Incentive Mechanisms for Large Public-Private Partnerships
Empirical Evidence from SESAR

Master Thesis within Business Administration

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Abstract

The purpose of our thesis is to investigate the incentive mechanisms that may be used for a timely and successful implementation of Public-Private Partnership (PPP) projects. This purpose is achieved by investigating challenges and success factors within one of the largest Public-Private Partnership projects in Europe, the SESAR programme which stands for Single European Sky ATM Research and that aims at modernising the European air traffic management (ATM) system.

The categories of SESAR actors that we investigated include:

- **stakeholders** (airspace users such as Air France, KLM, SAS; ANSPs from Sweden, Finland, Netherlands and the CANSO organisation; as well as airport representatives including Swedavia, Zürich Airport and Guernsey Airport);
- **manufacturers** (e.g. Airbus, Frequentis, Thales);
- **international organisations** as principals (e.g. European Commission – SESAR Joint Undertaking-, EUROCONTROL);
- **advisers** (e.g. Helios UK)

Referring to our contribution to the theory, we identify four categories of incentive mechanisms for timely implementation of large PPP projects:

i. Financial incentives such as loans, proportionate with the level of risks the implementer bears; the deduction of loan fees or reduction of service charges can motivate stakeholders to implement earlier, once they identify a positive business case.

ii. Operational incentives can refer to certain preferential treatment to those who comply and detrimental treatment to those who do not comply.

iii. Legal incentives such as mandates can force commitment and have an impact on the timely implementation of PPP projects within a certain time-frame.

iv. Intangible incentives, such as transparent communication, collaboration and less political behaviour, are seen as major factors contributing to the commitment and trust level among the actors involved, thus, enabling the success of the PPP project implementation.

**Keywords:** Public-Private Partnership (PPP); Single European Sky ATM Research (SESAR); European Commission; Air Traffic Management (ATM) industry; Challenges and Success factors; Incentives; International organisations; Project Management; Implementation.
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Acronyms & Abbreviations

ADP – Aéroports de Paris
AIOPA - International Association of Pilots and Aircraft
AIRE - Atlantic Interoperability Initiative to Reduce Emissions
ANSP – Air Navigation Service Provider (traffic controllers)
ATM – Air Traffic Management
BAA – British Airports Authority
CANSO – Civil Air Navigation Services Organisation
CDM – Collaborative Decision Making
DFS – Deutsche Flugsicherung; German ANSP
DM – Deployment Manager
DP – Deployment Plan
DSNA – Direction des Services de la navigation aérienne; French ANSP
EADS – European Aeronautic Defence and Space Company
EASA – European Airspace Safety Agency
EC – European Commission
ENAV – Ente nazionale per l’assistenza al volo; Italian ANSP
ERTMS – European Rail Traffic Management System
FAB - Functional airspace block
Finavia – Finnish ANSP
ICB – Industry Consultation Body
I-4D – Initial 4D flight
IP - Implementation Package
KLM – Royal Dutch Airlines
LFV – Luftfartsverket, Swedish ANSP
LMA – Last mover advantage
LVNL – Luchtverkeersleiding Nederland; Dutch ANSP
NATS – UK ANSP, formerly National Air Traffic Services Limited
Naviair – Danish ANSP
NextGen – Next Generation Air Transportation System, name given to the new National Airspace System initiated by Federal Aviation Administration in the US.
NLR – Nationaal Lucht –en Ruimtevaartlaboratorium = National Aerospace Laboratory, Netherlands
NORACON – North European and Austrian Consortium, consisting of eight European ANSPs.
NPM – New public management
PPP – Public-Private Partnership
PRB – Performance Review Body
SAS – Scandinavian Airlines System
SES – Single European Sky
SESAR – Single European Sky ATM Research; the technological pillar of SES that aims at building the future European air traffic management (ATM) system.
SJU – SESAR Joint Undertaking
Skyguide – Switzerland ANSP
Swedavia – owns and operates the major airports in Sweden.
WP – Work package
1 Introduction

In an ever-changing business environment more and more corporations engage in partnerships in order to pursue common interests and goals. Collaborations are often cumbersome in terms of regulations, management and performance. Such co-operations in industries that are owned by both public and private sectors are especially challenging. They may involve stakeholders both at national and international level. Private and public stakeholders possess different competences as well as are characterized by different interests. Therefore, questions of how to organize and attain results in such public-private collaborations are important to address.

An example of such collaborations serve the Public-Private Partnerships (PPP). A PPP is a cooperative project containing partners from both public and private sectors involving the expertise of each stakeholder (Tang et al., 2010). Tang et al. (2010) add that PPPs aim at best meeting clearly acknowledged public needs using the right allocation of resources, risk management and incentives. Furthermore, the private sector has to deliver results by providing all the resources needed - managerial, financial and technical (Grimsey & Lewis, 2005). This combination of public and private stakeholders makes management and leadership very complex, and if such partnerships exist at multinational level then achieving goals is even more challenging.

Salipante and Golden-Biddle (1995) argue that it is very difficult and time consuming to change the traditions of non-profit and public organisations, because of the policies and cornerstones that have been implemented throughout the years. Therefore, appropriate structures, policies and culture should be put in place before leading change (Jones, 2012; Burns, 2008). Moreover, Meng & Gallagher (2011) suggest that incentive provisions can be used as a contractual strategy with a significant potential to address performance problems.

Alain Jeunemaitre (2011) is a researcher at Oxford University and member of the Scientific Committee of one of the largest Public-Private Partnerships in Europe within the Air Traffic Management industry named SESAR (Single European Sky ATM Research). Mr Jeunemaitre has coined the notion of the “last mover advantage” affecting PPPs such as SESAR. This last mover advantage occurs when the intended outcome of a PPP is not synchronized in a timely manner. For example, an airline investing in a new airborne equipage will not see any benefit before the ANSPs (Air Navigation Service Providers) have made the corresponding investment on the ground. On the other hand, for an ANSP, the business case may not become positive until a significant number of aircraft are equipped. This dilemma triggers the last mover advantage and needs to be tackled through ways to stimulate and govern a timely synchronization of implementation of a certain PPP project. Moreover, incentives, on
how to improve a timely implementation of a project that involves multiple firms or stakeholders, to date lack an adequate academic discussion.

To sum up, we intend to investigate the incentive mechanisms that could be used for a timely and successful implementation of Public-Private Partnership projects. We start the thesis with a review of literature that has discussed the concept of PPP and their key elements and more specifically, elaborate on the concept of incentives in the context of large Public-Private Partnership projects. In the empirical part of this paper, we investigate the air traffic management industry evidenced through a modernization project and further introduce the PPP case study, SESAR, which is currently undergoing in Europe, including the incentive approaches to be adopted in the deployment phase of this project. Since the deployment phase of SESAR is planned to start in 2014 and will continue throughout the 2020’s we discuss how the investigated approaches may contribute favourably or unfavourably to the project’s performance. Consequently, since the Public-Private Partnership being investigated is of large proportions with multiple public and private partners, the theoretical contributions of this paper can refer to a comprehensive range of findings and assessments. Finally, we derive implications of the analysis to the area of incentives in large Public-Private Partnership projects and provide suggestions for further research.

2 Theoretical framework

With the purpose to create understanding about the chosen topic, we have reviewed the organisational theory of Public-Private Partnerships and analysed the challenges met regarding the timely and synchronized implementation of such projects as well as the incentive mechanisms used for enabling PPP performance.

This literature review starts with new public management theory, in order to understand what specific characteristics public organisations traditionally bring into a PPP.

2.1 New Public Management

The public sector covers an organisational form that is known as ‘state’ or ‘government’, but the theory ‘public sector’ is much wider that those two models (Lane, 2000). It involves an array of government activities, public finance and public regulation in general. Everything that is outside the public sector expresses the private sector or civil society. This is called also the ‘market economy’.

New public management (NPM) theory emerged in the United Kingdom and it emphasizes the change in the pattern of how the public sector could be managed (Lane, 2000). NPM involves areas such as game theory, law and economics. NPM is also the label for reforms created by academics in order to improve the performance and efficiency of public sector organisations (Pollitt et al., 2007). It started with
developing performance indicators benchmarked on private sector models, placing executive bodies to run the institutions, establishing Public-Private Partnerships, and introducing new governance techniques and mechanisms.

Lynn (1998) explains that new public management differs from traditional management through three practical legacies: 1) NPM is more focused on performance within the administration, institutional arrangements and structures; 2) NPM has a wider international and comparative perspective; and 3) NPM integrates many spheres such as economics, sociology or socio-psychology.

The main tool for governments to manage the public sector is by a set of contracts and agreements (Lane, 2000). Also, in order to manage people, rules are used as a core in accomplishing tasks, as without the rules those tasks would not be done. In addition, Kaboolian (1998) argues that new public management policies require managers to achieve their performance measures for which they are liable, but do not set them free from routines and regulations which limit their performance range. This is also seen as a challenge in Public-Private Partnerships (Tang et al., 2010), where the public party is ‘stubborn’ and focuses on following rules and regulations while it holds back the private partner which is more flexible and business oriented.

### 2.2 Public-Private Partnerships

Collaborative activities between all sectors have become more recognized and widespread in the past 30 years, and this has resulted in revolutionary change in institutional forms of governance (Selsky & Parker, 2005; Alter & Hage, 1993: 12). Examples of collaborative alignment include partnerships among three main societal sectors – government, businesses, and civil society. The main goal of those engagements is to tackle social issues and causes (Selsky & Parker, 2005; Sternberg, 1993; Stone, 2000; Young, 1999). Cross-sector partnerships differ in a great amount, starting with the scope, size and objective (Selsky & Parker, 2005). They also differ from duets to multiparty agreements, from local to global, short or long-term, and from volunteer to fully mandated. In addition, all sector organisations face the pressure of changes and increasing public expectations, which is one of determinants of partnering up across sectors. Many scholars have tried to define cross-sector partnerships, but they still struggle to accept one common definition, that is why the terms vary (Selsky & Parker, 2005):

- issues management alliances (Austrom & Lad, 1989)
- inter-sectoral partnerships (Waddell & Brown, 1997)
- strategic partnerships (Ashman, 2000)
- social alliances (Berger et al., 2004).
Waddock’s (1991) comprehensive definition of cross sector partnerships states that these are collaborative efforts of organisational representatives from two or more economic sectors, who meet to cooperatively try to overcome a mutual social issue or a problem that is identified through a public policy agenda. In particular, a Public-Private Partnership (PPP) is a long-term contract, which requires strict performance regimes (Grimsey & Lewis, 2005). The private sector partner has to deliver services in order to meet specified levels, also providing all the resources needed – managerial, financial and technical. In addition, the private partner takes the responsibility for risks taken for achieving the required service specification.

The literature in the field of Public-Private Partnerships states that those partnerships are managed through numerous of agreements, contracts and legal procedures that define the relationships and mutual benefits clearly (Pongsiri, 2002; Milliman & Grosskopf, 2004). Detailed regulation of organisational arrangements to specifically combine resources and activities is probably the most important requirement for high partnership performance and it has been proven to be more beneficial than standard organisational models (Grandori & Soda, 2006). In addition, the organisational arrangement is a core of coordination mechanisms. Within this mechanism the management should recognize ties that should be strongly coupled and ties that can be loose enough, in order to achieve better results. However, De Jong and Woolthuis (2008) argue that inter-organisational trust within partnership is a relevant antecedent, which involves even more value than contractual agreements. Therefore, Grandori and Soda (2006) state that some units of the whole partnership should be standardized (and managed through regulations), but some should be seen as resource units with a certain freedom in accomplishing their tasks.

The Office of Technology Policy (cited in Link, 1999, p. 213) proposed findings about PPP, based on the private partners’ point of view. Public-Private Partnerships:

1. Create value for society, foster the national competition, reduce risks for private and public entities, and increase the time for technology diffusion.
2. Enhance the effectiveness of government mission through the private sector commercial technologies, production efficiencies, and cost reductions.
4. Improve the regional economy through new jobs, products and profits.

According to Colombo et al. (2011), a crucial phenomenon in innovation studies has become that firms, in order to improve their innovativeness, can take advantage of knowledge gained from networks with external stakeholders. In order to do so, firms complement or even substitute their existing organisational structures with the network structures, so that the hierarchy flattens out in favour of new organisation forms. Innovation is an interactive action linking both formal and informal
relationships (social capital) between different actors collaborating through social networks (Doh & Acs, 2010).

Also Public-Private Partnerships become a more and more popular option of innovative project delivery, where the private partner invests its capital and expects it to be recovered through the operation income within the concession period (Ng et al., 2007). The shorter the concession period for a PPP project, the more beneficial it is for public as well as private partners as it allows to start operate earlier, hence, shortens the payback time on investment and helps to create a positive business case.

Within this thesis, we investigate in-depth a case of a PPP, which was instigated in order to deliver an innovative project. As project delivery requires some specific knowledge, below we review relevant project management literature.

2.3 Project Management
One of the first attempts to define project management was delivered by Oisen in 1971 (Cited in Atkinson, 1999, p. 337), who defined it as the application that has collected a variety of tools and techniques to focus the use of all resources to accomplish a unique and complex task that would fit time, cost and quality requirements. Today, the British Standard for project management BS6079, 1996, (Cited in Atkinson, 1999: 338) emphasizes that the project management contains planning, monitoring and control of all parts, and the motivation of all the stakeholders is seen as crucial in order to achieve the project goals on time, appropriate quality and to the specified cost. Even though there is not one simple description of project management, scholars agree that it is planning, coordination and control of complex and diverse activities, mostly of industrial and commercial projects (Reiss, 1996; Atkinson, 1999).

According to Atkinson (1999), three mostly used criteria of measuring the success of project management are cost, time and quality, known also as the Iron Triangle, but the scholar argues that there should be other success criteria considered, besides those three. Looking at reality, projects continue to fail, even though the success factors and criteria are known. This might be because the project management acquires new factors to achieve its goals, e.g. new methodologies, techniques, tools and knowledge, but continues to measure project management using ‘old’ criteria. Atkinson (1999) also suggests that it is of great importance for project management success to acknowledge and measure information exchange quality between different stakeholders, as well as different interests and goals’ exploration of all parts involved. In addition, an important role for the successful development and implementation of a project plays the understanding of the complexity of interconnections caused by social interfaces and boundaries between different organisations (Antoniadis et al., 2011). If managed appropriately the interconnections can improve the project’s schedule performance and implementation of innovative actions. Nevertheless, large multi-firm projects are seen as a dynamic network where different organisations combine their resources,
knowledge and capabilities in order to achieve some common goals, like construction of a nuclear power plant, or establishing a synchronized air traffic system. However, each actor is directed by its own interests and partially implicit objectives. That is why large projects face a variety of challenges if objectives and expectations of different actors conflict.

According to Marrewijk et al. (2007), large complex PPP projects often fail with meeting costs and time schedules, and are motivated by legal interests rather than public interests. This is also because those projects are limited by their governance structures and strategies imposed by the principals. The scholars emphasize that the key success factor for a positive outcome is cooperation between all project members. Ruuska et al. (2010) suggest four changes to overcome the current perspective of large multi-firm and multi-national projects. Firstly, a shift from seeing multi-firm projects as hierarchies towards considering them as complex supply networks within networked flat organisational structure. Secondly, a shift from the predominant forms of governance towards novel approaches that enhance network-level mechanisms like self-regulation within the project. Thirdly, a shift from seeing the project as a temporary whole towards seeing it as short-term events within a long-term sphere considering the common history and future expectations of actors involved. Fourth, a shift from a limited view of a hierarchical project management system towards an open system view which entails the management of complex systems within challenging institutional environments. For a PPP project to enhance chances of success, the public sector partner could act as a private organisation in terms of execution of the project (Reijniers, 1994). It can put in place particular rules and regulations while understanding democratic decision-making process. Continual policy changes limit cooperation within a PPP project. If the public sector needs to change rules, principles and preconditions, then it should support the private sector with appropriate compensations for arising consequences. Moreover, Ruuska et al. (2010) emphasize that it is crucial to understand that a large multi-firm project cannot be managed only by closed activity of one or few actors; that is why they developed key elements that play a major role in managing large multi-organisation projects:

- Contracts and agreements between involved parties;
- How risks are shared by project stakeholders;
- How work is controlled and coordinated within the project;
- How the project stakeholders collaborate;
- How communication between stakeholders is organized.

When timely implementation of a project is the prime objective, then according to Jha and Iyer (2007) key success factors are: commitments of the project participants;
principals’ competence, and principals’ ability to minimize destructive conflicts and control the constructive conflicts among project participants. According to El-Gohary et al. (2006) and Tang et al. (2010), understanding the importance of positive involvement of stakeholders in PPP projects is a crucial step towards establishing an involvement programme that will enhance the management and stakeholders’ communication. Effective interaction between stakeholders can be a critical success factor for a PPP project.

2.4 PPP Challenges

However, different actors in those partnerships will most likely have different goals, they will think differently and their approach will be different, too (Groves, 1973; Selsky & Parker, 2005). Moreover, misunderstanding and conflicts may arise if there is a lack of a strong relationship between public and private stakeholders (Tang et al., 2010). Nevertheless, those partnerships tend to break down the social boundaries between different nations, organisations and sectors (Selsky & Parker, 2005).

Thus, as most Public-Private (PP) projects require legislations, many of those projects have resulted in failure (Tang et al., 2010). Political obstacles stand in the way in those cases. Wagner & Llerena (2011) emphasize that policymakers sometimes even intentionally require non-feasible demands from the companies. And it is even more challenging to develop specific knowledge if it is not linked to the core competencies of the firm. That is why companies need considerable time and resources to accomplish what has been demanded from them. In addition, the governmental organisations may resist change in the delivery or financing.

Jha and Iyer (2007) mention some key failure factors for timely implementation of a project, namely: lack of coordination among participants, principals’ ignorance and lack of knowledge, hostile socio economic environments, and projects participants’ indecisiveness. Tang et al. (2010) divide three main risk categories: internal, specific project related and external (force major etc.).

According to Paier and Scherngell (2011) the most important challenges to collaboration are:

1. Geographical distance and spatial barriers, which means that some knowledge and routines are difficult to transfer within a space from some individuals or corporations to others.
2. Thematic distance, which emphasizes the necessity of complementary elements of the individual or corporation that are difficult to transfer without appropriate mutual relationships (Breschi & Lissoni, 2001).
3. Politically unwanted adaptation process (cultural or political barriers within an organisation).
That is why attention should be focused on agents’ preferences and organisational challenges in order to create appropriate incentive contracts (Beatty & Zajac, 1994). According to Groves (1973), in competitive free enterprise economies those agents that are encouraged by self-interest are more likely to achieve informational efficiency through individual decision making. However, in economies where decisions are made centrally, the Central Planning Bureau (CPB) guarantees the quality of the information through detailed instructions to all agents, or creates decentralized decision making system in which the incentives should be used in order to motivate the agents to behave in the advised way. The incentive challenge exists in any large organisation. As stated by Schultze (1969, p. 203) “the problem of incentives is... an aspect of social behaviour which should be taken into account at every stage of public policy formation”. Incentive problems appear in projects with many members who have different resources, information and decision policies, and one clear organisational objective may not be synchronized with members’ individual interests.

2.5 Incentive mechanisms

According to Groves (1973), the main management problem of any organisation or project is to choose the right incentive rules that will stimulate subunit managers to spread important information and make optimal decisions. Incentives are used as a tool in order to control the managerial performance and behaviour (Beatty & Zajac, 1994). Thus, government agencies are very much like large, complex corporations, and the incentives can be drawn upon the general theory, mainly concerning the organisation and regulation (Rose-Ackerman, 1986; Tirole, 1994; Dixit, 1997). However, Martimort and Pouyet (2006) argue that delegation in public services (like transportation) is much more complex than in normal businesses as it requires performing a compound range of tasks. Task delegation from the public sector to the private one very often is managed and overlooked through specifically organized agencies.

Also the outcomes of the government agencies are difficult to measure as there are very little substitutes, this is why it is complicated to use market-based or benchmark competition for incentives (Dixit, 1997). For this reason, the incentives in those organisations should not be financial, rather complex, large, multidimensional bargaining games. As there are many agents and many principals (institutions that one has to respond to), the moral hazard leads to the loss of a power of incentives. Also public projects, as they involve many different stakeholders, are most likely to meet political multi-principal incentive problems. For example, in the EU the sovereign member countries are liable to answering to the bureaucracy in Brussels, which is the reason why government agencies are neither managerial nor administrative organisations, and they have fragile incentives (Wilson, 1989; Dixit, 1996; Dixit, 1997).
In general, governments and public institutions have been considered as poor performers, mainly because their employees and managers lack the great incentives that promote the productivity in private firms (Dixit, 1997). Also, Meng and Gallagher (2011) disclosed that projects that are supported with incentives generate more timely and qualitative performance than non-incentive projects. Incentives are considered as an input of a project, and project’s performance (time, cost, quality and safety) - the output. Incentives also increase the agents’ awareness of required performance enhancement, which emphasize the importance of project management processes and collaboration in order to achieve exceptional outcome.

Thus, in the public sector typically economic relationships exist where one party (the principal) wants to influence the actions of another party (the agent) with the control of incentives (Dixit, 2002). Such relationships are classified into three categories depending on the nature of information exchange between the parties. The first one is known as moral hazard (Dixit, 2002; Picard, 1987), which means that the principal cannot directly observe the actions of the agent. In this case control can be ensured over the contractual agreements that are enforced or the observation can take place from other parties of the relationship, who can choose their future actions. The second form of information irregularity is called adverse selection, in which the agent holds some private information and under the contractual reward it is willing to disclose to the principal. And in the third one, the agent has an advantage to observe some outcome better than the principal, which means that the principal has to develop a reward scheme and an audit to ensure the outcome. The three require different optimal incentive schemes (Dixit, 2002). Talking about the public sector, the moral hazard is the one most used, because of its multi-task, multi-agent, multi-period and multi-principal contexts.

Rose and Manley (cited in Meng & Gallagher, 2011: 352-353) state that it is important to construct the incentives according to both, principal’s and agents’ interests and goals, because identification of mutual benefits is important for the project incentives’ success. Also to enhance the incentive mechanisms’ success, the relationships between principal and agents and between agents and other project members are crucial. Moreover, the principal needs to make efforts for the improvement of project management processes – to create collaborative working environments and platforms; and to motivate all stakeholders and their workforce (Meng & Gallagher, 2011). As stated by Love et al. (cited in Meng & Gallagher, 2011: 352), behaviours of project participants are possible to align towards the project’s goals through the use of incentives. In addition, Rose and Manley (cited in Meng & Gallagher, 2011: 352-353) recognize the use of incentives as stimulation of project members’ motivation to work harder and reach the performance objectives.
As stated by Meng and Gallagher (2011), the greatest challenges for large projects are timely implementation and best quality. Nevertheless, incentive provision used as a contractual strategy is the most efficient solution to performance problems. Thus, there are different incentives for different purposes, which can be used separately as well as combined in order to improve two or more performance parts. For timely completion the principal can provide a time incentive, cost incentive for saving costs, and quality incentives to avoid defects (Meng & Gallagher, 2011; Bubshait, 2003). Also, safety and environmental incentives can be used in order to comply with strict safety rules and standards in an environmentally friendly way. Two or more incentive combinations are called multiple incentives and are complex to manage, but also rather successful (Bower et al., 2002). A time incentive basically is a bonus to contractors for each day of early completion (Arditi et al. 1997, cited in Meng & Gallagher, 2011: 353-354). Safety incentives are very rarely found in practice, as most contractors have to comply with health and safety regulations and standards, and there is no need for specific incentives (Meng & Gallagher, 2011).

According to Shr and Chen (2004), in practice, besides incentives, disincentives are seen very often, e.g., time disincentives for late finishing of a project, cost disincentives for cost overrun, and quality disincentives for defects. Thus, incentives are seen as rewards and motivation for good performance, whilst disincentives are punishment and de-motivation to poor performance (Meng & Gallagher, 2011). Both incentives and disincentives can work in line in order to reach the project’s objectives. Dixit (2002) suggests that in the situation where the timely outcome is important for the principal, it is the most appropriate to use the Step Functions. Step Functions are incentive schemes promoting a high reward for timely/advanced implementation and punishment level in case of delay. Moreover, Habison (1985) suggests contractual penalties and claims for compensation in order to achieve timely implementations in complex large-scale projects.

According to Bubshait (2003), incentives and disincentives are used as cost and time reduction programs, and those have been used in contracts by managers to influence labour productivity, project duration and cost. Schedule incentives and disincentives are the most commonly used in contracting. Even though the owners pay some extra money for a timely or earlier implementation of the project, they achieve their return on investment also earlier, as the project is accomplished beforehand.

Aggregation over time as stated by Dixit (2002) emphasizes the importance of paying attention to how the principal distributes the incentives. Depending on the objective, if the incentive scheme does not work according to single period outcomes, but instead rewards the agent for the outcome aggregated over all periods, it gives the agent a chance to gamble in different periods, working harder at the beginning and relax at the end or vice versa. If the objective of the principal is the outcome of the sum of separate
agents, then each agent has to be considered separately, otherwise a team reward system provokes free rider behaviour. Also the incentive scheme based on rewards for performance may be unsatisfactory, because agents might not be all comparable (Mookherjee, 1984).

Herten and Peeters (1986) have drawn general conclusions from several articles written about the outcomes of incentive contracting. Those are as follows:

- Incentives cannot be linked to one of the aspects (time or cost or quality) only, as this may lead to decreasing other aspects.
- Incentives reduce cost overruns.
- Only simple incentives have been proven to be beneficial, as complex and sophisticated incentives are more difficult to implement and rarely influence the motivation of people to work more productively.
- Incentives require organisational visibility and knowledgeable project management.
- Incentives have proven to be effective if project objectives are important.

However, “even a good incentive scheme cannot make a bad project management better” (Herten & Peeters, 1986: 39).

As public sector agencies are complex systems involving several principals and many stakeholders, each holding different interests, incentive schemes are difficult to determine. However, if one attempts to establish some kind of mechanism, the suggestions from Dixit (2002) are that those should be based on clear policies; and a ‘devils advocates’ group could be developed in order to foresee if any of the policies and regulations can be misused or manipulated.

### 2.6 From theories to research

Even though Public-Private Partnerships are established on contractual agreements, strong structures, policies, rules and regulations, many project deliveries that have been initiated by public sector aligned in partnerships with private firms end up as failures. This is either because of insufficient performance from the private sector that has not been incentivized appropriately to achieve their set objectives, or because of inefficient management of the public sector, which entails lack of coordination among participants, as well as principals’ ignorance and lack of knowledge.

This literature review is used as theoretical basis on incentive mechanisms that can be used to influence timely and synchronized deployment of a PPP project. Several challenges of such partnerships have been identified. Nevertheless, these challenges are general and do not suggest directly what mechanisms could hide underneath them to be able to tackle them. At the same time, suggested incentives for overcoming these challenges are abstract and rarely refer to direct solutions that can be implemented.
within PPPs. This is why, deeper research on problems meeting multiple actors in large PPPs and possible solutions of incentives that can be used in practice is necessary. Since these multiple actors have different interests it is important to research what incentives can be applied especially in large PPPs such as the one being investigated in this thesis.

2.7 Research questions

Main question: What challenges for achieving a timely and successful implementation of a PPP project do multiple project actors face and what types of incentives can meet these challenges?

Sub-questions:

1. What are key success factors, for a timely and synchronized implementation of a large PPP project identified from an in-depth study of multiple actors?
2. What incentive mechanisms may be used for a timely and synchronized implementation of a PPP project?

3 Method

This chapter elaborates on appropriate methods and argues about why they have been chosen for achieving the purpose of this thesis. The different parts include the research approach, the research method, and selection of participating stakeholders, data collection, data analysis and validity of data to support the project’s investigation.

3.1 Research philosophy

The first step in establishing a research methodology is to choose a philosophy that is in line with the authors’ perception of the development of the thesis. According to Saunders et al. (2003), three main research philosophies have been identified. Those are as follows: interpretivism, positivism, and realism. Positivism involves an observable social reality and is considered by the testing of hypothesis derived from existing theory while realism suggests that there is an external reality that exists or acts, whether proven or not.

On the other hand, interpretivism focuses on meaning rather than extent of generalisability. Furthermore, Schwandt (1994) suggests constructivism as a related approach to research to interpretivism. Constructivists argue that truth is relative and that it is derived from one’s perspective (Baxter & Jack, 2008). This concept acknowledges a significance of a human as a creator of a subjective meaning, but does not discard absolutely a notion of objectivity. One of the main characteristics of this philosophy is a close collaboration between the researcher and respondents in order to let the participants to enlighten their stories (Crabtree & Miller, cited in Baxter & Jack, 2008: 545). In addition, through these stories the participants can portray their views
of reality and this enhances the researcher’s understanding of participants’ actions (Lather, cited in Baxter & Jack, 2008: 545). This philosophy forms the underpinning of our thesis, since there is a lack of exploratory research on incentive mechanisms that may be used for a timely and synchronized implementation of Public-Private Partnership projects. The focus of this kind of research is to understand meanings and interpretations of social actors (stakeholders) and to explore their world from their standpoint. We will investigate implementation of a PPP project, and, as implementation is a process, it requires a process perspective.

According to Van de Ven in 1992 (cited in Pettigrew, 1997: 338), a process can be defined in three ways: logic used to clarify a causal relationship; a category of activity concepts of individuals or organisations; a sequence of events describing how things change over time. According to Pettigrew (1997), a longitudinal comparative case study has been a primary method for a processual research.

3.2 Research approach

According to Saunders et al. (2007), interpretivist research is highly contextual and therefore is not widely generalisable. Moreover, given that this paradigm is subjective, and language is crucial, this philosophy is associated with qualitative approaches to data collecting (Eriksson and Kovalainen, 2008).

In order to answer the research questions and to fulfil the purpose of this thesis, we employ a qualitative research approach which is mostly focused on processes, actions, behaviours, feelings and human emotions (Ghauri & Grønhaug, 2005). This approach is used due to its nature, not the underlying philosophical alternative. Even though, some authors (Daymon & Holloway, 2011) argue that a qualitative research approach is most often linked with an interpretive worldview, as stated by Wakkee et al. (2007), a choice of a specific research strategy does not have to be dependent on the main philosophical approach. Nevertheless, a process research is an art activity filled with intuition, judgement and tacit knowledge (Pettigrew, 1997). Besides, in process research there is no ideal set of procedures, rules or steps, so it gives the variety of patterns to induce.

We are occupied with describing, analysing and explaining a sequence of individual or collective actions through the what, why and how questions. According to Pettigrew (1997), researchers are trying to catch the reality of a process in flight, as it occurs rather than exists. Even though actions drive processes, those are still embedded in contexts. The contexts must always be acknowledged, as they limit an information, insight and influence of actions. As stated by Pettigrew (1997), this interactive field of process studies represents the greatest inductive challenges for process scholars and a part of intellectual challenge which is difficult to achieve, justify and describe. However, many scholars enter this field with an ‘empty head’ expecting to gain an evidence of some assumptions and values that they hold. This is why Pettigrew (1997)
has increased the component of deduction in order to balance the act of deduction and induction in process studies. Deduction embraces testing theoretical propositions and in most cases is assumed to be incorporated rather within a quantitative research approach (Saunders et al., 2003; Punch, 2005). However, Hyde (2000) defines deductive reasoning as a process of theory testing, in which researchers want to find out if the theory is relevant for a particular case. On the other hand, within inductive reasoning the researcher develops a theory based on empirical findings (Saunders et al., 2003).

Pettigrew (1997) states that process research is best conducted in cycles of deduction and induction. With this in mind, the crucial deductive drivers embrace foresight about the primary purposes, themes and questions. These elements will occur after investigating the existing theory and empirical findings, and derived from their strengths and weaknesses.

### 3.3 Research method

To fulfil the purpose of this research, we chose a qualitative method. Wigren (2007: 383) defines qualitative study ‘... as a study that focuses on understanding the naturalistic setting, or everyday life, of a certain phenomenon or person’ that includes the context, not a uniform perspective. Qualitative study means coming close to the site and learning from it. Besides, qualitative data is more about actions than it is about behaviour of actors. In this thesis the qualitative study will allow the authors to explore in-depth the phenomena of incentives in PPP projects. In addition, the benefits of qualitative data are that it focuses on “... naturally occurring, ordinary events in natural settings” and this means that the researcher and a reader, both, get an understanding on what the „real life” is like (Miles & Huberman, 1994: 10). According to Saunders et al. (2003), the gathering of qualitative data is non-standardized, thus, it requires some form of classification.

There are two commonly used strategies (within qualitative methods) when gathering primary data: focus groups and interviews (Malhotra, 2009). Interviews are considered to be the one strategy that works as a co-elaborated act from both parties (social actors and researcher), not a gathering of information by just one party (Miles & Huberman, 1994). Saunders et al. (2003) emphasize that interviews are a useful strategy to obtain the information that is directly relevant to the research questions and purpose of the study. Furthermore, interviews vary in the level of structure and standardisation. Three forms of interviews are mostly discussed: structured interviews, semi-structured and unstructured or in-depth interviews (Saunders et al., 2007). In structured interviews respondents often are provided with variety of choices for the answers, mostly in order to quantify responses. On the other hand, the semi-structured interviews are created in determined themes but, even so, the researcher can choose the order of questions, as well as add or remove questions if needed. Semi-structured interviews can also be in-depth. However, unstructured interviews include very open questions in order to
explore events, beliefs and behaviour, and the interviewee to a high degree leads the interview in the direction towards he or she is more comfortable or more knowledgeable in talking about. We chose to conduct semi-structured in-depth interviews combined with an extensive investigation of secondary sources of data from a PPP project. Semi-structured in-depth interviews with many different actors at different organisational levels were used to discover and understand an individual and shared sense of meaning regarding the development of the project. The emphasis of this data gathering is on exploring the individual and shared meaning of the processes thus, explaining underlying mechanisms, or recognizing causal effects.

3.4 Data collection
Considering the given time frame for this thesis, the authors chose to use an exploratory case study of the PPP project, SESAR, in order to investigate causal processes and explore holistic explanations within the case, and to look at it in a context. The empirical data consists of publicly available information on one of the major air traffic management projects, SESAR, initiated by European Commission and EUROCONTROL and data collected through semi-structured in-depth interviews with different actors of the project.

More specifically, the data concerning SESAR consists of:
- The general coverage of articles published in the European Commission and EUROCONTROL online periodicals and newsletters about SESAR between years 2004 and 2012 (these periodicals and newsletters include: SESAR Magazine, Press Releases, News).
- Public information provided in the Internet sites of the founding actors: EUROCONTROL, European Commission.
- Data collection took place through 18 semi-structured interviews with different actors involved directly or indirectly with SESAR (selection of respondents see below). The interviews were conducted through phone or other virtual communication tools.

Moreover, the development of this thesis goes in line with Pettigrew’s (1997) suggested general cycle of deduction and induction:

*A rise of a primary question of the study* ("How a PPP such as SESAR is organized?") -> *related themes and questions* (new public management, PPP) -> *preliminary data collection* (magazines, newsletters, pivot study: interviews with SESAR JU board
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member and a representative from ANSP in Latvia) -> *early pattern recognition* (issues with a timely and synchronised implementation of the deployment phase) -> *early writing* (Theory: previously mentioned themes + incentives mechanisms; industry and project description; data collection through reports) -> *disconfirmation and verification* (disconfirmation of a governance focus study within this context, and verification instead of a study on what incentive mechanisms can be used for a timely and synchronized deployment of such Public-Private Partnership) -> *elaborated themes and questions* (what challenges do PPP face? How does project management theory apply within this context? Theories: challenges in project management; incentives in project management.) -> *further data collection* (reports, newsletters, interviews) -> *additional pattern recognition across more case examples* (clustering empirical framework under themes; adding manufacturers to the sample) -> *comparative analysis* (colour coding, pattern recognition, categorizing from emerging interaction of theory and data) -> *a more refined study vocabulary and research questions* (contribution to the theory with suggested incentive categories and further research).

### 3.4.1 Literature study

Initially, we conducted a search of relevant literature and previous research related to the topic within Google Scholar and the Diva database, using the main keywords: New public management, Public-Private Partnerships, Incentive mechanisms/schemes, PPP projects, project management, last mover advantage and SESAR. We gave priority to highly cited as well as more recent articles and books regarding the topic.

In order to obtain more in-depth understanding of the topic, we searched also the *International Journal of Project Management* for the period from 1983 to 2012, and the journal of *Industry and Innovation* for the period from 1993 to 2012.

### 3.4.2 Secondary data

In order to gather information about the SESAR project and its organisational processes, we have also chosen to investigate secondary data concerning the background of this project. Besides the previously mentioned data sources, some information was sent to us by e-mail from the participants. So far e-mail has been used mainly in quantitative studies, and only recently it has proved to be useful in qualitative research methodologies, as it offers to collect data not previously available (Wakkee et al., 2007). E-mail as a source of data gives researchers very rich information that may help to widen an understanding of phenomena similarly to observation but without actually being present at the field (Wakkee, 2003, cited in Wakkee et al., 2007: 332). The gathered information includes implementation legislation, deployment strategy, implementation plan, Booz&Co report on funding mechanisms for the preparation and transition to the deployment phase (2010), etc. Detailed SESAR background information can be found in the Empirical Framework section.
3.4.3 Primary data

The main work was conducted off-site with semi-structured in-depth interviews carried out with different actors involved directly and indirectly with SESAR. According to Pettigrew (1997), if one analytical vocabulary (themes) has been identified or tested in one interview then the researcher is in a much stronger position to take it further to another interviewee. In the cycles at the each end of the spectrum then gives opportunities to raise additional dimensions and this allows to discover more patterns. The semi-structured interview questions used in this thesis were constructed based on the initial data gathering through the pilot study and a literature review. All questions can be found in appendix 2. Moreover, we conducted follow-up interviews when new and relevant questions were triggered from our interviewing process.

As a geographical coverage of SESAR project is too broad, the authors of this thesis conducted 15 telephone interviews, excluding follow-up interviews, and 3 email interviews and verified collected data through electronic mails.

3.4.4 Selection of respondents

Qualitative researchers often work with small samples, investigating their context and studying in depth (Miles & Huberman, 1994). Those samples are purposive rather than random. Initial choice of respondents usually lead the researcher to similar and different ones; understanding one class of events invites contrast with another; understanding one relationship in a case reveals to study others. This is known as conceptually-driven sequential sampling. The main criteria for selecting respondents for this thesis initially revolved around the three key stakeholder categories linked to the airspace industry and hence implementation of the SESAR. Those stakeholders belong to both, private and public sectors, and are categorized as follows: airspace users, airports and ANSPs at European level. However, as we recognized that the transition from development to deployment brings structural and responsibility changes, it was relevant to refer to key players that are involved in this transition as well. This category includes the founding institutions of the SESAR and consultancy bodies that are involved in the deployment phase of the project.

It is interesting to note how sampling in qualitative research engages two actions that may pull the researcher in different directions (Miles & Huberman, 1994). The first action is to set boundaries (i.e. to define aspects of your case that can be studied within given time limit and that are related to the research questions), the second action is to create a frame that would help to uncover, explore and confirm the basic processes that support the study. This is in line with this thesis, as we initially selected airports, airlines and ANSPs as respondents; however, the findings revealed that most of them are partly publicly owned. This led to the exploration of some entirely private
manufacturers, which are involved in this project, in order to confirm the basic assumptions of the Public-Private Partnership.

The firms and organisations participating in this study were chosen on the basis of SESAR JU’s member list from the official homepage (2012). Telephone numbers and e-mail addresses were available on organisations’ websites and the LinkedIn database. The authors sent 190 e-mails during the data collection process and made 30 phone calls in order to arrange interviews. Furthermore, 10 participants were referred to from our initial respondents out of which 4 agreed to participate. This is also known as snowball sampling, where the initial respondents provide the researchers with information about the future respondents (Saunders et al., 2003). In total 18 organisations agreed to participate in this research. The range of interviewees covered the different actors and management levels involved in the development and implementation processes of SESAR.

3.5 Data analysis

In qualitative research the analysis of data is conducted through conceptualization, whereas in quantitative research data is analysed through diagrams and statistics (Saunders et al., 2003). According to Miles and Huberman (1994), qualitative analysis consists of three action components: data reduction, data display and conclusion drawing. The reduction of data may be accomplished through selection, summary, or paraphrasing, i.e. interviews are not usually immediately accessible for analysis, and they require some processing. In this thesis the tape recordings from the interviews needed to be re-written and corrected, and further in the process summarized (see appendix 3 for the transcripts from each interview). The second activity flow, data display, describes an organized, compressed structure of the findings that help the researcher to draw conclusion (Miles & Huberman, 1994). The third component is about deriving themes, patterns and relationships from the interaction of data collection and analysis (Saunders et al., 2009). Relationships and pattern recognition among data in the analysis was interpreted based on the objectives of the research questions as well as on the literature identified as being relevant to our research questions.

These three steps have simplified the analysis of this thesis, since there is a large amount of collected stories. One of the easiest ways to identify themes in summarized interviews is repetition (Bernard & Ryan, 2003). To compress and further clarify the data, and to identify patterns and themes, the authors clustered emerging categories from an interaction of theory and data, applying colour codes to the different and repeating thoughts found in the interviews. Researchers, working with texts or less well organized displays, often note frequent patterns and themes that draw together many separate pieces of data (Miles & Huberman, 1994). An important issue is to be able to see an evidence of the same pattern while remain open to disconfirming data.
when it appears. The conclusions derived from this thesis allow prospective initiators and participants of PPP projects, and already existing similar PPP project’s participators, to prepare for possible challenges with implementing appropriate incentive mechanisms.

3.6 Research credibility

Even though, there are no commonly agreed quality standards in qualitative study, in order to obtain increased legitimacy, each researcher makes his or her own choice as how to deal with quality issues (Wigren, 2007). According to Saunders et al. (2003), qualitative approach is fairly flexible, dynamic and complex and another researcher performing the same study would not gain the exact same information. This thesis has followed Lincoln and Guba’s, 1985, criteria (cited in Wigren, 2007: 387) for qualitative research. Those are as follows: credibility, transferability, dependability and confirmability.

3.6.1 Credibility

Patton in 2002 (cited in Wigren, 2007: 387) suggests that working with different types of triangulation, is one way to increase credibility. The authors of this thesis have: generated consistency of findings by using different data collection sources (e.g. primary data through interviews and secondary data retrieved from the internet and documents from e-mails received from the respondents); used multiple analysts to review findings (all interviews are recorded, thus, both authors listened to all interviews and summarized the results); used multiple perspectives of theories (the authors have identified five theoretical perspectives - Public management, Public-Private Partnerships, project management, PPP challenges, and incentives). Our collection of data was obtained through representatives involved with SESAR from the companies that we investigated. It is worth highlighting that such representatives include Programme Managers, Project Managers, CEOs, Directors, Advisers and Specialists which also adds to the credibility level of the collected data within our thesis.

3.6.2 Transferability

Transferability, also known as generalisability or external validity, refers to an applicability of the findings from a study on other contexts (Saunders et al., 2003). According to Lincoln and Guba in 1985 (cited in Wigren, 2007: 387), transferability refers to the issue that the researcher should provide the reader with sufficient case information so that the one could make generalizations, in terms of case-to-case transfer. This external validity issue is a dilemma if a sample of a study is small. To address this issue, the authors of this thesis have:

- Fully characterized the original sample of individuals, organisations, contexts and processes. This permits adequate comparisons with other samples (Miles & Huberman, 1994).
• Diversified the sample choosing heterogeneous firms/organisations and institutions, like airports, airlines, ANSPs, manufacturers, consultancy bodies and principals (EC and EUROCONTROL). This encourages broader applicability (Miles & Huberman, 1994).
• Revealed findings that are congruent with a prior theory, and made explicit the transferable theory from the thesis. This allows a case-to-case transfer (Miles & Huberman, 1994).
• Described the processes and outcomes in conclusions generic enough. This allows the conclusions to be applicable also in other settings, also of a different nature (Miles & Huberman, 1994).

Findings of this thesis are transferable to similar case and also industry contexts. For example, any traffic industry that is a cooperation of public and private industries would find this thesis applicable to some extent in order to ensure a timely implementation of a project. This thesis provides insights from different stakeholders’ perspectives, identifying different patterns that occur, e.g., financial, legal, operational and intangible, and are not related to only one industry context.

3.6.3 Dependability
Dependability, known also as reliability, refers to the issue that the researcher should ensure that the research process is logical, traceable and documented (Lincoln & Guba, cited in Wigren: 387). The technical details of the SESAR project systems were provided mainly through reports and archival data. Documentary proof permitted cross-checking of most of the interview materials. Reliability of interviewees’ recollections on details was controlled by comparing them with the written documents.

3.6.4 Confirmability
Confirmability refers to the issue that data and interpretations accurately represent reality, and are not creations of the researcher’s imagination (Lincoln & Guba, cited in Wigren: 387). According to Saunders et al. (2003), to overcome this issue some recommendations should be considered in interviews, and few of them are as follows: the preparation before the interview, the level of information supplied to the interviewee, interviewer’s behaviour during the interview, interviewers ability to listen, and an approach to record the information. To ensure the confirmability of this thesis, the authors used the given recommendations. The authors of this thesis have offered the representatives the opportunity to read the thesis prior its publication. According to Pettigrew (1997), this access and feedback is necessary to avoid any factual errors and inadvertent release of commercially sensitive information. However, the researcher retains editorial control over the interpretation and generating new data and ideas, given the participants’ agreements to contribute to this research.
4 Empirical framework

The empirical framework includes first an introduction of the air industry and the PPP (Public-Private Partnership) being investigated, named SESAR, followed by themes of primary data from the interviews conducted with SESAR actors. The interview summaries can be found in the appendix section.

Public-Private Partnership projects as introduced in the theoretical framework harness input from both public and private sectors for a scope that otherwise would not be possible or very expensive. Transport and mobility are important contributing factors to the economy, society, internal markets, prosperity and quality of life (McKinsey, 2011). Examples of such industries include infrastructure projects, highways, bridges, tunnels, satellites, railway systems and their modernisation, or the airspace industry. Even though all these examples can be represented by PPPs (such as ERTMS – European Rail Traffic management system; or Galileo Satellite Project), and therefore relevant for this study, there is one industry that is particularly interesting. This is the air industry. First of all, the scale of cooperation stretches over national borders and even continents, thus bringing an extensive network of actors involved. In Europe, the airspace industry claims a combination of public actors represented traditionally at national level such as traffic controllers, private or semiprivate actors, such as airlines calling for a borderless harmonization, and fully private manufacturers as solution providers to their customers: airspace users, controllers as well as airports. The airspace industry market is a niche market that operates differently than general consumer markets and changes are slow. Moreover, the industry did not experience any drastic technological changes since its inception more than half a century ago. Adding to this, the industry has not yet experienced any dramatic internal system problems. However, it is recognized that with the growing number of flights and a more mobile environment, traffic will be constrained by capacity in the future especially with the current inefficient and defragmented system and hence, the need for change becomes apparent. In this context, the satisfaction of a wide range of interests of industry actors along with harnessing political support are major enabling factors for change within this industry.

4.1 Airspace Industry

The dominant players in the airspace industry are the North Atlantic nations (North America and Europe) that also initiated the whole industry some 80 years ago (McGuire, 1999). The industry employs one of the largest amounts of high-technology specialists in the world (Niosi & Zhegu 2005). In particular the aircraft industry has been considered as vital for national economies and safety (Niosi & Zhegu 2005). The civil aviation manufacturing sector is the most significant in the airspace industry (Niosi & Zhegu 2005). Thus, the main contractors of civil aircraft are Boeing (USA),
Airbus (consortium between France, UK, Germany, Spain), Bombardier (Canada) and Embraer (Brazil).

Airspace is strongly influenced by time and scale, and it is a high value-added sector (Niosi & Zhegu 2005). Success in this industry depends on rapid technological advances and extensive government support for corporate R&D activities. However, from past deployment experiences this has not been the case, advances are slow and change within the industry is influenced by political forces along with other economic factors such as high ownership costs for example. In addition, implementation of international cooperation strategies within the industry has been forced because of the increasing R&D costs in decentralized aircraft operations. Expenditure in the airspace industry’s R&D as a percentage of sales in the UK is the second highest right after the Pharmaceuticals (McGuire, 1999). The airspace industry is an attractive combination of economics and glamour. Developing new technologies and aircraft become more and more expensive, and reaching the break-even point is more and more difficult. Also, as previously suggested, the practice of collaboration in this sector turns out not to be successful enough, as the main knowledge lies with the existing actors, who may not be willing to share their know-how.

According to Funk (2010), the airline/aircraft industry has complex systems, which involve relatively high complexity at time of creation, but does not require critical mass of users or complimentary products. Moreover, complex systems have to be more organized; and more decisions have to be made. Those also involve more different organisations (private, governmental etc.) in order to gain more resources for their development (Tushman & Rosenkopf, 1992; Hobday, 1998; Funk, 2010).

That is why government regulations and support for R&D in complex systems are crucial, but also it is necessary to collaborate with business models in order to create value in the industry (Funk, 2010). In the US, the airspace industry has established several clusters in order to share knowledge and reduce R&D costs; however in the European industry each country still manages its own operations and activities at national level (Niosi & Zhegu 2005) with some exceptions in the case of large private manufacturers such as Airbus that spans R&D and operations over several western European countries.

**4.2 PPP case study - SESAR**

For this research paper, we empirically studied incentives in the air traffic management modernization project named SESAR, which stands for Single European Sky ATM Research and represents the technological pillar of the Single European Sky (SES) initiative discussed further in Appendix 1. The SESAR PPP project involves a complex network of multiple organisational actors, both public and fully or partially private.
The current situation in Europe shows that the air transportation system does not operate at its optimum level, defragmentation of European skies and old-generation operating and communication systems playing an important role in this (SESARJU, 2012). In this light, the current ATM system cannot serve growing demands. Technology advances also highlight the possibilities for change and the need to replace old systems with more efficient ones. Moreover, communication between ground and air participants lacks and interaction of the network supported by technology is needed for the possibility of a better general service. To give an idea of what the future holds for the European sky, one of the busiest in the world, the situation is expected to worsen in the future as demand for air travel is expected to grow by over 70% between today and 2030 and adding to this growth, network inefficiencies makes the situation worse since each flight is, on average, 50 km longer than necessary, resulting in avoiding unnecessary fuel consumption (McKinsey, 2011). As presented by McKinsey (2011) in a macro-economic study, SESAR is the most ambitious Public-Private Partnership in the field of ATM ever launched in Europe.

SESAR was developed in collaboration with the entire Air Transport Industry and supported both politically and financially by the European Commission as being one of the projects of general interest. SESAR will improve the current network system by implementing operations built around a continuous data sharing between aircraft and air navigation service providers and airports ground infrastructure. This development of operational and technical solutions will enable improved services, more direct flight trajectories, more fuel efficient and energy optimized operations.

SESAR PPP is divided in three phases:

1. **Definition phase (2004-2008)** led by EUROCONTROL with the outcome of the ATM Master plan
2. **Development phase (2008-2013)** managed by the SESAR Joint Undertaking (SJU) to coordinate R&D efforts at European level
3. **Deployment phase (2014- 2020 onwards)** represented by validated technologies and equipments to be industrialized by manufacturers and implemented by the stakeholders. Governance structures for the deployment phase are not yet established but responsibility will lie on the industry to deploy since these stakeholders are the ones investing.

The definition phase, through the SESAR Consortium involving industry actors from all categories, developed a guiding book, called the Master Plan that would set the cornerstone of the future ATM system and its key contents. Subsequently, the SESAR Joint Undertaking, empowered by the European Commission, took charge to coordinate and concentrate all relevant research and development efforts with a view to harmonising implementation (Modernising European Sky, 2011). As the concluding
efforts of the development of R&D, the deployment phase seeks to build the new infrastructure at a wide scale being carried out under the responsibility of the industry through manufacturers and stakeholders. This phase is the longest of all phases and requires clear governance and incentives for a timely and synchronized deployment throughout Europe.

Some key performance targets for the year 2020 resulting in the case of a synchronized and timely deployment of SESAR include reaching a threefold increase in air traffic capacity, safer air travel along with 50% fewer delays, reducing the environmental impact by 10% per flight and cutting ATM costs by 50% through better communication and integration systems both on ground and in the air (Modernising European Sky, 2011). As air traffic is an enabler of economic growth, SESAR creates a combined positive impact on GDP within the EU of € 419 billion over the period 2013-2030, if it is deployed in a timely and synchronized manner as according to the Master plan (McKinsey, 2011). Moreover, SESAR would create approximately 42 000 additional jobs in the major air transport industries. On the other hand, total investments for SESAR are expected to reach €30 billion (excluding non-EU airlines) (Booz&Co, 2010). According to SJU (2011), the coordination and implementation time-frame is very important for the benefits of the whole program. Both, private and public stakeholders need to work in partnership to ensure efficient deployment of SESAR.

A major challenge is funding the timely deployment of SESAR in a synchronized manner. A consultation paper published by the European Commission, named “Establishment of governance and incentive mechanisms for the deployment of SESAR” (DG MOVE 2, 2011) introduces the main difficulties that result from the partial disconnection between investments and benefits during the transition from development to deployment. As a result, this gap between investments and benefits encourages stakeholders to adopt a procrastination approach rather than a proactive approach along with other challenges which will be further discussed. This procrastination behaviour is also known as the "last mover advantage" (LMA) (DG MOVE 1, 2011). This brings the question of how to stimulate the deployment phase to take place in a synchronized manner.

Accordingly, the Vice President of the European Commission, responsible for transport issues at European level, agreed that the biggest challenges for the SESAR project are institutional and organisational challenges, not the technological, engineering or even financial (SESARJU, 2012).

### 4.3 SESAR actors

As an illustration, we developed a mind-map with the actors involved in SESAR based on the interviews conducted for this thesis (marked in yellow).
It is worth mentioning that most stakeholders interviewed have chosen a proactive approach towards SESAR thus, preferring to “play rather than sit on the fence and wait” as one interviewee expresses. One of the advantages that stakeholders seek was to keep sovereignty over planning and steering processes and so, their involvement could secure this sovereignty. There is also a political reason, making sure they are in the leadership position. Furthermore, “influence over strategic definitions of how to design, develop and operate” was also important reason for involvement. Some stakeholders mention they got involved with SESAR because of pressure from the government, other mention that “if you want to be successful you must be part of the future system”. By paying a member fee the membership within SESAR Joint Undertaking can be established which gives SESAR members voting rights and input on very high level. However, associate partnerships and other forms of agreements exist within SESAR that creates the possibility to involve as many actors from the ATM industry, although, many are still not directly involved in SESAR although affected by it.

*Figure 4-1 SESAR actors. Source: Authors*
Director of Future Systems Architecture from the manufacturing side explains that before SESAR came to existence in 2004, there was a lot of R&D in Europe and “many within the ATM industry were looking at similar topics but from different angles” while R&D at that point was actually not being concluded or reaching tangible results. Therefore, nothing was really being implemented. Ground industry and airborne industry did not know what to invest in to support each other’s needs and capabilities. In other words, there was a need for the European Commission to make a case for harmonization of R&D at European level and development of a concept which will give a vision of where to go and that vision would help ground and air industry make decisions, particularly the airborne industry where long-term planning is very important. This was the rationale for the creation of SESAR at that point.

Some of the stakeholders interviewed were less involved within SESAR than others. Even though SESAR development phase consists of around 300 individual development projects, many industry actors in Europe as a whole are actually not involved in SESAR. As one representative said “if you are in the SESAR family you have access but if you are not in the SESAR family you may not really know what is happening” which creates a lot of uncertainty for those stakeholders outside of SESAR (for example, almost half of the national ANPSs in the EU are not involved, hardly any airport ANSPs, and about a dozen of airlines which really know what is happening and there are around 500 airlines in Europe). As SESAR will bring network changes, these indirect stakeholders will also be affected.

Undoubtedly, collaboration within SESAR is important. A service provider representative explains that they have a contract with the other ANSPs, and there are meetings about these contracts and each dedicates a certain amount of hours that employees need to spend inside the projects. One example is the AIRE project, where the role of meetings was to exchange experiences and harmonize the structure, because the SESAR Joint Undertaking (SJU) wants to be able to compare the results but the methods need to be same. Moreover, there are a number of AIRE projects in Europe with similar scope. They have the same aim and try to prove that technology works. Such meetings are useful as one could get ideas regarding challenges and ways to handle them.

On the other hand, an interviewee from the airport side mentions that at the beginning he did not have a clear idea of what was required as the scope of the project was not clear, as there was a lack of direction from the SJU. Because of this, there was
also a hard time setting up the agenda for the project. The Swedavia Senior Project Manager, from the side of airport category, explains that “what SJU lacks is in taking decisions towards the direction of projects or stopping those projects that do not deliver. From all over 300 projects that are part of SESAR, it would be good to have 5-10% of these projects to actually reach results. SJU should be more willing to control and take decisions as well have a more honest management approach. Only these projects delivering should be ready for deployment”. Furthermore, an airline interviewee points that some projects that are pushing really new technology he believes are beyond the scope of SESAR.

The SESAR Joint Undertaking is planned to be in force until the end of 2016 but currently, there are many issues remaining unresolved for example, who will be in charge of managing the program in 2017, what financing mechanisms will be in place for deployment, whether there will be public or private funding mechanisms to support investments, who will be able to receive such support and on what conditions.

### 4.4 SESAR deployment challenges

One main problem with previous projects in the air industry and with stakeholders that are now also part of SESAR is the cost of ownership. Cost of ownership involves the costs of purchasing, installation, training and maintenance of new equipment or systems that will be validated for implementation after the SESAR development phase. This cost is decided by manufacturers and borne by stakeholders such as airlines, ANSPs and airports and “when this cost is high, nobody will want to invest”.

KLM Senior Manager for ATM Strategy & Charges explains that when there is certain problem or need, the manufacturing industry, besides the solution in itself, pushes extra functionalities to this certain solution that are not necessary. Consequently, airlines will not see any direct benefit from these extra functionalities and therefore, will not want pay for these. Airlines have different tax constraints, and different investment cycles that are very strict plus they have very short payback periods compared to the traffic controllers on the ground (ANSPs). All ANSPs in Europe except the one in UK are publicly owned, and they have different abilities to access financial capital than airlines do.

Furthermore, considering the performance of air service providers in Europe, ANSPs have limits because they are bound to national requirements as they are a duty of states. This means that there is a limit in improving their performance. “As long as the states keep on playing the game of fragmentation, the ANSPs can do what they want, and they will not improve a lot”. That means that as long as ANSPs are governed by the states, performance improvements get overshadowed by political interests and defragmentation. Cooperation between ANSPs of different states can be done “fairly easy” one interviewee states. However, cooperation among states on a state level is sometimes really difficult to get as “it has a huge political dimension”. When asked
whether a possible long-term privatisation of ANSPs would increase the likelihood of a synchronized SESAR deployment, one interviewee answers that “it would be nice if that happens, but you cannot actually incentivise countries to proceed with privatisation, as each has different budget and different plans” while other interviewee mentions that “privatisation of ANSPs will eventually need to happen. Sooner or later there is no way around it, but it will take some time”.

Another issue is complementarity between airspace users and ANSPs when it comes to technology. “Current functionalities need to be used, and the performance targets of SESAR need to look at these first in order to reach more performance with the already existing technologies, before proposing new investments”. At the same time, ANSPs need to reduce their charges towards airlines as well as respond to capacity increases without increasing their operating costs. Airlines pay air charges for the air traffic control services that ANSPs around Europe provide. This way ANSPs can return their investments through such charges they impose on airlines. The problem as introduced earlier is that ANSPs until today make investments that are borne by airlines in the end. This has been called the default cost recovery. However, a new determined cost recovery model is currently studied to be put into place by the European Commission in 2012. Through the determined cost model, ANSPs will be given higher responsibility for the investment choices they make. This means that ANSPs will only partially be allowed to collect their costs and therefore, put pressure on them to make only the most essential investments. This ensures that cost and risk sharing will be borne by both ANSPs and respectively, airlines.

Referring to other organisational challenges, one interviewee refers to the communication and visibility of SESAR projects: “SJU needs to communicate better and bring visibility to the projects that are under development, to stop projects which are not delivering the correct forms and highlight those which do”. This transparency issue, although considered from the point of the development phase of SESAR that is currently undergoing, can equally have an impact on the deployment phase.

### 4.5 Last mover advantage

The EUROCONTROL ATM Principal Director explains that those who will implement last will be the ones nearest to benefits, thus, describing the last mover advantage. That is why deployment of SESAR needs synchronization between air and ground. When a mandate exists it is usually the case that everyone will push investments until the expiration date of the mandate. Thus, almost without exception, causing delays, as those who need to make the investments cannot all equip at the same time because long-term planning is needed and at the same time manufacturers may not have the capability to meet demand. One way to solve this delay is by incentivising pioneers, subsidizing them by covering parts of the cost or by offering favorable loans in order to get the capabilities on the market. Part of the SJU task is also to get airlines to
understand the value by simply sponsoring equipment for trial and by that to prove the benefits.

On the other hand, SAS Project Manager mentions that even if the return of investment is high, the period of benefits is too long in the future, as it seems now. It will be a challenge to many airlines to see a positive business case, he concludes thus, increasing the risk for adhering to the last mover advantage.

4.6 Incentives for SESAR deployment

4.6.1 Tangible incentives

Although not an external incentive, the business case of each stakeholder needs to be positive when deciding to invest in SESAR, a SJU Economist emphasizes. The business case is independent of the stakeholder groups. In the master plan the business case is positive to the majority of stakeholders, he points out. Business cases are created through consultation together with the stakeholder groups, airports, airlines, ANSPs, military and other key stakeholders. Moreover, the same interviewee emphasizes that one central need is to create business cases for each stakeholder in a smart way to allow payback period.

However, when business cases are not as convincing or when stakeholders seek the last mover advantage, a solution could be to impose an implementing rule. “Law is stronger than incentives; law would eventually force stakeholders to implement the required packages”, the SJU Economist mentions, even though the “law is the last resort to use”. Nevertheless, the Helios Technical Director argues that “if you want to incentivise people, the cut and dry approach is legislation. In other words, if a state does not apply, the EC can take it to court, or in the case of airline, it is not allowed to fly”.

Incentives on the other hand, are there to make stakeholders move earlier. And there are various ways to do that. One example could be financing access. “The earlier airlines invest the more financing support they would receive. For example, in the first year the financing rate would be at a certain level, while the years that follow the rate may be reduced” the SJU Economist explains. Such financing incentives can be made available through a public-private deployment fund.

But funding is not the essential part within deployment, CANSO Director, claims. For some stakeholders it might be essential, for example, airlines that might not have done a proper planning beforehand. Furthermore, when considering the funding loans it will reach less than 10% of the total costs, the rest is the industry bearing the costs. That is why the main pillar for a successful deployment of SESAR for stakeholders and manufacturers is commitment. Additionally, the same interviewee adds that manufacturers need to implement standards that are general not only for Europe, but for the rest of the world. “Through standards you bring simplicity and harmonisation.
And simplicity can reduce costs and also increase safety. The more complex a system is, the more difficult to check and control for safety measures.”

Moreover, one of the airline representatives mentioned the role of operational incentives. Operational incentives refer to the possible practice of a preferential treatment in the ATM for those investing early in SESAR equipment and technologies. One example is the “best equipped, best served” approach, through which the best equipped airlines are given priority in the system, for example, when landing or being provided with the most optimum trajectory when flying. Moreover, shorter routes, continuous descent approach, continuous climb departure, access to run-way and priority for landing or take-off are some examples of operational incentives that the EUROCONTROL Principal Director presents.

KLM Senior Manager ATM presents an operational incentive that has been used in North America within the NextGen project (SESAR’s counterpart in North America) where “airlines that are equipped are allowed to fly at high altitude while those who are not, are being constrained to fly at low altitude thus, experiencing more drag which is directly connected with fuel consumption. This situation constrains these airlines to make fuel stops, especially when flying long routes. If airlines equip themselves then they can fly a very efficient route at the best altitude, which is a direct incentive”. Secondly, another incentive, may relate to the charges airlines pay to ANSPs. An equipped aircraft could pay less in terms of charges.

As CANSO Director concludes, the biggest incentive (or in this case advantage) with SESAR is to reach a seamless ATM system for example, flying from Brussels to Hong Kong while having a simple system that participating actors are flying through. In other words that means a globally interoperable ATM system.

4.6.2 Intangible incentives

Besides financial, operational or legal incentives that have been presented as tangible incentives, from the data collected there has been obvious that other types of incentives are needed and they have been named in this thesis, intangible incentives. One interviewee argues that synchronization of deployment can be achieved through commitment, “simple as that”. Moreover, commitment can be built on trust. And at the moment the whole industry is lacking of trust, and that may also come from past experiences. Having experience in the ATM industry for over 20 years, the Director at CANSO, encourages to “forget the past, as we are building the future”. He also emphasizes the need for a change in attitude. "You need to sit together around the table, decide and commit to these decisions. Communication and cooperation are the key. Similarly, it is up to the customers to tell the manufacturers what they need and want. They need to discuss and decide. It’s a dramatic shift in attitude, dramatic shift in doing business”.


When it comes to SESAR development many are reinventing the wheel and that wastes a lot of time and resources. A lot of people are not willing and able to apply a common thinking to move forward. A real incentive is for people to look forward and not in their own shadow. Director of CANSO adds that the main tool for a successful deployment is the alignment of thinking and acting, “going beyond the past and looking at the future, seeing the big picture”. Stakeholders cannot only look at their own interests, and then claim they want to be part of the bigger picture. Money helps but is not really the solution. Stakeholders think that “if I do my work for the money that I get, there will be other people that won’t do their work which would be complementary for the investments I make in order to bring benefits”. This will result in no committed attitude and therefore no actions and no benefits in the end. And that is why trust is so important.

Transparency is also another important factor to achieve commitment. As Helios Technical Director emphasizes, communication and visibility of projects are needed to “get a sense of the deliveries as well as on what needs to be deployed”.

5 Analysis

In this section we include a thorough analysis of the empirical findings linking to appropriate literature from the theoretical framework and answer the research questions within the three main themes: challenges, success factors and incentives.

5.1 Challenges of large PPP projects

The literature study of this thesis reveals that the greatest challenges for large projects in general are timely implementation, low costs and good quality (Meng & Gallagher, 2011). Other scholars (Tang et al. 2010; Marrewijk et al., 2007) claim that political obstacles and legal interests in large PPP projects stand in the way in meeting time and cost schedules. However, the empirical findings of this thesis have identified several issues that are hiding underneath those previously mentioned challenges.

5.1.1 Financial capital

The deployment phase of SESAR depends on the whole airspace industry’s performance and willingness to invest in the project’s implementation. According to CANSO’s director, the funding loans will cover only 10% of the total cost and the industry will have to bear the rest while SJU Economist state the loans may reach 20% of total investments costs. Furthermore, manufacturers state that the European Commission does not have enough money to provide appropriate funding in deployment. According to Wagner & Llerena (2011), very often policy makers demand strategically non-feasible requirements from stakeholders. In this context, stakeholders either need considerable time and resources to accomplish what has been required or incline towards ignoring the policies.
The CANSO Director points out that a cost of ownership has been a major problem within the airspace industry in previous projects and also appears to be a general issue in SESAR. This cost is decided by manufactures and paid by other stakeholders who have to apply such new technologies and equipments. However, if the cost will be too high, nobody will want to invest. Helios Technical Director pointed out that there is an on-going debate between the airspace users and manufacturers on the subject of “governance of implementation”. At the same time, manufacturers invest a lot in the development phase and they expect to have a return on their investment sometime in the future and besides, it is always a matter of discussion with the customer to decide on the price.

Other than manufacturers, another group of stakeholders that dictate over the charges they impose over airspace users are ANSPs (Air Navigation Service Providers). ANSPs in Europe are publicly owned (except the UK ANSP, NATS), and often operate as monopolies at national level and they have different abilities to access financial capital than airlines do. According to the CANSO Director, airlines complain about the charges they need to pay for the ANSP services. Thus, the introduction of performance schemes targets a reduction of user costs and a positive effect on the performance of ANSPs. However, the problem is that there is no recovery cost plans for an inefficient service provided by certain ANSPs.

Furthermore, SJU Economist mentions that many airlines have different tax constraints, different investment cycles and very short and strict payback periods compared to the ANSPs. At the same time, there are some airlines that are accused of abusing the system.

The EUROCONTROL Principal Director ATM argues that the most critical element appears to be the situation when one does not get full benefits from the investment made. In the past there have been situations when an organisation has been forced to deploy but there was no new value added from these investments because of lack of synchronization between all parties involved. Regarding this, Reijniers (1994) has written that continual policy changes will not improve cooperation within a PPP project, this is why the public sector must provide the private sector with appropriate compensations for arising consequences. However, the Helios Technical Director disclosed that people are focusing on short-time benefits, even though SESAR has long-term goals. Regarding this, airline and manufacturer’s representatives explain that because of the financial crisis in 2008, the expected air traffic for 2020 will now happen in 2043, and this may be a reason behind some stakeholders’ attitude towards investment, as this is very unusual to have such prolonged period of return on investment. KLM Senior Manager highlights that airlines are also expecting to get immediate benefits but if benefits arrive in 10-15 years it is not motivating for investments as the technology changes rapidly.
5.1.2 Different Interests

According to the theory, in a PPP project the private partner is the one that delivers services and provides all the resources needed in order to meet specified levels (Grimsey & Lewis, 2005). Thus, considering SESAR private stakeholders, in particular manufacturers, they sometimes obstruct changes because they agree to take over innovations that do not match their core products and own strategy. As stated by the EUROCONTROL Principal Director ATM, this is because they are afraid of market share loss or even becoming obsolete in the market, as it is not as dynamic as other markets, and introduction of a new product takes much longer than in other consumer markets. The Helios Technical Director argues that SESAR should enable industrialisation of solutions by manufacturers without a contract with a customer in order to reduce risks. The Frequentis Programme Manager on the other hand, claims that they know very well what their customers want, as they ask the stakeholders what benefits they would like to see. Also he said that they prioritize customer needs rather than exact operational and technical specifications. However, airline and airport representatives argue that manufacturers are trying to push new technologies that are not entirely necessary for airspace users. Thales explains that there is a competition within the ‘ground’ industry where the participants want to have a competitive advantage and increase their market share.

Moreover, De Jong and Woolthuis (2008) explain that inter-organisational trust is very important within PPPs and it gives even more value than contractual agreements. In this light, within SESAR there is a lack of trust among stakeholders and this contributes to the lack of commitment LVNL and EUROCONTROL Principal Director ATM mention. They explain that this situation is due to cases in the past when investments did not happen in a synchronized manner. The Helios Technical Director adds that there is also a great uncertainty at this point between SESAR stakeholders, especially those which are not directly involved, which holds many of them back.

According to the CANSO Director, SESAR stakeholders think that “if they will do their work, then others will not do theirs”, so it will not bring benefits since complementary investments need to be made between ground and air. This will result in no commitment hence, the lack of trust between the participants.

5.1.3 Communication

Jha and Iyer (2007) have mentioned the lack of coordination among participants and their indecisiveness as the key failure factors for a timely implementation of a project. Airline and airport representatives disclose that there is a lack of coordination within and between different SESAR work packages (smaller projects) and many companies use different definitions of the same terms, which complicates the decision making process. At the same time, duplication of tasks and scopes within SESAR and its work packages makes communication within the PPP unclear.
According to Paier and Scherngell (2011), the most important collaboration challenges are: distance, which means that some knowledge and routines are difficult to transfer; thematic distance, which explains elements of the individual or corporation that are difficult to transfer without appropriate mutual relationships; politically unwanted adaptation process. Even though new public management has a wider international and comparative perspective (Lynn, 1998), the CANSO Director argues that cooperation among governments on a state level is sometimes very difficult to achieve, as it has huge political dimension, and this is one of the major topics. However, he also states that cooperation among different ANSPs can be done fairly easily, and FABs are one of the contributing factors to this.

However, the Helios Technical Director and the Frequentis Programme Manager point out that communication challenges are mainly external. For example, an ANSP that is not a member in SESAR may find it difficult to obtain information. Also, people lack information about the successes and failures within SESAR, and also external communication is not transparent at all. Interviewees noted that, communication with the stakeholders who are “not in the SESAR family” is scarce and this brings confusion to them about the progress of SESAR and how it will affect them.

In addition, the Helios Technical Director explained that a consensus-based approach is at the heart of the SESAR and it should reduce the need for implementing rules in the project in the future.

5.1.4 Last Mover Advantage

Another challenge facing the SESAR project and not previously much discussed in the literature is the last mover advantage (LMA). Both, the SJU Economist and the EUROCONTROL Principal Director ATM state that those stakeholders who will implement last will be the ones closest to benefits. The EUROCONTROL Principal Director ATM explains that when a mandate will exist, everyone will push their investments until the expiration date, thus causing delays, as all cannot equip at the same time because of limited manufacturers’ capabilities. The Helios Technical Director discloses that the LMA is mainly an airspace user issue, for example, when ANSPs have already implemented on the ground but airlines implement as late as possible. The benefits arise only when over 70% of the total equipment is implemented. In addition, Helios pointed out that if there will not be an implementing rule, the stakeholders will incline towards the last mover advantage. This is in line with KLM Senior Manager who agrees that they would use the opportunity to be the last mover if they had one.

5.2 Success factors for PPP implementation

Atkinson, (1999) argues that besides the three mostly used success criteria (time, cost and quality) there should be other key success factors considered. From our findings arouse several other success factors to PPP implementation such as: synchronization
and standardisation, planning, positive business case, contractual agreements and commitment, cooperation and communication, transparency and privatisation of inefficient public organisations.

5.2.1 Governance
The CEO of Airbus ProSky argues that it is important to firstly build a governance structure for SESAR deployment that would take over the programme management responsibilities. SESAR lacks a strong framework for incentives that reflects European legislation and at the same time does not unbalance competition. As stated by several scholars (Atkinson, 1999; Reiss, 1996) the project management contains detailed planning, coordination and control over complex and diverse activities. Herten & Peeters (1986) highlight that “even a good incentive scheme cannot make a bad project management better”. This is line with the EUROCONTROL Principal Director ATM’s view who states that solid planning is important for achieving synchronized deployment, referring to “realistic plans that everybody sticks to”. He also explains how important the hierarchy of the initial design is, such as developing procedures and training. The better the design phase is defined the easier will the next phase be. Also the Helios representative explains that the project really needs a deployment plan, which is realistic. He thinks that if there would be a clear plan, this would create commitment in achieving it.

According to Grimsey and Lewis (2005), a PPP is a long-term contract requiring strict performance regimes. Within the SESAR partnership performance schemes are initiated by the European Commission. The SJU Economist explained that the performance targets on ANSPs aim at increasing their performance and reducing operational costs. In this light, ANSP and airport representatives highlight that monitoring of the progress by SESAR management team needs to be improved. This can be achieved by making visible the projects that are performing and validated and taking concrete actions on those projects that are not performing.

According to Marrewijk et al. (2007), PPP projects are often limited because of their governance structures and strategies imposed by principals. This is in line with the empirical findings. In the SESAR case, ANSPs are bound to national requirements, as they are a duty of states, and this, according to the CANSO Director, limits their improvements of performance. That means that as long as ANSPs are governed by the states, performance improvements get overshadowed by political interests and defragmentation. As stated by Salipante and Golden Biddle (1995), it is very difficult and time consuming to change policies and regulations of public organisations as these have been implemented throughout the years. Hence, public organisations tend to be conservative. Besides, public institutions have been considered as poor performers because of a lack of incentives for their employees and managers (Dixit, 1997).
5.2.2 **Synchronization and standardisation**

As stated by the EUROCONTROL Principal Director ATM, the Frequentis Programme Manager, airspace users such as KLM, SAS, the Dutch ANSP –LVNL- and manufacturers such as Airbus and Thales, the most critical element to make SESAR a success is the synchronization of deployment between the ground and the air levels. SESAR aims to get everyone to agree on a strategy to harmonize the system based on consensus and complemented by mandates where required.

Scholars (Grandori & Soda, 2006) claim that in order to achieve better results, some units of the partnership should be standardized (and managed through regulations) and some can be loose enough with certain freedom in accomplishing tasks. For example, in SESAR case, manufacturers are the ones that need to implement standards and adjust them with the rest of the world. This will bring simplicity, harmonization, reduce costs and increase safety. However, manufacturers say that standardisation and harmonization will detriment innovation. Nevertheless, airlines and ANSPs insist that compatibility among stakeholders is crucial and standards can enhance it while performance should be secured with the already existing technologies.

Moreover, the Helios Technical Director states that different stakeholders have different needs, as some may not need to implement SESAR as soon as others, and some may already have technologies in place that fulfil their needs. The goal with implementing SESAR is to improve the overall efficiency of the network, but efficiency needs differ depending on who will implement and where. For example, ANSPs should work on new technologies in the future in order to be able to handle more capacity without increasing their operational costs and taking advantage of the already existing capabilities of airspace users.

As explained in the following parts of this thesis, synchronization of implementation of PPPs can be achieved through positive business cases and by reaching commitment through strategies such as mandates or incentive mechanisms.

5.2.3 **Positive business case**

An important factor when deciding to invest in SESAR is a positive business case for each stakeholder (SJU Economist; EUROCONTROL Principal Director ATM; Helios). As explained by Ng et al. (2007), the private partner invests its capital expecting to recover from the operation income within the concession period. Thus, a shorter concession period for a PPP project is more beneficial not only for a public party but also for the private one as it helps to create a positive business case. The SJU Economist claims that a crucial need is to develop business cases for each stakeholder in a smart way to allow a more appropriate payback period for each stakeholder group.

The EUROCONTROL Principal Director ATM and Air France ensure that once there is a guarantee to achieve quick return on investment, organisations will not mind
investing. Moreover, Bubshait (2001) states that if people would pay some extra money for a timely or earlier implementation they would achieve the returns earlier as well, as the project would be accomplished beforehand.

5.2.4 Commitment
The literature in the field of PPP states that in order to achieve a high partnership performance, PPPs should be controlled through numerous contracts, agreements and procedures that clearly define the relationships and mutual benefits (Pongsiri, 2002; Milliman & Grosskopf, 2004; Grandori & Soda, 2006). This is also considered as one way to achieve commitment. The CANSO Director states that one way is by forcing commitment through the law. But he also questions if this would be a constructive commitment or would it become a burden to the point of damaging the industry. The Helios Technical Director expressed that implementing rules may put pressure on manufacturers as they create a unique peak in demand as the deadline of implementation approaches.

Thus, if a goal is to achieve a long-term commitment and informational efficiency through individual decision making, then motivation and self-interest of all stakeholders are crucial (Atkinson, 1999; Groves, 1973). Jha and Iyer (2007) state that if timely implementation of a project is the main objective then commitment is the primary key success factor. The main pillar for successful deployment of SESAR for stakeholders and manufacturers is commitment. The CANSO Director ensures that the synchronization can be achieved through commitment. Moreover, he explains that the alignment of thinking and acting is very important, and that stakeholders cannot look only at their own interests and claim that they want to be a part of the big picture. In addition, the Swedavia Senior Project Manager says that SESAR should have a less political and more honest approach towards its stakeholders.

5.2.5 Cooperation
In order to achieve commitment, communication and cooperation are very important. Scholars (Tang et al., 2010; Atkinson, 1999; El-Gohary et al., 2006) state that communication is one of the main factors for successful partnership. When asked how this can be achieved, the CANSO Director emphasizes the need for a change in attitude. He explains that “people need to sit together around the table, decide and commit to these decisions”. He agrees that communication and cooperation are the key, and it is up to customers to tell the manufacturers what they need and want. Furthermore, the Frequentis Programme Manager states that many responsible people from airlines and ANSPs do not know exactly what SESAR is doing and what benefits they will get from the project. He emphasizes that better and clearer communication is important.

In addition, Marrewijk et al. (2007) conclude that a positive outcome delivers cooperation between all project members. And Ruuska et al. (2010) add that large
multi-firm project cannot be managed only by close cooperation between one or few actors. In this light, Thales states that collaboration of all parties involved is necessary. All stakeholders (airlines, airports and ANSPs) need to be equally connected to the network and need to have a communication system connecting them. As there is a duplication of tasks within SESAR and FABs, according to LVNL advisor, people need to make sure that what they work on within the FABs is in line with SESAR.

5.2.6 Transparency
Considering commitment, the CANSO Director states that transparency is also one of the key factors to create trust. He explains that transparency is clear at the working level but at the political level it is up to the governments and transport ministers of how much information they are willing to disclose. Thus, this creates a huge political impact on SESAR. Antoniadis et al. (2011) have discussed the importance of understanding such complexity of interconnections; they claim that the visibility may improve the project’s schedule and implementation of innovative actions.

The Helios Technical Director and the Swedavia Senior Project Manager state that communication and visibility of projects are crucial in order to stop those projects that are not delivering and highlight those that are. The true beauty of SESAR is that collaboration between ANSPs, airspace users, airports and manufacturers is taking place, and this usually brings consensus and hence, commitment Helios argues.

5.3 Incentive mechanisms
By investigating the existing theory on incentives, it shows that proposed incentive mechanisms so far are very general and not directly applicable to PPP projects. Incentives in the case of SESAR represent stimuli for deploying of technologies and equipment in a timely manner at European level. As we conclude, such incentives that encourage timely deployment include financial incentives, operational incentives, legal incentives through mandates that force commitment in order to reach timely functionality at network level and intangible incentives that seem to be of high importance for a general stimulation of cooperation, trust and commitment among stakeholders.

5.3.1 Financial incentives
In 1997, Arditi et al. (cited in Meng & Gallagher, 2011: 353-354) defined a time incentive as a bonus to service providers for each day of early implementation. The SJU Economist, the EUROCONTROL Principal Director ATM and Thales mention that the existence of a public-private fund, also referred to as the deployment fund, would help finance deployment, for example offer loans to the stakeholders, mainly airlines as those are bearing the highest costs. The payback time would be required only after the respective companies begin drawing benefits form the investments made. One manufacturer suggests to rather financially support ANSPs in order for them to invest in ground updates and make use of technologies and capabilities already existing
within aircraft. An ANSP representative argues that co-funding and direct monetary contributions could be an incentive to overcome the issue of the LMA. Nevertheless, a governance structure should be in place for a funding scheme to be successful as the CEO of Airbus ProSky highlights.

The financial incentive can reflect differentiation treatment, as the earlier stakeholders invest, the more financing support they would receive. Another suggestion that the Frequentis Programme Manager makes is about increased funding for ANSPs and airlines when applying for funding projects together rather than invest separately in a desynchronized manner.

On the other hand, the EUROCONTROL Principal Director ATM and LVNL adviser emphasize that the primary incentive is to get a positive business case. Within the ATM industry, there have been situations in the past when an investment was made in one part of the value chain, but it triggered benefits in another part of the value chain. This is why incentives need to be put in place for the ones who make the investment but do not have direct return on that investment. Those incentives can be cost reductions or subsidizing investment fees as presented by Air France representative. However, the LFV Director of Business Development argues that benefits for stakeholders should be visible, if they are not, then the investment would have to be financed through the European Commission. One more financial incentive suggested by the EUROCONTROL Principal Director ATM is to get the airlines to understand the value simply by SJU sponsoring equipment for trials and by that proving the benefits. Regarding this, Helios Technical Director also suggests lowering the prices of the equipage if implemented early, or lowering the charges airlines pay to ANSPs, as equipped aircraft could pay less than non-equipped.

Another financial incentive suggested by both Helios and LFV is the lowering of charges for ANSP services for those aircraft that are fully equipped. This approach would bring benefits to both airlines and ANSPs since airlines can benefit of lower charges and ANSPs can benefit when a high number of aircraft are equipped. Furthermore, the determined cost recovery approach presented by the SJU Economist would make ANSPs more responsible for the investments they undergo and less dependent on the possibility to recover their costs fully through charges from airlines, thus, incentivising airlines with better performance without an increase in charges.

5.3.2 Operational incentives

According to Dixit (2002), in situations where the outcome is important for the principal within a certain time-frame, it is the best to use incentive schemes promoting a high reward for timely/advanced implementation and punishment in case of delay. More specific, these incentives are applied in SESAR within the “best equipped, best served” approach. The SJU Economist, EUROCONTROL Principal Director ATM, Helios Technical Director and representatives from airline, ANSP and manufacturer
sides argue that aircraft which are better equipped should be given preferential treatment. The EUROCONTROL Principal Director ATM exemplifies incentives such as shorter routes, continuous descent approach, continuous climb departure, access to run-way and priority for landing or take-off. The Helios Technical Director and SAS Project Manager suggest that the best equipped airlines would be able to land in the main airports but those airlines that land in smaller airports would not have to equip. However, Air France representative argues that it is not clear how much the airlines will save with this approach, and it is important that return on investment can be expressed in clear numbers. Conversely, an operational disincentive example relates to the differential treatment on the altitude level that an aircraft is allowed to fly, which means that if an aircraft is not equipped it would not be allowed to fly higher than a certain altitude. Lowering the altitude level would bring a disincentive since the efficiency of flying decreases considerably along with the increase of consumption of fuel. Such situation brings to light the issue of environmental friendliness of airlines. Airlines that claim to be environmentally responsible would need to consider the adherence to such operational incentives. Undoubtedly, operational incentives need to be enforced and managed by the ANSPs, thus, the necessity for new procedures and technologies. Strict procedures and rules need to be enforced for a democratic preferential system.

LVNL adviser highlights that validation of work and exercises need to be done in order to show that the SESAR technologies really work, and in this way convince organisations. This also responds to the theory that incentives should be applied in a way that links the principal’s expectations with the agent’s objectives (Meng & Gallagher, 2011).

### 5.3.3 Legal incentives

Theory presents that legal instruments such as rules and agreements can be used as a control mechanism to ensure project performance (Lane, 2000). The CANSO Director states that when business cases are not positive or stakeholders seek the last mover advantage, a legal incentive could be used to impose an implementing rule through mandates. Even though, he says, that the law is stronger than incentives he also argues that the law should be the last resource to use. However, the Helios Technical Director argues that the most direct way to force stakeholders to implement is legislation. For example, if a state does not comply, the European Commission can take it to court and if an airline does not implement the required equipment, it is not allowed to fly. In addition, the Frequentis Programme Manager mentions that usually, when there is regulation, stakeholders will comply. Likewise, airlines and manufacturing representatives agree that implementing rules work as mechanisms to ensure that the system will reach operational level. Equally important, as explained by the EUROCONTROL Principal Director ATM, when a mandate exists it is usually the case
that everyone will push investments until the expiration date of the mandate thus, almost without exception, causing delays. This can be solved by incentivizing pioneers.

Also, scholars (Meng & Gallagher, 2011; Habison, 1985) suggest incentive provision used as a contractual strategy as the most efficient solution to performance problems. For example, the European Commission in 2012 established a cost recovery model that will be implemented for ANSPs limiting them to recover their costs fully from airlines. This model will ensure that the charges will be reduced and performance increased.

5.3.4 Intangible incentives
Meng and Gallagher (2011) emphasize that for incentive mechanisms to be successful collaborative working environments and motivation of all stakeholders should be created. LVNL adviser suggests that if SJU will give more responsibility to the industry within deployment, then participants will be more motivated to accomplish the work. Moreover, trust and commitment are crucial, however, these have been influenced negatively from past experiences. This is why the CANSO Director suggests to “forget the past, as we are building the future”. Accordingly, the Frequentis Programme manager argues that commitment can be achieved by explaining the business case and the benefits to ANSPs and airlines. Furthermore, the LVNL adviser believes that creating the role of a deployment manager could enhance the trust between all stakeholders.
6 Conclusion
The purpose of this thesis was to investigate the incentive mechanisms that may be used for a timely and successful implementation of large Public-Private Partnership projects. In order to discover appropriate incentive mechanisms, we explored what challenges different participants of such partnerships face and what incentives may contribute to overcome such challenges. Since there is a lack of an adequate academic discussion on how to ensure a timely implementation of a project with multiple principals and agents through incentives, we found the need to research deeper into the field. Therefore, we conducted a literature review on general challenges and incentives within PPP, project management and public sector, as well as, carried out an in-depth case study evidenced through SESAR in order to understand underlying challenges and explore possible solutions in terms of incentives. Through this thesis we clearly established that to some extent the underpinning theory is applicable to reality, however, it is too abstract and needs to be explored deeper, as well as explained with a more practical focus.

The most common challenges identified in previous studies are timely implementation, low cost and good quality (Meng & Gallagher, 2011; Tang et al.2010; Marrewijk et al., 2007). These are also the general challenges facing our case study. However, in addition to what the literature review presents, our empirical findings reveal what issues are at the core of the previously mentioned challenges. As the main objectives of the SESAR project are to increase quality and decrease costs in the long-run in ATM through synchronized implementation of new technologies and equipment one can argue that timely implementation is the primary determinant for achieving this.

Given that timely implementation is the main success factor for our investigated PPP project, the findings discover that synchronization of stakeholders’ investments is crucial. Thus, in order to invest, all stakeholders want to be sure that everyone in the value chain will implement changes in a timely manner. It is agreed by both, scholars and our interviewees, that inter-organisational trust and commitment between all parties involved is an important factor to ensure synchronization. Another essential issue standing in the way of implementation is money, as in order to invest organisations need to ensure a positive business case. Previous studies acknowledge the need for time and appropriate resources; however, there is not an appropriate discussion on supporting funding mechanisms to enhance the investments. Even if stakeholders have enough finances to invest, an emerging issue is the enhanced chance of positive return on investment. In other words, nobody wants to invest if the payback period is ambiguous or too long in the future. That is why communication with both, internal and external parties, is relevant. Our findings disclose that communication of potential benefits from investments and visibility of successes and failures within the
process of implementation can decrease uncertainty and ensure clearer monitoring for implementing projects in progress.

In the previous studies on incentives for PPP projects we did not find research that would provide appropriate suggestions for incentive mechanisms that can be used in the implementation of large PPP projects. Therefore, from our findings we discover patterns that different participants perceive as successful incentives in order to ensure timely implementation of the project. Based on these patterns, we develop a new classification of time incentives for large PPP projects as described below.

![Figure 6-1: Process from theory to contribution. Source: Authors](image)

The exploration of challenges and success factors led to our contribution to the theory by the identification of incentives for timely implementation of large PPP projects, as presented in figure 6.1. Time incentives can be used combined or separately, to improve the overall implementation of large Public-Private Partnership projects:

i. Financial incentives can be exemplified through an implementation fund that can offer loans to stakeholders that are bearing the highest risks. The earlier one implements, the more financing support can be received. Moreover, loans could reach payback after the stakeholders start receiving benefits. Other financial incentives can refer to subsidizing the interest fee of loans, or reducing service charges that private actors pay to the public actors.

ii. Furthermore, operational incentives work as a preferential treatment in terms of better service provided to those who implement the required changes. Nevertheless, operational disincentives can be used to punish the ones lagging behind. This can be achieved through detrimental treatment that could
decrease their efficiency and thus, increase the cost level. In order to ensure democratic preferential system, strict rules need to be established.

iii. Implementing rules can work as a legal instrument to guarantee that the project will reach operational level and increase performance needed within a certain time-frame. On the other hand, since law often forces commitment, implementing rules may enhance the risk of the last mover advantage and uncompetitive behaviour. Also, implementing rules can be used as disincentives for those who do not implement, this way taking them to court or forbid them to operate.

iv. Additionally, intangible incentives, such as transparent communication with all parties affected by the project either directly or indirectly, cooperation and less political behaviour, are seen as major factors contributing to the commitment and trust level among the actors involved, thus, enabling the success of the PPP project.

7 Further remarks

7.1 Delimitations

The research questions refer to the implementation of PPP projects whereas within the empirical framework the deployment of SESAR is presented. It is worth drawing the delimitation between implementation and deployment. Deployment of SESAR includes both industrialization of technologies and equipment and implementation of these. Since we investigated actors that are involved in the industrialisation and implementation, we refer in the empirical framework to the deployment of SESAR. However, since our research questions refer to the challenges and incentive mechanisms for the implementation phase of PPPs, in the analysis section we only refer to the implementation phase of PPPs. Data drawn from the interview summaries and further themed up in the empirical framework represent a wider pool of information from which only the relevant information is being selected to answer our research questions in the analysis.

A globalized seamless ATM system is considered to be the ideal outcome of both SESAR and other similar PPP around the globe such as NextGen in America. We have however, focused on the ATM industry at the European level, even though many of the organisations we interviewed are global players. Therefore, the sample size was decided based only on those members that are part of SESAR in Europe.

7.2 Further research

Since the deployment phase of SESAR has not been commenced, we encourage further research on governance of PPP projects. It may be difficult to have access to such information since it may be sensitive and of political significance depending on the
involvement of the public sector as well as the stage at which the PPP project is situated in its progress. SESAR is such an option for possible governance study at the time when more information is available. Moreover, testing the actual incentive mechanisms identified in this paper should bring interesting insight on their practicality. A comparative research study between SESAR and NextGen in terms of governance structure including challenges and success factors, as well as incentives to deploy used on both sides, should be interesting. Other industries than the air traffic industry can be investigated as well, for example, the satellite industry, railway industry, or the space navigation industry which recently has drawn interest from the private sector, for example through the Virgin Galactic commercial space flights. Studies can refer to how a public sector, industry or actor can be privatised or made commercial and what incentives can have an impact in this respect. Furthermore, the decision making process of investments in PPPs (even in the case of SESAR) can be researched, as well as the impact of positive business cases, implementing rules or trust and transparency on the decision-making process.
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Appendix 1 Single European Sky

McKinsey (2011) explains that the Single European Sky (SES) is an ambitious initiative launched by the European Commission in 2004 to reform the architecture of European air traffic management (ATM). SES regulatory framework as introduced in a report from the Commission on the implementation of “Single Sky legislation- time to deliver” (2011) includes:

a. **FABs (Functional Airspace Blocks)** – cooperation among regional ANSPs grouped into Functional Airspace Blocks such as NUAC (Denmark, Sweden), DanubeFab (Romania, Bulgaria) or FABEC (France, Germany, Belgium, Netherlands, Switzerland, Luxembourg) which ought to be established and operable by end of 2012.

b. **Performance schemes for ANSPs – Air navigation service providers** at national level. Member States were given the deadline of 30 June 2011 to prepare and adopt their national or FAB performance plans and targets.

c. **NSAs (National Supervisory Agencies)** – oversight over Member State’s compliance to SES regulation over areas such as safety, interoperability and performance. All Member States have now established NSAs however, they are constrained by a lack of resources and improvements are necessary in how they operate.

d. **PRB (Performance Review Body)** is to assist the Commission and the NSAs in the implementation and monitoring of the performance scheme, allowing the start of the first reference period of the performance scheme in 2012.

e. **Network manager** (EUROCONTROL) The Network Manager is an important asset to improve performance in the use of the airspace, already being in place to deliver the desired benefits for the network. ANSPs, airspace users and airports expect immediate actions at network, FAB and national levels to anticipate and mitigate capacity problems.

f. **SESAR** is the technological pillar of the SES.
Appendix 2 Semi-structured Interview guide

1. How did your organisation get involved with SESAR? Please explain the reasons behind your (direct or indirect) involvement in SESAR.
2. What is your role within SESAR? Where do you see your organisation stand in the organisational structure of this project?
3. Please describe what partnerships do you have with any other organisation/s as part of SESAR, and what is their purpose?
4. What are in your opinion the key success factors for SESAR deployment? Refer to challenges, benefits, or any other factors.
5. Referring to the last mover advantage, how does your organisation relate with it?
6. What incentives do you see in investing in SESAR equipment? Please refer to different types of incentives for example financial, operational or legal.
7. When it comes to operational incentives the „Best equipped best served” approach was expressed that could serve as an incentive. How could this differentiation of treatment among airlines actually work?
8. What positive aspects do you find with the business case of SESAR investments when it comes to your case? As well as what negative aspects?
9. Can you give examples of some short-term benefits with SESAR? Do you plan to invest in any SESAR equipment soon?
10. In a report on financing and funding of SESAR deployment, it is stated that there is a lack of confidence in the others stakeholders’ commitments towards investments. In what way do you think this trust affects the synchronization of investments between ANSPs and airlines? How would you describe this level of trust among stakeholders? And also towards the management level?
11. How satisfied are you with SESAR development deliveries? What could be improved in the communication and decision making process within SESAR?
12. SESAR requires timely and synchronized deployment. What are the main incentives to successful deployment, in your opinion?
13. How optimistic are you with SESAR deployment and its progress so far?
### Appendix 3 Interview summaries

<table>
<thead>
<tr>
<th>Name</th>
<th>Position &amp; Organisation</th>
<th>Location &amp; Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot interview - Alain Siebert</td>
<td>Chief Economics &amp; Environment, SESAR Joint Undertaking</td>
<td>Bruxelles, BE 15-02-2012</td>
</tr>
<tr>
<td>Bo Redeborn</td>
<td>Principal Director ATM, EUROCONTROL</td>
<td>Bruxelles, BE 16-04-2012</td>
</tr>
<tr>
<td>Dimitris Vartis</td>
<td>Economist, SESAR Joint Undertaking</td>
<td>Bruxelles, BE 28-03-2012</td>
</tr>
<tr>
<td>Guenter Martis</td>
<td>Director European Affairs, CANSO</td>
<td>Bruxelles, BE 04-04-2012</td>
</tr>
<tr>
<td>Paul Ravenhill</td>
<td>Technical Director, Helios</td>
<td>London, UK 16-03-2012 (1st) 13-04-2012 (2nd)</td>
</tr>
<tr>
<td>Michael Holzbauer</td>
<td>SESAR Programme Manager, Frequentis</td>
<td>Vienna, AT 18-04-2012</td>
</tr>
<tr>
<td>Tomas Paál</td>
<td>SESAR Project Manager, SAS</td>
<td>Stockholm, SE 28-03-2012</td>
</tr>
<tr>
<td>Ceriel Janssen</td>
<td>Senior Manager ATM Strategy &amp; Charges at KLM Royal Dutch Airlines</td>
<td>Amsterdam, NL 29-03-2012</td>
</tr>
<tr>
<td>Rene de Vogel</td>
<td>Project manager Air Traffic Management KLM Royal Dutch Airlines</td>
<td>Amsterdam, NL 10-04-2012</td>
</tr>
<tr>
<td>Jean-Gaël Duboc</td>
<td>Corporate Finance, Air France</td>
<td>Paris, FR 19-04-2012</td>
</tr>
<tr>
<td>Niclas Gustavsson</td>
<td>Director Business Development, LFV</td>
<td>Stockholm, SE 22-03-2012</td>
</tr>
<tr>
<td>Bianca de Wit</td>
<td>Adviser, LVNL</td>
<td>Amsterdam, NL 29-03-2012</td>
</tr>
<tr>
<td>Mark Blanchard</td>
<td>ATS Specialist, Finavia</td>
<td>Helsinki, FI 28-03-2012</td>
</tr>
<tr>
<td>Henrik Bagewitz</td>
<td>Senior Project Manager PMP Swedavia</td>
<td>Stockholm, SE 27-03-2012</td>
</tr>
<tr>
<td>Rolf Wyss</td>
<td>Senior Project Leader in Planning &amp; Engineering at Flughafen Zürich AG</td>
<td>Zürich, CH 23-03-2012</td>
</tr>
<tr>
<td>Frank J. McMeiken</td>
<td>Manager ATC, Guernsey Airport</td>
<td>Guernsey, UK 19-03-2012</td>
</tr>
</tbody>
</table>

*Table 1 Interview respondents*
EUROCONTROL – Principal Director ATM

The European Organisation for the Safety of Air Navigation (EUROCONTROL) is an intergovernmental organisation made up of 39 Member States and the European Community. Founded in 1960, it is a civil-military organisation that has developed into a vital European repository of air traffic management (ATM) excellence, both leading and supporting ATM improvements across Europe. EUROCONTROL supports its Member States to achieve safe, efficient and environmentally-friendly air traffic operations across the whole of the European region while providing at the same time technical expertise for building the Single European Sky (EUROCONTROL, 2012).

Mr Bo Redeborn, Principal Director ATM at EUROCONTROL, is responsible for overseeing the organisation’s ATM policy and development and for managing high level strategic relations with key ATM partners. Mr Redeborn is the EUROCONTROL representative in the SESAR Joint Undertaking Administrative Board and he participates as an observer in the Single Sky Committee (SSC) and the Industry Consultation Body (ICB).

The challenges for SESAR deployment, the technological pillar of SES, were discussed as well as the possible incentives for the future deployment phase of SESAR.

Mr Redeborn presents two successful models for pushing deployment. The first is “to mandate, to regulate, and those who operate in the system will normally comply”, and the second is a “very positive business case”. The most critical element, however, is to avoid the situation where one does not get full benefits from the investments made. “That is why deployment is complicated”. There have been situations in the past where some have been forced to deploy but there was no new added value coming from these investments since there was a “lack of synchronization between the various bits and pieces”. Referring to the challenges of SESAR, “the synchronization of deployment of capabilities on the ground and in the air is the most critical element to make this a success”. Returning to the second model, Mr Redeborn explains that “when there is a strong business case, normally, there will be no problem to find the money to invest since there will be a quick return on investment. Once there is a guarantee to get the benefits, organisations won’t mind investing”.

When asked about the level of collaboration between the ground and air stakeholders as well as with manufacturers, Mr Redeborn states that they cooperate well. At the same time, manufacturers sometimes obstruct from changes and do not perfectly suit their own product, and their own strategic expectations that are decided within the company, manipulating in this way to prevent more cost-efficient solutions that could be put into place to do the same job, as that would mean that they will not use market share or that they would become obsolete in the market. The ATM industry market is not as dynamic as other consumer markets. This relates to the time needed for products within the ATM industry to get certified and be used within an operational
environment, since safety comes first. Because of this the cycle of products in aviation is typically much longer than in more dynamic consumer markets.

Returning to the manufacturers’ role in deployment and their commitment to the exact needs of stakeholders, Mr Redeborn refers to the importance of “being very clear of what is needed and when”. One example that he gives is the performance based navigation. Instead of defining exactly what is needed on board an aircraft, there are performance requirements that are defined in terms of, for example, accuracy, availability, integrity for navigation. When these performance requirements are set, then an avionics manufacturer could find whatever solutions that fulfill all these requirements. This way you demand a capability instead of a system. First, there is a mandate on performance requirements, then procedures are developed to actually make use of those capabilities and finally, a manufacturer that can achieve these capabilities can then be negotiated with. One way to relate to this is to move from specific requirements to performance related requirements. It is better to specify what an airplane should be capable of doing instead of how. This can be seen as an incentive to the industry to come up with clever solutions that meet these capability requirements.

The SESAR Joint Undertaking will not directly and formally decide on the products directed towards deployment. The SJU will prepare instead a menu of results, a set of validated proposals. On the one hand, those related to network efficiency will be demanded and regulated when the agreement process is settled, and on the other hand, validation will show that a value added product or capability will have higher benefits than costs and thus will incentivize airlines to equip.

The weak point in aviation these days is the physical connectivity between the air and the ground. When this connectivity is reached, the system can develop further by having airlines subscribe to various “applications” for getting services from the “cloud”. But this can be possible by having the right connectivity between air and ground, which is not the case at the moment. However, there is a complexity built into this idea because for certain applications, in order to make them work, one must be extraordinarily specific on the requirements, while for other applications one may set a couple of performance or capability requirements and based on these one can dynamically improve and develop them. It is hoped from the side of the SJU to deliver better data on what “we are now capable of doing and when” to implement these capabilities. Since the SJU was created to engage the industry from the beginning, whatever will be proposed, the industry should actually be capable of delivering, otherwise it would not be proposed. Currently, a lot of money is put into the end phase of development to actually reach the point of deliveries being ready to deploy. Mr Redeborn makes reference to the hierarchy of the initial design, developing procedures
and training of how these procedures can be used. The better defined the initial design phase is, the easier the next phases will be.

One of the primary incentives for deployment is to get the business case right. Incentives will not fall in the regulatory area as everybody will have to comply when a mandate is enforced, thus creating no competitive stimuli. There have been cases in the past when an investment made in one part of the value chain, for example ANSPs, will trigger benefits in another part of the value chain, airspace users. So, in this case, incentives need to be put into place for the ones who make the investment but don’t actually have a direct return on that investment. For example, incentives can refer to cost reductions or even subsidizing investments. Solidarity is something most people subscribe to up to a certain point until one asks “what do I actually get in return?” especially if the money comes out from one’s pocket while benefits rise in another’s. At this point it is important to find ideas and ways to incentivize people to invest.

Another example is the last mover advantage which is common in aviation. It is typical, especially when a mandate is established. The last mover advantage is preferred because the one who invests last is also the closest to the benefits. When a mandate exists the usual case is that everyone will push investments until the expiration date of the mandate thus, almost without exception, causing delays. Moreover, those who need to make the investments cannot all equip at the same time because the process is long and at the same time manufacturers may not have the capability to meet demand. One way to solve this delay is by incentivising pioneers, subsidizing them by covering parts of the cost or by offering favourable loans in order to get the capabilities on the market. Part of the SJU is also to get airlines to understand the value by simply sponsoring equipage trials and through that proving the benefits.

Other types of incentives are operational incentives. The “best equipped/performant, best served” approach gives priority to those who are more capable. Some operational incentives examples include incentives for sequencing, delays or departure, with less buffers for the controllers as well. Moreover, improving or simplifying procedures for those who are capable of meeting certain requirements would also create a strong incentive to airlines. For example, a decade ago when noise rules were introduced, a discount was given for landing fees for those airlines that were running quieter aircraft and very quickly many airlines moved from noisy aircraft to quieter ones at operational level in those airports that offered this discount. Operational incentives will have an effect on the rate of deployment for those capabilities that SESAR development will provide. Some other examples of operational incentives include shorter routes, continuous descent approach, continuous climb departure, access to runway that is dedicated for those who are equipped when regular runways are congested.
Additionally, the lack of trust among stakeholders in combination with the fact that the system works reasonably well today, and it grows very slowly, contributes to the lack of commitment, especially when there have been cases in the past when investments did not happen in a synchronized manner. Solid planning, through “realistic plans that everyone sticks to, is important for counteracting this and achieving synchronized deployment.

The introduction of performance schemes which, as of this year, is a sharp target in reducing user charges, has had a positive effect on the performance of ANSPs. However, the problem is that there is not an obvious recovery cost for inefficient service. What changed this behaviour is the rule on performance established by the performance targets, in the first reference period until the 2014 and the second period 5 years ahead after that. In this particular case, regulation was required through the performance review mechanisms of the SES. Sharp targets have been set and it seems that it works quite well. Even though these particular targets were based on airspace usage forecasts, which were much higher when they were discussed than now, the ANPSs easily meet the capacity targets, most of them, but many of them will have difficulty in meeting the cost-cutting targets.

Mr Redeborn is rather optimistic about SESAR deployment and its progress so far, albeit with some reservations about the whole community being able to keep within the timeframe scale. However, when it comes to the concept of operation and the direction that SESAR is moving towards, it is step-by-step proving that it is the right direction, and the acceptance of this fact is rather widely spread. “I think we are moving in the right direction, but not as fast as people believe. There will be slippages, but I am sure we are on the right track”. Mr Redeborn mentions that as soon as a lot of stakeholders question the need to quickly move in the right direction, it will obviously create delays. “If you are in a real crisis, it is easier to get people to understand and act accordingly. Even though we are in an economic crisis, the aviation industry is not in crisis, the system works pretty well at the moment. There are other parts of world such as the Middle East (e.g. Dubai, Abu Dhabi) and Eastern China and India where growth may cause difficult situations in the near future”.

**SESAR Joint Undertaking – SJU Economist**

The SESAR Joint Undertaking (SJU) established by the European Commission is in charge of the development phase of the SESAR project, coordinating research & development efforts in the ATM industry at European level (SESARJU, 2012).

*Dimitris Vartis, Economist, SESAR Joint Undertaking, Bruxelles.*

As SJU is responsible for the development phase, the transition from development to deployment is currently studied by a project team within SESAR. The team also
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considers the financial incentives that can be put into place to support deployment. According to Mr Vartis, financial incentives are one way to stimulate deployment. Secondly, operational incentives are also discussed such as one early project flight trial initiated by SAS, named the “best equipped, best served” approach. If planes are better equipped they will get benefits from having direct preferential treatment.

Mr Vartis argues that those who will implement last will be the ones nearest to benefits, thus, describing the last mover advantage. That is why deployment of SESAR needs synchronization between air and ground. He adds that airlines have different tax constraints, and different investment cycles that are very strict plus they have very short payback periods compared to the air controllers on the ground (ANSPs). ANSPs are publicly owned, and they have different abilities to access financial capital than airlines do. Moreover, ANSPs return their investments through the charges they impose on airlines. Airlines pay air charges for the air traffic control services that ANSPs throughout Europe provide. Therefore, the burden for capital investment lays heavier on airlines than ANSPs. The problem as introduced earlier is that ANSPs until today make investments that are borne by airlines in the end. This has been called the default cost recovery. However, a new cost recovery model is currently studied to be put into place by the European Commission in 2012. This model is called the determined cost model and constrains ANSPs to no longer be able to fully recover their investment costs through charges upon airlines. This means that the determined cost model will only partially allow ANSPs to collect their costs and therefore, put pressure on them to make only the most essential investments. In other words, ANSPs need to make more rational investments, those where there is a necessity for them and in the end, there will be higher responsibility for the choices ANSPs make. The determined cost model will ensure that cost and risk sharing will be borne by both ANSPs and respectively, airlines. “The trend is clear, charges need to be reduced and performance increased”.

All ANSPs in Europe, with the exception of UK, are publicly owned and often operate as monopolies at national level. There have been discussions around the performance targets on ANSPs, through the performance schemes that the Commission has initiated. The performance scheme is an EU wide initiative that puts targets on ANSPs. These targets generally aim at increasing performance and reducing operational costs of ANSPs. However, the question is how to incentivize ANSPs to reach these targets. Financial incentives are of course helpful. Furthermore, when asked whether a long-term privatisation goal for ANSPs will bring a more likelihood of a synchronized SESAR deployment, Mr Vartis points out that “it would be nice if that happens, but you cannot actually incentivise countries to proceed with privatisation, as each has different budget and different plans”. Instead, there are different targets that could increase ANSPs performance, such as the performance schemes and the determined cost model as evidenced above.
It is worth mentioning that SESAR is only a part of the Single European Sky (SES) project as a whole. Performance schemes are another pillar of SES, FABs as well and so on. FABs are “functional airspace blocks” that are regions in Europe containing several countries with their respective ANSPs, thus, making ANSPs cooperate and inherently states as well. SESAR is the technological pillar of SES. Incentives for SESAR refer to incentives on technology deployment. However, the performance schemes of ANSPs do have an impact on SESAR deployment and are worth mentioning.

Mr Vartis further presents that a main financial incentive for SESAR stakeholders would be a public-private fund (also referred to as the Deployment fund) that would offer loans for deployment. These loans would mainly target airlines as they are the ones bearing the major costs for deployment (two thirds of the whole deployment investment costs of SESAR) and their access to financial capital is tougher than other stakeholder groups in general (ANSPs and airports). In addition, these loans would not cover the whole investment costs (only about 20%) and airlines would have to pay them back when they start receiving benefits. These loans can be guaranteed according to airlines’ credit ratings. Some agreements could be put into place between airlines and ANSPs for short term benefits, however, this is still unknown and under preparation.

Although not an external incentive, the business case of each stakeholder needs to be positive when deciding to invest in SESAR. Business case is independent to stakeholder groups. In the master plan the business case is positive to the majority of stakeholders. Business cases are created through consultation together with the stakeholder groups, airports, airlines, ANSPs, military and other key stakeholders. Mr Vartis emphasizes that one central need is to create business cases for each stakeholder in a smart way to allow payback period.

Incentives exist or should be put into place in order to make “stakeholders move earlier”. And there are various ways to achieve incentives. One example could be funding access from the Commission’s sources such as the TEN-T fund. The earlier airlines invest, the more financing support they would receive. For example, in the first year the financing rate would be at a certain level, while the following years the rate would be reduced.

However, when business cases are not positive or stakeholders seek the last mover advantage, a legal measure could be used to impose investments. Law is stronger than incentives; law would eventually force stakeholders to implement the required

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2 Trans-European Transport supports the modernisation of European roads, railways, airports and other traffic management systems. Member States can be guaranteed funds from the Trans-European transport budget established by the European Commission (European Commission TEN-T, 2012)
packages. However, the law is the last resort to use, Mr Vartis concludes since stakeholders need to be convinced through a smart business case.

CANSO – Director European Affairs

Canso (Civil air navigation services organisation) creates an international forum for discussion of Air Traffic Management related issues, where all aviation stakeholders unite to develop and exchange ideas in support of global Air Navigation Services. Furthermore, as the global association of ANSPs, CANSO represents its members by coordinating joint positions and speaking out on industry issues. CANSO acts as the global ANSP Voice on both regulatory and industry issues (CANSO, 2012).

Guenter Martis is the Director of European Affairs at CANSO. Mr Martis heads CANSO’s activities in Europe and represents ANSPs in EUROCONTROL, the Industry Consultation Body (ICB), the SESAR Joint Undertaking Administrative Board, and co-chairs the EU Social Dialogue.

The deployment phase of SESAR is currently under development and therefore, Mr Martis explains it is premature to give a formal point about this, as discussion is still developing. However, funding is not the essential part within deployment, Mr Martis claims. For some stakeholders it might be essential, for example, airlines that might not have done a proper planning beforehand. Furthermore, when considering the funding loans made available for helping stakeholders, these loan resources will probably reach less than 10 percent of the total costs of SESAR deployment, the rest would be the industry bearing the costs. That is why the main pillar for a successful deployment of SESAR for stakeholders and manufacturers is commitment. Synchronization of deployment can be achieved through commitment. And commitment must be an attitude; it must be a principle to which those involved must adhere to. Moreover, commitment can be built on trust. And at the moment, the whole industry is lacking of trust. This results also from past experiences of previous deployment projects in the ATM industry. Having experience in the ATM industry for over 20 years, Mr Martis encourages to “forget the past, as we are building the future”. One way to do it is by forcing commitment. The law is one way to achieve this commitment but it is still unclear whether mandates would bring a constructive commitment or would it become a burden to the point of damaging the industry.

When asked about how transparency affects the commitment of stakeholders, Mr Martis argues that transparency is clear at the working level, however, at political level, it is up to the states and the transport ministers of how much information they want to disclose. Furthermore, “the political impact on SESAR is huge”. That is why transparency is the key to create trust as well. “That is part of the new attitude that we need to show. Change of mind-set is necessary”.

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One main problem with previous projects in the air industry and with stakeholders that are now also part of SESAR, is the cost of ownership. Cost of ownership involves the costs of purchasing, installation, training and maintenance of new equipment or systems. This cost is decided by manufacturers and borne by stakeholders such as airlines, ANSPs and airports and when this cost is high, nobody will want to invest.

Furthermore, manufacturers need to implement standards that are general not only for Europe, but for the rest of the world. Through standards one brings simplicity and harmonisation. Simplicity can reduce costs and also increase safety. The more complex a system is, the more difficult to check and control for safety measures. When asked how can this be achieved, Mr Martis emphasizes the need for a change in attitude. You need to sit together around the table, decide and commit to these decisions. Communication and cooperation are the key. It is up to the customers to tell the manufacturers what they need and want. They need to discuss and decide. “It is a dramatic shift in attitude and dramatic shift in doing business”.

Referring once more to the role manufacturers have upon the deployment of SESAR, it is clear that they play a key role in the decision making process, especially on the costs of SESAR technology and equipment that needs to be deployed. In the end, “if manufacturers place so high costs on their products, nobody will buy those”. As an example of an airborne system that needed to be deployed several years ago, “a major manufacturer knew that the system was required. Consequently, the prices were absolutely huge and they were killing the project. Because of this, valuable time has been lost, that even to this day this project has not been largely deployed”.

Additionally, Mr Martis has been the one who represented the airline contribution in the first definition phase of SESAR. “It was tough, we had a lot of debates, and we put a lot of energy. But we worked very well and we achieved it. In 2 years we had the master plan ready, when everyone was claiming that this would fail. This is a clear message that if there is a will, there is a way”.

Furthermore, considering the performance of air navigation service providers in Europe, ANSPs have limits because they are bound to national requirements as they are a duty of states. This means that there is a limit in improving their performance. “As long as the states keep on playing the game of fragmentation, the ANSPs can do what they want, and they will not improve a lot”. This means that as long as ANSPs are governed by the states, performance improvements get overshadowed by political interests and defragmentation. Airlines complain about the charges they need to pay for the ANSP services. There are standard airlines that use the system in a certain way, and others who actually abuse it. ANSPs need to give service to all, equally, as stated in the Chicago convention. In the future, with a single system this would be completely different.
Cooperation between ANSPs of different states can be done fairly easily. However, cooperation among states on a state level is sometimes really difficult to achieve since there is a huge political dimension. This is one of the major topics. When asked whether the privatisation of ANSPs will bring positive outcomes on SESAR deployment, Mr Martis suggests that “privatisation of ANSPs will eventually need to happen. Sooner or later there is no way around it, but it will take some time”. FABs are certainly one of the contributing factors to this.

Moving back to the first point Mr Martis made at the beginning of the interview, the main tool for a successful deployment is the alignment of thinking and acting, “going beyond the past and looking at the future, seeing the big picture”. Stakeholders cannot only look at their own interests, and then claim they want to be part of the bigger picture. Money helps but is not really the solution. Stakeholders think that “if i do my work for the money that i get, there will be other people that won’t do the complementary work in order to bring benefits for the investments I make”. This will result in no committed attitude and therefore no actions and no benefits in the end. And that is why trust is so important.

Furthermore, when it comes to SESAR development, many are reinventing the wheel and that wastes a lot of time and resources. A lot of people are not willing and able to apply a common thinking to move forward. The key is for people to look forward and not in their own shadow and the question which should be posed is “what is the mechanism and arbitration for that?”

Mr Martis concludes that the biggest incentive (or in this case advantage) with SESAR is to reach a seamless ATM for example, flying from Brussels to Hong Kong while having a simple system that they are flying through. In other words that means a globally interoperable ATM system.

**Helios UK – Technical Director**

*Helios is a consultancy firm from the UK that has around 40 employees. Their turnover is around £5 million pounds, out of which 70% from the ATM industry. SESAR plays an increasingly important role in Helios work – supporting SESAR Members on their contribution to the work programme and advising other parties on the potential impact of SESAR on their business. (Helios Technology, 2012).*

*Paul Ravenhill has the role of Technical Director at Helios Technology, UK. Mr Ravenhill is well known in the industry for his work leading the Industry Consultation Body secretariat. That is why two interviews have been conducted to assess the consultants view and the industry view on SESAR deployment.*
First Interview – Consultants View

SJU cannot have a direct role in deployment control due to the constraints of their legal basis as Joint Undertaking which is limited by the EU treaty to R&D activities. However, their expertise is vital for SESAR implementation, as SJU owns the master plan, are in charge of the R&D development phase and therefore, a smooth transition to deployment will require their support. Deployment governance is currently being discussed. One possibility is the SESAR deployment manager, an industry led construct that would have a governance role while EC would have political role. This is under discussion at the moment therefore it is quite a new issue, and a very complex one. This brings the need for a new governance structure to manage the deployment phase. This is difficult as fundamentally, it is an industry issue.

The last mover advantage is mainly an airspace user issue. Synchronization between air and ground is one part of LMA. Another part is when you have already implemented on ground but airlines implement it as late as possible, as they choose the best cash flow alternative for them. The benefits often only accrue when over 70% of the equipment is implemented.

“If you want to incentivise people the cut and dry approach is legislation”. In other words, if a State does not apply, the EC can take it to court, in the case of airline, it is not allowed to fly. An alternative approach is monetary incentives which can help, mainly to airspace users. For example, financial incentives through a fund, making it possible to lower the price of the equipage if installed early by the stakeholder. Secondly, another incentive, may relate to the charges airlines pay to ANSPs. An equipped aircraft could pay less in terms of charges. Thirdly, a possible approach is the “best equipped, best served”. The silent flight is an approach Mr Ravenhill introduced and explained that it relates to the optimum trajectory of a flight. The idea behind this approach is that air traffic control keeps that optimum trajectory by prioritizing the equipped airline users. This approach should be a planned process. Airlines are given parameters of where they situate themselves in the equipment adoption. These parameters define their priority level and according to this, the ANSPs will decide which aircraft receives the optimum trajectory benefit.

The need to ensure a synchronized deployment is however, not prescriptive. One cannot assume that for example, from 2015 “module A” of SESAR should be implemented all around Europe, as States and stakeholders have different operational needs, some may not need to implement it as soon as others, as they already have technologies in place that fulfil their needs or already have sufficient capacity or may not have sufficient traffic growth to justify expenditure. The goal with implementing SESAR is to improve efficiency. Efficiency needs may differ according to where it is implemented. This is very difficult for the master plan and the commission to control and coordinate, ensuring cost-effective and beneficial transition for all airspace.
Mr Ravenhill mentions that the performance schemes for ANSPs are separate from SESAR although within SES. The performance scheme is about improving performance (including reducing costs), by setting targets that drive ANSP behaviour. SESAR on the other hand, is about creating long-term benefits, is about the deployment process, the implementation of technologies.

Some key points that Mr Ravenhill mentions are communication and visibility within the SESAR project. SESAR needs to “communicate better and bring visibility to the projects, to stop projects which are which do not have sufficient performance uplift (recognising that successful R&D includes ruling out options) and highlight those which do. It might be the case that, as would be expected in R&D, 30% of the projects are successful, 70% are not. Politically, the focus is on short-term benefits. However, SESAR has long term goals. SESAR needs room to breathe in order to also deliver long term solutions. People are anxious to see short term demonstrations of SESAR benefits. It is like asking a PhD to finish the study in a 3 month instead of 3 years”. Communication challenges are also external. For example, for an ANSP that is not a member it might be problematic to receive detailed information.

Relating to the issue of transparency at the project level, on a day to day basis things appear to go well. Contracts with SJU are pretty settled. Mr Ravenhill explains that as the program evolves, R&D shows both negative and positive results. But they can’t really reprioritize on the good things, as contracts are already settled, he mentions.

Second Interview – Industry View

In order to support our understanding of the current debate in the industry, Paul Ravenhill provided details of the work to date within the ICB. The interview does not represent an ICB position.

The Council has requested that the Commission presents a proposal for “the preparation and transition to the SESAR deployment phase emphasising its governance and its adequate and, if appropriate for some stakeholders, innovative funding mechanisms”. As part of the process, the Commission initiated a task force, supported by an expert group of the Industry Consultation Body which includes industry representatives, to assess the options for a deployment strategy. The ICB involves stakeholders from the overall ATM industry such as manufacturers, airspace users, ANSPs as well as some neutral participators (DG MOVE 1, 2011)

The role of the ICB is to give strategic advice to the European Commission on the Single European Sky including the deployment of SESAR. The ICB have established an expert group known as the SESAR Deployment Task Force (SDTF) to provide advice on the creation of a Deployment Manager. The notion of the deployment manager was
introduced already in a consultation paper from the Commission in December 2011 and sets guidelines for the governance of the future deployment phase of SESAR.

The European Commission is currently writing a legal text which will create the legal basis for the deployment manager. The SDTF is working on advice to the Commission on the roles, responsibilities and composition of the Deployment Manager.

The deployment manager will represent a partnership between ANSPs, airports and airspace users, with the manufacturing industry somehow connected. The deployment manager will provide a governance function for deployment such as prioritization process, coordination, monitoring and risk management of SESAR deployment. The actual implementation of SESAR will be done at level three by the actual stakeholders through ANSPs, airspace users and airports as evidenced in figure 1.

When asked about challenges for deployment Mr Ravenhill refers to the two main parts of deployment as evidenced in figure 2. First, when a product is validated by the SJU the industrialisation phase can begin. This will be taken care of by the supply industry through manufacturers and solution providers. And secondly, the implementation phase involves the purchasing of such products by the stakeholders: ANSPs, airspace users or airports.

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**Figure 1 Three levels of governance for SESAR deployment.** Source: Ravenhill (2012)

**Figure 2 Scope of Deployment Manager activities.** Source: Wyss (2012)
The deployment manager is intended to be solely responsible for the governance of the implementation phase. One of the big issues is how to ensure that the industrialization phase happens, and the direction that the industry needs to actually productize the correct products. In other words, how could an impetus be created for industrialization? Will the master plan update coming this year, be sufficiently detailed to support productisation given the implementation may not follow for three to five years? The second big issue is what role will the manufacturers play in the governance of the implementation phase, given that at that point is really about which products are bought; it could represent a strong conflict of interest. Manufacturers argue that they should have a strong role in implementation because they are the ones who understand the risks of large scale deployment. However, the network users argue actually that manufacturers are too conflicted to have any governance role in implementation.

SJU is trying to get the concepts and systems as far along as possible in a 50% funding environment, but that doesn’t necessarily get to a valid product Mr Ravenhill points. There is a process that manufactures in general need to go through to turn a the validated concept (supported by pre-industrial prototype) into a product. There is a certain risk they take before putting that product on the market. In a mass market that is fine but in a niche market such as ATM, the non-recurring engineering costs are generally high given the number of products that may be sold. Actually, many ATM systems are developed for ANSPs and these development processes are usually initiated by contracts. In other words, there is a difference in the risk that general manufacturers take and the risk that ATM manufacturers are being used to take when developing new products. SESAR will lead to more harmonised ATM products and could lead to more of the industrialisation phase being performed prior to contract signature. It is quite a complicated set of discussion going on about what sort of stimulus manufacturers need in order to commit to the needs of stakeholders. A much more rigorous master plan with the key stones of actions, and much more agreed than they are now, could give manufacturers the confidence that the products they have been asked to develop would be eventually sold. Mr Ravenhill compares this concept with a feedback loop between what the master plan says and what is actually achieved at the point when the product is ready for the market. What SESAR should do is reach a situation where manufacturers are able to start the industrialization phase before the ANSPs place contracts. But that is the risk they are being asked to undertake.

The true beauty with SESAR is that collaboration between ANSPs, airspace users, airports and manufacturers is taking place and this usually brings consensus. The validation of concepts and the development of system specifications are done in a collaborative manner. At the end of the SJU process should bring is a product spec that is agreed. And as the master plan resulted through such collaboration, it should define the set of products that would actually be needed in the future. However, it is not
100% certain that what it is written in the master plan will come true 5 years later, which also is the problem and the cause of risks, for both manufacturers and stakeholders.

Referring to whether implementing rules (through mandates) would possibly eliminate the risks and offer clarity for what is needed to be deployed as well as security to manufacturers that their product will have a market, Mr Ravenhill suggests that implementing rules would be used for some of the big deployments depending on the deployment requirements including the scope and timeframe. Firstly, implementing rules however are ‘heavy’ and may constrain the ability of the ANSPs to plan against the performance schemes to lower their costs deliver additional capacity in line with actual traffic growth. Secondly, when it comes to the manufacturers, an implementing rule can cause demand issues as stakeholders may focus on the compliance date thus, leading to a peak requirement; but overall manufacturers like implementing rules as it gives them the certainty of the market. Thirdly, airspace users tend to like implementing rules for avionics because “it is often difficult to justify investment in ATM solutions with long payback periods over passenger related investments”. The historical equipage curves for avionics is very low until an actual implementing rule is enforced. Mr Ravenhill mentions that nothing else has ever worked for widespread avionics equipage than mandates. However, it is difficult to decide when an implementing rule is preferred over benefits led deployment.

When asked about the possible effects of regulation compared to the possible effects of a positive business case on the actual commitment of stakeholders, Mr Ravenhill explains that any deployment often requires both. A strong business case is required to stimulate stakeholders to decide themselves to invest as they would invest in extra value added to their business. To ensure that benefits are maximised especially at the network level, an implementing rule may be necessary to achieve widespread equipage (especially where the benefits are not evenly spread amongst stakeholders). This can be seen as a two phase approach for deployment. From previous experiences, what is seen is that when an implementing rule is enforced, deployment tends to move slowly as stakeholders wait until the last minute to adhere. Furthermore, it is difficult to get all ANSPs agree on one solution when they face different operational issues. Across Europe there are different strategies used to cope with the capacity growth, and SESAR aims to get everyone to agree on one core strategy and that would harmonize the system. Furthermore, the consensus-based approach which is at the heart of SESAR (supported by the master plan) should enable deployment to reduce the amount of implementing rules.

When asked about what factors other than implementing rules, can impact ANSPs to reach their performance targets of reducing costs and improving performance, Mr Ravenhill explains that ANPSs tend to have high staff costs, the key is to handle more
traffic without increasing their head count, and new technology from SESAR will play a part in that. Furthermore, they also have constraints as their engineering costs tend to be higher than a private engineering company. It is also difficult as ANSPs are a 24/7 safety organisation and staff are absolutely critical. If we consider on what the ANSPs should be doing for the next five years, is decreasing their operating costs where they can, and looking at technology enhancements that can enable them to handle more capacity without increasing their head count.

When talking about incentives, Mr Ravenhill notes that the overall ATM industry has struggled with incentives in the past. Mentioning about previous equipment that needed to be deployed within avionics, there were various financial schemes that would enable early adopters to be subsidised. At the time of an implementing rule being enforced for that particular deployment, the subsidy amount was at percentage of around 20%. The idea is that the uptake on these financial schemes was not huge. It was cheaper when benefiting from the financial incentives but one can still delay costs until the mandate date which was the option found most suitable for most considering their cash-flows.

Another idea of an incentive is to modulate the charges of the ANSPs according to the equipage level of an airline. In other words, if an airline would equip with some equipment that would enable the ATC (Air Traffic Control) to be handled better, then they would benefit from reduced charges. But this concept hasn’t really got off the ground yet, Mr Ravenhill points out.

Thirdly, an operational incentive that can be used is the “best equipped, best served”. Airlines which are equipped with a certain capability are also allowed to fly certain routes. This approach allows for direct benefits for airlines since the routes they are allowed to fly reduce their costs (for example high altitude routes create less drag and hence, less fuel consumption). However, for those using the airspace rarely (for example, general aviation), it is a disadvantage as they do not see any point in investing and at the same time they are automatically disqualified in using certain space portion. Mr Ravenhill argues that this approach should not penalize those for not having any money. The best equipped, best served is a very good paradigm for a route that goes from one busy airport to another busy airport (for example, if an airline wants to fly from Paris to London, that airline should have the best equipment in order to make the most from the situation of a complex and condensed airspace).

When asked about how optimistic he feels about the deployment phase of SESAR and its progress so far, Mr Ravenhill’s biggest concern is that “we don’t know what we really need to deploy”. This problem may be enlightened with the new master plan coming this year. Once there is a clear picture of what is needed in the medium term, there is hope. The feeling in the industry is that if deployment could be achieved, it will demonstrate that there is no need for further regulation from the Commission. At the
moment there is a positive drive. By the end of 2013 a deployment manager will come into existence and will help to achieve a more performance-led deployment than in the past experiences. However, the main issue is that it is not clear what needs to be deployed given the current downturn in traffic and this uncertainty takes away the energy and drive to deploy. Some stakeholders even postpone their investments as they are aware that something big comes along. This may affect the industry on the long-run. One of the risks is that SESAR is condensing the timelines very much and in reality it takes a long time for industry to adopt a new technology. So, the timeframe of deployment can take much longer than initially planned. This lack of certainty of what is needed may also come from the fact that SESAR has been concentrating on securing the baseline of Step 1 for deployment, Step 2 is where the big benefits are supposed to come from. But this long-term certainty isn’t there yet. “Once it is there, you really need a deployment plan that is realistic. Once you have a realistic deployment plan, I think there would be commitment in achieving it”. Another issue is the uncertainty of those stakeholders that are not involved in SESAR at the moment but which will be affected by it. SESAR have internalized the work to those involved with little industry wide consultation and consensus building that the definition phase was very good at. Mr Ravenhill describes that “if you are in the SESAR family you have access but if you are not in the SESAR family you may not really know what is happening” which creates a lot of uncertainty for those stakeholders outside of SESAR (for example, almost half of the national ANPSs in the EU are not directly involved, nor are the majority of airports and airlines – although the SJU makes efforts to involve all stakeholders in the work programme). The master plan update is seen as a big test for SESAR especially by those on the outside of SESAR.

**Thales – Director Future Systems Architecture**

*Thales is a world leader in ATM, onboard electronics and critical systems, and through its experience in large R&D programmes, Thales has continuously played a leading role in the SESAR programme since its creation. The Group’s wide and coherent range of systems and facilities are made available to meet common objectives for both national and European initiatives. Thales has been selected to co-lead the 3 work packages dedicated to the development of the new generation of Air Traffic Control systems, of the System Wide Information management system, which will be the backbone of the European ATM network, and of Communication - Navigation – Surveillance technologies (Thales Group, 2012).*

*Jean-François Grout, Director Future Systems Architecture, Thales, Paris*

Mr Grout commences the interview explaining the story of SESAR which started as a joint initiative between Thales and Airbus to ask for a programme which will allow a better organisation of R&D at European level so that industry would have a clear vision of where ANSPs would like to go. The issue in year 2000 was that there was a lot of
R&D in Europe and many were looking at the same topic but from different angles, and the R&D was not being concluded therefore, nothing was really implemented. Ground industry and airborne industry did not know what to invest in order to support each other’s needs and capabilities. So, there was a need for the European Commission to try to make a case for harmonization of R&D and development of a concept which will give a vision of where to go and that vision would help ground and air industry make decisions, particularly the airborne industry in which planning is very important. This was the rationale for the creation of SESAR in 2003-2004.

In SESAR, at the moment, excluding airspace users which have a special contract, there are three types of SESAR partners including ANSPs (or organisations related to them such as EUROCONTROL), airports (through SEAC consortium), and then ground and airborne industry at large. Within SESAR the ground industry is in competition even if they work together. It is not that simple to work in partnership since in the end the ground industry participants want to have a competitive advantage and keep or increase their market share. If everyone works on the same topic, that advantage will disappear. The main relation that Thales has is with their customers such as NORACON and DSNA. Those partnerships were set up during the construction of the development phase. Mr Grout explains that the validation platform is under development. When projects were initiated Thales would try to ensure test the features that either NORACON or DSNA would need. For example, the initial-4D project was set up among Thales, NORACON, DSNA, Mastricht and Airbus to ensure that the flight test would be able to fly in the airspace being used and the participants would also be able to exchange information. For the ground industry point of view, the key success factors to have a successful development phase is to make sure that ANSPs are willing to test the new functionalities, Mr Grout mentions. This can be achieved by picking topics that are relevant to the ANSPs, for example with NORACON in the northern Europe where traffic is not that intense, the continuous descent approach, related to the improvement of airlines operations, and human machine interface. So it is important to pick up topics which have the most interest to the ANSPs.

Referring to the period before the financial crisis Mr Grout explains that the industry was not deploying systems because of the lack of synchronization among stakeholders. Airlines did not want to invest in new capabilities since the already existing capabilities were not made use of by the ground, and the ground did not want to invest in new systems since not all airlines were using the system. However, now, after the financial crisis, the issue is even more complicated since the budgets of ANSPs and Airlines have decreased considerably. Synchronization is still an issue, adding to the pressure of reduced budgets, thus, without a strong business case nobody will want to invest. Besides, the traffic decrease at European level is also a demotivational factor. At the moment the financial issue is the main one when it comes to deployment. However, it is not that simple to provide financial incentives. A major manufacturer stated some
time ago that airlines should not be supported in terms of finance to invest in new equipments. “If they would need these equipments they would make such investments anyway”. Instead, direct finance should support ANSPs to invest in ground updates to make use of the capabilities already existing within aircraft.

Within deployment, Thales was part of the task force of key SESAR partners in preparing the position that the SJU was putting forward to the Commission. Furthermore, Thales is member of the ICB (Industry Consultation Body). Since Thales is a ground industry provider and also airborne equipment provider, they will not be part of the deployment structure and the rationale is something that cannot be moved against, since the ANSPs claim that it is difficult for the industry to be a judging party in the decision making process. However, it was important for Thales to ensure that deployment would be fair and recognize the constraints that ground industry has, in terms of what needs to be achieved and in which time-frame. In this light, they will provide support and advice but not be part of the deployment structure. The ones who will be part of the deployment structure will be those who will be making investments and those are the operating industry, ANSPs, airspace users and airports.

Referring to incentives that could be used in deployment, operational incentives are seen as easier to implement and less controversial. If an aircraft has an equipment then it will be given priority or better service, for example direct routes, Mr Grout mentions. This is less controversial than financial incentives, since some airlines may say that is not fair if not all of them receive financial support. Loans could be however, granted to airlines and once they start receiving benefits they would then repay such loans. The difficulty is to design such operational incentives very carefully. Collaboration of all interested parties is necessary, for example in the I4D project. That is not easy to achieve, since benefits would depend on the input of several ANSPs. In other words, one ANSP may have to accept doing things for the benefit of another. The type of incentive would need to be carefully designed.

On the other hand, implementing rules are seen by Mr Grout as the only way to force implementation of functionality at large scale, even though not that was not so successful in the past. However, implementing rules are quite new in the ATM industry. Mr Grout mentions that implementing rules force ANSPs to work together, even though it would be better to be voluntary investments. Mr Grout mentions that the issue is how to demonstrate benefits with the investments required. “You have to believe that at one stage you would get benefits but the demonstration is not that simple. If you ask airlines to invest they would want to see how to make money out of that investment”. In the SESAR work right at the moment, there are people who try to quantify the benefits that each change would bring, but it is rather a judgment and there is no real evidence for it. In this case, one way to deploy is to provide incentives or through implementing rule mechanisms.
Regarding ANSP performance, the best way for ANSP to reduce charges is to reduce the cost of labour. However, it needs to be done in a sustainable manner. Many ANSPs for example in Eastern Europe who gained independence quite recently, want to keep autonomy over their airspace even though from an overall system point of view that is not efficient, particularly in the case of smaller states which can be crossed very fast in the air. This is one of the reasons why costs are high in Europe, almost double comparing with the US, for an airspace which is the same and with less traffic. In France for example, the air traffic control union is very strong, and if changes appear they may go on strike, so it is very difficult in some countries to change the rationale. One solution is to bring more automation that would support the system or even increase capacity in a way that does not require more labour costs, although automation has limits. It will take years before systems are able to replace the human factor, for example conflict detection or solving conflicts, if that could be achievable anyway. Because of such factors, change is very slow. At one stage, the ANSPs will have to face the issue of reducing or at least not increasing the work force. This would be a painful and hard exercise in Mr Grout’s view.

Moving to the industrialization phase of deployment, when asked about the importance of contracts, the challenges Mr Grout mentions are that as ATM is a niche market, Thales does not sell many samples every year and not many ANSPs are renewing their systems although they are established on many markets. At the same time, there are companies that they need to tailor products for, each ANSP has its way to ask for certain features and to cooperate. General rules are the same but the application of the rules is local. In this context, ground manufacturers cannot build a product and then hope for the ANSPs to buy it without a certain guarantee. Costs will increase tremendously if customers change their mind. So, “the risks are too high”. Furthermore, if there is no implementing rule, the chance that all ANSPs will go for the exact same tool when it comes to deployment is low. What needs to be achieved in SESAR is to have more harmonization, when an ANSP asks for a new tool, and that tool would come from SESAR, then Thales would hope to do the same for all the customers. Such harmonization is not achievable in the short-run. However, Thales hopes that tailoring would decrease over time. On the other hand, too much standardizing and harmonization will kill innovation Mr Grout mentions. It is not simple. The process of SESAR could be improved for example, by not having ground industry share so much of the requirements and give flexibility to manufacturers to come with a way to fulfill such requirements. In other words, overall functionality is preferred than specific requirements on how to fulfill a needed functionality. Some customers understand while others don’t, Mr Grout mentions. It is unusual in an industry such as the phone industry, to have the customer tell the manufacturer how to design the phone.
The SESAR deployment phase was initially supposed to start in 2008 with the Implementation Package 1 to be fully deployed by 2013 but nothing has happened since 2008. Moreover, the development phase that is currently undergoing was supposed to develop products to be implemented in the next implementation package from 2013 onwards. However, if IP1 functionality, although not as important as IP2, had difficulty in being implemented then, it will also be equally if not even more challenging for future deployment. Now in 2012 almost nothing from the first package has been implemented. “We need to understand why is it taking so long and why people are not moving?” It is worth mentioning that IP1 was needed to make use of the already existing technologies and capabilities. As ANSPs each has their own cycle of renewing systems, some have newer systems and others have older generation ones therefore, there is a need to upgrade these systems to make use of capabilities as well as the procedures of how to use them.

Sometimes there is no correlation between the ANSP renewal plans and the SESAR plans. In the past few years, ANSPs made no relation to the SESAR plans, as if there was no SESAR at all. Mr Grout hopes that with the new deployment structure this situation will change. At the time of the definition phase many ANSP did not believe that it will succeed. Plus, at that time, ANSPs were fully funded to do the work but they did not care of the outcome of SESAR, or that it will be binding. However, the EC has input a lot of resources and there is a will to make things better for the future.

**Airbus – CEO Airbus ProSky**

*Airbus is the world’s leading aircraft manufacturer. Headquartered in Toulouse, Airbus is owned by EADS, a global leader in aerospace, defence and related services. This group has a presence on every continent, and employs a total workforce of more than 119,000. Airbus also relies on industrial co-operation and partnerships with major companies all over the world, and a network of some 1,500 suppliers in 30 countries. Airbus today consistently captures about half of all commercial airliner orders (Airbus, 2012).*

*As a full member of SESAR Joint Undertaking, Airbus ProSky ensures that expertise both within Airbus and the wider EADS group are used to contribute to the advancement of SESAR with multiple initiatives, including Initial-4D (I-4D), Atlantic Interoperability Initiative to Reduce Emissions (AIRE). Airbus ProSky aims to partner with the world’s ANSPs, airlines, airports, supplier organisations and industry groups to enhance ATM performance. Airbus ProSky is dedicated to supporting Collaborative Decision Making (CDM) and the communication between all stakeholders for the benefit of the total system (Airbus ProSky, 2012).*

*Eric Stefanello, CEO Airbus ProSky, mentions that Airbus is playing many roles in SESAR development phase, in terms of avionics, board and ground integration*
technologies as well as a strong role in NextGen in the U.S. The main question he refers to is “how to deploy SESAR?”

It is important to build the governance structure which will allow to deploy SESAR from a programme management point of view as well as financial point of view. As soon as there is a clear governance the system will be easy to solve since business cases are very positive. Governance will ensure that development, deployment and implementation will be on time. It is the “rendezvous” of the board and ground systems that is the issue. Solutions already exist in terms of incentives and financing Mr Stefanello argues. That is what the Nexa fund in the US is currently doing. It is a private fund held by ITT and by Airbus and it is dedicated to help finance upfront avionics for airlines. Mr Stefanello mentions that “if we want to mimic this funding scheme for Europe we need a governance structure”.

Today, the governance of SESAR deployment is totally unclear because EU has not finance power to take the leading role. Instead it is proposed to build a three level scheme. First level will be detained by the project owner which will be the EU. The second level could be a consortium which will organise and monitor the whole work of SESAR. As long as there is no functional administration the system is totally scattered and will be very difficult to manage. It is important defining what will be deployed to get the maximum of performance for the minimum of price. The consortium on the second level will ensure that the performance will be achieved and it is important that both ground and air will be at the “rendezvous”, meaning that both air and ground implementation will be done in a synchronized manner. The third level can be represented by contracts all Europe wide, country by country. In the third level, key role will play big systems which are from Bruxelles, from the network manager, EUROCONTROL, and from airlines as well, as there will be a need to equip aircraft. When asked about the level Airbus is situated in, Mr Stefanello mentions that it is not clear today. Airbus is not in ATM as a business; ATM is a problem since it is the biggest threat to air transport growth in the world. Airbus is trying to contribute to organise things moving forward mainly to protect growth, but that is a difficult issue. The main interest of Airbus is to have a performant ATM system and the SESAR programme to achieve such system for allowing growth. Incentives are not the major challenge, since “we will find incentives” but governance is the issue, one in which Airbus is interested in.

As mentioned, there already exist solutions for incentives, for example, operational incentives such as “best equipped, best served”. Another example is financial incentives which will be given to airlines. The private fund which will be set up can be a finance system. He gives the example of the NextGen Equipage Fund in the US which will bring “private-sector capital to overcome the investment barriers in an innovative way to
incentivize the retrofitting of commercial aircraft with NextGen avionics equipment” (NextGen Fund, 2012).

Referring to the law as a way to stimulate deployment, Mr Stefanello points out that mandates should not be seen as a direct solution but it is important to find ways that the various stakeholders are committing. But this comes back to the power to organise deployment, which is an issue not solved yet, he concludes. Airbus, like Boeing, are different kind of actors. In terms of nature they are closer to the ANSPs than the rest of industry. “We are not part of industry” Mr Stefanello states.

When asked about the SESAR deployment and its progress so far, Mr Stefanello states that SESAR is very delayed and that is a big issue. Europe is already being delayed. He mentions that US is ahead when it comes to deployment. Hence, organising governance is the key ahead. One main challenge for governance he concludes is that the Commission does not have power to fund.

**Frequentis – SESAR Lead Programme manager**

Frequentis is a high-tech company headquartered in Vienna, Austria, that develops communication and information systems for safety critical applications in two business segments: air traffic management (civil and military) and public safety & transport while the core business remains the ATM sector. The company is the global market leader in voice communication systems for air traffic control, with a market share of 30%. Today, Frequentis and its associated companies employ staff at locations in over 50 countries. It has an export rate of over 90%. SESAR is an ambition that is carried from the whole Frequentis organisation (Frequentis, 2012).

Michael Holzbauer, European ATM Programs, Lead Programme management for SESAR, Frequentis, Vienna

Frequentis is involved in 40 SESAR projects. Communications is an obvious interface problem by nature. Both the ground based and the air-ground part face major changes. In order to manage the airspace it is essential to manage the information representing comprehensively this airspace and all its users. The interface between SWIM and services collaborating on SWIM is key for Information management. Shaping SWIM as well as Information modelling from the very beginning are important pillows of the Frequentis contribution to SESAR. The Frequentis user-centric approach manifests itself most exquisitely in the SESAR integrated Controller Working Position (iCWP) initiative. The interface between the controller and his supporting technical environment requires special attention in the light of increased performance, increased safety and still increased flexibility as well, allowing controllers to rapidly resume work in any sector of the SES.
Referring to the initial definition phase of SESAR, within the master plan there are defined several hundred operational improvements as well as technology enablers which settled the foundations of project specifications such as those introduced above. SESAR formulated project descriptions which result in the development of certain technologies, concepts and new procedures. However, Mr Holzbauer mentions that within SESAR nowadays, everyone is focusing on delivering meaningful results as fast as possible which is not always the best solution. “It is not the best quality as it could be. So there is a trade-off between quality and time-to-deliver”.

Frequentis is delivering ATM solutions to ANSPs such as DFS in Germany, DSNA in France and LFV in Sweden. Mr Holzbauer indicates that Frequentis knows very well in which direction their customers are thinking and which direction they would like to go from an operational and technical perspective. However, it appears that the customers position is slightly different within SESAR projects compared to day-to-day business – whereas the focus within SESAR is typically on concepts and solutions for a time period after 2015 or even 2020, Frequentis delivers today solutions which will not only satisfy the customers’ needs of today but which will also allow upgrading to SESAR compliant concepts once those concepts are ready for deployment.

Referring to deployment, Mr Holzbauer mentions that the synchronization issue among all stakeholders when it comes to new procedures and technologies is the most important. When a new procedure is developed for example in Sweden with its respective technology, these procedures and technologies should be implemented in the rest of Europe as well. Synchronization could be a basis for incentives. If ANSPs apply for funding projects together with airlines for example, they should get a higher funding rate compared to when ANSPs and airlines invest separately in a desynchronized manner.

When asked about the role of manufactures in the industrialization phase of SESAR deployment, Mr Holzbauer suggests that any type of future deployment, any type of future funding, should not be set up as a PPP as it is today involving the manufacturing industry. Any funding for deployment should go to those stakeholders directly concerned, in this case ANSPs and airspace users. Those stakeholders are deploying the technology while manufacturers are just supplying the technology.

Mr Holzbauer sees regulation from the political centre as one potential way to achieve deployment. “Normally when there is a mandate, stakeholders will comply. However, to reach a synchronized deployment, funding will play an important role, and funding synchronization between ANSPs and airlines investing in complementary technologies should be encouraged”.

Besides financial incentive mechanisms or funding of certain technology, commitment can be achieved by explaining the business case to the ANSPs and airlines. Business
cases are not calculated today thoroughly though. Several responsible persons within airlines and ANSPs do not know exactly what SESAR is doing and what benefits they can expect out of the programme. That is why better and clearer and more transparent communication is important.

However, Frequentis knows how the outcome of SESAR concerns their portfolio. But on the other hand, not all stakeholders know exactly what the outcome will be and what is available today. “If you take a look at ANSPs outside of SESAR such as the Czech or Hungarian ANSP, from their perspective is quite natural that they lean back and wait until someone will explain to them about the outcome and what benefits they might get”.

When asked about the collaboration between manufacturers, such as Frequentis and other stakeholders, each with their own interests and needs, Mr Holzbauer explains that the advantage with this SESAR Public-Private Partnership is that they work jointly with their customers as well as with competitors on delivering results for the benefit of all. This way they have a better understanding of what their customers need. By having this direct connection with customers, they can focus on the most important topics, they can identify which procedures stakeholders would like to work with and in the end, they can translate those into solutions.

Equally important, Frequentis is investing quite a lot in this PPP and it is natural that they need to have a return on these costs sometime in the future. It is a huge investment right now in the development phase but in the deployment phase it has to pay back by providing SESAR compliant solutions to their customers.

To conclude, the risk not to achieve synchronization of SESAR deployment is high especially, when explanations and information to stakeholders outside of SESAR are not in place. It should be part of SESAR work to explain the need for synchronization also to stakeholders outside SESAR. By providing information and transparent communication, synchronization in practice can happen.

When asked about the level of optimism for SESAR deployment and its progress so far, Mr Holzbauer is convinced that SESAR deployment is at the right pace as it should be as deployment is happening even today from an administrative perspective for example, recently through the FABEC area. What has been discussed in the previous years to achieve with FABEC, led already to the implementation of products within this region. Examples of already implemented products include network equipment and, voice communication equipment. So, it is an operational change happening that

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3 Functional airspace block Europe central. Region of national airspaces including Germany, Belgium, France, Luxembourg, the Netherlands and Switzerland working together to harmonize management of their airspace. FABEC airspace accounts for 55% of all European traffic and is located above or close to the major European airports.
requires new types of systems such as network solutions and security management plans. What is happening now is already deployed, probably not in the final version but definitely better than no version at all. In general, the deployment progress is taking place today and will probably also go faster if funding mechanisms are in place in the future.

SAS – SESAR-JU Project Manager

*SAS, the Scandinavian Airlines System, is a scheduled airline based in Scandinavia’s three countries: Denmark, Sweden and Norway. The company is half owned by the three countries’ governments as well as private investors. In August 2010, SAS was ranked as world’s most punctual airline (SAS Group, 2012).*

_Tomas Paál, SESAR-JU Project Manager, Green Flight & Fuel Efficiency STODE-E, Scandinavian Airlines System_

SAS is contracted by the SJU along with other 160 companies which also take part in the development phase of SESAR. It is a huge research programme and it is both a political and technological program, Mr Paál mentions. The political objective is to unify the European sky. In order to meet these targets they need to modernize on operational and technological level both on ground and air. In other words, the goal is to better connect stakeholders in the ATM industry and construct a more efficient system in order to meet future demand.

SAS has dedicated around 18 people that are involved in 43 different projects within SESAR in areas such as operational control, financial control or traffic control. In some projects they have the role of participator but in other they have the lead role.

Mr Paál mentions that there are three different roles from the side of SJU: Lead role, contributor or reviewer in a project. SAS is the lead in a project with a programme manager from the German ANSP. This project deals with maintenance and cost of operations, and quite many airspace users are involved. As a lead you have higher responsibility. You need to communicate consensus from the airspace user to the programme manager and then he or she will communicate further to the SJU.

Airspace users call for the possibility to fly freely, to fly direct routes, “*just as the fish in the ocean*”. There has been a certain increase in traffic; however, after the global financial crisis in 2008 the growth has reduced significantly. He mentions that traffic estimations expected to realize in 2020 will now supposedly happen in year 2043. Maybe that is also one of the factors for stakeholders’ attitude towards investments. From an airspace users' perspective, it is very unusual to have such prolonged period of investment. This period can reach to 15 years. So, it is very hard to find a positive business case.
The master plan is the roadmap for the development of the new capabilities and technologies for SESAR. The decision of which of those developments will be implemented would be decided later on. There will also be a new version of the master plan in the summer of 2012. Until then, he mentions that they cannot really identify a business case.

When asked about the success factors for deployment, Mr Paál refers to the significant loss if SESAR is not deployed. He adds that the deployment phase is not yet decided, and overall, the financial aspect is significant. “Retrofits for existing aircraft of around 6000 airliners that fly in Europe are very expensive. SAS fleet is already relatively well equipped, so the investments would be lower but this is of major concern to us”.

When asked about what incentives can be used in deciding to make these investments, Mr Paál refers to the business cases definitions. There is one project within SESAR that identifies and defines the business cases of stakeholders. He mentions they are quite late, at the same time the master plan update is expected to be available in mid-2012. Moreover, SAS is working on its own business analysis inside the company to assess the already existing capabilities in the fleet and the future possible investments for SESAR. He mentions that even if the return of investment is high, the period of benefits is too long in the future, as it seems now. It will be a challenge to many airlines to see a positive business case.

However, it would be worse not to do anything. A negative aspect would be the delays, because of inefficiencies in the system. “If you want to be successful you must be part of the future system. We must equip the whole fleet as it is required in the case of flying to bigger airports” (for example a flight to Kiruna, north of Sweden, may not need some equipment but then the same plane will fly to Heathrow and that is why the whole fleet needs to be properly equipped). On the other hand, they also want to guard unnecessary investments. An example is the automatic breaking system\(^4\). It is a new system developed by Airbus trying to sell to airspace users. But some of these functionalities are not necessary, Mr Paál mentions. It is a typical example of manufacturers pushing new technology. “We want to be in this program to keep the goal against unwanted technologies. That is one of the reasons of being in the program”.

Airports are responsible for optimizing the runway usage. ANSPs are responsible for the airspace around the airport. But both airports and ANSPs need to invest in new systems and technologies and work together. Traditionally, ANSPs have been connected to the network. But airports and airspace users should be equally connected to the network. Mr Paál states that not all stakeholders are equally connected in the

\(^4\) The automatic breaking system is called breaking the gate and uses data that is input into the system by the pilot to automate the landing process.
network. This means that all need to have a communication system among them. Aircraft in the future should be seen as a node in the network. Direct communication as explained can be achieved through the SWIM system (direct and automated communication between pilots and controllers).

The SESAR Joint Undertaking is planned to be in force until the end of 2016 but currently, there are many issues remaining unresolved for example, who will be in charge of managing the program in 2017, what financing mechanisms will be in place for deployment, and whether there will be public or private, who will be able to receive it and on what conditions and so on. Mr Paál states that it has been mentioned that the financial loans to airlines will be interest free and that they would need to pay back when they start getting benefits.

When referring to operational incentives, the traditional approach has been first come first served by the service providers on ground. The best equipped best served is a way to incentivise airlines to invest in new equipment. However, “we don’t get the benefits from the capabilities we already have” Mr Paál mentions. 75% of aircraft are highly capable and these capabilities are not used by traffic controllers. ANSPs have to invest in new tools for planning and controlling the sequences and the traffic flow.

The ideal scenario is to avoid any unnecessary flying at low altitude, as the higher the altitude the better as well as having engines on idle when descending to minimize noise. It is common that in Paris, Heathrow, Frankfurt the congestion causes airlines to end up on a waiting list for landing. The fuel that is consumed in these situations is called brown fuel, as it is wasted fuel. The ideal case would be to use green fuel only. Some airports in Europe are very crowded. There are many operators who want to reach these airports. And the airlines speed up in the air to be the first in line to land; they descend and eventually are constrained to circle around the airport for around 20 min before having the green light for landing. And this is just not efficient, not mentioning environmentally unfriendly. It is important to be an environmentally friendly airline. Customers look on that as well. SAS has a good reputation to be proactive in environmental work; it is one of the arguments of being involved in SESAR. "If we hadn’t been involved in SESAR, SAS would have worked with green flight anyway". At the same time, it is about saving fuel and money.

Implementing rules are a mechanism to make sure that the system reaches operational level. “It is important that we take part in these decisions, to make sure that there are only wanted rules and not any unwanted rules”.

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5 The concept of SWIM – System Wide Information Management - covers a complete change in paradigm of how information is managed along its full lifecycle and across the whole European ATM system. The implementation of the SWIM concept will enable direct ATM business benefits to be generated by assuring the provision of commonly understood quality information delivered to the right people at the right time.
Mr Paál concludes that “if you compare it to the Apollo project in the USA in the 60’s, SESAR is far more complicated. There are 20 plus governments, with as many national ANSPs, different objectives, different needs, and different interests. It is challenging”.

**KLM – Senior Manager ATM Strategy & Charges**

*KLM Royal Dutch Airlines is the oldest airline in the world. And 66 of their routes are unique being the only commercial airline flying them. KLM is the flag carrier airline of the Netherlands and is part of Air France–KLM group* (*KLM, 2012*).

_Ceriel Janssen, Senior Manager ATM Strategy & Charges at KLM Royal Dutch Airlines_

In 2005, KLM was facing delays in Europe and at the time of the proposal from the Commission they decided to get involved with SESAR. Capacity is an important future factor in the airspace industry. If there will be no space in the air to cope with this demand of future operations, SESAR is therefore, important. KLM is a partner in the SESAR Joint Undertaking PPP. They have no other partnerships that they are directly connected with. Nevertheless, they communicate with manufacturers, the laboratory research in Netherlands (NLR) and LVNL which is the national ANSP in the Netherlands.

When asked about success factors for SESAR deployment, Mr Janssen claims that the synchronization among all stakeholders is an important factor. He refers to past experiences when there were some decisions taken when airlines had to equip and ANSPs did not have to do anything, which led to uncomplementary investments and hence, capabilities. “Current functionalities need to be used, and the performance targets of SESAR need to look at these. It is important to reach more performance with the already existing technologies”. That is why a performance drive ATM system is the key for deployment.

Another important factor is also the role that the manufacturing industry plays in deployment. Mr Janssen argues that manufacturers are pushing new technologies that are not really needed, as airlines may use the already existing technology. For example, when a certain problem needs to be solved, the manufacturing industry, besides the solution in itself, pushes extra functionalities that are not necessary. Consequently, “airlines won’t see any direct benefit from these extra functionalities and therefore, won’t pay for these”.

When asked about how manufacturers can be stimulated to commit to the stakeholders’ needs, Mr Janssen states that SJU has partnerships with manufacturers that may contribute to this. He points out that KLM would certainly oppose these extra costs that are not necessary. “If one is forced to invest in equipment that is not directly contributing, or that it has not proved to be beneficial, then airlines do not want to invest in those”. Investments should be made at all stakeholder levels, in the correct
manner, in order to see benefits. Benefits in 10-15 years are not so motivating, as technology changes rapidly. Moreover, future financial crisis may appear and that is a risk as well when planning investments.

Regarding the last mover advantage, he mentions that “if we can be the last mover, we would certainly take the opportunity as well”. In the recent 8-10 years, from the ATM point of view, Airlines have been faced with mandates to equip aircraft while the last mover advantage applies to ANSPs as well and they do not equip their part.

Furthermore, referring to the synchronization aspect of deployment, in 2005 there was a project, Mode ELS/EHS, when ANSPs did not invest in while airlines were investing. ANSPs have created a little bit of false premises. They claimed that if airlines implement the new equipment they could predict more direct trajectories with the help of this new system. ANSPs did not fulfill their promises as they were having their own mandate. He mentions that KLM invested around 2 mil € and the deployment was not a success, as only certain ANSPs in Germany and England have invested in it as well.

Mr Janssen explains that an operational incentive can be the “best equipped, best served” approach. “If you are not equipped you cannot fly for example, higher than a certain altitude feet, gradually lowering this altitude which means that efficiency of flying decreases considerably. Airlines need to make fuel stops if they fly at low altitude (because of density of air you experience a certain drag, directly connected with fuel consumption). If the airline equips itself, then it can fly a very efficient route at the best altitude which is a direct incentive for airlines, especially for long-haul flights”.

Since there will be a high need for communication among stakeholders in the future and hence, data transfer will increase significantly, one project he mentions is a new satellite system that would be dedicated only for ATM industry to support communication. However, there are commercial satellites that are being used currently and Mr Janssen argues that the industry has not proven that the current communication equipment is able to handle future data communication needs. “Some projects that are pushing new technology are beyond the scope of SESAR”.

Regarding financial incentives, Mr Janssen states that “they certainly help”. To give an example, there was a mandate in 2005 to equip aircraft with a new communication system called Datalink6 and for 2-3 years ago KLM was considering whether to choose the last mover advantage or not. KLM considered the burden they could alleviate and together with the financial incentives they received they installed the equipment much

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6 The Link 2000+ Programme is providing controllers and pilots with a second communication channel: air/ground data link.
earlier. So, financial incentives do work, but the premiere part is to have to believe in the equipment first. “Incentives are nice, after you take the decision to comply with regulation”.

Furthermore, for certain key improvements, the Commission will create mandates. But the Commission does not see mandates as the preferable option. “They too want to promote the best equipped best served principle and incentivize stakeholders to invest themselves”.

**KLM – ATM Project Manager**

*Rene de Vogel, Project manager for Air Traffic Management KLM*

At the time he was involved with SESAR, Mr deVogel was working for KLM Cityhopper, a regional airline in Netherlands part of the KLM Group. Currently, his role changed to Project Manager for air traffic management for KLM. Within SESAR, the interviewee had the role of reviewer for a project that dealt with the interconnection of flight sequence between the ground and the air. In other words, Mr de Vogel’s role was to review the documents that were developed within the project. The name of the project is SESAR 6.5.1 Project, Task 10, and Mr de Vogel was involved in this project in June 2011.

He mentions that the problem he saw at that time was that the documents were written in a very complicated way. The documents were developed by the SJU and there were used different definitions that were already used in practice. He refers to the Collaborative decision making (CDM) process. There are certain airports already implementing CDM and they used certain terms for certain times in the process. What surprised Mr de Vogel was that within SESAR definitions for the same time moments in the CDM project were used differently, which created confusion.

Within this working group, Mr de Vogel had the role of a reviewer of documents from a finalized phase of a project. This was necessary to be able to publicize the report and move to a next phase. The idea was that, because there were not many regional airlines involved in the working group, the documents had instead to be reviewed by one airspace user, and KLM Cityhopper had that responsibility. However, Mr de Vogel explains that decisions were not clear, especially when similar responsibilities interrelated between ground and air groups. This was a problem and Mr de Vogel admits that there was no interaction between the different small parts of the project, pushing decisions to other groups, and not all groups knew about each other’s role or responsibility. In the end, KLM Cityhopper did not approve the documents and no

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7 For example, at Schiphol, KLM wants to have departure and arrival priority for the most important flights, meaning that for delayed flights which have many transit passenger on board would be given priority for landing than those which do not have many connecting passengers. This is called Collaborative Decision Making (CDM)
longer participated in this particular task. The reasons for their decision were the confusing terminologies as well as the lack of connectivity among the tasks presented. Another reason was that it was very time consuming and few airlines were participating so, many tasks were put on the shoulders of the few ones participating. “It was no problem to put time as the company would benefit from the future system as well, but the problem was that there was not enough output from SESAR and also a lack of coordination”. Furthermore, there were also a lot of conflicting ideas between the working group meaning that some of the groups were requiring information from others and those did not want to provide it or did not see the relevance for it.

Regarding this project, Mr de Vogel mentions that, in the end, after many discussions and convincing, there was a decision to rewrite the report so, their feedback was taken into consideration and everything was put into line. However, Mr de Vogel explains that he only dealt with the reviewing of the tasks and did not participate in the meetings of the actual project.

To conclude, Mr de Vogel admits the need for SESAR as a whole, considering the congestion rates in some places in Europe. “Without SESAR, there will be big problems in the future”. However, from his experience Mr de Vogel states that even though SESAR is required to accommodate future air traffic growth, many hurdles have still to be taken such as the lack of coordination and high complexity due to the structuring of the overall project.

**Air France – Corporate Finance Department**

*In 2003 Air France decided to combine their strength in a more close-knit fashion together with KLM and announced their intended merger via Air France’s international public offering (IPO) for KLM shares. The IPO was launched one year later on the Paris Euronext and Amsterdam markets as well as on the New York Stock Exchange. This operation which transferred the majority of Air France’s stock to the private sector by dilution of the French States’ stake resulted in the French company’s privatisation (Air France-KLM, 2012).*

*Jean-Gaël Duboc, Corporate Finance within Air France, Paris*

Mr Duboc works in the corporate finance department of Air France in Paris. He mentions that he deals mainly with aircraft finance and is not involved with operations or navigation. Before discussing about incentives, the primary question Mr Duboc mentions is the kind of standard one needs to invest in. It is important to know whether investments are relevant. What Air France is expecting is to get immediate benefits from investments. Such benefits could relate to the quality of service that depends on the ground implementation of SESAR. The fear airlines have is to be faced with different standard requirements. Investing in different systems because of
different standards worldwide is inefficient and that is why, Mr Duboc argues, the importance of a harmonized system.

One key success factor for SESAR deployment is commitment to the benefits for airspace users. ANSPs have efficient way to recover investments but airspace users have different constraints. A clear incentive would be to have a strong commitment from ANSPs. The quality of service is thus, a key incentive. In the end, ANSPs are the ones who control the business. The main financial incentive that has been discussed is a subsidy of interest fee that an airline needs to pay when receiving a loan.

One operational incentive that was briefly discussed is the “best equipped, best served” approach, which is possible if the service is provided by the ANSPs and if most airlines are equipped. However, there is no certainty of how much these airlines will save. That is why it is important to assess the return of investments in clear numbers, to have the business case show the possible returns of an investment. Mr Duboc adds that the best incentive is not only to get the financial subsidy, but to have a good business case of the investment.

The level of interest fee an airline would pay depends on the credit quality of the airline. If one airline has good credit quality then the interest is low. Therefore, if the interest is subsidised it would be a stronger incentives for airlines with lower credit.

There is also the bank guarantee that needs to be considered when referring to loans. The individual value of the equipment is very small compared to the value of the aircraft. The bank has no effective security on the assets. This means the loan is considered as unsecured. If the level of guarantee is very low, the banks would not feel confident to put forward financial capital. Therefore, banks need to have guarantees that they would recover their financial capital. Just as airlines need guarantees that they would recover their investments.

When asked about other financial incentives, Mr Duboc mentions that financial options are difficult to implement because of the wide variety of players, big and small airlines that have good and bad credit types. And in the end there is a limited amount of money.

**LFV – Business Development Director**

*The LFV Group is a state enterprise with 1,400 employees that operates air navigation services for civil and military customers at over 40 locations in Sweden. LFV is one of Europe’s leading actors in air navigation services. Their solutions for safer and more cost-effective air navigation are being noticed, and in the area of environment LFV is at the forefront to minimize environmental impact. This culture of safety, in combination with a strict international system of regulations, has made aviation the safest means of*
transportation. LFV’s vision is to be vision is to be a leading supplier of tomorrow’s air navigation service in Europe (LFV, 2012)

Niclas Gustavsson, Director Business Development at LFV, Stockholm

Mr Gustavsson mentions that LFV actively sought in SESAR, it was a strategic decision that offered them the chance to “play rather than sit on the fence and wait”. LFV is furthermore, a full member of SESAR Joint Undertaking which gives them voting rights and input on very high level.

NORACON ⁸ is a key partnership of several traffic controllers in the north of Europe and Austria, in order to spread resources and risks around smaller providers in the north. When referring to deployment, it is important that everyone has the same view and common understanding on priorities. Consensus is one result through the partnering up in NORACON. As LFV is an investing partner for SJU they are “absolutely integrated with SJU” as members. Another reason for getting involved is “making sure we are in the leadership position” while another refers more to innovation in general, that characterizes Sweden in general, as well as LFV. Since LFV’s involvement is not only about research, tangible results and deliveries are expected from SESAR, in connection to focus on operations for example. There are multiple advantages that LFV seeks to gain through SESAR and one of them is an increased level of automation meaning to reduce operational costs while maintaining capacity.

The main factor that brings a synchronized implementation first of all, is a consensus that allows for incentives. It is also important to have a framework for incentives that takes into consideration European legislation and that does not unbalance competition. Furthermore, enforcement is also a key factor in reaching deployment since legislation to deploy would force stakeholders to follow the plans that are established.

There is a trend within incentives and that is the “best equipped, best served” approach. The traditional approach is “first come, first served” however, in the case of an incentive, the better equipped airline would be given preferential treatment such as direct routes or better service by the ANSPs. This scheme may work for airlines, but it may not work for airports or ANSPs. There is lack of incentive schemes for these stakeholders together. That is why both legislation and incentives should be developed for a successful deployment.

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⁸ NORACON, the NORth European and Austrian CONsortium, is a member of the SESAR Joint Undertaking and consists of eight European ANSPs: Austro Control (Austria) and the North European ANS Providers (NEAP) including AVINOR (Norway), EANS (Estonia), Finavia (Finland), IAA (Ireland), ISAVIA (Iceland), LFV (Sweden) and Naviair (Denmark).
10 years ago it was initiated a new data communication system between air and ground in Europe. It had positive ideas but it was not very good in deployment. Airlines did not see benefits. That is why there is a need to find a way to incentivize equipage, a need to find benefits for local stakeholder. If that is not possible, then investments need to be financed through the EU. Furthermore, a successful project in 2012 is the i-4D flight that used an optimum trajectory from Toulouse in France all the way up to Stockholm, through Copenhagen. This project put into practice a conceptual way to improve efficiency. And in 2012 through cooperation and connectivity between air and ground the i-4D flight was successfully operated.

Furthermore, there is a need to work closer with industry and ANSPs. This can also bring the negative aspect of suppressing competition. However, the positive effects of cooperation override the negative since there is “no room for errors”. The market is small and investments cannot be made twice, in a short period of time. Europe and the U.S are the main markets where the question of capacity constrain is relevant. Moreover, China will probably have capacity constraints soon.

Joint agreements can also be established between ANSPs, airports and the industry to collaborate for long-term planning when it comes to the products needed to be invested. When the market is opening up, as it becomes less monopolized by states, decisions need to be made on solid financial plans. Joint agreements play a key role in such long-term plans.

An operational incentive can refer to the separation of costs depending on when an aircraft flies during the day since there are peak hours when everyone wants to fly, for example in the morning. Costs can be distributed on a 24h basis according capacity schemes around the busy areas in Europe.

Another incentive could be to have airlines benefit from reduced fees from ANSPs in case they are equipped. But there is a need for a business model.

Furthermore, incentives may refer also to the connectivity between air and ground. Connectivity of aircraft to the Internet may also drive the technical operational development of the network and motivate airlines. To give an example, pilots today are using radio technologies to communicate with traffic controllers, via voice medium, and without any automation or Internet connectivity. Current technologies are old. Therefore, technology jumps are much needed. Such jumps can refer to the transparent flow of information between the air and ground, which is not the case today.

Financial incentives through a deployment fund to stimulate investments are also important. Since the last mover advantage dictates today and is a threat to deployment, such financial incentives need to be established. Otherwise, without incentives, deployment will fail. Moreover, if ANSPs perform well, they will also need
to receive incentives or some economical contributions. Otherwise the system will not work. Such performance feedbacks need to be encouraged through legislation.

However, it is difficult to decide on the type of incentives that would bring the most benefits since there is actually a blend of legislation, incentives and positive business cases through value added systems. A pyramide of these three can represent a model for deployment, and it should be tailored according to situation among the different levels and tools within the model.

Trust and cooperation among stakeholders are also key to deployment. Agreements among different stakeholders and the fact that the market is opening up and becoming more dynamic to competition are factors that should be encouraged as they may also affect trust among stakeholders and the industry as a whole.

**LVNL - Adviser**

LVNL, the Air Traffic Control the Netherlands and the National Aerospace Laboratory (NLR) work together on the SESAR programme (as part of the LVNL Consortium). LVNL is responsible for the control of the Dutch airspace and related tasks. NLR on the other hand conducts applied research on behalf of the aviation and aerospace sectors. The Consortium LVNL is a SESAR associate partner in close working relation with neighbouring ANSPs: DFS (Germany), DSNA (France) and ENAV (Italy), working together on projects such as CDM (Collaborative Decision Making) within SESAR (SESARJU, 2012).

Bianca de Wit, Adviser LVNL, Amsterdam

Bianca de Wit explains first the reasons behind LVNL’s involvement within SESAR. LVNL was thinking of joining SESAR already in 2007 but “you could only become a member when you pay a huge member fee and you didn’t yet know what kind of commitment you had”. There was also a lot of pressure from the government, the ministry of infrastructure and environment, to join the research within SESAR as the National Airspace Institute (NLR) in Netherlands was receiving less money, due to European funds refocusing in the direction of SESAR. The ministry also wanted the NLR to be less dependent on the money from the government. LVNL were interested in benefiting from the expertise from NLR and that is why they decided to build a consortium. This consortium would then enter the SESAR project as associate partners, without being required to pay any fee. Even though they don’t have a voting right and are not part of SJU as members, they can however, have an influence on the content of SESAR.

When asked about the collaboration process within SESAR Ms de Wit explains that they have a contract with the other ANSPs, there are meetings about these contracts and each dedicates a certain amount of hours inside certain projects that employees
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need to spend. For example, in the AIRE project, the role of the meetings was to exchange experiences and harmonize the structure, because the SJU wants to be able to compare the results but the methods need to be same. As a result, there are a number of AIRE projects in Europe with similar scope. They have the same aim to try to prove the new concept and that technology works. These meetings were useful, as they could get ideas regarding challenges and ways to handle them.

Until now Ms de Wit explains that they do not deploy any projects from SESAR. Of course, the EC has the performance scheme, on the basis of this they set targets for states including ANSPs, and with these targets the SESAR technology will help achieve improvements in safety, capacity and environment. The master plan has a planning period of 5 year time span including projects and investments for these years, but “we think that the projects will come later than this”.

These performance targets are intended to put pressure on ANSPs. The Performance Review Body (PRB) is in charge of monitoring the performance plans of ANPSs at national or FAB level. She mentions that their role is to put more pressure. At the moment, they are in the middle of the first reference period, and they are learning how to deal with these performance schemes. It is possible that in the second period they could get fines if not performing as expected adding that the expectation for the second reference period is to prepare the performance schemes only from the FAB level thus, putting extra pressure on ANSPs and on states to work together. These are instruments for pressure and actually help, Ms de Wit concludes.

Referring to implementing rules and mandates, it will be very important prerequisite to get the support and acceptance of both the air traffic controllers and pilots, as they have to work with it.

There is a need for synchronized deployment. A lot of validation work and exercises needs to be done to show that the SESAR technologies really work and in this way convince people. Ms de Wit points out that “for controllers it also has to be attractive to work with the new technology and concept, and it has to make their work more fun. If it makes their work much simpler and they only have to look at their screen, then there is less chance to be implemented actually”. From past experiences it takes a lot of time to implement new technology at the level of ANSPs as well as airlines. Ms de Wit mentions of a project that have taken more than 30 years to implement. “This is an industry in which change of technology in the past has gone very slow and I hope very much that SESAR can change this but I still have some doubts”.

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9 The AIRE (Atlantic Interoperability Initiative to Reduce Emissions) initiative was launched by the European Commission and US Federal Aviation Administration (FAA) in 2007 and is designed to improve energy efficiency and lower engine emissions and aircraft noise capitalised on existing aircraft technologies.
What is very clever from the EC is to make actually airports, airspace users and ANSPs responsible for deployment. This is a very good move. “If you give an employee more responsibility, he or she will be more motivated for work”.

A problem however, is the trust among stakeholders. The problem is that the airline industry has limited money and margins, especially after the crisis. And the airline industry pays for the charging fees for ANSPs so “in the end they will pay for everything”, except the financing that the EC will provide. However, ANSPs will also have to invest. For example, LVNL can finance investments through loans from the ministry of finance very cheaply. Referring to the possible positive effects of long-term privatisation of ANSPs upon the deployment of SESAR, there is no clear relationship between privatisation and the performance of ANSPs but would be interesting in getting to know about this relationship Ms de Wit mentions.

Synchronization of deployment can be achieved by having a deployment manager that connects stakeholders. One of the main important aims from the deployment manager is to get commitment from all partners. The performance regulation already exist, there will probably be more mandates from the commission on interoperability but the important question is how to organise this. Of course, it will help if the commission has some funds available to pay for investments within SESAR. Also another incentive is to have the proof that it works, for example that the airlines get benefits, that they can fly shorter routes, that they avoid consuming fuel uselessly and cause less CO2. If there is no positive business case or limited one, which would be the case of ANSPs, then financing from EC will be needed. Therefore, if there is a very positive business case, the airlines and ANSPs will do it anyway.

Technology standards are also an important issue. Industry has to start building, when the industrialisation of equipments is necessary. There is a need of a structure between the countries, “we need the governance arrangements”. Together with their FABEC partners, LVNL works on cross border arrival management. “You cannot work alone anymore as an ANSP. Within the FABEC area, there are used different arrival management methods, so there is a need to synchronize. Such vehicles like FABs are definitely helping the synchronization”. Referring to FABEC, Ms de Wit mentions that it’s a complex project with a lot of stakeholder, 6 member states and their ANPSs, 2 military ANSPs. “We have a lot of partners involved with different interests, it moves forward but slowly”. There is a need to see some real successes coming out of FABEC. These successes mostly come within the airspace area. There is also a need for designing the airspace more on what the users want rather than on borders. There are around 6 airspace design projects where the design phase goes well, but some problems appear in the implementation phase. One challenge is that there is no unit rate. Every country has its own unit rate. If traffic-flows change then income changes
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as well. But if there is one rate at the FAB level then this problem disappears. “You can then define the income by the work you actually do”.

Regarding development of projects, Ms de Wit mentions that they need to make sure that what they do in FABEC is in line with SESAR, so that there is no duplication. She adds that there is already a lot of duplication within SESAR, which is why there is a need for a lot of validation projects to really prove that it works.

Duplication exists as SJU wanted to have all ANSPs involved, Ms de Wit mentions. For some research projects (for example AIRE where there is need for a lot of validation) this duplication is good, for others it could be done more efficiently. When you start a project like SESAR, efficiency will grow.

Most benefits with SESAR are long term. Before ending the interview, Ms de Wit concludes that part of their 5 year strategy they initiated a communication process with airlines, mainly KLM to decide what priorities they should make. So far however, no SESAR investment has been planned in their 5 year strategy, but communication with airlines is taking place to decide on future priorities.

**Finavia – ATS Specialist**

Finavia is a network of 25 Finland’s airports and air navigation services. It employs about 2500 people and is owned by the state that sets their operational and profit targets. The company is financed by its airspace users (Finavia, 2012).

*Mark Blanchard, ATS specialist, Finavia, Helsinki*

Mr Blanchard explains that Finavia’s involvement in SESAR was a common decision of the Nordic ANSPs to participate in the project, because of the possibility to closely follow up the R&D in ATM industry. For that purpose was set-up the NORACON consortium, which has a structured organisation and is a member of the SESAR PPP. According to Mr Blanchard, Finavia as a member of NORACON participates in various work packages (WP) – mainly as a contributor. Being involved with SESAR, Finavia and its staff expects that their expertise and experience could be utilized in the development programmes. Also Finavia expects to gain a better understanding of the developments and their backgrounds.

Mr Blanchard states that there are no other partnerships for Finavia apart from NORACON, and within this partnership the members have established a communication section.

Regarding the requirements that SESAR poses, Finavia timely allocates appropriately competent staff for participation in WPs. To do so, Finavia management estimates resource requests and process plans according to the WPs. As stated by Mr Blanchard,
“WP schedules seem to be continuously changing”, which leads to internal, staff resource requirement problems.

As SJU has the overall responsibility over the SESAR project and its timely deliveries, Mr Blanchard believes that SJU would provide the additional help if one will be needing it. However, he mentions that monitoring of the progress by SESAR programme management committee should be improved. Asked about any signs of the last mover advantage, Mr Blanchard disclosed that “not at this stage as deployment is not included”, but in order to overcome it in the future co-funding and also direct monetary contributions could be supportive during this phase.

Swedavia – Senior Project Manager

Swedavia is a state-owned group that owns, operates and develops eleven airports across Sweden including Arlanda airport (Stockholm) and Landvetter airport (Gothenburg). Swedavia’s airports have an important function in creating the access needs in Sweden and linking regional, national and international mass transit (Swedavia, 2012).

Henrik Bagewitz, Senior Project Manager, Swedavia, Stockholm

In the case of Swedavia, the reason for actually getting involved with SESAR was that they preferred to “be in rather than out, they have chosen a proactive approach for contributing to the development of SESAR”, through the projects they got involved with. Mr Bagewitz is a project manager at Swedavia and involved in one of the SESAR projects, Work Package 6.6.2 named collaborative decision making (CDM). He mentions that at the beginning he did not have a clear idea of what was required as the scope of the project was not clear. However, the initiation phase had a 3 month deadline and SJU was requesting certain milestones on the way. Certain tangible results have been reached but would have been preferred to have a clearer scope of the project at the beginning. Because of this, there was also a hard time setting up the agenda for the project.

Mr Bagewitz points out he was surprised by having “people around the table” to check the progress of the project, to either accept or decline the solutions, instead of a creative and active participation. Moreover, parallel with his project there were other programmes initiated by the European Commission with similar scope and this was surprising with regard that communication was not that clear. “I was amazed by the lack of direction from SJU. When contacting them their answer was to try to be pragmatic”. As a research and development project, one does not really know what the results will be, so, the choices in which direction to follow are important during this development phase. What SJU lacks is in taking decisions towards this direction or stopping those projects that do not deliver. From all over 300 projects that are part of SESAR, it would be good to have 5-10% of these projects to actually reach results, Mr
Bagewitz argues. Furthermore, he is not aware of any projects that have been stopped because they would not deliver or because they were on the wrong track. He wishes that SJU would be more willing to control and take decisions. Only these projects delivering should be ready for deployment.

What the deployment phase of SESAR needs are tangible results and value added to its deliverables. Also less political approach and more honest management towards those stakeholders involved. However, it is understandable that because of so many stakeholders involved, the programme management of SESAR is difficult to control.

Zürich Airport – Senior Project Leader in Planning & Engineering

Zürich Airport is part of the SEAC (SESAR European Airports Consortium) together with other 5 main airports in Europe: Amsterdam Schiphol, Frankfurt, Aeroport de Paris, BAA –British Airport Authority, and Flughafen Munich. As full member of SESAR, one of the key SEAC goals is the introduction of new procedures and technologies to prepare airports for the air traffic demand expected for 2020 and beyond (SEAC, 2012).

Rolf Wyss is Senior Project Leader in Planning & Engineering at Flughafen Zürich AG

Some of the reasons why Zürich Airport actually got involved with SESAR include the importance to keep sovereignty over planning and steering processes and so, their involvement could secure this sovereignty. Furthermore, influence was also important. Influence over strategic definitions of how to design, develop and operate airports; influence in defining procedures for the airspace in the environment of the airport. One example may be to avoid the risk that “existing solutions and procedures of airports may not be used”.

By being a member of the SESAR Joint Undertaking, they also have voting rights and they will be part of and influence the governance of the development phase as well as they will play a key role in the definition and preparation of the deployment phase. All this together, along with the opportunity of having “full visibility and first hand access to the major ATM Research developments”, have been good incentives for Zürich Airport’s involvement in SESAR.

However, within the deployment phase of SESAR, Mr Wyss points that they are informally involved in the Deployment Task Force, initiated by the European Commission. He mentions that there is still discussion on the structuring of the deployment phase. When asked about what incentives would stimulate airports to invest in SESAR, Mr Wyss states that “the SJU published a study on this subject. According to this a negative business case is expected”.

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Guernsey Airport – ATC Manager

The Airport Terminal was opened in April 2004, and was shortlisted for several architectural awards. The building won the ‘Guernsey Design Award’ in November 2005. Guernsey Airport has no direct involvement in SESAR, but monitors the project in order to be capable of responding to changes in procedures or infrastructure that results from its work (Guernsey Airport, 2012).

Frank J. McMeiken, Manager ATC, Guernsey Airport

As stated by Mr McMeiken, “It is vital for the island that Guernsey maintains its external air links, and the island must ensure that these are not threatened by an inability to integrate with our contiguous agencies”. Moreover, Guernsey maintains a close relationship with its customer airlines, and has recently collaborated with NATS, EUROCONTROL, and a local airline operator to introduce new satellite-based instrument approach procedures at a subsidiary airport, in Alderney.

Asked about what the Guernsey Airport and its staff expect to gain from SESAR, Mr McMeiken disclosed that “by monitoring SESAR developments, Guernsey ATC would hope to ensure continuity of its air links by mitigating any risk of exclusion from European airspace through non-compliance with procedures.”

Even though Guernsey Airport had no current direct partnerships in SESAR (but they would participate if requested), Guernsey has a close working relationship with Jersey ATC, its parent ATCC, and participates in the exchange of flight data and ATC messaging. Guernsey also has a close relationship with its customer airlines, and has recently worked together with a local operator to establish a new system at a subsidiary airport, in Alderney. These approaches were introduced as part of a EUROCONTROL programme funded by the European Commission. Mr McMeiken stated that regarding the SESAR objectives it would be of a great assistance to the introduction of new systems and procedures if common safety cases were developed, which could be used to accelerate regulatory approval and implementation.