA)	

Competent Authorities

Resources and workload:

- Overall, the majority of CAs (12 in total), including both large and small CAs, experienced staff increases across all domains following the establishment and development of EASA in 2003 in order to deal with the increase in workload. This trend was observed until the outbreak of the economic crisis in 2008. Of the remaining, 2 large CAs reported decreases (one of which cited increases in efficiency as being the reason for staff reductions) and 3 small CAs reported stable staffing levels;
- Since 2008, four CAs (1 large, 3 small) reported stable or slightly increasing levels of staff, one of which also reported reductions in certain areas due to internal efficiency gains. The remaining CAs interviewed have experienced substantial reductions in the staff and resources available from 2008 to the present and report having insufficient resources – in terms of quality and quantity – to carry out workload. OPS, FCL and certification staff appear to be most problematic, however overall no significant deviations for a specific domain reported. 5 CAs, 3 large and 2 small, indicated a hiring freeze in response to the economic and budget constraints. No clear trends is discernible in terms of geographic location; the financing structures of these CAs include fully-government funded and mixed funding, where the latter in all cases is also majority government-funded;
- All 16 CAs interviewed indicated having experienced a significant increase in workload over the last decade following the establishment and development of EASA in 2003. 12 CAs cited the complexity of the regulatory framework (i.e., the overall increase in the number regulations and requirements to authorities; the detailed nature of the regulations, and; the rate and pace of introduction and change) as one of the main contributing factors to the increase in workload; 10 CAs – 5 large and 5 small – cite the increase in effort required to comply with standardisation requirements, in particular the extensive documentation and focus given to administrative (i.e., paperwork) processes. The full list of causal factors related to increasing workload is discussed in chapter 6 of this report. As such, no trend is observed in regards to CA size or geography;
- Regarding qualification levels of technical staff, 11 CAs – including 5 large and 6 small authorities – reported concerns over maintaining current qualification levels of technical staff and/or declining levels of qualification, both in their own authority as well as in those of authorities. Small CAs experience more difficulties with respect to developing specialized resources for niche areas of expertise (e.g., 1 small CA reports helicopters and hot balloons operations and oversight; another small CA reports difficulties complying with MED oversight due to strict requirements of personnel, PEL and CAMO/Part-M oversight);
- The oversight approaches of CAs are evolving towards risk-based oversight (in certain, appropriate areas/domains). In general, CAs recognize the expected mid- to long-term efficiency gains and overall safety benefits of risk-based oversight, however the majority point to the inherent increase in workload and effort required of the CAs in the process of this transition.

Current situation and baseline:

- Roles and responsibilities between (different) national authorities and EASA in the current regulatory system are perceived to be sufficiently clear by nearly all CAs interviewed;
- The majority of interviewees perceive the roles to be sufficiently clear between ICAO and EASA, while 4 CAs report a duplication of effort between ICAO and EASA audits. 7 CAs (2 large, 5 small) perceive there to be confusion between Eurocontrol and EASA, with EASA intervening with tasks that come under Eurocontrol responsibility (e.g., remote towers);
- All CAs interviewed agree that the common rules are the biggest benefit (as opposed to previous voluntary nature of JAA system) as well as the certification being done under one authority and the centralised bank of certificates. Levels of standardisation are significantly higher than previous to the system, despite the issues with respect to varying levels of standardisation;
- The major inefficiencies in the work of EASA according to CAs are: Overregulation, which leads to increasing workload; the requirement that all CAs have to provide all possible services and take full responsibility leads to a lot of small authorities developing idle or unnecessary capacity to create procedures and provide services to al limited industry sector; Insufficient guidance and training, implementation of standardization;
- The major inefficiencies at the MS level include misinterpretation of current aviation safety rules, diverse criteria applied leads to variations in the implementation of EU regulations;
- Regarding Annex II, small authorities consider the exclusion of Annex II aircrafts from EASA scope to cause inefficiency; this could be more flexible in order to reduce overall workload. Large CAs generally favor maintaining current division.

Options:

- It was agreed by the majority of CAs – both large and small - that the system could be improved through the facilitation of more flexibility on the sharing of tasks and cooperation across borders on a voluntary basis; the States should have more say in what is outsourced or delegated, while the current regulations do not allow such flexibility;
- Outsourcing of tasks from MS to MS is considered to be a beneficial arrangement by the majority of CAs; it is perceived to be useful for those with limited industry in a particular domain. Most CAs have not outsourced tasks to other CAs, however; 9 CAs (3 large, 6 small) indicate this is largely due to cost and liability concerns, with differences in culture and language also playing an important role;
- Outsourcing tasks from EASA to MS, and MS to EASA were mentioned positively only by 2 CAs, both smaller authorities;
- The domains most supported for further centralisation are rulemaking on and oversight of RPAS; additional domains were supported by only 2-3 CAs each. These are: further centralisation of Annex II aircraft, ground handling safety, security, and operations inspections. In general, these options are primarily supported by smaller CAs, while only the domain of RPAS was supported by a large CA. Further centralisation is opposed primarily by the large CAs due to

political sensitivities, different ways of working, and a preference to maintain local expertise;

- 3 CAs explicitly indicated support for further delegation of oversight tasks to competent user's organisations in the GA sector, such as aeroclubs;
- Pooling of resources at the EU level is strongly supported by small CAs (6) as a viable option for sharing resources should the need arise (i.e., lack of competence in a certain domain); however it is perceived to be costly, and linguistic and cultural issues may be an obstacle.

Impacts:

- The main expected impacts of the potential options from the perspective of the CAs interviewed pertain to the expected increases in overall knowledge and skills available that would result from greater resources sharing; increased safety through improved standardisation of knowledge and skills; and increased competitiveness of industry through stronger EASA-CAA system;
- Further centralisation was also viewed by several CAs (both large and small) to have an expected impact on the level of competence in their organisation, as the knowledge of local communities and operating condition are crucial aspects of a well-functioning system.

Multinational organisations

EASA:

- The internalisation strategy of EASA has led to an increase in required resources, while the change in working methods, with one expert per discipline present in inspection (rather than 2) has partially balanced this need;
- As part of this strategy, EASA takes on an additional part of the certification work from MS each year, which gone from 5% internalisation in 2004 to 80% of workload carried out by EASA in 2013. Workload on certification has increased overall across Europe, while FTE at European level has decreased (from 800 FTE in 2003, to 200 EASA + a handful of certifying staff remaining in some MS in 2013). However there is a limit to internalisation, and small projects will likely be delegated to CAs, to be conducted by separate local teams;
- Stabilisation of rulemaking effort at EASA; Increased workload experienced in the States' CAs in terms of rulemaking is considered to be a result of the increase in standards of the EASA system compared to the standards the MS were used, as well as the monitoring activity;
- CAs' concern over a loss of competencies is considered to be invalid as they should no longer require the skills they are losing;
- Strong points are considered to be the EASA certificates, which are much more easily accepted by foreign authorities than by those of individual CAs, and an EASA department that works on industry support. The latter was said to provide consultancy to industry explaining the certification. This position was not reflected in the position of industry nor CAs;
- Extension of aircrafts falling under Annex II would create inefficiencies for CAs as they would again need to hire resources; support is expressed for the following of the GA roadmap, however a re-decentralisation of the GA

responsibility to CAs would mean a regression in the common market idea, creating inefficiencies.

Eurocontrol:

- Eurocontrol workload not impacted significantly by the creation of EASA aside from those activities from which it withdrew; in these areas, workload decrease has been naturally followed by a staff decrease; further staff decreases experienced as well, irrespective of the changes in workload. In other areas, where workload has not been particularly impacted, such as the Network Management Directorate, intense resource reductions have been the result of the economic crisis and hiring restrictions. Overall, Eurocontrol staff has decreased by approximately 25-33% overall; further reductions expected in the next 1-2 years due to continued budget cuts, not EASA;
- Eurocontrol's Network management Directorate is performing mainly support activities for network management and service providers – areas that EASA's remit is not covering;
- Overlap with EASA functions was relevant to the EASA task of network oversight, however Eurocontrol tasks are broader. The conflict was resolved by dissolving the former Safety Research Unit of Eurocontrol, which is now split between other Eurocontrol departments, mainly within the Single Sky Directorate;
- The day-to-day division of rules and responsibilities between different national authorities, EASA and Eurcontrol is considered to be clear, while the distinction between safety management and safety regulation – the barrier between EASA and Eurocontrol – should be made clearer.

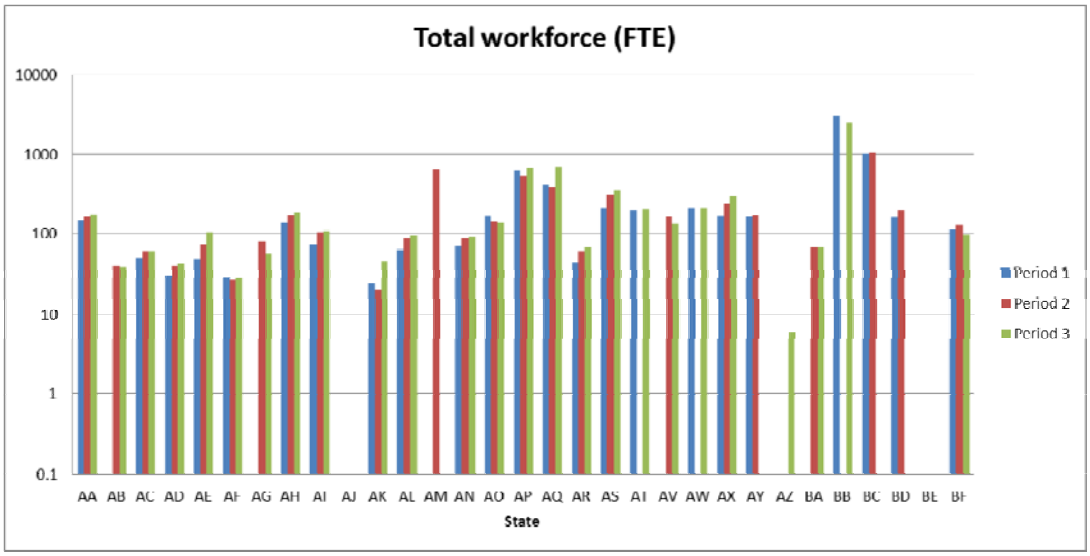
Industry Associations

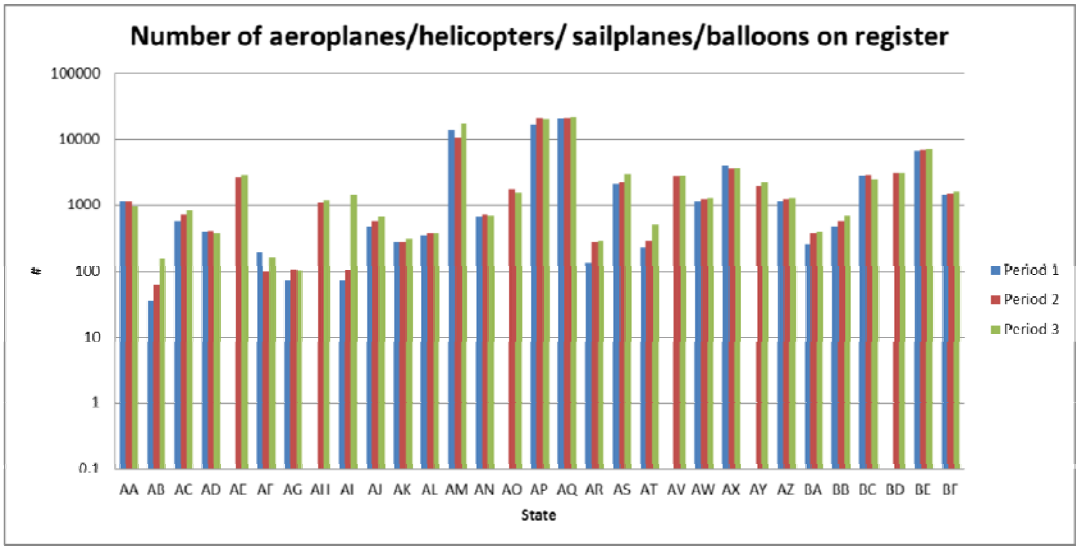
- Overall, the industry representatives interviewed agree that the changes brought about by the EASA regulatory system are beneficial, including the centralised and integrated decision-making, harmonisation with one contact point, etc.;
- Industry generally perceives the regulations to be too detailed and not always based on safety risk assessments. Three of the industry representatives interviewed perceive a disproportional approach to aviation, with small private aircraft, for example, falling under the same regulatory requirements as large commercial airlines. It was indicated that regulation has been developed to rule airline-type operations, commercial airlines and large aircraft, to the detriment of small, on-demand operations or GA, forcing the latter types to adapt their operations to fulfil requirements even if not relevant, thus inducing inefficiencies. Moreover, the current distinction between commercial aviation and all else is considered to be a huge problem;
- Several of the industry associations have observed and/or been directly impacted by the decrease in staff and resources available to CAs. This is reportedly due to the fact that CAs are unable to assist industry to overcome issues linked with implementation of the new legislation. This is made even more problematic in light of the pace of regulatory change, which makes it difficult for CAs to communicate in a timely manner with CAs;

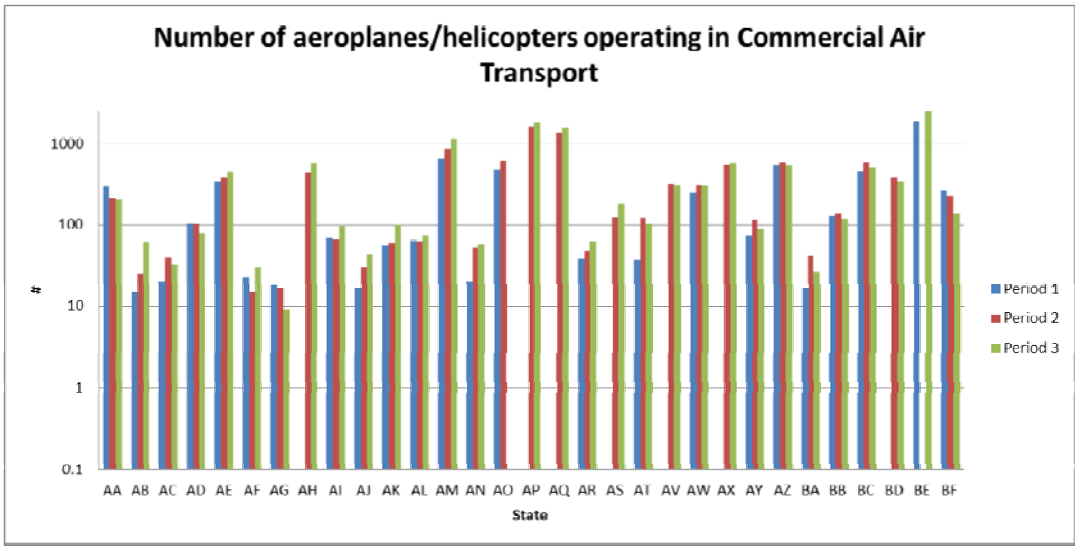
- Three industry representatives indicated that ambiguities exist for industry and the need for EASA to be given more power to clarify interpretations because industry remains without legal clarity;
- It was also confirmed by three representatives the issue of differing interpretations among CAs, which means CAs apply and implement safety rules in different ways, resulting in unequal treatment, for, e.g. OPS, and a distorted market. This might be improved with EASA taking over certain State responsibilities without hampering local specificities;
- One industry association expressed support for a more FAA-like system in Europe; another prefers to avoid the centrist approach by having EASA staff based in Member State "representations". The latter may be beneficial to reducing communication cost transactions for industry representatives by making EASA staff more available and accessible. Support was also expressed among the representatives for some delegation and resource pooling;
- Regarding the shift to performance/risk based oversight approaches, the expected impacts are primarily beneficial for industry. Five of the representatives interviewed indicated that currently, extensive effort is needed to comply with constant system requirements, thus risk-based oversight will reduce workload on airlines that perform well as well as reduce bureaucracy. While detailed prescriptive aviation safety rules hamper innovation, performance based oversight reduces enforcement costs for authorities; reduces inspection-related costs for well-performing operators; allows focus on issues, areas or organisations where there are higher risks to safety, and; facilitates innovation, bringing new products to market.

11 Annex II: Quantitative results (Full set)

11.1 General






Number of aeroplanes/helicopters operating in Commercial Air Transport
#
1000
100
10
1
0.1
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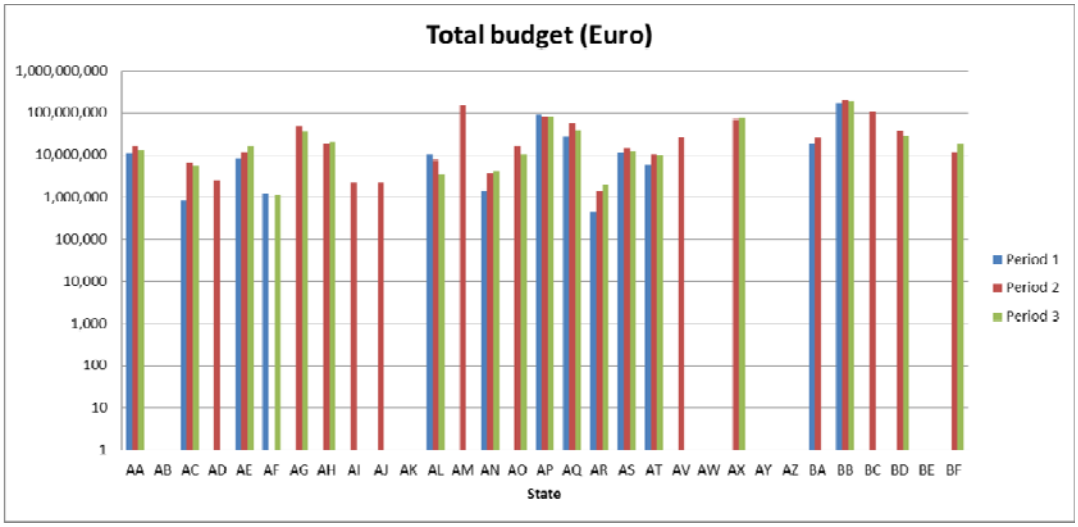
State
Period 1
Period 2
Period 3


Total budget (Euro)
1,000,000,000
100,000,000
10,000,000
1,000,000
100,000
10,000
1,000
100
10
1
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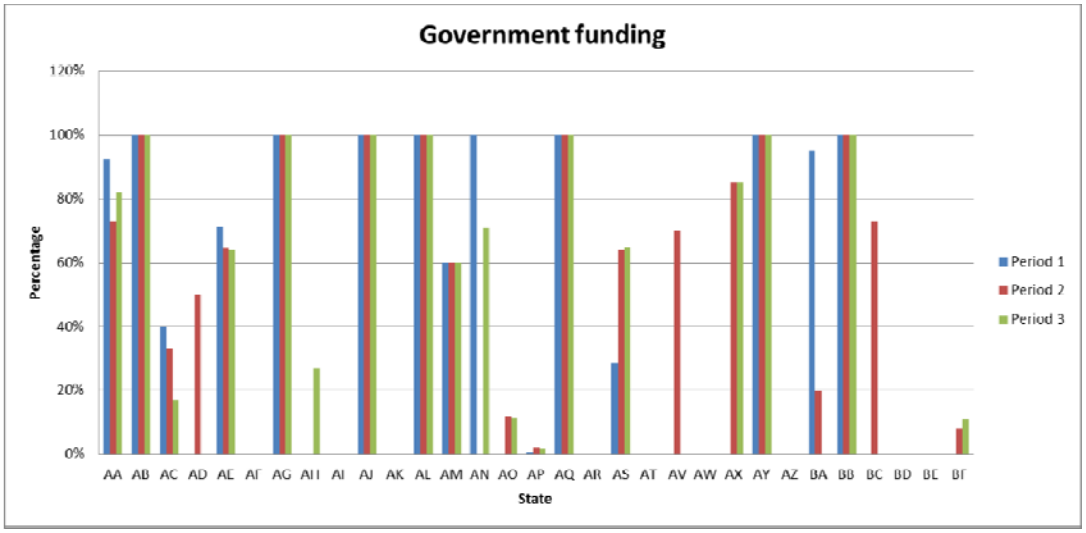
State
Period 1
Period 2
Period 3


Government funding
Percentage
120%
100%
80%
60%
40%
20%
0%
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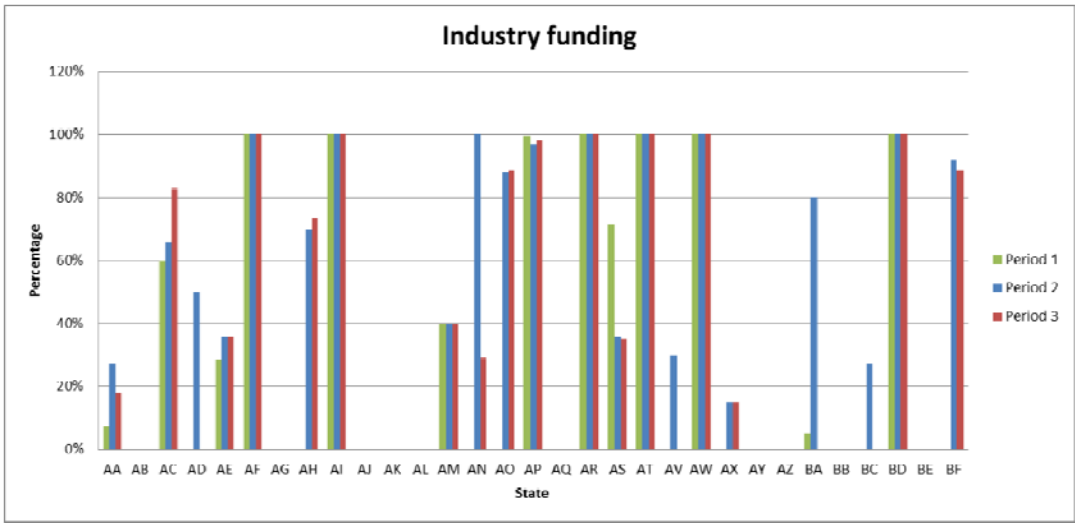
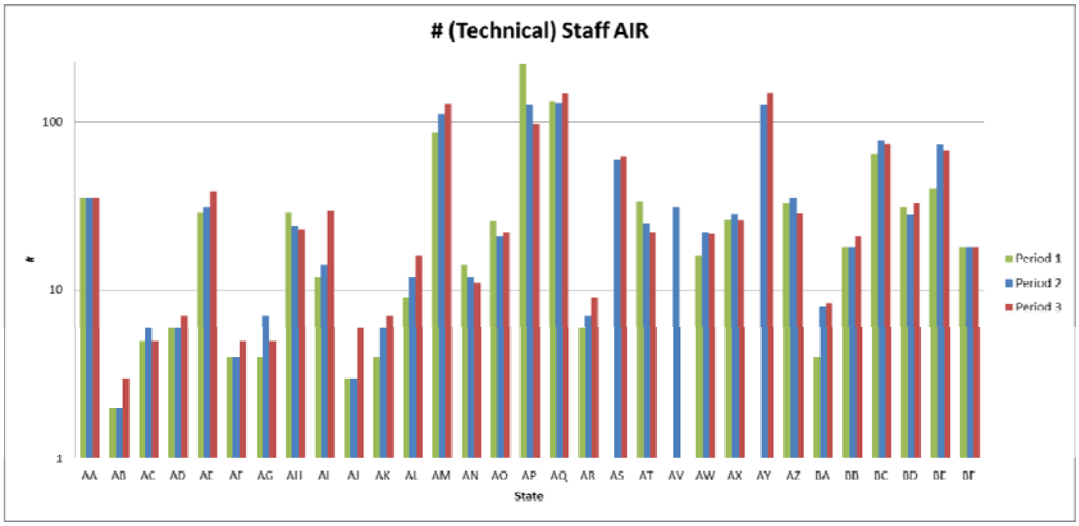
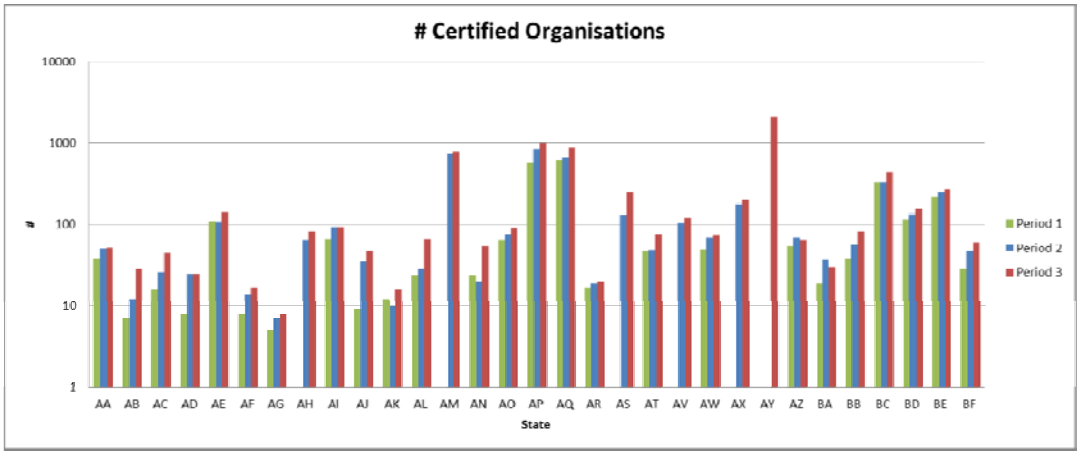
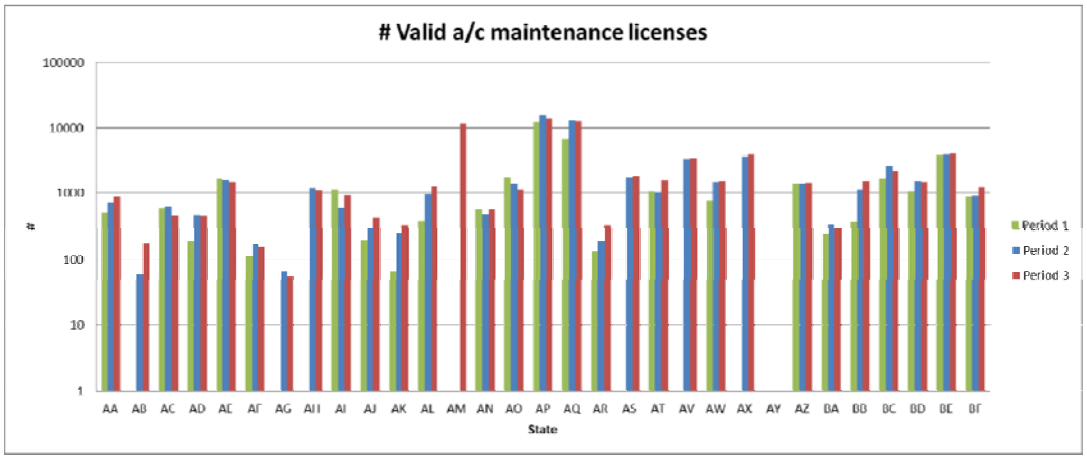
State
Period 1
Period 2
Period 3



11.2 Airworthiness






Valid a/c maintenance licenses
100000
10000
1000
100
10
1
#
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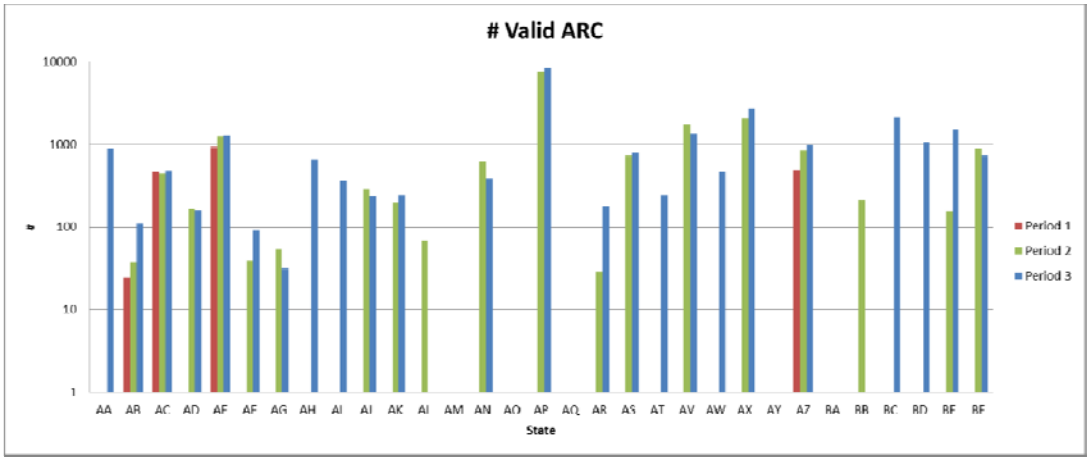
State
Period 1
Period 2
Period 3


Valid ARC
10000
1000
100
10
1
#
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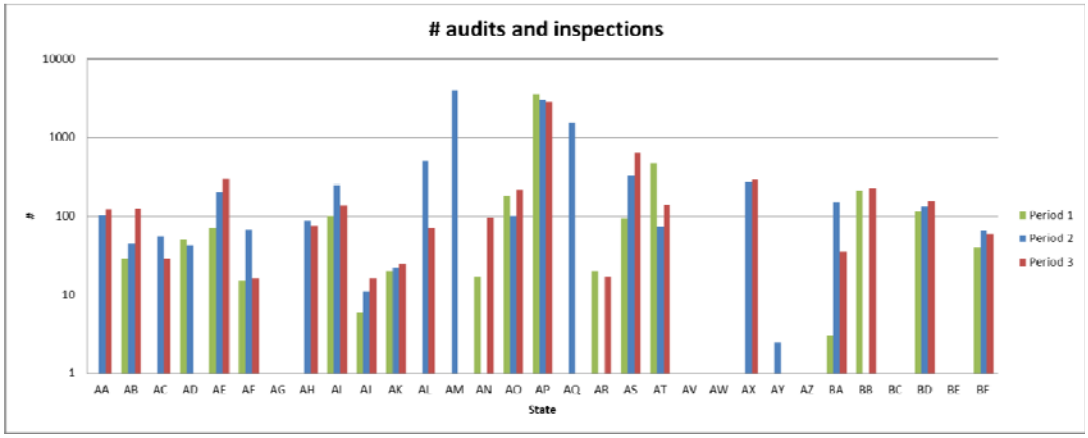
State
Period 1
Period 2
Period 3


audits and inspections
10000
1000
100
10
1
#
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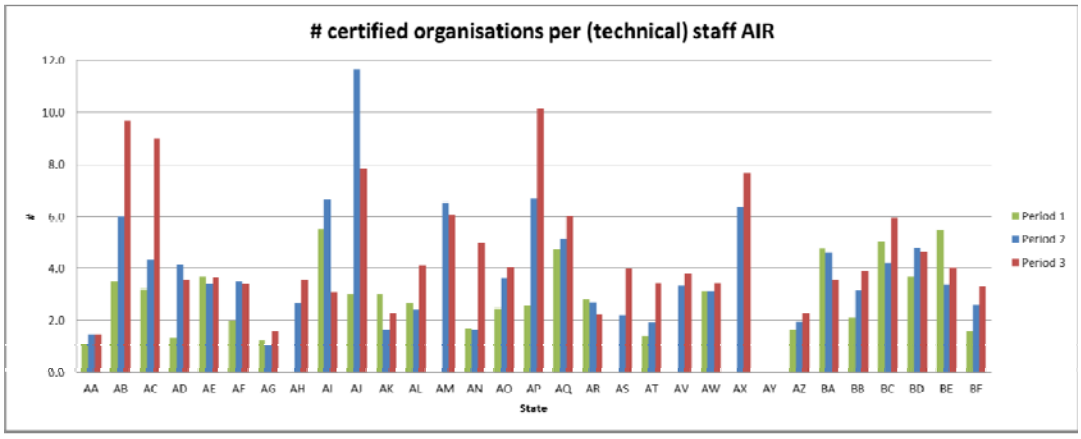
State
Period 1
Period 2
Period 3


certified organisations per (technical) staff AIR
12.0
10.0
8.0
6.0
4.0
2.0
0.0
#
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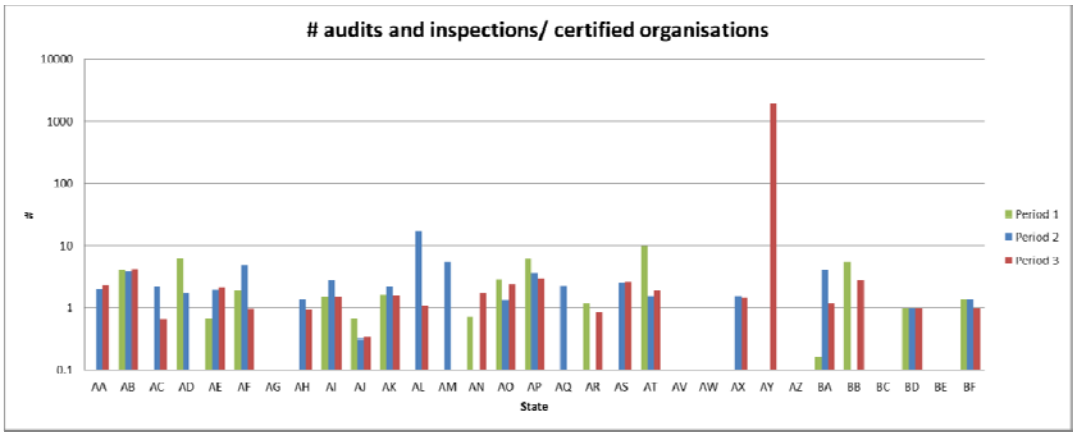
State
Period 1
Period 2
Period 3


audits and inspections/ certified organisations
10000
1000
100
10
1
0.1
#
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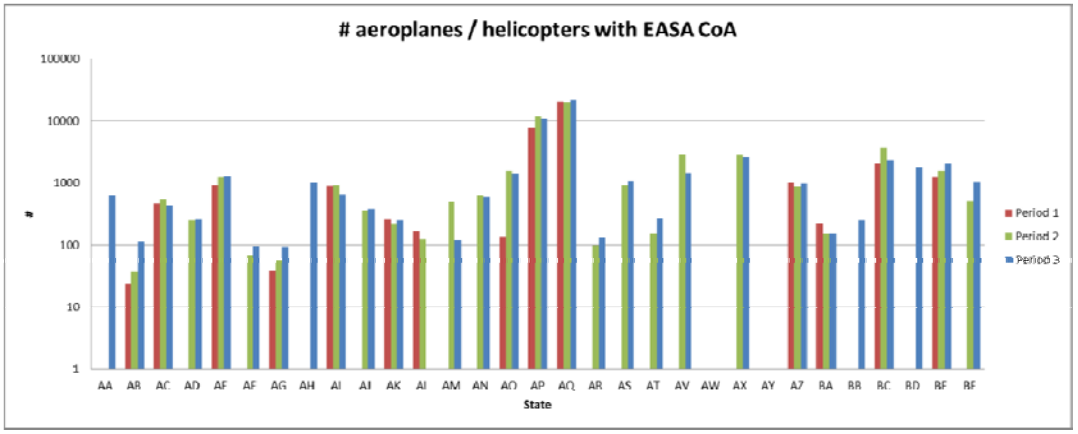
State
Period 1
Period 2
Period 3


aeroplanes / helicopters with EASA CoA
100000
10000
1000
100
10
1
#
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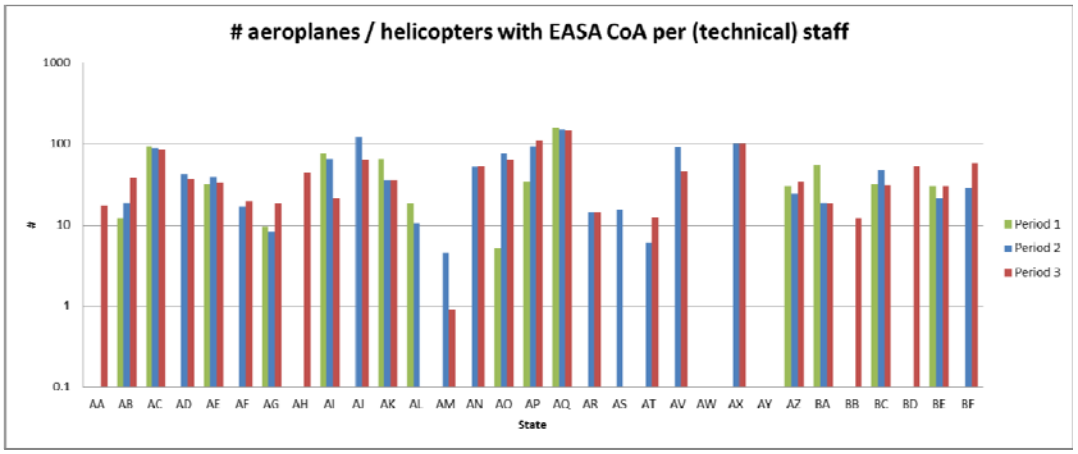
State
Period 1
Period 2
Period 3


aeroplanes / helicopters with EASA CoA per (technical) staff
1000
100
10
1
0.1
#
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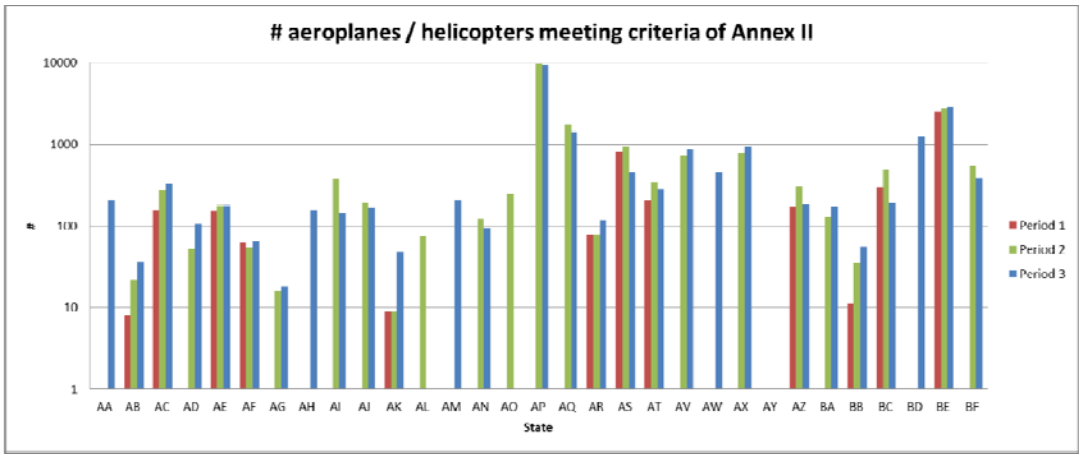
State
Period 1
Period 2
Period 3


aeroplanes / helicopters meeting criteria of Annex II
10000
1000
100
10
1
#
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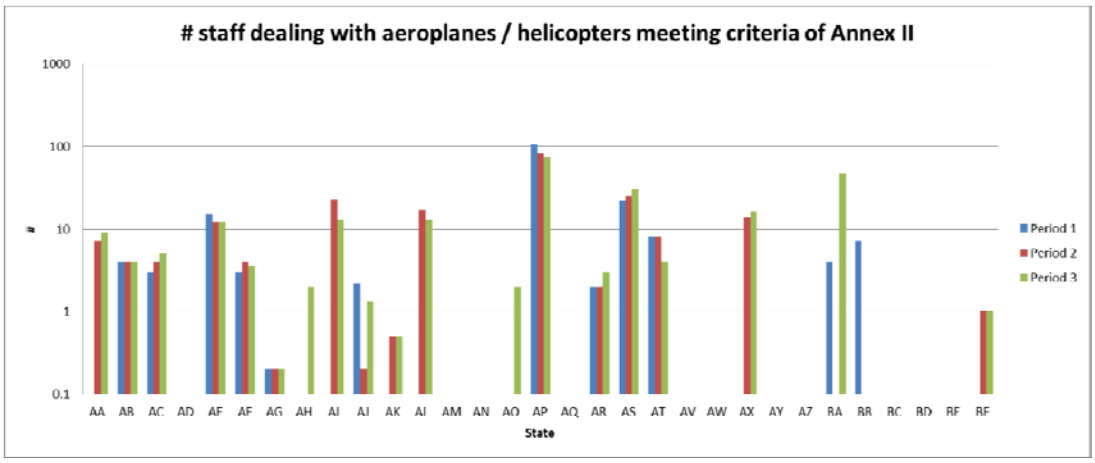
State
Period 1
Period 2
Period 3


staff dealing with aeroplanes / helicopters meeting criteria of Annex II
1000
100
10
1
0.1
#
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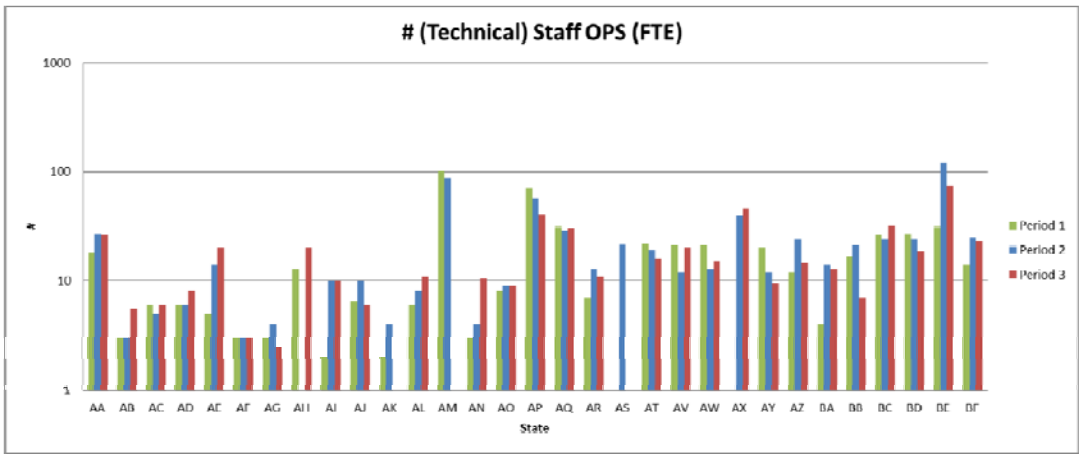
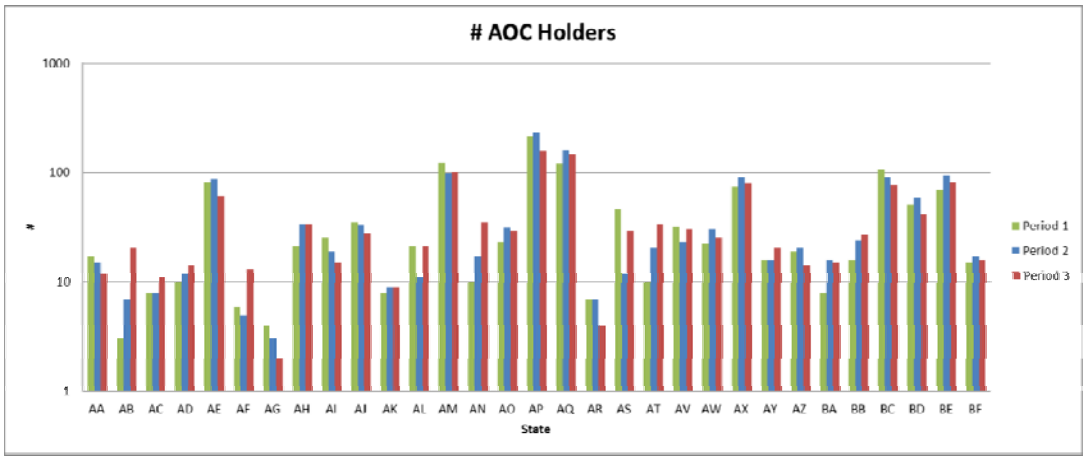
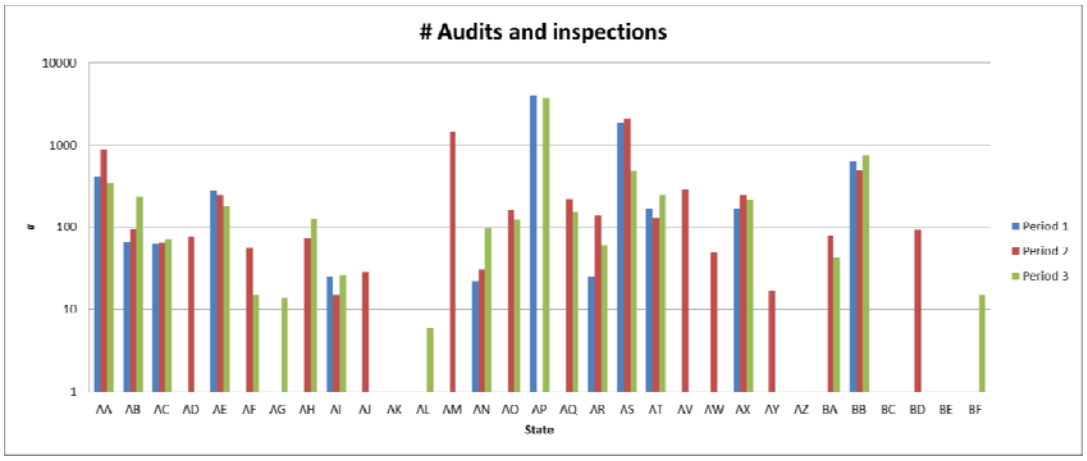
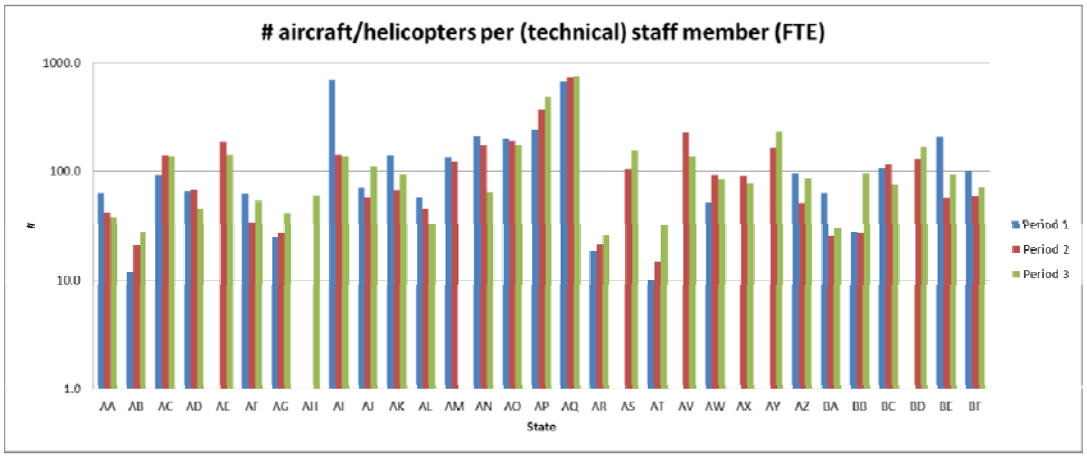
State
Period 1
Period 2
Period 3

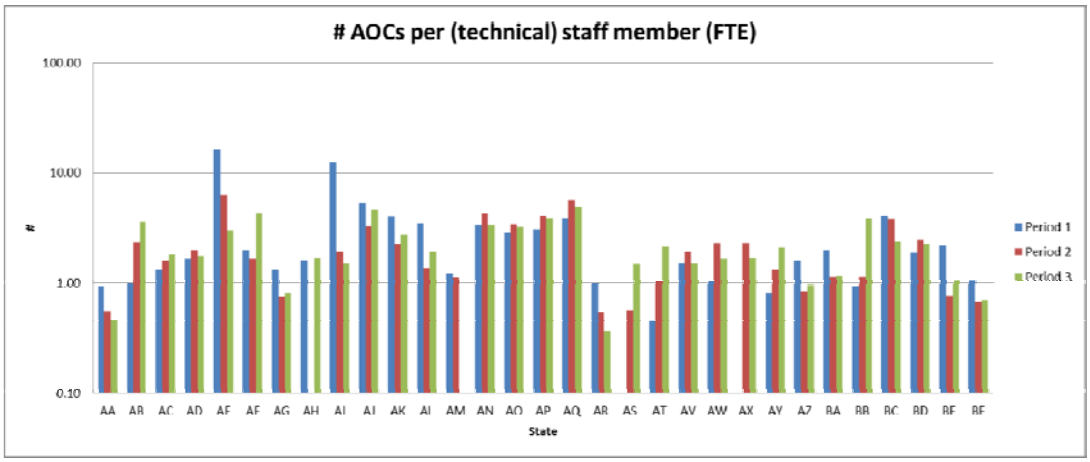
11.3 Operations

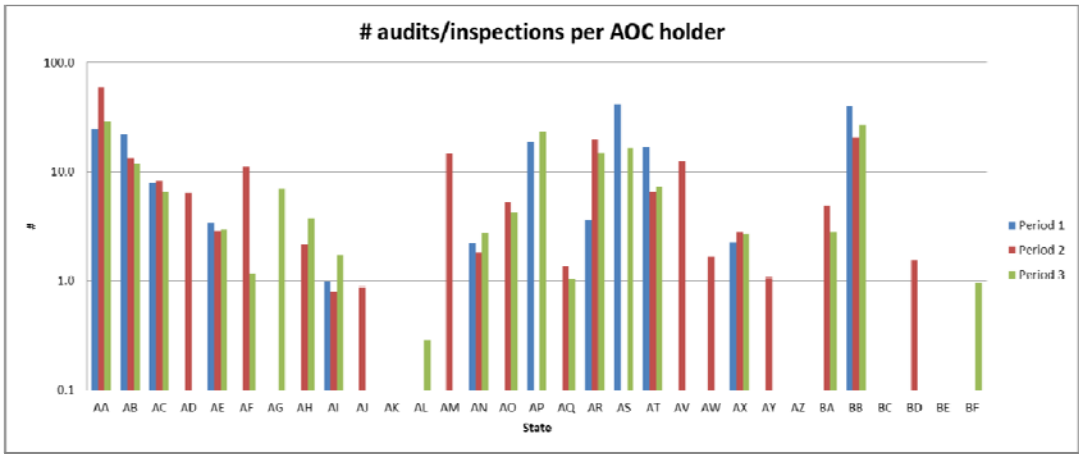




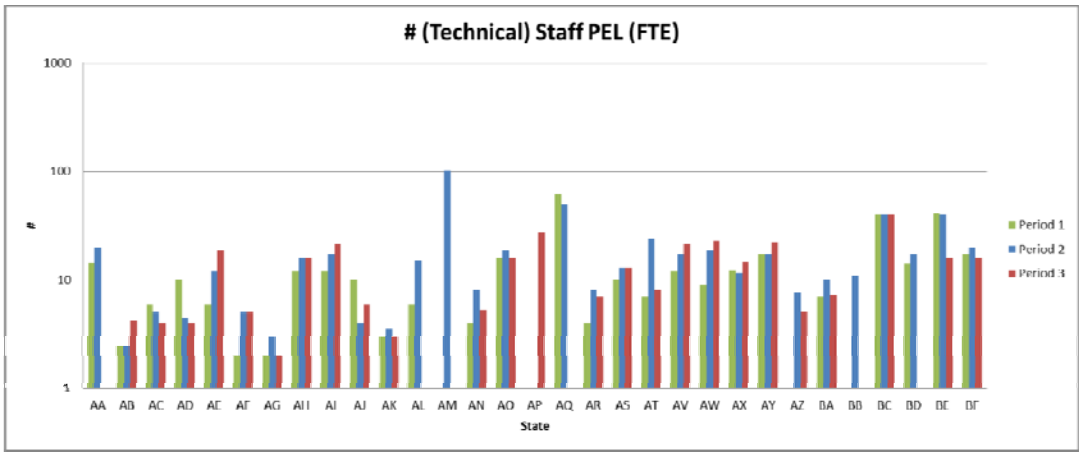


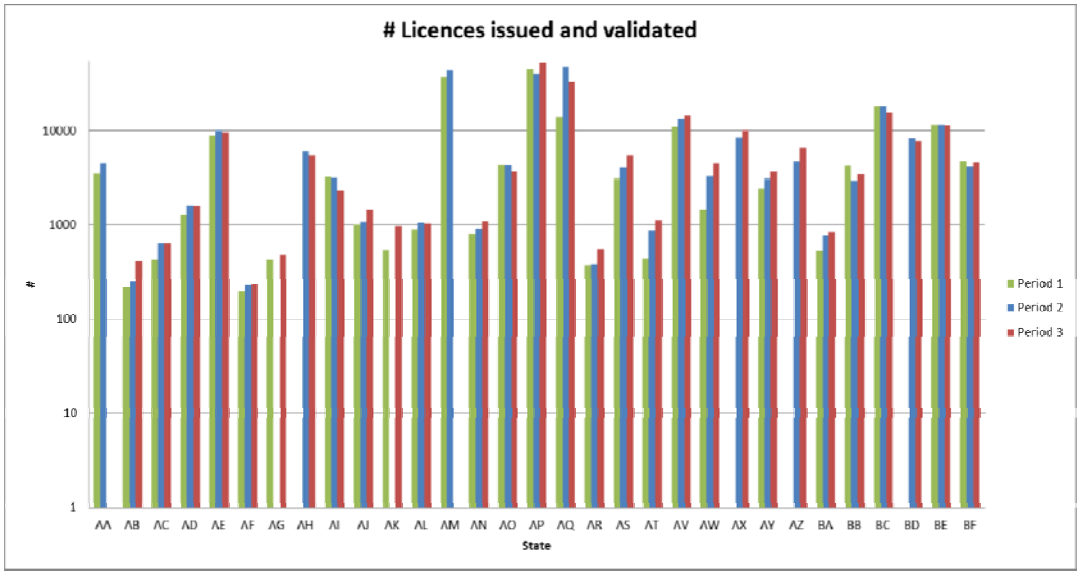

aircraft/helicopters per (technical) staff member (FTE)
1000.0
100.0
10.0
1.0
#
State
Period 1
Period 2
Period 3

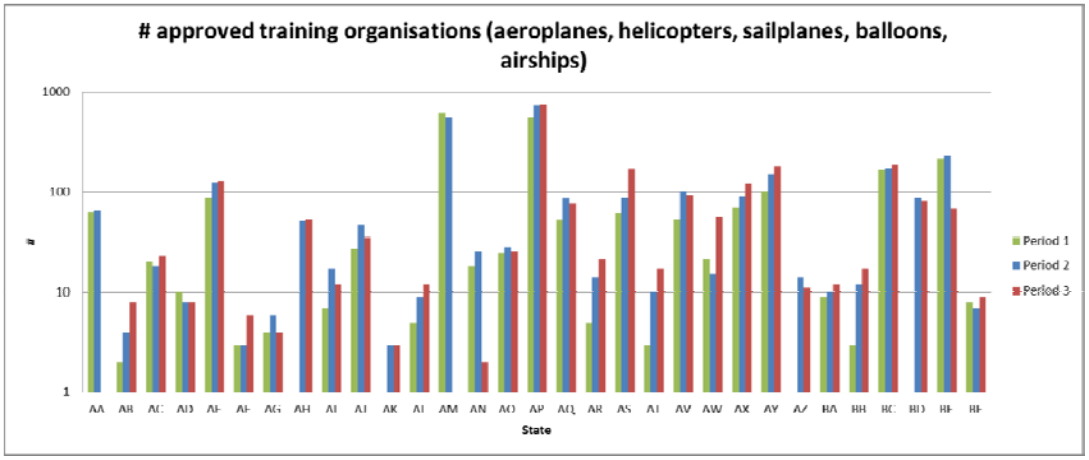

AOCs per (technical) staff member (FTE)
100.00
10.00
1.00
0.10
#
State
Period 1
Period 2
Period 3

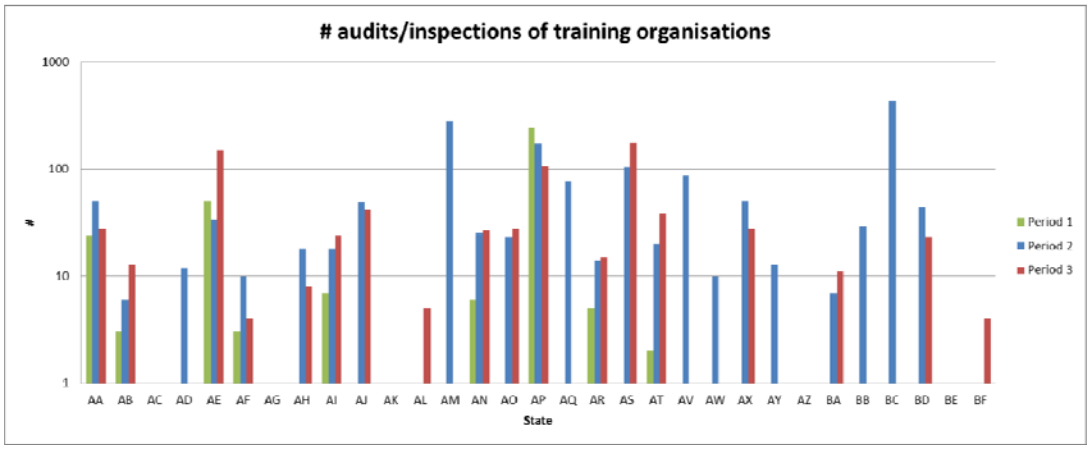

audits/inspections per AOC holder
100.0
10.0
1.0
0.1
#
State
Period 1
Period 2
Period 3

11.4 Personnel licensing








audits/inspections of training organisations
1000
100
10
1
#
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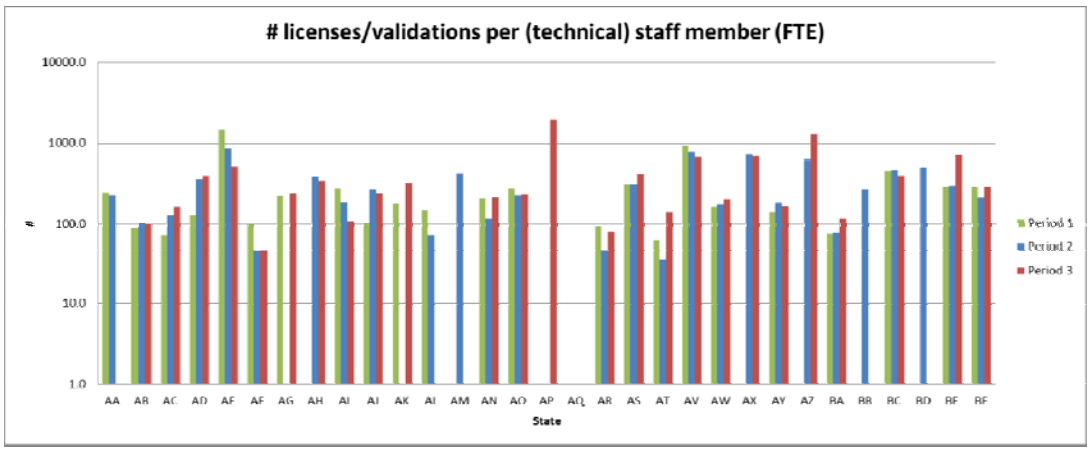
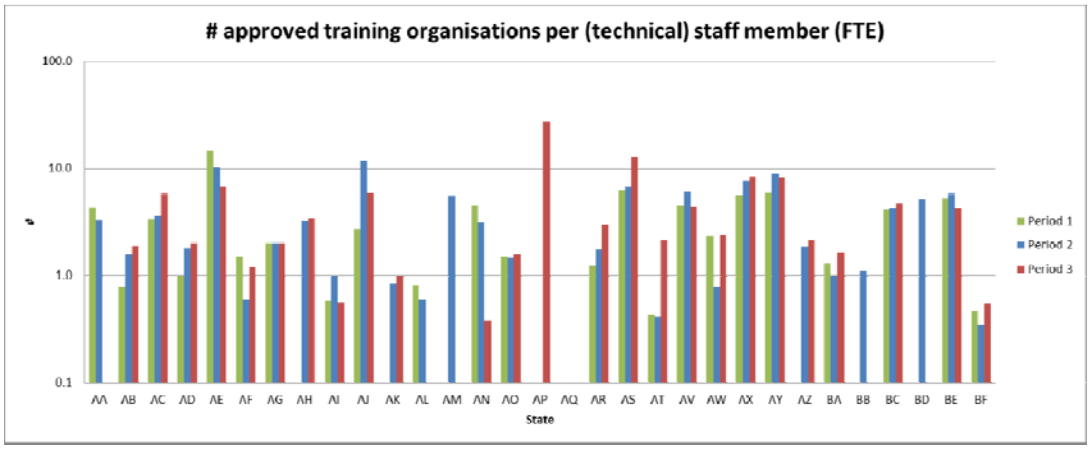
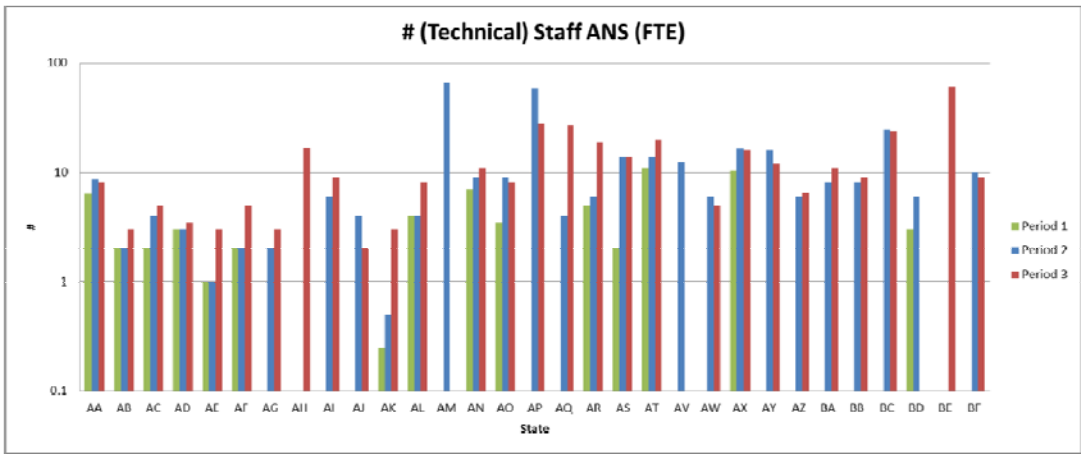
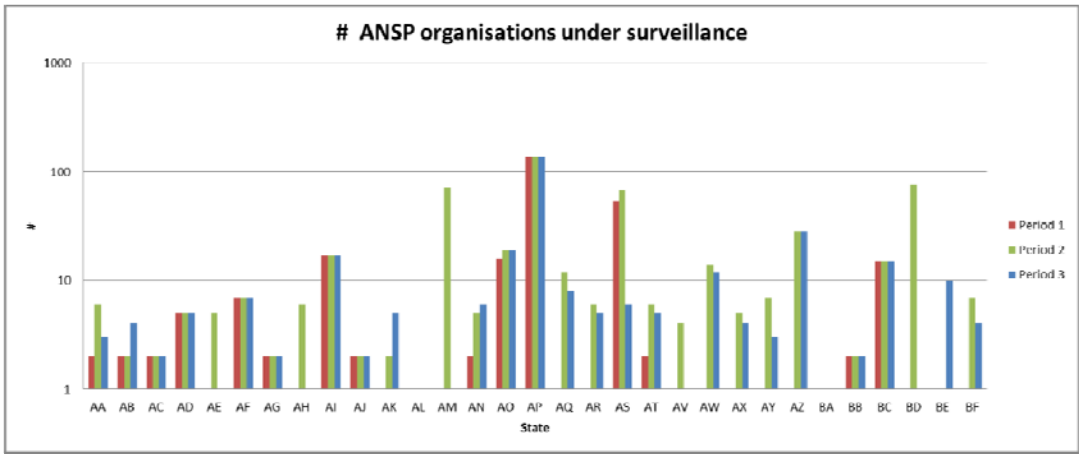
State
Period 1
Period 2
Period 3

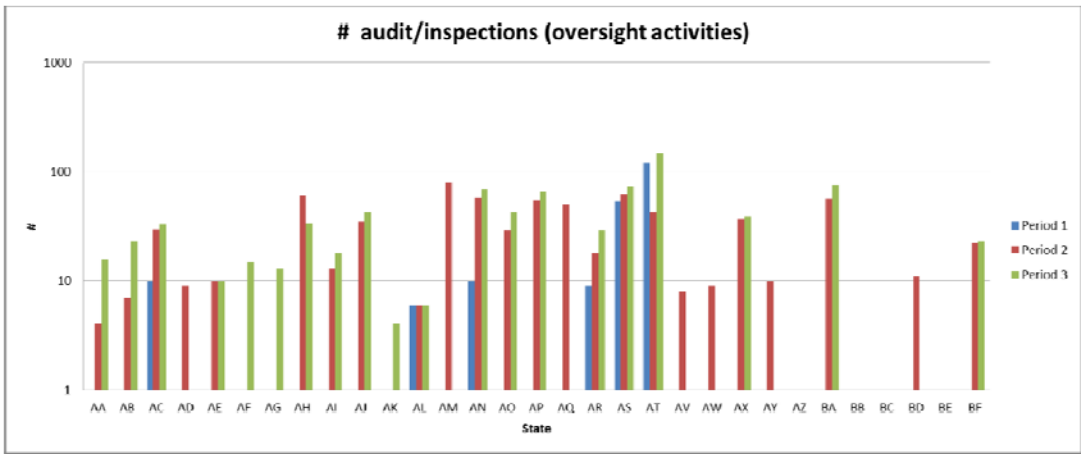

licenses/validations per (technical) staff member (FTE)
10000.0
1000.0
100.0
10.0
1.0
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3

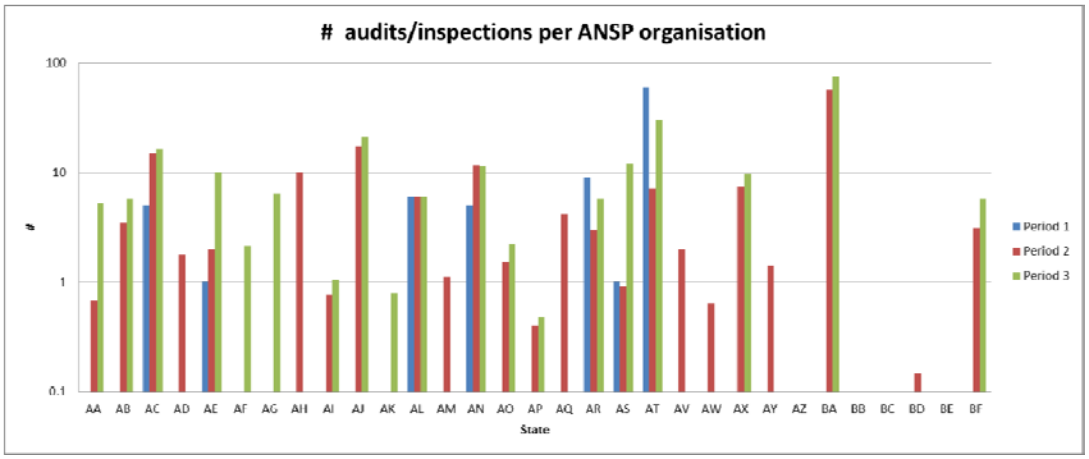

approved training organisations per (technical) staff member (FTE)
100.0
10.0
1.0
0.1
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3

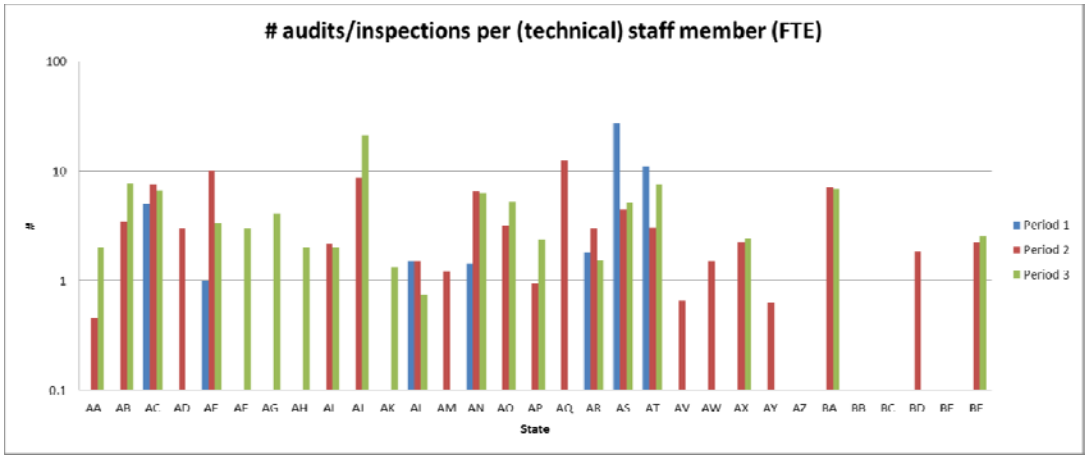
11.5 Air Navigation Services

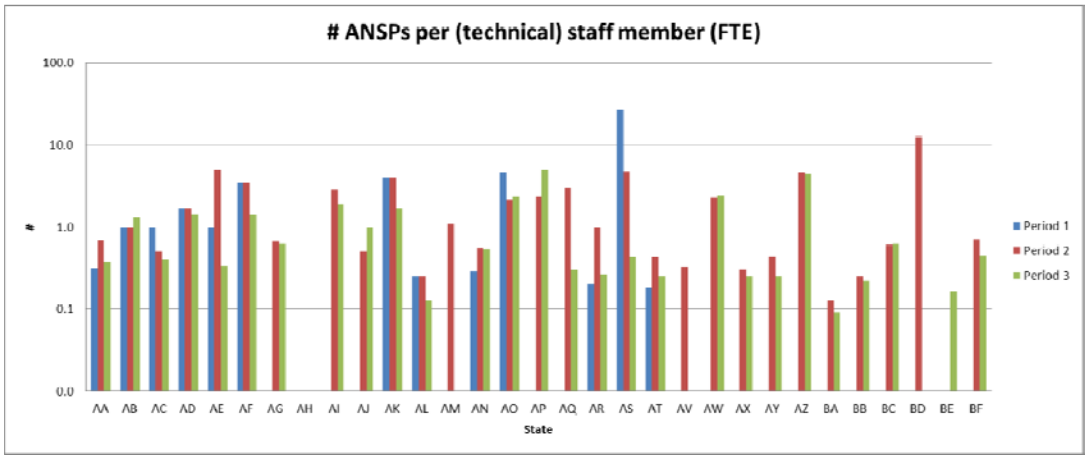




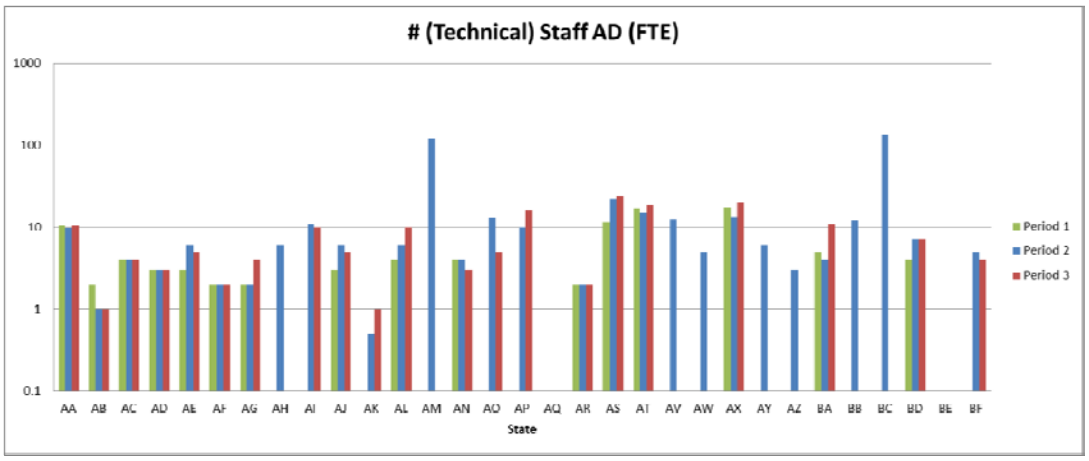


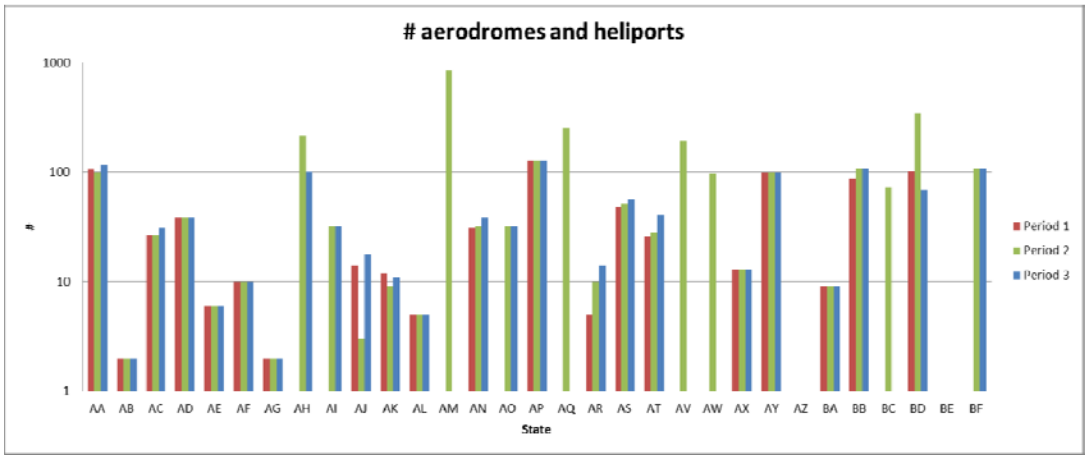

audits/inspections per ANSP organisation
100
10
1
0.1
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3

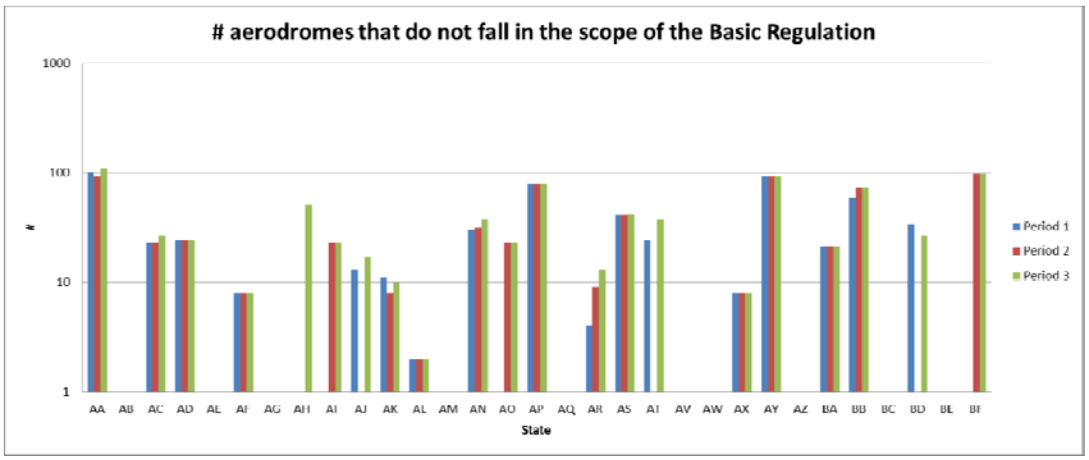

audits/inspections per (technical) staff member (FTE)
100
10
1
0.1
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3


ANSPs per (technical) staff member (FTE)
100.0
10.0
1.0
0.1
0.0
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3

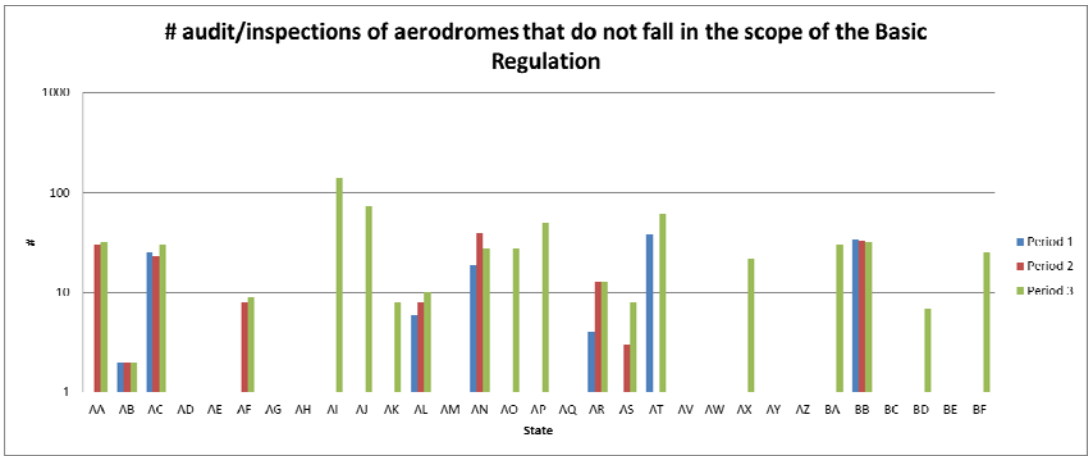
11.6 Aerodromes

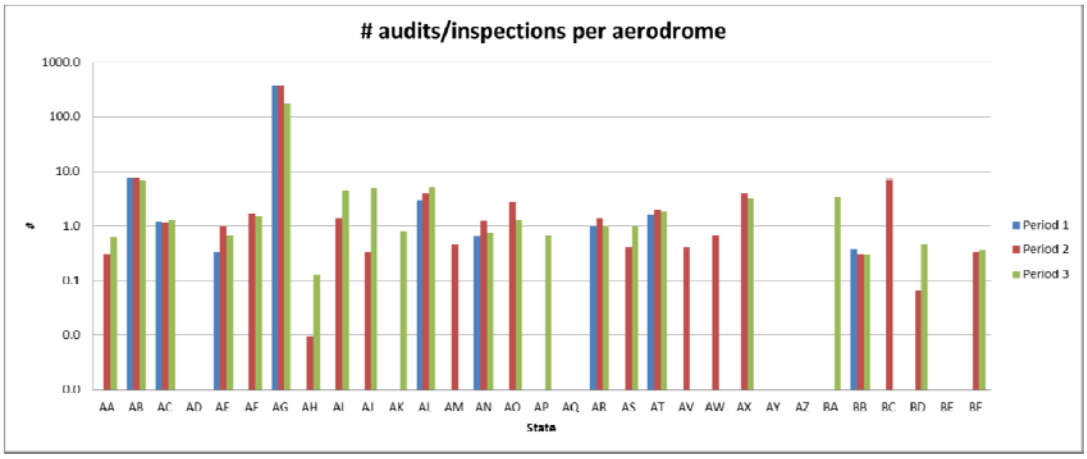


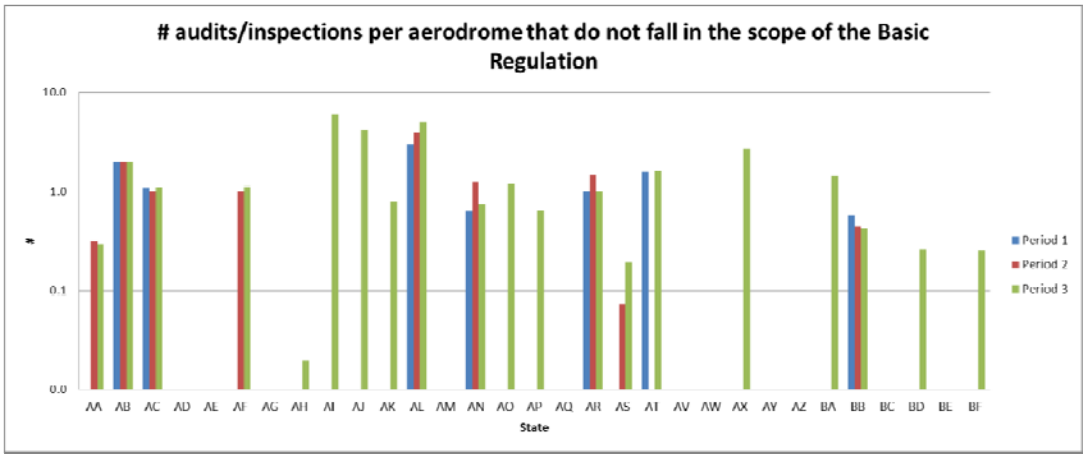


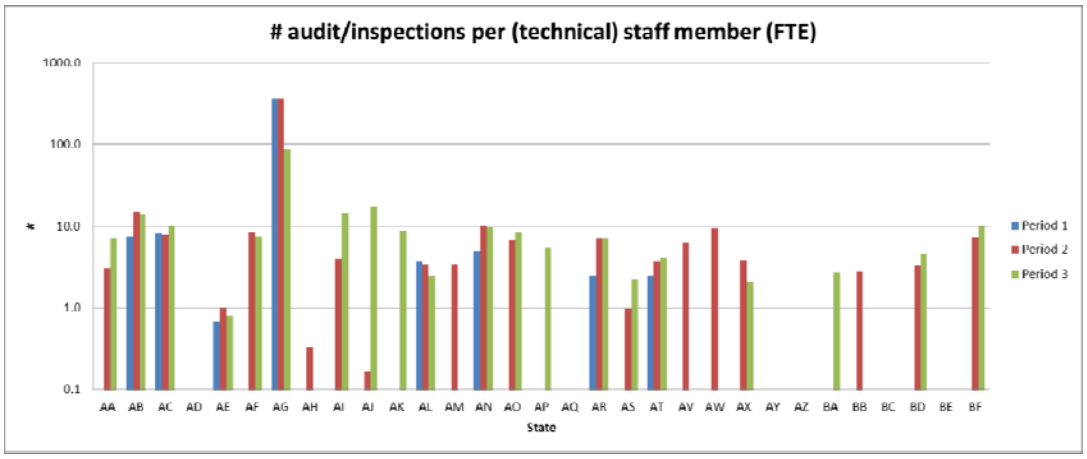


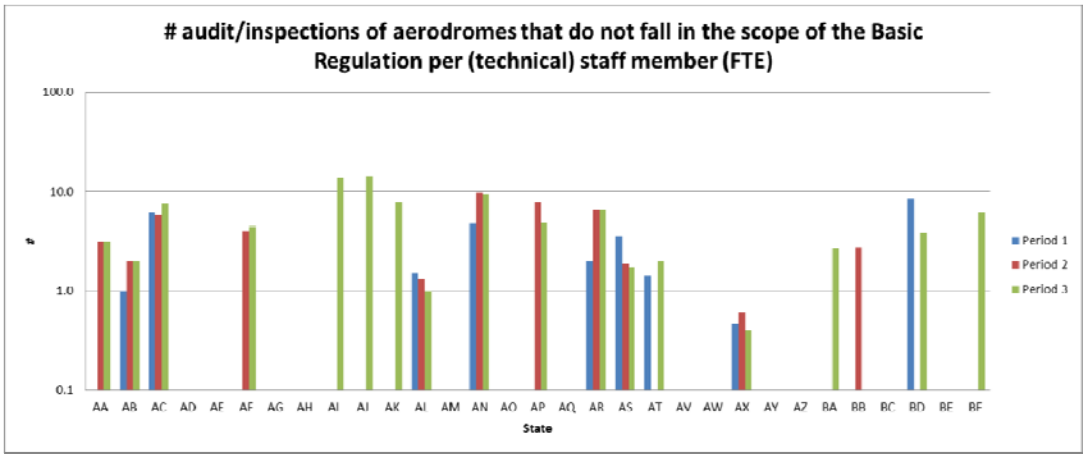

audit/inspections
1000
100
10
1
#
Period 1
Period 2
Period 3
State


audit/inspections of aerodromes that do not fall in the scope of the Basic Regulation
1000
100
10
1
#
Period 1
Period 2
Period 3
State

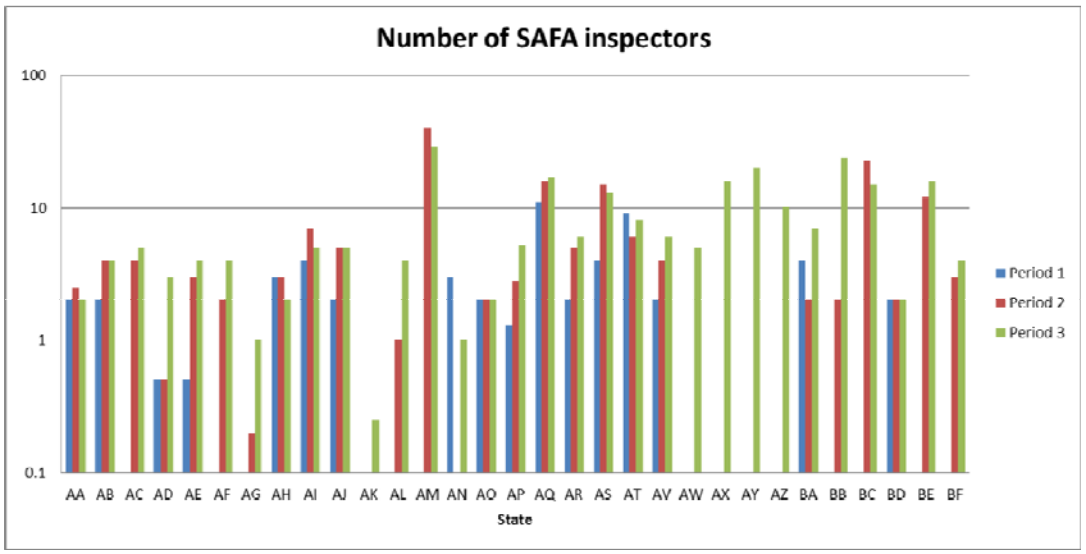

audits/inspections per aerodrome
1000.0
100.0
10.0
1.0
0.1
0.0
0.0
#
Period 1
Period 2
Period 3
State

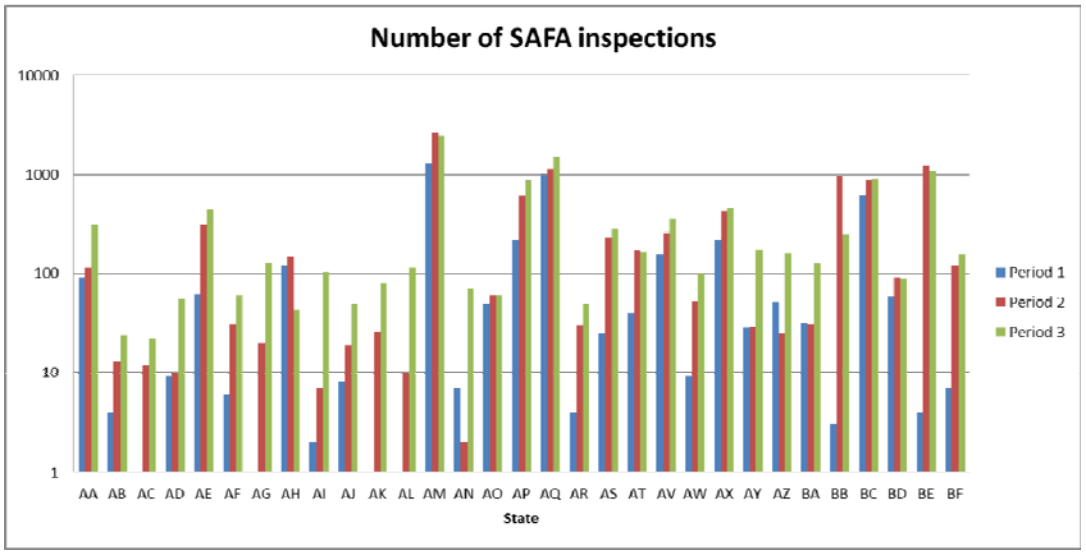

audits/inspections per aerodrome that do not fall in the scope of the Basic Regulation
10.0
1.0
0.1
0.0
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3


audit/inspections per (technical) staff member (FTE)
1000.0
100.0
10.0
1.0
0.1
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3


audit/inspections of aerodromes that do not fall in the scope of the Basic Regulation per (technical) staff member (FTE)
100.0
10.0
1.0
0.1
#
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3

11.7 SAFA


Number of SAFA inspectors
100
10
1
0.1
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3


Number of SAFA inspections
10000
1000
100
10
1
AA AB AC AD AE AF AG AH AI AJ AK AL AM AN AO AP AQ AR AS AT AV AW AX AY AZ BA BB BC BD BE BF
State
Period 1
Period 2
Period 3