

PRB white paper

RP3 Performance Objectives

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1. Introduction

1.1 Context

- 1.1.1 The performance scheme of the European Union, Single European Sky Programme was set up in 2010 to address managing the changes necessary to achieve progress towards the ATM master plan aspirational goals, by monitoring and assessing, performance contributions of individual Member States.
- 1.1.2. Reference Period Two is now running, and towards the end of this period it is expected that SESAR deliverables will start to roll out, increasing the potential for improving performance. This discussion will need to address; what has been achieved so far, and propose targets designed to improve the contribution of the collective efforts, as well as the changes implemented as part of the European Union effort to industrialise SESAR solutions. It is now expected that discussions will start on the next Reference Period (RP3) where stakeholder expectation is high that improvements will be addressed across all KPA's with significant improvements in cost performance.
- 1.1.3. Reference Period three of the Performance scheme is scheduled to run from the 1st January 2020, to 31st December 2024. This paper will lay out the views of the Performance Review Body on Performance Objectives (PO) for the Reference Period. The purpose of this document is to initiate the target setting process for RP3, promote discussion with Stakeholders on the issues and, possible performance improvement solutions that will need to be addressed during detailed target setting due in 2017.
- 1.1.4. The approach of this white paper is to look at; what is still to be done, suggest approaches to be included in the evaluation this year of the 2015 data which will help in understanding the progress so far, and suggest performance objectives which could be included in RP3.
- 1.1.5. This white paper will outline a summary of progress to date, the PRB's views on issues to be discussed, and provide background debate on the issues with Stakeholders to provide an initial foundation for the PRB to generate the EU targets.

1.2 Performance Management Evolution

- 1.2.1 In its communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 25 June 2008¹, the Commission created a four pillar strategy towards a more sustainable and better performing aviation.
- 1.2.2 The communication laid out the clear intent of the Commission to reform Air Traffic Management into a Single European Sky transforming a multi managed region to a single operating area. It is based on four pillars: performance, single safety framework, new technology, and managing capacity on the ground. This was later enhanced by adding human factors as a fifth pillar².

1.3 The First pillar: Regulating performance

The Commission proposed three measures under this pillar:

- 1.3.1 **Measure One: Driving the performance of the air traffic control system:**
an independent Performance Review Body was to be created to monitor and assesses the performance of the system proposing Community wide targets for delays, cost reduction and the shortening of routes. These objectives are approved by the Commission and passed on to national supervisory authorities who organise consultations to agree binding national and regional objectives. The performance Review Body was created in 2010 and has set targets for the first and second reference periods.
- 1.3.2 **Measure Two: Facilitate the integration of service provision:** *the aim is to turn the current initiatives for functional airspace blocks into genuine instruments of regional integration to achieve performance targets. These blocks must be created by the end of 2012 at the latest. These were created by the start of Reference Period One and further enhanced by making Performance Planning in the revised performance scheme implementing regulation (390/2013) FAB Centric.*
- 1.3.3 **Measure Three: Strengthening the network management function:** *this function completes the performance framework and comprises a range of tasks, including European route network design, slot coordination and allocation and management of the deployment of the Single European Sky ATM Research ([SESAR](#)) technologies, to be carried out by different actors.*

¹ “Single European Sky II: towards more sustainable and better performing aviation” [[COM\(2008\) 389 final](#)]

² http://ec.europa.eu/transport/modes/air/single_european_sky/doc/2010_02_26_madrid_declaration.pdf

This has been implemented in two functions the first being the creation of the Network Manager function and finally the SESAR Deployment Manager focusing on delivery of the new technology.

Summary of Progress in this pillar

1.3.4 **Measure One Driving Performance:** in the first reference period the implementation of all the elements of SES has been firmly based on the achievements of performance gains through the setting of binding performance targets and the adoption of enforceable performance plans. Consequently, the performance of ATM in Europe has been improved:

- Safety was maintained and there was no fatal accident with ANS contribution since 2011 in the SES area.
- Air Traffic Management-related delays reached the best levels ever recorded in 2013 (0.53 minute per flight, less than 10% of air transport delays). This however degraded towards the end of the period suggesting that measures were unsustainable long term. This indicates there is still much to do.
- Flight-efficiency improved by the implementation of new routes and free route deployment. It is claimed, that as a result, the carbon impact of ANS has become neutral. There was also a shift to measuring actual routes flown which identified interdependencies with cost.
- Full cost recovery was replaced by determined costs and incentives for ANSPs to manage the traffic and costs risks through risk sharing mechanisms. ANS Providers responded to lower revenue than planned arising from traffic downturn and cut their costs so as to maintain, or in some cases improve their margins.
- The PRB summary of achievements was that there was marginal performance improvement in all KPAs during RP1, even though two of the targets were not met.
- Overall there has been progress towards improving the quality of service but this is offset against scheduling intensity which provides risks to sustainability of the measures. Therefore the approach of some States has been to allow delays to rise rather than address the intensity degrading overall performance.

- 1.3.5 **Measure Two : Facilitate the integration of service provision:** There has been some small progress in a few FAB's to integrating services, but to date there has been no move to service integration levels envisaged by this pillar.

Fragmentation of airspace:

- 1.3.6 Airspace fragmentation along national boundaries results in environmental, operational and economic inefficiencies, more fuel burn, emissions, noise, and flight time than necessary. Moreover, the needs of both civil and military users are not always best served. In assessing options further research in this area will be necessary to ascertain the extent of the problem.

Fragmentation of service provision:

- 1.3.7 Most ANS providers supply all services, including Air Traffic Control and technical infrastructure, and operate as silos within national boundaries. Network benefits, economies of scale and seamless functional evolution expected in the Single European Sky have not fully materialised in all areas, but there is some early signs of movement.

- 1.3.8 Functional Airspace Blocks (FABs) were expected to reduce the fragmentation of airspace, service provision and infrastructure. In fact, FABs as implemented, in many instances, bring more fragmentation instead of expected consolidation (30 States + 9 FABs), blur accountability (additional layer between States and EU), generate additional costs (tens of millions per annum) and sometimes act as obstacles (e.g. blocking initiatives proposed by the NM and others), all of which goes against performance and adds significant costs in additional millions of euros. An approach the PRB will take this year is to quantify this disruption cost.

- 1.3.9 It is the PRB opinion that FABs offer considerable opportunity to improve in all KPA's and whilst measures to date have offered some change which is welcomed. There is still much to do thus a further study on the strengths and weaknesses of the FAB approach may be indicated by the results so far. This will form part of the dialogue with stakeholders.

- 1.3.10 **Measure Three: Strengthening the network management function:** Whilst the Network Manager function was created and has become a moderately effective tool for the management of the wide area network, it remains fragmented. Heterogeneous legacy infrastructure still exists frustrating efforts of the Network Management team to address issues.

- 1.3.11 These discontinuities lead to:

- 1.3.12 Fragmented procurement and maintenance of infrastructure which results in:

- excessive expenditure (no economy of scale, low bargaining power),
 - obstacles to labour mobility and operational cooperation (e.g. delegation of airspace),
 - poor interoperability and synchronisation of upgrades between ground systems,
 - lengthy and difficult deployment of air-ground upgrades (e.g. data-link), and
 - limited reliance on joint procurement and maintenance of ATC systems that so far remain an exception (e.g. COOPANS, ITEC).
- 1.3.13 So far, defragmentation came mostly from voluntary initiatives, such as COOPANS and Borealis and have been less due to strategic management of the airspace. Such initiatives are incentivised by cost risk sharing (ANSP retains savings made jointly), and could be further encouraged through, for example, priority in allocation of CEF funds, even before the proposed SES 2+ “industrial partnerships” are adopted.
- 1.3.14 The PRB believes that this situation is aggravated by monopolies, lack of competition, and weaknesses in regulation and oversight, which is difficult to oppose as member states and their ANSPs have a vested interest in maintaining, and profiting from the status quo.
- 1.3.15 This has led to:
- [Near-absence of competition:](#) Competition for the ANS market, which was clearly intended in the original SES package, remains exceptional, and at Member States’ discretion (e.g. some tower or terminal services in Sweden, Spain, Germany and UK). Competition in the market for air traffic control is currently precluded by the geographic organisation of airspace in sectors. Most ANS Providers remain strong monopolies, designated at Member States’ discretion, often over long periods and fully vertically integrated. The result is there are few incentives for greater efficiency other than the penalty of greater regulation.
 - [Limited choice and nugatory incentives for airspace users:](#) At the moment, the only choice for airspace users in selecting their ANS provider is to circumnavigate expensive, or congested areas, which has negative environmental impact, distorting network performance
 - [Weak National Supervisory Authorities \(NSA\):](#) NSAs in charge of local regulation, a key element of the SES scheme, are often under-

resourced, or closely linked to monopolistic service provision, and Member States have blocking power in the SES Committee. They are fragmented along Member States' boundaries with little ability to manage effectively the challenges. In most cases, whilst separation has been achieved, they all ultimately report to the same Ministry and/or Minister who is faced with making the technical judgement calls usually undertaken at expert level. This is an unacceptable mechanism for public officials who are not equipped to operate this sort of decision making.

- [Calls for more aggressive Economic regulation:](#) Strong economic regulation is required as long as monopolies exist, which the SES Performance and Charging regulations can provide. However, their implementation is far from optimal. During RP1, ANSPs managed to generate 10% of economic surplus in average, 20% in some cases. This is high for a low risk industry whose maximum exposure to revenue shortfall is 4.4%, and indicates weaknesses in the economic regulation.
- 1.3.16 At the same time, other ANSPs had losses but were unable to accept these losses, as liquidity buffers are not present to ensure cash flow issues are addressed. Economic regulation has to be fit for very different cases, with some already very good, some having much room for improvement and others struggling in specific circumstances.
- 1.3.17 Unhelpful behaviours and gaming are observed. Not only in the regulated community but also in the operational elements of the legislation. Targets are being set on inputs to unit rates, not outcomes, this leads plans to be set on very conservative levels to de risk the plan in favour of the ANSP and ensure profitability. Assumptions, such as low traffic scenarios, which reduces the traffic risk, increases unit rates to protect revenues. This increases chances of failure in capacity due to reduction in capacity building measures indicated by the low traffic. Incentives, being defined by States, are vulnerable to gaming by this skew on risk sharing. Some FABs have designed incentives that are easy to meet, or ineffective, due to wide dead bands and selective application of delay reasons.
- 1.3.18 Finally, the SES programme has also created more new actors; at the last assessment by the PRB approximately 30, which have increased fragmentation of decision making and some in service provision. In particular, taking out redundant systems, or processes seems to be a continuous problem in achieving cost benefits as the new actors take over roles as competences are transferred, but old legacy systems are still retained and no cost savings are made.

1.4 The Second pillar: A single safety framework

- 1.4.1 In this pillar the Commission stressed that the growth in air traffic, the congestion of air space and aerodromes, as well as the use of new technologies justifies, a common approach to the development, and application of harmonised regulation to improve safety levels in air transport. Following this approach the Commission proposed to extend the competence of the European Aviation Safety Agency ([EASA](#)) to the remaining key safety fields: aerodromes, air traffic management and air navigation services. This has been achieved and as we move into RP2 EASA now has competence on safety regulation and assists the Performance Review Body with the oversight of the Safety Key Performance Area.
- 1.4.2 However, despite this good intent there remains an issue with the opaqueness in safety.
- 1.4.3 Although there was no fatal accident with ANS contribution involving commercial aviation since 2011, the PRB believes that accidents were avoided, in some cases by the intervention of final safety barrier system interventions e.g. TCAS defence, in a number of very serious incidents. This diminishes the work so far in making progress in this area, as a single accident negates the large efforts made by the safety professionals. Aviation safety standards have traditionally always tried to maintain two safety interventions before accident as a benchmark. ICAO in its conflict management work addresses three layers strategic, tactical and lical collision avoidance promoting the transport system to Hypersafe operating strategies. Thus the activation of final defence systems suggests we are missing indicators in higher levels, and thus safety needs to be improved.
- 1.4.4 The task for safety in RP3 is to examine system changes brought about by strategic change. Traditional measurement of steady state safety will need to be enhanced to give early warning of degradation. Thus a move towards a hyper-safe transport risk methodology is required able to detect early warning signs.
- 1.4.5 The PRB makes the following observations.
- Most aviation casualties are from accidents involving General aviation (GA). The prevention of such accidents does not appear to be given a proportionate degree of priority.

- ANS safety remains opaque. Contrary to other transport modes, safety targets are set in terms of process and rule compliance rather than risk. There are currently no reliable risk indicators on which targets could be set. These are a priority for RP3.
 - Risk is not measured in a consistent way. Incident reporting depends on willingness to report and is hampered by absence of just culture in some Member States.
- 1.4.6 EASA is currently working with its working groups within its Safety Framework and it is expected that the output will inform the PRB on how to address these issues in detail, assessing measures to track, and monitor, safety performance and interdependency impacts.
- 1.5 [The Third pillar: opening the door to new technologies.](#)
- 1.5.1 The Commission stated in its communication³ that; *the present air traffic control system is being pushed to its limits, working with obsolescent technologies and suffering from fragmentation.* As a consequence, it suggested that Europe must accelerate the development of its control system by implementing SESAR in order to increase safety levels and quality of service. This pillar is now supported by the Pilot Common Projects regulation (PCP) and future arrangements may include further enhancements to this programme. The first deliverables emanating from SESAR will be delivered around 2018.
- 1.5.2 So far there has been little improvement attributable to SESAR deliverables as most improvements appear to be centred around local actions. However as identified in master plan risks, Datalink is a key constituent required to be deployed in order that the new technologies can function. Difficulties in deployment of Datalink have resulted in a deferment of the implementation date and this will have far reaching consequences for the industry as the updated technology may require further costs to find solutions. Added to this the lack of global interoperability is creating barriers for airlines that may need to cease operations on routes affected by differing global standards.
- 1.5.3 An example was given in a recent case given to the PRB cited by the industry, is on the use of North Atlantic Tango routes. Global mandate in this region is for FANs/1A and CPLDC is not compatible. Airlines will not be able to use these routes in the near future unless dual stack equipped (cost prohibitive for most operators). Meaning that they will need to fly longer routes, and increase loadings on adjacent ATM sectors which are already

³ Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions of 25 June 2008: "Single European Sky II: towards more sustainable and better performing aviation" [COM(2008) 389 final – Not published in the Official Journal].

stretched in providing capacity. These additional routes are in some cases longer, and have the further downside of adding significant costs to airline operations in additional en-route charges. This is a concern for the PRB as SESAR is targeted at the improvement areas for capacity and this interoperability issue outside of the SES region is creating further disruption and fragmentation of service provision and destruction of business cases for implementation. It is evident therefore that performance objectives are required to address not only operational delivery, but also the strategic level.

1.5.4 The issue of the North Atlantic Tango Routes highlights the importance of a necessity to create/maintain links with ICAO regulatory activities, considering their (possible) effect on capacity and other operational/financial issues within the European airspace.

1.5.5 There are a number of strategic concerns:

- [Conservative use of H2020 and CEF funds in relation to the SESAR project:](#) Without a comprehensive plan (i.e the ATM Master Plan) that drives the deployment towards standard ground infrastructure, comprehensive interoperability, impact assessments, and new business models, SESAR deployment (PCP) will fail to improve existing work practices, and therefore safeguards monopolies for ANS and risks even further fragmentation and degradation of service.
- Alignment of regulation towards performance: The Performance, Charging and Deployment regulations are insufficiently aligned towards improving performance, which is the overarching SES goal.
- SES performance management seeks to improve performance by bringing pressure by reducing costs and improving capacity capability, and route choice, whilst monitoring risks in environmental and safety areas. At the same time it applies cost pressure to stimulate improvement. EU funds are made available to foster deployment and provide an acceleration of deployment. However, success in deployment is measured in terms of system implementation, and not achieved performance improvements. In addition, there is a perceived risk of multiple funding channels (RP1, RP2, CEF) with no commitments on additional performance for the technology deployed, or the costs incurred.
- The PRB expected to have a role in checking that deployment is performance-driven and planned performance outcomes achieved. To date the PRB have not seen any activity to address this as, like safety, there is no visibility of deployed projects and EU funding levels at individual project level as well as linkage with Performance Plans.

- The first implementation of SESAR Deployment includes a majority of ANSP-tailored projects, which tends to indicate that it will prolong the fragmentation of infrastructure and waste opportunities of market opening, standardisation and unbundling of infrastructure. It is important to ensure that performance is a key criterion in allocating CEF funds and in monitoring implementation projects with suitable metrics, and project management techniques.
- Absence of standards for ground systems (FDPS,RDPS,CWP): Standards for ANS ground systems are very limited, contrary to airborne, air-ground systems and even baggage handling and check in systems. Standards are prerequisites for many improvements in the European Aviation programme to date; facilitating competition in markets, and global interoperability, and key to SES success of the European ATM systems supply industry on the global market. The Maritime industry, Mobile Phone operators, Gas suppliers and Electricity suppliers have very successfully managed this process in much larger networks. Competition is fierce in some markets regulating price by market measures, rather than lengthy, and ineffective price cap regulation.

1.6 The Fourth Pillar: managing capacity on the ground

- 1.6.1 The Commission stated that investment is necessary to ensure that airport capacity remains aligned with air transport management capacity and to preserve the overall efficiency of the network. The measures to address this being proposed in the [action plan](#) for airport capacity, efficiency and safety in Europe. It is in this airport environment that capacity is still highly restricted with at least one high utilisation airport now unable to grow to meet demands until additional runway capacity is provided. Environmental concerns (noise requirements) are impacting heavily on this pillar.
- 1.6.2 The Commission created the European Observatory on Airport Capacity & Quality to address growth constraints, composed of Member States, relevant authorities and stakeholders, to exchange, and monitor data and information on airport capacity, as a whole, as well as to provide advice on the development and implementation of European Union transport legislation. Numerous reports have been produced on this important factor to air transport growth. With the start of focus shift in RP3 the PRB will be looking at the ATM network as 'Gate to Gate' rather than as a fragmented system. Assessing the weakness of the current approach that will require further integration as we move towards RP4. Options to address this will be necessary in line with the EC Action Plan bringing further coherency to the Air Transport system through improvements in Airport and ATM activities.

1.6.3 Even if during RP2, new targets in the various KPA for European airports have been elaborated and fixed, one can note that the level of ambition reached is not as high as we could have hoped for via a gate to gate approach. In fact, airports concerns are not the same, very large airports are the only ones affected by congestion whereas most of the others have no real difficulty with congestion but suffer from cyclical behaviours generating troughs and peaks of activity which are difficult to manage in terms of staffing and costs.

1.6.4 So as far as targets are concerned aggregation of airports has to be questioned as the true nature of activity is hidden by this approach, and performance measures designed upon aggregation therefore elicit the wrong response for all. (This is a fact for all KPA's and all PI's) Some will improve some will suffer worse performance and the policy response will be disproportionate. Complimentary to this, within very large airports their quality of service is not completely satisfactory if you ignore the level of coordination or the level of scheduling intensity. This needs to be addressed to ensure improvement of performance from the ATM community and overall improvement of the system. Finally, airport operators cannot be ignored when speaking of airport capacity they are a necessary part of the equation and therefore should be included in the target approach. Nevertheless, PRB is convinced that in the medium and long term airports are crucial for the capacity of the whole system. So believes that an in-depth analysis could be launched specifically on these concerns.

1.7 The Fifth Pillar: The Social Dimension

1.7.1 Finally, the SES programme adopted a fifth pillar of the framework to include Human factors. This was designed to address the human element and adopting change management techniques to aid delivery. This approach has had mixed effect, but today one of the two the main obstacles to achieving SES success remains a poor change management strategy involving inclusion of the work force, and stakeholders, engaged in the programme.

1.7.2 European ANS directly employs some 43500 staff, representing 63% of the cost base (c. €5bn p.a.). Half of the staff costs are related to Air Traffic Controllers (ATCOs). The average productivity of European ATCOs is 0.8 aircraft under control per controller on duty. With the current organisation of airspace (sectors) and rigid staff management in many European ANSPs, capacity is being wasted in many sectors and insufficient in others. PRB experience shows that both ANS costs and delays can be reduced by applying best practices in human resource management. The other half of staff costs is related to technical, operational and administrative support.

Cost-efficiency could be much higher if service provision and infrastructure were rationalised.

1.7.3 Furthermore, a proper involvement of staff in all developments concerning ATM and ANS is key to managing change and ensuring change acceptance. The value of deployment projects can be negated if rejected by the staff. Therefore, it is the PRB opinion that the SES fifth pillar is crucial for SES success and should be significantly improved.

1.7.4 [Performance Evolution Opinion.](#)

1.7.5 The Commission states, in its routine reports to the European Parliament, that the Single European Sky, has not delivered the expected results in some key areas, such as the defragmentation within functional airspace blocks, air traffic control processes, cost-efficiency and the environmental inefficiency of the European air network as a whole. The PRB would agree with this assessment, but would go further to suggest that some additional elements of the policy are not functioning well; an example being the charging regulation where PRB perception is that:

- The current regulation is too much cost based which leads to low incentives for cost and expensive and bureaucratic method of regulation.
- The current regulation is only monitoring standardized investment, but not incentivizing it. SESAR and the current regulation are not coordinated and this may lead to distortions.
- Regulation needs to be lighter and more incentive based. Price cap and light handed regulation as practiced in other network industries.

1.7.6 As a result, airspace users and passengers continue to pay an unnecessary cost in time, fuel burn and money for the existing inefficiencies, coupled with an increasing cost of bureaucracy.

1.7.7 The opinion of the PRB is that; whilst generally there has been some good steps to achieve SES, overall the primary risks to the programme still remain, and are deep rooted. Increasing the risk of non-delivery of the SES aspirational goals (See risk analysis table Annex One). Thus, a strategic step change is needed to improve performance. This step change is the key focus of RP3. The PRB in setting its targets for Reference Period One, and Two, had its ambition degraded and this continues today with mediocre targets and considerable resistance to regulation, or attempts to improve performance, by key states. Unless this issue is addressed and there is

widespread 'buy in' to change, then there is a high risk of policy failure and further damage to the air transport industry.

2. Performance strategy

- 2.1. The original PRB strategy, put together in 2010, laid out the strategic steps to be taken each reference period to achieve the SES desirable state. These steps were a series of statements of nature of the period with detail being managed at local level by Performance Plans.
- 2.2. The steps were:
 - Step One: Achieving performance management.
 - Step Two: Institutional change and reform of management of the system.
 - Step Three: Transformation and restructuring.
 - Step Four: Optimisation and refinement.
 - Step Five: Final Delivery.
- 2.3. With this strategic approach it was envisaged it would take 25 years to deliver against the ATM Master Plan aspirational goals, achieving SES delivery by 2035. 15 years later than originally envisaged. Thus the approach of the PRB is to seek acceleration, where possible, to delivery. This 'acceleration opportunity' review will be a critical element to target development necessary for Reference Period Three (RP3) and will open considerable debate on this issue and will be critical to the scheme.
- 2.4. The approach of the PRB in this white paper in proposing performance objectives, is to revisit the strategic steps to confirm timelines and a thorough review of operating mechanisms, including legislation and indicators during monitoring of 2015, to further improve the system performance both at functional, and supervisory levels.
- 2.5. In order to achieve the 2010 PRB strategic plan, the PRB implemented a system of slow change, by applying pressure, where required, to allow for change and restructuring of all entities without the need to compromise safety. These pressures are primarily financial but, in the first reference period, particular focus was applied to capacity management which, historically has always lagged airline growth. This later issue was considered necessary to ensure that future growth can be accommodated by improved delay management, and in the second reference period could be incentivised to maintain, and improve delivery levels to even higher levels of performance.
- 2.6. Technology development to date has, as a result of the performance targets, focused on capacity management, allowing traffic levels to rise while keeping costs relatively static in real terms, the focus of SESAR being capacity

management as opposed to cost reduction. This approach, whilst valid at the time of creation, has proved unworkable as traffic levels dropped during the first reference period leading to a need to cut real costs in response to make the profile. These planned costs dropped by 5.7% in en-route over 2014 and by 8.6% in Terminal charges. This created problems for ANSP's facing large investments to deploy new equipment at the same time as facing reductions in budgets and has led to deferments further aggravating transition and slowing progress overall.

- 2.7. This has lead in some cases to increases in costs of ATM in some key states during the transition from RP1 to RP2 suggesting that full cost recovery is still a key attribute of the system, or even worse full cost recovery plus allowing retention of profitability above full cost levels.
- 2.8. Overall, a package of performance (improvement) objectives needs to be optimised to accelerate the performance programme to ensure delivery without further delay and with a higher incentivised ambition level of achieving SES goals prior to 2035. These measures should also include the phasing out of unnecessary infrastructure to reduce maintenance and equipage costs, and capital budget requirements, and are proposed by the PRB as performance objectives.

3. Risk Analysis

A review of the performance and objectives for RP3 would be incomplete without a review of internal and external threats. The aviation context has substantially changed over the last years, and the recent economic crisis, which has had a strong impact on European air transport, has led to severe difficulties for the European air carriers to remain viable in the global context.

3.1 ATM Master plan risks

- 3.1.1 The risk assessment of the ATM master plan Ed 2 published in 2012 at the start of the European Performance scheme lists 13 high level risks which were considered as factors that would affect the delivery of the Single European Sky. (See Appendix One of this report for risk list updated to ATM Master Plan 2015 and PRB risk perceptions. Please note the original 13 has been refined down to 9 in the 2015 edition). These risks will need to be examined in detail in the context of performance management using the monitoring report programme to look for indicators of risk attenuation, or amplification.
- 3.1.2 The PRB review of Performance Objectives for RP3 and the monitoring report for 2015 will use the list of risks from the master plan to examine performance priorities for RP3. To assist in the development of options for consideration. The crystallisation of some these risks from observed

performance makes programme adjustment necessary, and re-evaluation of future threats to ensure that a higher focus is applied to change and risk management and that these measures are built into future plans.

- 3.1.3 The focus of the European ATM improvement process therefore needs to be organised and equipped to tackle the challenges of growth, safety, and sustainability for the next decades and this focus is now becoming the primary concern of the PRB. For all these reasons, all initiatives aiming at improving the performance and technology of European aviation are given a high level of attention and priority. This is designed to ensure that the aviation programme remains viable to facilitate the European growth plans and local initiatives.
- 3.1.4 These objectives will not be delivered by chance. A strategic programme of delivery management through consideration of risks and options, and achievability of goals needs to be considered in RP3 to ensure optimal delivery against the aspiration but to develop this a strategy of delivery of ATM projects in Europe needs to be considered in its global context.
- 3.1.5 As can be seen from the risk tables in Appendix One, out of the 9 identified areas, all but two key risks are perceived to be rising and in some cases already forming to become barriers in the near future. Action is required to address this with some requiring recovery measures already. This requires urgent action to address and will be necessary discussion issues during option development as well as target and plan development. The risks have been discussed in context of where this may be happening in this report. Further analysis is necessary during this years monitoring to provide evidence of risk amplification and crystallisation.

3.2 Global developments

- 3.2.1 European contribution to the global aviation market has been assessed recently in the draft aviation strategy for Europe proposed by the European Commission. Its contribution is stated as:
- 3.2.2 The EU aviation sector directly employs between 1.4 million and 2 million people and overall supports between 4.8 million and to 5.5 million jobs. The direct contribution of aviation to EU GDP is €110 billion, while the overall impact, including tourism, is as large as €510 billion through the multiplier effect. The availability of direct intercontinental flights is effectively a major determinant in the location choices of large firms' headquarters in Europe: a 10% increase in the supply of intercontinental flights results in a 4% increase

in the number of headquarters of large firms. A 10% increase of departing passengers in a metropolitan region increases local employment in the services sector by 1%.⁴

- 3.2.3 Its contribution therefore has been assessed having both direct and indirect effects. As a transportation system for Europe and, since deregulation, as a business in its own right. A recent paper commissioned and published by IATA states that:

*'the aviation industry is a major industry in its own right, supporting about 12 million jobs and 4.1 percent of GDP in Europe.'*⁵

- 3.2.4 The benefits of the aviation programme therefore have far wider implications. As a transport system it facilitates global contacts, mobility, and trade. This facility to travel safely, quickly, and in comfort have allowed globalisation to accelerate making travel to even the farthest reaches of the globe possible at a realistic price, and in reasonable time, as well as the development of trading partnerships which lower production costs of goods and services to the European Union. As can be seen by its GDP contribution, this trade is critical to EU development, suggesting that the improvement of ATM is not just about airlines but must be seen in the context of the aviation value chain.

- 3.2.5 This aviation value chain is not the only global transportation mechanism, the airline industry competes with other modes of transport, and other technologies (such as virtual meeting centres for business to reduce travel needs). This creates tensions on operating cost reduction. Since deregulation, flight tickets, and freight rates, are market driven by competition (which was not the case when ATM cost allocations were first created in the 1960's) these costs, along with taxation, and additional fees and charges degrade commercial viability of the airline programme as they are no longer easy to pass through as fees and charges as additional to ticket prices. This later element is not a performance issue but needs to be considered as background when it comes to assessing traffic scenarios.

- 3.2.6 The PRB focus therefore, is not just on the actions and developments of the Air Traffic Management Programme, but must also be aware of the aviation market position in Europe, and threats to its economic sustainability. Disruption to plans of system users at passenger and freight carrier level are

⁴ An Aviation Strategy for Europe {SWD2015} 261 Final

⁵ SEO Economics paper ECONOMIC BENEFITS OF EUROPEAN AIRSPACE MODERNIZATION Commissioned by IATA 2016

expensive. Delays, high risk events, damage the credibility and sustainability of the aviation programme, undermining cost initiatives which lead to a need for ever lower operating costs to attract, and maintain customers.

- 3.2.7 In discussion with Aviation Stakeholders, ATM, as a monopoly provider, is seen as a barrier to remaining cost efficient and the need for ever lower costs. This means all operational costs of the aviation value chain need to be reviewed frequently and reduced where possible, and as soon as practical. It must be considered that lower service prices will not result in increased profitability for the whole industry, but will filter through to price by greater competition and end users who benefit in lower process of goods and services. This means the European economy benefits overall which is the basis of SES.
- 3.2.8 ATM is traditionally difficult to assess, and hotly debated, in its overall contribution to freight and passenger ticket prices. This analysis needs to be studied in more detail to assess pricing levels and ability to achieve them. Therefore ATM stakeholders have focused on the aspiration to *'reduce the unit cost of ATM services to the airspace users by 50% so as to ensure that Europe remains an attractive air travel destination, both for business and tourism, and also an efficient transit place.'*⁶ This remains a key component to change and, as we enter RP3, there will be considerable calls from airspace users to stop the cycle of mediocre targets and slow transition towards delivery in part of this aspirational goal. However, to achieve this, the goals are subject to a number of very tenacious, external, and internal threats.
- 3.2.9 As part of the EU Aviation Strategy, there is an opportunity to generate large added value to European aviation (€150B business) and not only ANS (€8B business) through extended Network Management at limited cost already in RP3. The ICB Report "Draft position paper on Long-Term Evolution of Network Management" suggests: *The scope should be extended to cover a full gate to gate optimisation. Air transport delays were 10 minutes per flight in 2015. The ANS contributed delays is only 10% (1 min per flight) which is addressed today by the Network Management functions. The remaining 90% of air transport delays (turn around delays, reactionary delays, etc.) are not addressed sufficiently by the Network Manager today limiting potential benefits for the airlines, airports and passengers. The optimisation scope should be extended to the full gate to gate approach. Increased collaborative decision making processes involving airline operation centres and airside*

⁶ ATM master plan

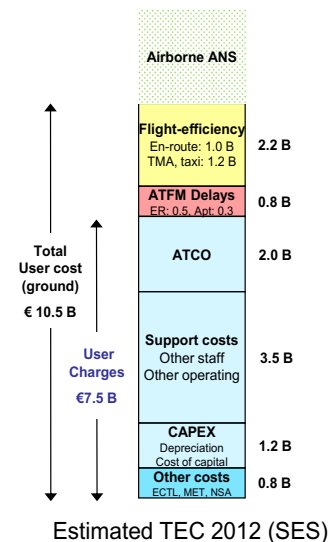
and land side operations of airports would be key for this extended optimisation.”

3.2.10 The latter point would require further development of the SES 4th pillar (Airports) to include integration in the performance environment, and adequate links with other pillars. Thus an integrated and harmonised approach is a necessary performance objective.

3.2.11 In numerous PRB reports, high ANS-related costs remain an issue. In Europe, users bear all ANS-related costs: user charges, cost of delays, non-optimum flight profiles and airborne equipment. This is more than €10B per annum for the ground part alone (see graph), between 6-12% of airline operating costs. The PRB published in 2012 its total economic cost model, seen below, showing breakdown into key cost areas.

3.2.12 Although marginally improving, ANS-related unit costs are still high. This causes significant penalties to European aviation and negatively impacts the economy. More efficient ANS would help support European growth and competitiveness in:

- reducing operating costs for airlines in the very competitive European market,
- creating competitive advantages for airlines that operate in a global market,
- avoiding disruptions of air transport, which underpins the whole European economy (the virtual shutdown air traffic in April 2010 due to a volcano eruption in Iceland caused losses in excess of 1.5 billion euro per day),
- and providing a strong home base for the European ANS manufacturing industry.



3.2.13 A success test for RP3 would be to reduce the total economic cost well below that achieved at end of RP2, within acceptable levels of safety, in line with performance ambitions for 2035.

3.3 Airline viability

3.3.1 A downward revision of the expected European traffic growth hampered the SES strategy of holding costs static to reduce unit rates by increased productivity on capacity. Instead of a doubling of traffic by 2020 (as forecasted in 2005), the most credible expectations are now of a 50% traffic growth

between 2012 and 2035 (from 9.5 Million flights in 2012 to 14.4 Million flights in 2035).⁷ This growth is still substantial, but now requires real cost reductions as well, to meet the aspirational goals.

3.3.2 This has generated a shift of priorities from the initial focus on airspace capacity needs and reduction of delay, towards sustainability / environment and cost-efficiency concerns, whilst maintaining safety. At the same time, other areas of the world, such as the Middle East, have been developing strong infrastructure, large capacity airports and powerful airlines that already appear as serious competitors to European airlines and airports. In RP3 an additional demand in Turkey will affect European Performance in the South East Quadrant as a new airport and continued expansion of the national carrier continues. This leads to the PRB view that there are a number of policy issues and shortcomings in the current arrangements.

3.3.3 An analysis of European carriers shows that as a leading group of nations in the global aviation market, three European Carriers are in the top ten airlines in the world by passenger numbers⁸

Ryanair	6	1	90.6 million pax ⁹
Easyjet	8	2	68.6 million pax ¹⁰
Lufthansa	9	3	60 million pax ¹¹

3.3.4 This contribution as the second largest global contribution represents 26.3% of the global passenger market. However, on freight, the numbers are not so good with no airlines in the top ten freight operators, despite its global market share of 22.7%, maintaining second position.

3.3.5 This shows that air transport remains part of the critical supranational infrastructure and requires a strong strategic plan to maintain it at these levels. The entire aviation value chain of airports, airlines and ATM need to collaborate in a stronger way to improve costs. Improving the way we do business by, reduction of duplication, harmonisation, sharing resources, eliminating double regulation, and improved collaborative decision. These are considerations for RP3 and in this ATM, as a global provider of infrastructure, has a key role.

3.3.6 Global travel for Europe consists of strong intra EU traffic supporting strong out of region traffic via the South East, serving Middle East Australasia, east

⁷ ATM master plan 2015, Eurocontrol challenges to growth study

⁸ IATA WATS 59

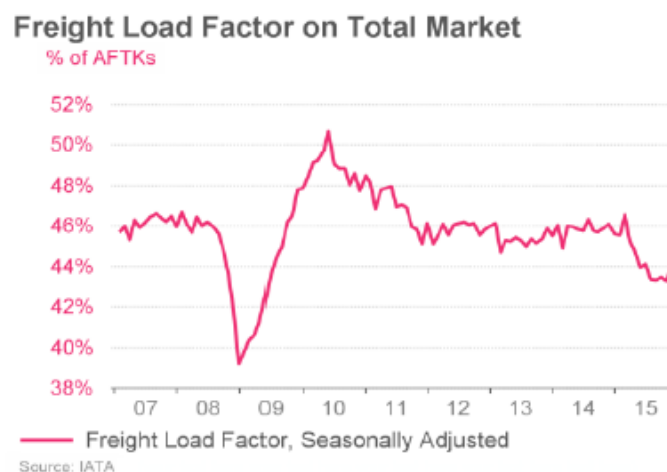
⁹ Ryanair Annual Report 2015.

¹⁰ EasyJet annual Report 2015

¹¹ WATS 59 report numbers however Lufthansa Annual Report 2015 shows 79.3 million for airline and 107.7 million for group.

Africa and near East States. North East Serving: China, Russia and Japan, US and Canada Western seaboard, South West to South America, and Africa (During disruption in North Africa). IATA reports in its global outlook 2015 that there is a favourable economic market for passengers but still considerable weakness in cargo. Europe still lags growth in other markets making conditions volatile for ANSP managers to successfully predict capacity in time to meet demands.

3.3.7 The weakness in freight suggests that there are other factors at play in this segment of the aviation market. IATA analysis in 2014¹² show that market competition from modal shift from aviation to maritime is high due to external competition from maritime trade partners as freight rates are lowered. This contrasts' passenger markets which are driven by time and less affected by modal shift pressures. Freight load factors have continued to remain low at approximately 44% and these continue to show a slow decline.



3.3.8 IATA, in the 2014 World Cargo symposium, analysed this issue and in its report shows that over 13 years there was a slow progression of cargo moving from air, to sea, and that growth in movement of goods has predominantly gone to the maritime industry with growth rates exceeding that of air by a significant level. The study suggests losing an estimated 15 million tonnes of growth air cargo over 13 years¹³.

3.3.9 This shift has a number of drivers but the analysis shows that approximately 5.4 million tonnes of new air freight was lost by modal shift of goods traditionally carried by air and are now being shipped by sea. An example

¹² IATA Seabury Report 11th March 2014. Mode Shift and how to respond?

¹³ IATA modal shift World cargo symposium March 2014

being: hard disk drives that used to be shipped by air have matured and have shifted to ocean freight. In addition, and whilst difficult to quantify, the effect of the Icelandic volcanic disruption of flights by Eyjafjallajökull in 2010, was felt heavily by manufacturers reliant on air cargo supported, 'just in time,' production, who's manufacturers had to move transportation requirements over night to maintain production.

- 3.3.10 This has also led some to shift of transport reliance away from air and this has undermined the original assumptions for the SES strategy.
- 3.3.11 Similarly, passenger growth has seen some significant shifts in markets over the last 16 years. Growth of low cost markets has increased, with 'point to point' travel, becoming more prevalent rather than network operations built around large transport hubs. Modal shifts occur in passenger markets when competing with rail, and where suitable rail links exist, air transport has been seriously affected. Further, less tangible effects, are seen in the advent of new technology providing virtual meeting spaces and other initiatives which negate the need for high level of business traffic. These passenger demands drive higher competition of ticket prices, and thus a further demand for lower direct operating costs of airlines.
- 3.3.12 This suggests that direct operating costs are under pressure both in passenger, and freight market segments and will need to be progressively driven down, suggesting that traditional responses of cost pass through by infrastructure monopolies are no longer possible as flight yields are being driven by market forces. This leads airline directors to constantly review direct contributions to cost of operations, attacking costs were possible, as part of the overall assessment of viability as rising costs cannot be easily absorbed. Thus the airspace user demands for delivery of significant targets in RP3 on cost.
- 3.3.13 Despite the effects of RP1 Air traffic control charges for flights remain a significant contribution to the overall cost of operation.
- 3.3.14 This year we have seen, in the operating reports of the three big carriers mentioned earlier, varying mentions to direct operating costs issues. Examination of the annual reports of the airlines show differing response in terms of reporting, but the message is clear that the direct operating costs issue remains a high risk to airline viability and must be addressed.
- 3.3.15 In the annual report of Ryanair, the air traffic cost issue is exposed in its report to shareholders.

- 3.3.16 In absolute terms, route charges increased 4.9%, from €522.0 million in the 2014 fiscal year, to €547.4 million in the 2015 fiscal year, primarily as a result of the 3.9% increase in sectors flown and price increases in Germany, France and the U.K¹⁴.
- 3.3.17 They produced a breakdown of operating cost produced in page 103 of the report showing the following allocation of costs.

	Fiscal Year Ended March 31, 2015	Fiscal Year Ended March 31, 2014	% Change
	€	€	
Fuel and oil.....	22.00	24.65	(10.8%)
Airport and handling charges.....	7.87	7.56	4.1%
Route charges	6.05	6.39	(5.3%)
Staff costs	5.55	5.68	(2.3%)
Depreciation	4.17	4.31	(3.2%)
Marketing, distribution and other	2.58	2.36	9.3%
Maintenance, materials and repairs	1.49	1.42	4.9%
Aircraft rentals.....	1.21	1.24	(2.4%)
Total operating expenses	<u>50.92</u>	<u>53.61</u>	<u>(5.0%)</u>

Ryanair give the following methodology to cost calculation. The table sets forth the amounts in euro cent of, and percentage changes in, Ryanair's operating expenses (on a per-passenger basis) for the fiscal years ended March 31, 2015 and March 31, 2014 under IFRS. These data are calculated by dividing the relevant expense amount (as shown in the consolidated financial statements) by the number of booked passengers in the relevant year as shown in the table of "Selected Operating and Other Data" in Item 3 and rounding to the nearest euro cent; the percentage change is calculated on the basis of the relevant figures before rounding.

- 3.3.18 Complimentary to this, but not as detailed, are the two operating reports of the two other European airlines.
- 3.3.19 Lufthansa in its annual report saying its air traffic control charges rose by 8.2 percent overall reflecting the high charges in Germany which adversely affects its operational cost¹⁵.

¹⁴ Annual Report of Ryanair to investors 2015

¹⁵ Lufthansa annual report 2015. Lufthansa do not provide a breakdown of its fees and charges in a similar way to Ryanair but lists fees and charges at 5.651 billion, 16.9 % of operating expenses, including landing take off and route charges.

- 3.3.20 Easyjet lists navigation costs at £313 million pounds (401.6 million euros) thus similar to Ryanair. It represents an increase of 7.7 million euros over 2014¹⁶.
- 3.3.21 This again indicates difficulties created for Air Traffic Managers who are trying to predict growth requirements and timings to invest in new equipment and also to provide sufficient capacity to address short to midterm capacity increases/decreases. For this reason, the PRB believes, that the analysis in growth demands for a lower growth forecast than originally envisaged by the SES programme is prudent and suggests that this fragility remains a key risk for the future with some detrimental effects to the ATM programme expected. As a whole that must be mitigated, or delivery will fail. The PRB supports the challenges to growth analysis produced by Eurocontrol and agrees with the risks outlined. Its conclusions support rescheduling SES, and acceleration of measures to bring the change management plan on track and eliminate further delivery slippage.

3.4 Complexity of the European institutional landscape

- 3.4.1 ANS institutions used to revolve around ICAO, States and Eurocontrol. Several institutions now coexist and cooperate at European level on regulatory, ANS provision, R&D and deployment matters (EC, EASA, EDA, Eurocontrol, Network manager, Deployment Manager, SESAR Joint Undertaking). Coordination and decision making can be challenging. Streamlining of institutional arrangements would improve the efficiency of European ANS, and reduce the burden on all interested parties.
- 3.4.2 Eurocontrol for example is a key contributor to the ATM management mechanisms and a influential actor in the whole delivery of SES. This is recognised in a recent communication on the role of the organisation from the EU Council started to address the issue of institutional reform. The following issue was raised in the recital of the Decision¹⁷ *'The definition of the roles and tasks of Eurocontrol may have consequences with regard to the application of Union law and, in particular, the integrity of Union competences, given that Union legislation covers important areas in which Eurocontrol is active. In some cases, Eurocontrol's role and activity depend on decisions taken at Union level'*.

¹⁶ Easyjet annual report 2015

¹⁷ COUNCIL DECISION (EU) 2015/2394 of 8 December 2015 on the position to be taken by the Member States on behalf of the European Union, concerning the decisions to be adopted by the Permanent Commission of Eurocontrol, with regard to the roles and tasks of Eurocontrol and on centralised services

3.4.3 In its communication the Council stated that, an internal reform of Eurocontrol should align the government structures of the organisation with the Single European Sky. The document suggested that a key assumption was that the reform would be complimentary to the programme and effectively carried out, the Commission intended to enhance cooperation with Eurocontrol to implement its policies.

3.4.4 Views on this are mixed, but it is difficult to see where any of this has had an impact on performance improvements and the costs of this organisation, which are now part of the performance scheme, with arguably even more duplication and double regulation and conflicting strategies. Handover of safety from Eurocontrol to EASA has resulted in no tangible savings, with requests being made to change safety costs by paying EASA and not Eurocontrol, and this remains a key delivery risk, with stresses showing in other key areas of business case development and policy management. This issue will need to be addressed during RP2 to gather visibility on cost data of duplication for effective targeting in RP3, via a performance objective on institutional reform.

3.5 Complexity of the regulatory framework

3.5.1 SES Regulations are complex and at times inconsistent following successive revisions. They are not sufficiently aligned towards performance and on occasions drive unwanted behaviours. There is an opportunity for better regulation, with simpler regulations and more incentives driving the intended behaviours.

3.5.2 The implementation of some SES tools (in particular the performance and charging scheme) proved to be a complex and lengthy exercise. There is a high regulatory compliance load on PRB, NSAs and EASA while airspace users that bear all ANS related costs feel have little influence in ANS decision-making. Costs are high and this will be examined in the PRB monitoring report for 2015 as a review of National Supervisory Costs.

3.6 Emerging challenges and opportunities

3.6.1 Preparations for RP3 need to take account not only of past experience, but also of emerging challenges and opportunities.

- The regulatory set-up for RP3 (Local performance targets, incentives, corrective actions, dissemination of performance data, etc.) should foster

the desired behaviours of regulated parties within their respective areas of accountability, so as to meet easily understandable clear unambiguous EU-wide targets.

- It should be consistent with, and foster, the implementation of SESAR innovations. For example, the NM and ANSPs could have incentives to accommodate user preferred trajectories to the maximum extent possible.
- It should seek to improve the balance between economic performance (limited competition for traffic between providers through unit rates), environmental performance (routing distortions due to higher unit rates) and operational/safety performance (unexpected over/under loads). Addressing the points above would reduce the above-mentioned performance issues resulting from unexpected deviations.
- Airport capacity is crucial for the medium and long term capacity of the whole system. We need to assess how to avoid airport capacity crunch in the future as this critical factor is a key constituent of what the ATM structure needs to address in 2035. In fact, small changes like Time Based Separations (London area), vortex separation category (Paris CDG) and a lot of other tools taken into account by SESAR can significantly increase airport capacity even without building new runways which in the currently environmental debate are unacceptable. These changes could entail progressive airport capacity increase year after year. As theoretical airport capacity is not easy to calculate we can base performance indicators on level of coordination and/or of scheduling intensity which is accepted by stakeholders and specifically by airspace users in conjunction with the impact of this level of coordination on quality of service. So it could be considered that a target asking the same increase of slots as for the traffic forecasted. This could also be sued in conjunction with all the airports serving the same area.
- Finally, RPAS represents both a big challenge and a significant risk and is discussed below in more detail.

3.7 Remotely Piloted Vehicles

- 3.7.1 The innovation of producing remotely piloted vehicles has accelerated partly because of high level investments by major industrialists, and partly though cheaper access to technology. Line of sight systems now proliferate and many organisations across Europe are now using them in support of business enterprise and additional services. While they are registered in some countries, this is not always the case, so estimates on usage are

inaccurate. However, with the ability of consumers to purchase these in high street stores, they are now measured in thousands.

- 3.7.2 The next evolution underway which offers many significant benefits, is the development of non-line of sight platforms. Applications, such as cargo transportation, are perceived to offer development opportunities to compete with maritime trade by reducing unit costs, increasing payloads, and reducing operating crew costs. Whilst it is unlikely we will see un-crewed passenger platforms, unmanned cargo platforms are highly likely, and plans are being discussed by special interest groups who look to deploy these platforms, where possible, maybe as early as RP3.
- 3.7.3 This puts additional strain on the transformation processes, and this risk will need to be carefully tracked.
- 3.7.4 Overall, performance improvements achievable in RP3 will, to a significant extent, depend on alignment of tools in the SES toolbox towards performance. This will be a key challenge for the IR updates in 2017 and a follow on for target setting in 2018. This plan will need to be addressed in a global context and synchronised on a regional basis.

4. Global Context

4.1 Global Air Navigation Plan

- 4.1.1 The European region expects to meet, and exceed, their global obligations under the block upgrade programme planned by ICAO in its global air navigation plan 2013-2028. During RP3, we will see two block upgrade milestones; one in 2018 and the second in 2023. Technology upgrades are synchronised through SESAR complemented by the Common Project mechanism. This is further incentivised by grants through calls coordinated by SESAR Deployment Management and in line with the block upgrade programme. The PRB, in formulating its performance objectives for RP3, will take into consideration the ICAO plan, the SESAR contributions to this plan, and propose objectives which complement the ambition of the global plan and regional response.
- 4.1.2 SESAR deliverables are expected to be rolled out from 2018 onto the network and some small performance benefit is expected in the early years. During the target setting process, an assessment will be conducted of the expected benefits from this important programme, and its overall contribution

and will form one of the key pieces of evidence to support performance targets.

4.1.3 In addition; the PRB will need visibility of CEF finance grants to look at what is approved, what is in development, project deferments, and risks to delivery. This will need to be coordinated between PRB, SESAR DM, the military, and the NSA's of each state, and will materialise as a statement of expected contribution which will provide indicative target ranges for each State in all KPA's. The second block upgrade will start in 2023 and it is considered that this second step will have a larger benefit to the community so that more ambition levels can start to be realised in the later part of RP3 and RP4.

4.1.4 This is expected to form the second package of common projects for delivery and the next step of deployment options. The PRB believe that this second package will need to address real cost reductions to aid ATM managers. However, it must be stated that this will not address the very difficult issue of pension costs. This remains an issue at State level for consideration by individual ATM business directors. Pension fund contributions are planned to increase in RP2 and RP3 and this challenges the sustainability of the current programme. Future benefit obligations are substantial, and in some cases unsustainable, they are not possible to target in performance matters as they can only be addressed at individual provider level.

4.2 System monitoring results

4.2.1 As detailed in the PRB review report for 2014 achievements to date have been mixed with some minor improvements, but overall with little ambition to promote change. The following is a summary of the findings of that report.

Military and Special Use Airspace

4.2.2 In RP1 performance improvements were made by improved management of special use airspace. This transition has released back, for unrestricted use, airspace to airlines to operate straighter routes and improve congestion, e.g. around military areas and improve delay around general aviation bottlenecks. Whilst considerable effort has been made in many countries to achieve this, airlines have been reluctant to take up the use of this airspace resulting in military users questioning the efficacy of this shift in airspace management, which could make them reluctant to engage in further efforts to improve efficient use of airspace.

4.2.3 It should be noted that restrictions in the airspace are generated by many different stakeholders such as military units, sport pilots, aircraft testing

grounds for civil and military aircraft, scientific research and also special events, security, and volcanoes. All can produce restrictions in the airspace and also reduce capacity for a defined period of time, which could degrade environmental performance by increasing route lengths.

- 4.2.4 In RP3 it is expected that beyond line of sight remotely piloted platforms, and possibly autonomous aerial platforms could be introduced as commercial companies invest in this technology in order to maintain low costs. Introduction timelines vary, but it can be expected that when it becomes apparent that there is a good business case, there will be considerable drive to introduce them as quickly as possible. This may result in increased use of special use airspace to adapt to these requirements together with new procedures for Air Traffic Managers to control insertion in non-segregated airspace.
- 4.2.5 The traditional measure of performance is to measure conditional route usage. However, this alone is insufficient to reflect the whole nature of airspace restrictions, and further work is necessary to provide a harmonised approach to airspace restrictions, and in order to address the future airspace needs thus the PRB expect that this will need to change.
- 4.2.6 It should also be considered that the role of the PRB is to work in conjunction with military airspace representatives, but the PRB has no role to manage military performance, or effectiveness. This is a state sovereign issue and this must be managed locally within Governmental command and control structures. The PRB can influence the civil needs but it cannot interfere with military and state security requirements. Therefore, our role is one of observational only in this key area in support of Military requirements.
- 4.2.7 As RP3 will focus overall on improvements in performance, based on harmonizing management and improving the management of competing needs and fragmentation. The PRB recognizes the military users role, and needs to address improving the performance of the European Route Network when airspace volume is required, and in line with local Member State requirements. This is managed by the Network Manager through its Performance Plan but closely linked to the PRB's overview of the system as a whole.
- 4.2.8 It should also be recognised that; advanced flexible use may require additional civil-military tools to ensure military and special use needs are achieved. Examples of this are the management of moving blocks of

airspace restrictions built into advanced concepts as well as remotely piloted vehicles.

- 4.2.9 Work is needed during RP2 to provide the requisite tool kits and working methodologies for introduction of advanced techniques. It must also be recognised that; military efforts are not free of cost, and that the requirements of costs efficiency need to ensure that in providing these additional tools that costs are bought down overall. Ineffective cost management of the judgements necessary to release airspace can have little or no effect in improving efficiency. Similarly cost transfer to other budgets outside of the scope of the performance scheme is not an improvement. In some circumstances this may longer term produce higher cost scenarios overall to manage one airspace change. Performance improvements must be seen in the overall context.
- 4.2.10 The user in the case of special use airspace can be split into two, the needs of the restrictor, and the needs of the community.
- 4.2.11 The needs of the restrictor are obvious. If special use airspace is required, it is considered necessary to protect other airspace users from some activity within the airspace, or to remove risks to crews operating within the airspace, from inadvertent conflicts with other airspace users. There are numerous examples of this, but any time that high, or low, energy manoeuvres are being conducted aircraft response may be extreme, or unpredictable. It is essential that restrictions are made to protect both restrictor and general user.
- 4.2.12 However, in this management equation it must also be considered that users also have needs, predictability being the highest one. Aircraft scheduling does not only address when an aircraft takes off and arrives. It must also address the ground needs by scheduling arrival and departure slots at airports where necessary, global time differences, ground crew availability, weather variation, and crew scheduling. An aircraft arriving significantly early is as bad as an aircraft arriving late. It may result in aircraft stands, engineering and ground crews, being unavailable and/or arrival slot flexibility/penalties being a limiting factor.
- 4.2.13 In addition, knowledge of the availability of additional routes needs to be timely and clearly communicated. Long haul crews departing on a 14 hour flight will not know that airspace is available if they are informed four hours before, too late to adjust what is happening. This suggests there needs to be increasing ability to understand the airspace environment and that this is

what collaborative decision making can bring to the performance management structure of restrictions.

- 4.2.14 In RP3 the PRB believes that it is necessary to improve the management of Special Use airspace by improving the assignment and management of airspace at a local, and Regional level, and improving the visibility and predictability at EU level. The performance objectives necessary to achieve this will be improved measurement of restrictions as well as increased surveillance of released use. These would be necessary at local level. At EC level the objectives would be to assess the overall improvement in flight routings and support to the military users as well as measures to improve predictability. New metrics would be required for this and tested in RP2.
- 4.2.15 Therefore, during the coming months additional work is required to assess options for improving the management of special use airspace, with a view to not only providing a better service to users, but also improving the delivery for the military who are key operational stakeholders.
- 4.2.16 This concludes a general and summarized view on the Performance Evolution to date and we now need to consider the Performance to date.

5. KPA Analysis

5.1 Safety KPA (SKPA)

- 5.1.1 The Safety KPA was not targeted in Reference Period One, only monitored. This was seen as appropriate at the time, as the system changes were not expected to take effect till RP2. The existing safety system was seen as adequate. The primary change during RP1 and the first part of RP2 was the transfer of safety accountabilities to EASA for ATM, as the competences were approved, and the development of common rules of the air. These did not challenge other KPA's and are still underway.
- 5.1.2 Targets for RP2 were designed to accelerate the changes on safety management prior to legislative changes necessary for the transfer of safety accountabilities. As we start the process of targeting for RP3, these changes are expected to be completed and current targets subsumed into legislative reporting and oversight programmes. These are considered unnecessary for RP3 at EU level. It is expected that they may still feature in local targets where performance plan monitoring suggests that risks still exist in localized areas, and in local just culture mechanisms.

- 5.1.3 This means that there is scope to refocus attention on key risks which show interdependency issues. This is considered highly desirable from a performance perspective as change management requires identification of problem areas generated by either; interdependency interaction with the Safety KPA, or problems created by technology interaction with latent, human factors or unidentified errors. This is shown as a key risk in item 9 of the risk table in the ATM master plan.
- 5.1.4 This analysis suggests therefore that target profiles should continue to look at loss of separation at system level with runway incursion targeted in local plans. However, there may need to be a debate on loss of communications, in particular datalink, as this affects both piloted, and non-piloted aircraft, that may be operating RP4 onwards. It is argued by some that had this reporting being in place we would have realised that datalink was not operating as envisaged much earlier and that safety barriers were being eroded.
- 5.1.5 There is also a concern that a higher reliance on technology can, and will, generate security threats (Cyber Security) that could affect safety, or data integrity. This reliance requires focus on business continuity and threat management of the technology interfaces. The PRB believes this should be added to the Safety KPA as a key risk issue which requires the development of indicators, reporting measures and target profiles which will last for a minimum of three reference periods during transition and IT upgrade programmes.
- 5.1.6 This indicates the Safety Key Performance Area requires a focus on the following objectives:
- At EU level: Reduction of loss of separation incidents both horizontally and vertically.
- At local level: Elimination of Runway Incursions at local level.
- Social dimension assistance is required to address just culture with a continued focus at local level on change management and social inclusion.
- Security Management
- At EU level: Business Continuity preparedness for loss of systems. Incident reporting of security threats detected.
- At local level: Threat management programme effectiveness.
- 5.1.7 SKPA Primary interdependency issues;

For the Safety KPA primary interdependencies exist in the following ways:

Safety adds cost to the system to address identified threats.
Safety restricts capacity development beyond minima thresholds.
Regulation due to overload restricts capacity and causes delays.

Safety KPA and Environmental KPA issues interact in terminal areas particularly on noise issues.

- 5.1.8 EASA is currently working with its working groups within its Safety Framework and it is expected that the output will inform the PRB on how to address these issues in detail, assessing measures to track, and monitor, safety performance and interdependency impacts.

5.2 Environmental KPA (EKPA)

- 5.2.1 During RP1, the environmental KPA was focused at network level and only applied to flight planning with an expectation that as systems develop, actual routes could be calculated. This has resulted in the end of RP1 two indicators, KEP, and KEA, on en route being adopted in Reference Period Two, for use to measure environmental effectiveness. The first gives insight into route design and cost effectiveness interdependency, the second into route usage, traffic flow and cost allocation insights.
- 5.2.2 These indicators have helped in identifying the contribution of controllers at tactical level to improve routes and shorten where possible flight routings. Routes are now being offered to airlines which represent significant improvements reducing the level of scope to improve the routings by route design and availability in RP3. With a routine improvement of approximately 2% between KEP and KEA.
- 5.2.3 These KPA's have managed to identify the key dependency of cost of routing, versus shortest available route. The process of airline flight plan is focused on cost of operation. Therefore, the route navigated is created by a number of key factors in the aircraft operating costs. Fuel, crew costs (including available crew time), aircraft lease costs, weather, air navigation, and airport fees all combine to create a complex financial interplay. This can lead in some cases to routings being preferred by airlines which are not optimal from a straight line perspective. This occurs when route charges contain a high cost segment in the route. Airline operational planners will always opt for lower cost routings, where possible. This causes disruption to the ATM network as it generates demands for capacity where pricing

changes may generate a change in traffic. This change is difficult to predict and creates tactical challenges for front line ATM staff.

- 5.2.4 A key focus for RP3 will be to examine this interaction in detail for RP3 and may require this to become an aspect of assessment of plans in RP3.
- 5.2.5 At a local level, there is considerable scope for improvement of the environmental contribution and this requires local indicators. Vertical flight efficiency has scope particularly at congested airports for targeting. This should form part of the focus for RP3. But as each airport has its own unique requirements, these indicators should be targeted at local level. In particular, the interaction between noise and CO₂/NO_x would be very difficult to target at EU level.
- 5.2.6 As it has been mentioned previously in this report, noise issues have considerable impact on flight profiles. Noise sensitive environments are being particularly vocal about the lack of attention to this issue and some local initiatives have now started. These range from host of financial measures: Fines for track deviation, or noise pollution exceedances, levied on operators, or the ANSP). Environmental modulation of charges, caps on capacity, and noise curfews further limiting capacity, as well as in some cases having a negative impact on the safety performance increasing complexity. These problems are increasing and are highly popular to apply in local communities adjacent to busy airports. However, there are still demands for further improvement in this area. Aircraft design has done much to address this but it remains an issue and as such the actual operation must be addressed.
- 5.2.7 The move to Performance Based Navigation (PBN) gives more scope to route planners to design new routes of more complexity requiring considerable track accuracy to avoid financial penalty. The PRB believes this will require a performance focus in RP3 to be developed to examine this issue in more detail through monitoring with an expectation of targeting in RP4. As well as a focus on PBN Implementation. But as it is said further PRB is convinced that noise concerns have to be kept at local level. The recent “noise regulation “ of the airport package has clearly adopted this option¹⁸.

¹⁸ REGULATION (EU) No 598/2014 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 April 2014 on the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at Union airports within a Balanced Approach and repealing Directive 2002/30/EC

5.2.8 The final issue in the environmental area is that of military use of airspace. This area also features in Capacity management. Since the advent of flexible use of airspace, considerable areas of special use airspace have been released for use by civil flights on alternative (conditional) routings being made available. This programme however is considered to be ineffective by special use interests as the released airspace is not used by civil operators resulting in considerable frustration being developed on both sides. Here the main issue which has important influence is the Flight Planning IT Systems (LIDO and others) by the Airlines. These systems are used for preparing the flight plans, with a clear objective of cost optimisation (not using always the most direct routes). These systems, which according to operational managers are not very flexible and are not always able to take advantage of the spaces released by Militaries (FUA), when the information is not given sufficiently in advance, or is changing on an unpredictable manner as the systems may not detect the change.

5.2.9 Stakeholder feedback to the PRB on both sides suggests that this requires additional focus in RP3. This indicates that the following areas of Performance focus will be required for the EKPA

At EU level: Route design and use. Special Use airspace management and use. Delays referenced to phase of flight. Actual trajectory monitoring and delay buffering in flight plans.

At local level. Route design and use in terminal airspace. Noise impacts route design and adherence to noise measures.

5.2.10 Primary interdependencies

As already discussed interdependencies exist between the different KPAs make and performance regulation very complex to understand and manage. There is a much better understanding of the interdependency issue today and listed below there are some of the issues that could be better addressed in RP3 of known and measurable interactions.

- The Network Manager (NM) has strong power over users (delays, etc) and nearly no power over providers (capacity). Capacity-demand balancing is essential for performance of the network. The NM could be given a stronger role in capacity management, e.g. non-financial or financial incentives, with positive impact on both delays and costs.
- The disjointed approach to Capacity (FAB plans) and Cost-efficiency performance (Charging Zone plans) in RP2 make it impossible to assess trade-offs between cost and capacity, difficult to assign responsibilities

for corrective actions, and creates issues in allocation of incentives (e.g. Italy risks being penalised by under-delivery in Greece and Cyprus within BlueMed). All parts of a performance plan should relate to the same zone which should have clearly identified boundaries, with clear accountability for delivery.

- There are very strong incentives for reducing costs (ANSPs retain margins) and weak incentives on capacity. Results have shown that this is planning for failure in capacity/delays for RP2 (e.g. FABEC) and underinvestment (25% in RP1). This has to be rebalanced.
- Numerous flights are facilitated to deviate significantly from their flight plans (KEP well above KEA) at ATC tactical level initiative, or user request (avoiding expensive unit rates and asking for direct routing). The latter has negative impacts on safety (sector overloads), capacity (ACC under and over-load, traffic unknown to automation to be identified and entered manually) and cost-efficiency disruptions (ANSP revenue does not match service), or environment if direct routing is not allowed.
- The observations on shortest route versus cheapest route supports a debate on introducing a single unit rate per FAB. As there will be winners and losers, a compensation mechanism for suppliers would need considerable debate as it can become complex when considering the diverse local financial arrangements.
- So as can be seen, lowest cost of route flown versus shortest available route is a key planning concern for the reference period. This combined with the additional constraint of noise routings versus shortest available routes makes for a complex picture and provides further restrictions on capacity.

5.3 Capacity KPA (CKPA)

- 5.3.1 In RP1, this KPA was the primary focus to reduce delays to airlines generated by capacity restrictions. The PRB's view was that, in RP1, the generation of the performance scheme would require further investigation into the costs efficiency issues prior to active targeting of a reduction path in line with technology deployment. There has been very little growth over the period with traffic levels below 2008 levels,¹⁹ and the traffic has been affected by changes in traffic flows at local level driven by longer term disruptions.

¹⁹ PRB Annual Monitoring Report 2014 Volume 1 - European overview and PRB recommendations Section 1.4.

- 5.3.2 The PRB's view being that capacity improvements would have immediate effects for airlines.
- 5.3.3 This programme, initially effective, produced capacity production at unseen levels in historical performance. However, notably in the last two years, this situation has deteriorated in some parts of the region. This deterioration is partly due to technology deployment, and partly due to social unrest.
- 5.3.4 Capacity challenges are also further aggregated by external events and factors which distort traffic flows. Conflict zones, and disputed territory arguments still persist in the south east quadrant. As can be seen in the early discussion on the global context of aviation these factors must be addressed collectively to reduce impacts. Cyprus and Greece both need support to deliver the required capacity, and the issues affecting these states will need to be carefully examined in the statement of requirements for in the indicative targets and actions required for RP3 developments.
- 5.3.5 Finally, in terms of external developments steps in Turkey, external to the SES zone, but complimentary to it, will by RP3 have its new airport online. As the largest airport development in the European region we can expect to have a considerable traffic changes as a result of this build, affecting adjoining states. Bulgaria is already working on changes in airspace design and capacity management in line with the Turkish requirements and this will become a key feature of the performance plans of this State as well as adjoining States.
- 5.3.6 Conflict regions bordering the Mediterranean region in Syria, Ukraine and North Africa have changed traffic flows over the south eastern quadrant of the Single European sky region. These changes have been difficult to accommodate and have resulted in risks to performance plan delivery in a number of keys states. Added to this we also have difficulties in Greece and Cyprus as they struggle to cope with European Stability Mechanisms. These states are strategically important for the south eastern quadrant traffic flows, and require particular focus over the coming period to ensure they have the right mechanisms in place to address the investment necessary for modernisation and capacity delivery. This flow is a top priority for performance improvements and will be an area of particular focus.
- 5.3.7 As a result of traffic flow disruptions a number of key states in the south have gained significant traffic flows when at the same time some of those in the north have also lost traffic disrupting plans. The effects of this will need to be

monitored and reacted to with corrective measures in RP2 and RP3 to bring the plans back on track as the effects damage cash flow, and modernisation projects, and may require more rapid restructuring that had been planned to address short term needs.

5.3.8 This suggests that focus on capacity will be required with the possibility of development of additional/new measures to look at the change and management of airspace. The present capacity target used in RP2 has 2 main limitations: the PRB believe that it measures only about 20 to 25% of the total delays on which ATC can have an impact (ASMA, additional time in taxi-out phase, ATC pre-departure, Airport ATFM are not covered) and The measure is an average on en-route delay on the 9 millions of annual flights. Targeting averages hides the real causes and can lead to poor intervention development.

5.3.9 For RP3, may be we could try to focus more on the main European bottlenecks (essentially situated in the core area) that create most of the delays, during the peak hours (every morning and evening), and long delay reasons. It should also look at multiple flight plan submission by Ops teams looking for options to circumvent a traffic delay.

At EU Level: Capacity delay, use of en route restrictions, use of flexible use airspace by operators (Shared measure with Environment) service complexity levels. Use of regulation due to overload. Technology implementation disruptions. Resource usage levels (e.g. frequencies) It is possible that these will need allocation at network management and local levels.

At local level: Arrival delays and holding usage. Weather generated delays. Runway capacity usage.

5.3.10 Primary interdependencies

5.3.11 There is a primary interdependency as discussed above with environment.

Safety requirements degrading capacity (e.g. wake turbulence) regulation of airspace to reduce overload.

Scarcity of resources limiting expansion/optimisation.

Airspace complexity and cost (shared with environment)

Use of free route and environmental measures.

5.4 Cost Efficiency KPA (CEKPA)

- 5.4.1 As already discussed in detail earlier in this report, the PRB would argue that more appropriate regulatory mechanisms and better use of market conditions could help the ATM service operators to achieve their goals. Focus should be applied on economic regulation where it is necessary (i.e. prices, output, investment and quality) and only deal with safety and environmental regulation when these affect economic regulation directly. Important secondary questions include how do we account for the interests of multiple stakeholders including passengers, airlines, airports, ANSPs, Member States and the EU when designing the mechanism in such a way that the reform of regulation can be implemented when the decision making actors have a vested interest in the status quo.
- 5.4.2 As part of this set up for RP3, the PRB will wish to expand on the effects of the regulatory practices of other network-based industries contained in the modulation of charges study²⁰ which face comparable problems to those of the ATM sector. More precisely, look at the sectors just in so far as they face comparable problems. In particular, a review the regulatory practices imposed on airports, railway infrastructure, energy transmission, telecommunication infrastructure, and (in some countries) water infrastructure. These are network-based industries that are characterised by geographic monopolies, technological fragmentation (except telecommunications), investment, service quality issues, and regulation.
- 5.4.3 Gas, Rail and Electricity supply are pan also European networks creating many similar issues. In railway, energy and telecommunications – as with air transport – the provision of services has been liberalised whereas the infrastructure remains at least partly a natural geographic monopoly.
- 5.4.4 For example: In the railway sector, a substantial part of EU regulatory policy (the so-called technical pillar) is concerned with interoperability of infrastructure and passenger rolling stock, because technological fragmentation is one reason for market fragmentation and underdeveloped competition in the market.²¹ What is also relevant is that in the railway freight market, rolling stock is completely technologically compatible over most parts

²⁰ Part A: Study on the Cost of Capital and Return on Equity of Air Navigation Service Providers (ANSP) Part B: Study on Pension Costs of Air Navigation Service Providers and the application of International Financial Reporting Standards (IFRS)

²¹ Nash, C. (2013). Rail Transport. In Finger, M. and T. Holvad (eds.) *Regulating Transport in Europe*, Cheltenham: Edward Elgar Publishing, 61-81.

of Europe for the past hundred years. This sector suffers from an inability to modernise which is partly due to the desire for interchangeability – which also appears to be similar to the ATM sector.

- 5.4.5 In addition, there is a lot of experience with price, quality and investment regulation of many different types in the network-based industries mentioned above. Hence the PRB draw on this experience in order to draw prescriptions for the ATM sector. For example, major airport expansion projects were regulated under a price cap system in Dublin, Manchester, London and Paris which offer rich experience to study ex-ante and ex-post how incentive schemes work.²² In some countries, regulatory and commercial functions have been unbundled and independent regulators have been institutionalised.²³
- 5.4.6 The PRB believes what is required to continue delivery towards the financial mechanisms of the SES aspirational goals is a clearer understanding of the attitudes and interests of the divergent stakeholders. In this context, the use of a study in this area would be beneficial as a consistent review method across stakeholders. However it must be pointed out that this study could not aim at reaching consensus in responses, but only to assess the regulatory impact on the community as well as to generate policy alternatives in the area of economic and legal changes in ATM. This is expected from the post RP1 evaluation study ongoing at present and this white paper and the post RP1 evaluation will need to come together at the end of 2016 to assess the overall view propose next steps and assess the impact.
- 5.4.7 What needs to be addressed are the clearly identified boundaries between the different phases of flight and allocation accordingly of cost methodology. We also note that regulatory scenarios options will depend on the governance structure of the ATM market, namely on the levels of competition as well as on ownership form.
- 5.4.8 The current mechanisms allow for a number of differing economic responses to ATM performance management.

²² Adler, N., Forsyth, P., Mueller, J. and Niemeier, H.M. (2015). An Economic Assessment of Airport Incentive Regulation. *Transport Policy*, 41, 5–15. Starkie, D., (2006). Investment Incentives and Airport Regulation, *Utilities Policy*, 14, 262-265.

²³ Niemeier, H.M. (2010). Effective Regulatory Institutions for Air Transport – A European Perspective, Paper prepared for the Round Table on Effective Regulatory Institutions: The Regulator's Role in the Policy process" of the OECD/ITF Transport Research Centre Dec. 2 and 3, 2010 Paris. International Transport Forum at the OECD (ITF) (2010). Better Economic Regulation: The Role of the Regulator, Round Table 2-3 December 2010, Paris. Summary of Discussions, Discussion Paper No 2011-03, April 2011

- 5.4.9 Competition: Parts of the ATM value chain could be better organised by direct competition, or by competition for the market. Competition *for* the market is already part of the status quo in those countries with franchised terminal services (for a description of the slow but steady growth in competitive forces in the UK market see the CAA report²⁴). The same approach will be adopted in regard to competition *in* the market which is generally the preferred option as it strengthens competitive forces, but is very often not feasible without major technological changes. This drives a link with SESAR with arguments from some that liberalising technology should have precedence to EU funds. In the upstream market, firms compete in the software and hardware markets, but these markets are very often not open due to national interests, security barriers and Sovereignty arguments. The lack of compatibility across ATM service providers due to poor standardisation is a key obstacle towards a competitive industry (ICB report (2015)). Openness and the role of potential competition can be the guiding principle to construct scenarios across the ATM value chain.
- 5.4.10 Competition however can have the adverse effect of increasing fragmentation. Many actors vie for trade and this is where the standards are necessary to ensure interoperability. These standards are lacking and need urgent development to ensure that risk are contained. Making a key performance objective to manage fragmentation better through standards management. To date there is little application of market approaches.
- 5.4.11 Ownership and political economy: We also note that the independence and credibility of the regulator is a function of the political economy that creates the regulator, sets its goals and instruments, and is always in a position to subsequently change the rules. With a few notable exceptions in terminal areas all ANSPs are state-owned with the exception of the British ANSP, NATS, which is a public-private partnership with a majority share belonging to the state. Thus Ministries retain control of the infrastructure and manage the interaction within its regulating bodies leaving clear conflicts of interests.
- 5.4.12 A quantitative and qualitative analysis could be used to highlight through a systematic approach both the drivers for reform and the obstacles towards such reform. An implementation plan for future regulation that will balance the needs of consumers, and producers, such that overall social welfare is maximised. This will need to be assessed in the options later this year informed by the post RP1 review currently taking place in the Commission.

²⁴ CAP 1293 Review SES for Air Navigation Services

- 5.4.13 Given that, the quantitative approach will not be able to consider all the ramifications of regulatory change, the qualitative analysis will provide the practical balance to inform a post report impact assessment.
- 5.4.14 The qualitative and quantitative approach of the ATM economy will guide the search for the best options of feasible regulatory reform given the interests of the stakeholders. It can provide a much more realistic picture of what could be achieved and is the basis of developing a coherent strategy for reform that will move the ATM market towards the SES aspirational goals.
- 5.4.15 Finally, the performance programme needs to examine the effects of targeting given the history of the programme. SES economic targets are currently set on inputs not outputs. Thus generating adverse behaviours in planning making planning approval a complex and lengthy business. This encourages gaming the system and makes corrective measures unlikely to be applied without the necessity of lengthy legislative dialogues to pricing in the annual review. In particular, where one of the primary factors is modulation of traffic levels with no better indicators than a coin toss these are ineffective mechanisms for pricing structures, and will need review as assumptions cannot be tested as the likelihood of delivery of a chosen level varies greatly. RP1 showed the effects of poorly anticipating the needs of traffic. These led to far more conservative approach in RP3 skewing the risk tables to reduce ANSP risk.
- 5.4.16 This suggests that one of the objectives for the next reference period is to address behaviour of actors by shifting focus to outputs of economic interventions and generating more collaborative behaviours. This will also interrelate with the fifth pillar making this a true change management programme.
- 5.4.17 The primary effect, to date, of the performance scheme is that the actors have had to adapt quickly to the new realities set by targets to achieve but, the regulation has not always triggered positive behaviours which shows high potential to improve the overall performance of the system.
- 5.4.18 A final issue to address is the cost allocation of Eurocontrol costs in line with its institutional framework changes. These costs are applied in bulk but this may need some further breakout to apply costs in the right areas as the organisation reforms. This will need to be addressed during option generation later in the year.
- 5.4.19 PRB perceptions of weakness of the current charging regime are:

- The Charging regime provides no flexibility and focuses on inputs, not outputs.
- There is no real link between policy, regulation and transition towards a commonly agreed and shared vision. This drives non collaborative behaviour of the user community against the interests of a better, or improved network performance (e.g. spending a lot of energy to avoid network conducive measures for an individual flight of an airline).
- ANSPs maintain high level contact and reporting lines to benefit the Member States and the staff in order to justify that they cannot deploy any of the new technology to improve performance.
- The SDM working on its own with different set of experts when approving the funds increasing the fragmentation of the service provision on the longer term.
- The states struggling against the EC's intent to effect change delaying any possible changes.
- Boundaries for charging Zones not reflecting operational boundaries making application of cohesive evaluation of performance impossible. (e.g. En Route and Terminal).
- Effective targeting of Terminal Air Navigation costs at EU level extremely problematic.

5.4.20 KPA cost efficiency objective areas

5.4.21 This suggests that focus on cost efficiency for RP3 is a key priority as it is the primary driver for all aspects of SES. In conjunction with other KPA's, division of airspace and application of charging is a key dependency and will require interdependency metrics to achieve monitoring oversight.

5.4.22 At EU Level:

En Route Cost broken down by cost per 100 km and determined Unit cost achievements.

Cost benchmarking not only cross sector, but also with other external data for other comparable areas such as staff costs, infrastructure, capital markets, and external financial reports for all key cost reports in the reporting tables.

Staff productivity measures.

Eurocontrol costs and cost allocations to charging zones.

Use of market opening on internal services.

Use of common use platforms and synergies.

- 5.4.23 At local level: Terminal costs, use of market opening, benchmarking between regulated and non-regulated entities, staff productivity measures and technology deployment measures.

Capital requirements, asset bases, and legacy system decommissioning rates.

Interoperability degradations and service quality measures.

Business continuity failures

- 5.4.24 Primary interdependencies

There is a primary interdependency as discussed above with all KPAs.

Safety requirements degrading capacity (e.g. wake turbulence) regulation of airspace to reduce overload.

Scarcity of resources limiting expansion/optimisation.

Airspace complexity and cost (shared with environment)

5.5 Summary of Performance Objectives

- 5.5.1 In summary therefore the PRB suggests 16 performance objectives for RP3 and the next steps will be to develop options later this year on how to address these objectives. Including a review of metrics and review mechanisms. The options generation will produce supporting evidence for the objectives. This evidence will either confirm or refute the system level views.

Safety

- 5.5.2 Performance Objective One: Reduction of loss of separation incidents both horizontally and vertically by focusing on system risk.

- 5.5.3 Application level: EU system wide.

- 5.5.4 Performance Objective Two: Elimination of Runway Incursions.
- 5.5.5 Application level: Local airport level.
- 5.5.6 Performance Objective Three: Improved management of ATM system security and business continuity.
- 5.5.7 Application level: EU system wide.

Environment

- 5.5.8 Performance Objective Four : Maintenance of contribution towards global emission by maintaining, or improving ATM contribution to fuel burn. (CO2 emissions)
- 5.5.9 Application level: EU system wide.
- 5.5.10 Performance Objective Five: Improving the assessment of noise contribution and route design at a local level.
- 5.5.11 Application level: Local Airport Level. Within TMA's
- 5.5.12 Performance Objective Six: Improving the delay caused by holding and en route delay management to reduce CO2 and NOX effects at Airports.
- 5.5.13 Application level: Local TMA Level.
- 5.5.14 Performance Objective Seven: Improving the management of fragmentation through better through standards management and facilitating competition in ATM.
- 5.5.15 Application level: EU system wide.

Capacity

- 5.5.16 Performance Objective Eight: Maintaining delay measures to facilitate 98% of aircraft on time performance.
- 5.5.17 Application level: EU system wide.

- 5.5.18 Performance Objective Nine: Improving the use of Special Use airspace released to the community by special use airspace managers.
- 5.5.19 Application level: EU system wide.
- 5.5.20 Performance Objective Ten: Improving the resilience of the South East Quadrant with particular focus on Balkan State inclusion and improvements of Greece and Cyprus performance.
- 5.5.21 Application level: EU system wide.
- 5.5.22 Performance Objective Eleven: Improving the level of airport capacity during RP3 and onwards, on the largest coordinated European airports, with an increase of airport slots at the same rate as the traffic increase.
- 5.5.23 Application Local targeting.

Cost Efficiency

- 5.5.24 Performance Objective Twelve: Incentivising the deployment of technological developments to improve cost efficiency targets
- 5.5.25 Application level: EU system wide.
- 5.5.26 Performance Objective Thirteen: Improving the effectiveness of the charging mechanisms to improve cost efficiency.
- 5.5.27 Application level: EU system wide.
- 5.5.28 Performance Objective Fourteen: Increasing the view of Gate to Gate to match cost and operational performance.
- 5.5.29 Application level: TNC Charging Zones.

Overall objectives

- 5.5.30 Performance Objective Fifteen: Improve the effectiveness of the fifth pillar of SES by improving communication and change management dialogues.
- 5.5.31 Application level: EU system wide.
- 5.5.32 Performance Objective Sixteen: Improving the institutional arrangements to reduce duplication, improve harmonisation of common rule sets, and reduction of red tape.
- 5.5.33 Application level: EU system wide.

6. Conclusion

- 6.1.1 This white paper set out to introduce the objectives for RP3 by discussing the network issues as they stand today along with a summary of evidence when seen from a Performance Review Body perspective. The paper has highlighted some key areas of concern, which in the PRB's opinion that will need to be addressed resulting in 16 performance objectives being proposed for target development and delivery options later this year.
- 6.1.2 The paper has been written to stimulate discussion and focus activity for the assessment of monitoring for RP3. The next steps is a discussion with the community on the performance objectives, with a view to providing options for delivery and target developments in the Autumn of 2016 based on 2015 monitoring results and assessment of risks.

Appendix 1 ATM Master plan Identified high-priority risks²⁵

Risk	Description	Consequences/Impact	Mitigation/Actions	PRB Perception
1. The R & D Programme does not deliver solutions that are ready for preparation for deployment.	Lack of efficiency leading to the delivery of SESAR Solutions which are not fully ready for preparation for deployment.	Delay to deployment plans related to SESAR R & D results. Performance ambition is not met.	By: SJU Action: Ensure consistency between the expectations outlined in the Master Plan and the delivery of SESAR Solutions in terms of time and scope. Deliver and publish SESAR Solution Packs to prepare for deployment of the first SESAR R & D results.	Solutions are being proposed but address mainly capacity they do not address staff or support costs which represent an EU average of 63% of the cost base. This approach is unlikely to deliver cost efficiency savings in this area and thus will not meet the SES Aspirational goals. Risk is amplified.
2. The transition from SESAR 1 to SESAR 2020 causes delays and discontinuation of R & D activities.	The Master Plan should ensure the integrity and consistency of the entire SESAR project from development to deployment. Continuity should be maintained between the two activities.	An interruption in the planning and monitoring of this process, at any stage, will substantially compromise the successful and coherent modernisation of European ATM. Capacity of ATM to meet the performance ambitions is undermined, with a negative impact on the industrialisation processes and consequently on synchronisation of deployment.	By: EC, SJU Action: Ensure a good transition plan from SESAR 1 to SESAR 2020 in order to guarantee the seamless continuation of all activities required for the modernisation of European ATM. Ensure the adequate documentation of all relevant R & D output and the identification and storage of all results, necessary to ensure continuity of ATM R & D and deployment planning activities supporting the execution of the Master Plan.	The risks appear contained by current measures Risk diminished.
3. Ineffective bridging between development	Ineffective bridging between R & D and industrialisation/deployment leads to inefficiencies, in	Delays and lack of harmonisation in deployment.	By: EC, SJU, SDM, standardization bodies	The perception of these risks is that this

²⁵ ATM Master Plan published 2015 page 104 onwards.

<p>and deployment activities may put industrialization at risk and delay deployment.</p>	<p>particular for third parties (non-SJU members) and the SESAR Deployment Manager (SDM).</p> <p>Regulatory and standardisation needs to support harmonised deployment are not met.</p>	<p>Performance ambition is not met.</p> <p>Compromise to the delivery of Enhanced performance due to reliance on 'workarounds' to secure regulatory approval.</p> <p>The full scope of industrialisation may be missed, omitting certain stakeholders' needs.</p>	<p>Action: Launch first wave of SESAR Very Large Scale Demonstration activities to bridge R & D with deployment in the context of SESAR 2020.</p> <p>Strengthen cooperation arrangements with standardization bodies to ensure alignment of their respective work programmes with the needs identified in the Master Plan.</p> <p>Strengthen current engagement of the regulatory authorities in the development phase to prepare for deployment.</p>	<p>remains a very high risk at present due to lack of harmonisation and standards. In particular SEAR DM and JU interaction is needed to understand the delivery issues. To date the PRB has not been involved in this and has no visibility of process.</p> <p>Risk is amplified.</p>
<p>4. Interoperability and global harmonisation are not ensured.</p>	<p>Interoperability and global harmonisation rely on the synchronised application of standards and common principles, together with common technical and operational solutions for relevant aircraft and ATM systems. This includes civil-military interoperability.</p>	<p>Global modernisation programmes are not aligned. Reworking required, resulting in delays in development and increased development costs.</p> <p>Basis for sound investment decision-making is not established.</p> <p>Delay of the deployment of the Programme.</p>	<p>By: EC, SJU Action: Work towards global interoperability in the framework of ICAO working arrangements. Continue to strengthen SESAR/ NextGen coordination under the EU/US MoC with particular focus on securing further alignment between the Master Plan and the NextGen Implementation Plan.</p>	<p>Perception is driven by stakeholder feedback suggesting that this risk is crystallising and a recovery plan is necessary. Recent evidence given to the PRB shows disconnects on FANS1A and CPLDC issues. Requiring work arounds to maintain service delivery.</p> <p>Risk amplifying.</p> <p>To be reviewed in 2015 monitoring report.</p>
<p>5. Delays in the implementation of the Pilot Common Project (PCP).</p>	<p>The Pilot Common Project (PCP) provides the first wave of deployment of SESAR R & D results.</p>	<p>Insufficient commitment for the deployment phase.</p> <p>Delay/de synchronisation of deployment plans related to the first SESAR R & D</p>	<p>By: EC, SDM, and all stakeholders Action: Synchronisation and coordination by SDM.</p> <p>Ensure a strong</p>	<p>Perception is that this risk has also strong crystallisation characteristics suggesting that it is occurring.</p>

		<p>results.</p> <p>Performance ambition is not met.</p> <p>Negative impact on the EU economy, employment, mobility and the environment.</p>	<p>promotion of the Deployment Programme.</p> <p>Identify, stabilise and ensure implementation of elements that are prerequisites for SESAR deployment and/or essential for contributing to the performance ambition.</p> <p>Implement the pre-SESAR changes and the PCP precursors according to stakeholder roadmaps.</p>	<p>There is little visibility of what PCP funding has achieved in the first wave and the PRB believes there is no Community level performance contribution.</p> <p>Risk Crystallisation occurring and recovery measures required.</p>
<p>6. Investments to support deployment beyond 2020 are not secured.</p>	<p>The roll-out of the SESAR vision relies on coordinated timing of investments to ensure synchronised deployment (coordinated deployment and incentivisation).</p>	<p>§§ Performance ambition is not met.</p> <p>§§ Insufficient commitment, financial resources and investment for the deployment phase. Delay/de-synchronisation of deployment. Severe negative impact on the EU economy, employment, mobility and environment.</p>	<p>By: EC, SJU, SDM</p> <p>Action: §§ Prepare for the deployment of SESAR R & D results (business cases, impact assessments, future common projects when appropriate).</p> <p>Ensure that financial and operational incentive mechanisms are defined and implemented in a timely manner in order to facilitate the deployment of SESAR.</p> <p>Ensure consistency between the stakeholder roadmaps in the Master Plan and stakeholders' investment plans.</p>	<p>The risks appear contained by current measures</p> <p>Risk neutral.</p>
<p>7. Governance structure is not capable of ensuring successful deployment.</p>	<p>The governance structure is not capable of ensuring a strong link between SESAR development and deployment activities.</p>	<p>Lack of accountability between the various actors. Delay/de-synchronisation of deployment.</p> <p>Performance ambition is not met.</p> <p>Severe negative impact on the EU economy, employment, mobility and the environment.</p>	<p>By: EC (assisted by PRB), SDM, SJU, EUROCONTROL and all stakeholders</p> <p>Action: Define and implement an appropriate deployment Governance mechanism and efficient interaction of all</p>	<p>Perception is that this is a critical factor for success and still not well established. Requests for information to be given to the PRB have resulted in no data on this thus this risk has occurred</p>

			<p>parties involved in order to ensure an effective execution of the Deployment Programme consistently with the Master Plan and the Network Strategy Plan.</p> <p>Governance has to ensure that the required resources are available for timely local and synchronised deployment.</p> <p>Further improve SESAR development and deployment reporting mechanisms concerning the execution of the Master Plan now that the 3 phases of the SESAR life cycle are active: definition, development and deployment.</p>	<p>and recovery is now necessary.</p> <p>Risk occurring.</p>
<p>8. Deployment of SESAR Solutions leads to unaddressed cybersecurity vulnerabilities.</p>	<p>The R & D programme must set clear guidance to ensure that delivered solutions can be made secure, are securely integrated into operational ATM systems (including legacy systems) and contribute to a resilient European ATM system.</p>	<p>While serious incidents are likely to be very infrequent, they may have very serious consequences; even a trickle of low impact incidents will erode trust in the system and could delay SESAR deployment and benefits.</p>	<p>By: EC. SJU Action:</p> <p>Ensure efforts on ATM cybersecurity are coordinated, and assess policy options for strengthening cybersecurity and resilience.</p> <p>Establish principles and processes for ensuring cybersecurity and resilience are included appropriately within the SESAR R & D work programme.</p>	<p>Perception is that this is a routine issue in a hyper connected world. Security issues of critical national infrastructure are required. However routine reporting and data gathering on incidents is low to non existent. Therefore in the absence of data it is difficult to assess threat.</p> <p>Risk amplified by lack of data. PRB performance objective to be proposed</p>
<p>9. Failure to manage human performance (human factors,</p>	<p>Human factors are not integrated into concepts, development and validation (with operational staff), including applying</p>	<p>Without addressing these risks the future European ATM System will not fully achieve its</p>	<p>By: SJU and all stakeholders Action:</p> <p>Ensure that</p>	<p>Perception is that this risk is occurring and change management</p>

<p>competency and change management) issues in the development and implementation of the Target Concept.</p>	<p>minimal standards and unrealistic assumptions (especially human workload and automation).</p> <p>Lack of appropriate competency (training and assessment) regulatory, certification, training and assessment framework.</p> <p>Lack of verified and competent human resources to support operations in a new technological environment (timely and in sufficient numbers).</p> <p>Absence of appropriate social and change management processes and social dialogue structures at European, national and local levels.</p> <p>Lack of an integrated and consistent approach (consistency between regulatory and working bodies).</p>	<p>objectives.</p> <p>Risk of additional safety hazards.</p>	<p>operational staff are included in development and R & D validation activities.</p> <p>Issue regular recommendations and activity plans for Human Performance in the area of R & D, regulation, standards, and management at industry level.</p> <p>Monitor all SESAR-oriented R & D and validation phases regarding Human Performance standards, methods and requirements.</p> <p>Examine staffing implications of all deployment activities for all groups of operational aviation staff and publish results and related recommendations.</p> <p>Ensure appropriate coordination between all stakeholders concerned to ensure consistency between initiatives related to human factors, competency and social dialogue.</p>	<p>is not being addressed adequately</p> <p>Change management programmes in large workforces require change management champions who track and monitor perception and track recovery measures. This is lacking in the current system and requires recovery measures</p> <p>Risk occurring and recovery measures required.</p>
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