EUROCONTROL

Acceptable Level of Safety Performance (ALoSP) implementation in EUROCONTROL Member States

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the Performance Review Commission

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Background

This report has been produced by the Performance Review Commission (PRC). The PRC was established by the Permanent Commission of EUROCONTROL in accordance with the ECAC Institutional Strategy 1997. One objective of this strategy is "to introduce a strong, transparent and independent performance review and target setting system to facilitate more effective management of the European ATM system, encourage mutual accountability for system performance…"

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1 Introduction

1.1 Study background and objectives

In 2013, the International Civil Aviation Organization (ICAO) acceded to new regulations [Ref.1] which require the contracting states to establish a State Safety Programme (SSP) in order to achieve an Acceptable Level of Safety Performance (ALoSP) in a number of activities, including the provision of air traffic services. ICAO standards (Annex 19) also explicitly require states to establish and achieve an ALoSP as a means of verifying satisfactory performance of the SSP and the service providers' Safety Management System (SMS). Therefore, the implementation of the ALoSP concept is an integral part of establishing a SSP.

Effective SSP implementation is a gradual process, requiring time to mature fully. Factors that affect the time required to establish an SSP include the complexity of the air transportation system as well as the maturity of the aviation safety oversight capabilities of the state [Ref.1].

ICAO has identified a set of deliverables and timelines to support the Annex 19 implementation. The applicability date for Amendment 1 is set for 7 November 2019. The schedule ultimately seeks to bring all States in compliance with the Global Aviation Safety Plan's (GASP) objectives [Ref.2].

In their most recent Performance Review Report [Ref.3], the Performance Review Commission (PRC) raised concerns that definitions and guidance on the development of the ALoSP (as defined by ICAO) are currently not available in Europe. Moreover, the existence and development of the European concept of ALoSP has been pointed out by the PRC for some time as a requirement to show what exactly is happening to the aviation system and what and where the real risks are.

In addition, in the recent proposal on the establishment of the ICAO Safety Management Programme, ICAO is identifying the need to develop guidance and mechanisms for sharing best practices to support SSP implementation. In this proposal, ICAO encourages all states and safety partners to engage with the ICAO Safety Management programme in order to achieve its objectives on a very tight schedule.

However, as the ICAO requirements for ALoSP currently leave room for interpretation in choosing the best way to implement the concept, the EUROCONTROL Member States could demonstrate leadership in filling such a gap by developing a harmonised approach. A common approach to measuring and managing safety performance will ultimately ensure a harmonised implementation of SSPs and facilitate the exchange of safety information in the future.

Due to the importance of this issue, the Provisional Council (PC) of EUROCONTROL, at its 45th Session (June 2016), requested the PRC to review the implementation status of the ALoSP and to report back to the PC/47 (June 2017). Following this request, in November 2016, the PRU initiated the study "*Support to reviewing implementation of Acceptable Level of Safety Performance (ALoSP) concept in EUROCONTROL Member States and development of an initial definition and guidance*" to investigate this problem further.

The objectives of the study were two-fold:

- to review the implementation status of ALoSP in EUROCONTROL Member States, and
- to develop initial guidance on ALoSP implementation by sharing of best practices.

The analysis of the ALoSP implementation in this report is based solely on States' responses (self-assessment) provided via survey and additional desktop analysis using all publicly available information, such as information from the ICAO Integrated Safety Trend Analysis and Reporting System (iSTARS) portal, publicly available state information (web searches), state-published SSPs, and various ICAO documents and presentations.

It is important to explicitly stress that it is not the PRC's intention to neither replace nor challenge the authority of the EASA audits and standardisation inspections, and therefore the findings in this report should not be misinterpreted. The monitoring of the States' implementation of SSPs is under EASA remit and States should work on any identified inconsistencies within their SSP implementation directly with EASA.

1.2 ALoSP concept

According to the ICAO Safety Management Manual (SMM), ALoSP is defined as [Ref. 4]: "*The minimum level of safety performance of civil aviation in a State, as defined in its State Safety Programme, or of a service provider, as defined in its safety management system, expressed in terms of safety performance targets and safety performance indicators*." The ALoSP definition within the SSP and the SMS is important, as it indicates what the state and the service provider want to achieve, and hence can be used to verify / monitor progress and whether the state/service provider achieve set/agreed goals.

In SMM, ICAO emphasised that states' ALoSP criteria are dependent on the specific context of each state's aviation system (for example the number of air transport service providers comprising the aviation system) as well as on the maturity of its safety oversight system. Moreover, the document states that: "*the ALoSP for a given SSP, once developed, is a manifestation of what the state considers as appropriate within the context of its own aviation system. A state's ALoSP also expresses the minimum safety objectives acceptable to the oversight authority to be achieved by the aggregate service providers under its authority.*"

A fully developed ALoSP monitoring and measurement process, according to ICAO SMM needs to:

a) "identify all the **safety-critical sectors** and the **safety indicators**[1] that define the level of safety";

b) "identify **targets** that define the level to be maintained or desired improvement to be achieved for relevant indicators in each sector with a view to achieving continuous improvement throughout the entire aviation system";

c) "identify **alerts** that will indicate an actual or developing safety performance problem in a particular safety indicator or sector"; and,

d) "review **SSP safety performance** to determine whether modifications or additions to existing indicators, targets or alerts are needed to achieve continuous improvement".

1.3 ALoSP survey

An online survey was used to collect information about the implementation of the ALoSP concept from EUROCONTROL Member States. The purpose of the ALoSP survey was to get a deeper and more comprehensive understanding of the ALoSP concept and its implementation in EUROCONTROL Member States, in terms of concept definition, scope, and implementation challenges. Emphasis was put on the state level and the concept introduction within SSPs.

To address all important elements of the ALoSP concept structure, three groups of questions were designed:

[1] *Safety indicators are tactical monitoring and measurement tools of the state's safety performance. During the initial development and implementation of an SSP, the level of safety performance is normally represented by safety indicators related to high-consequence outcomes (such as accident and serious incident rates) and high-level system assessment outcomes (such as effective implementation of ICAO SARPs). As the SSP matures, the level of safety performance can be complemented by indicators representing lower-consequence system outcomes or deviation events (ICAO Doc 9859, 2013).*

- **SSP implementation level**: This group of questions addresses the SSP implementation level, required by ICAO Annex 19 as standard, and how advanced the implementation of the SSP is;
- **ALoSP concept implementation level**: This group of questions evaluates whether states have established the ALoSP concept, how they defined it and what the major challenges in defining ALoSP were. It furthermore analyses the number of Safety Performance Indicators (SPIs) within the SSP and for how many SPIs defined target levels existed;
- **SSP-influencing factors**: This group of questions establishes the wider complexity context of the states' air transport system, considering that complexity affects the time required to establish an SSP. This included the number of service providers in the SSP, and the obligation and frequency of reporting of agreed SPIs to the state.

A survey was distributed by EUROCONTROL's Performance Review Unit (PRU) to EUROCONTROL Member State representatives (41 Member States) on behalf of the PRC Chairman (see Appendix 2) on December 19, 2016. In order to increase the survey response rate, on January 11, 2017 reminders were sent and the deadline was extended to February 3, 2017.

A complete response to the ALoSP survey was received from 26 EUROCONTROL Member States, a response rate of 63%.

The geographical coverage of EUROCONTROL Member States that have responded to the survey is shown in Figure 1.

Several states provided incomplete responses which were not included in the analysis.

To complement survey responses (responses provided by the states which present their self-assessment) extensive desktop research was carried out to validate the received responses and to acquire missing information wherever possible (collecting information for states that have not responded to the survey or that have omitted certain questions).

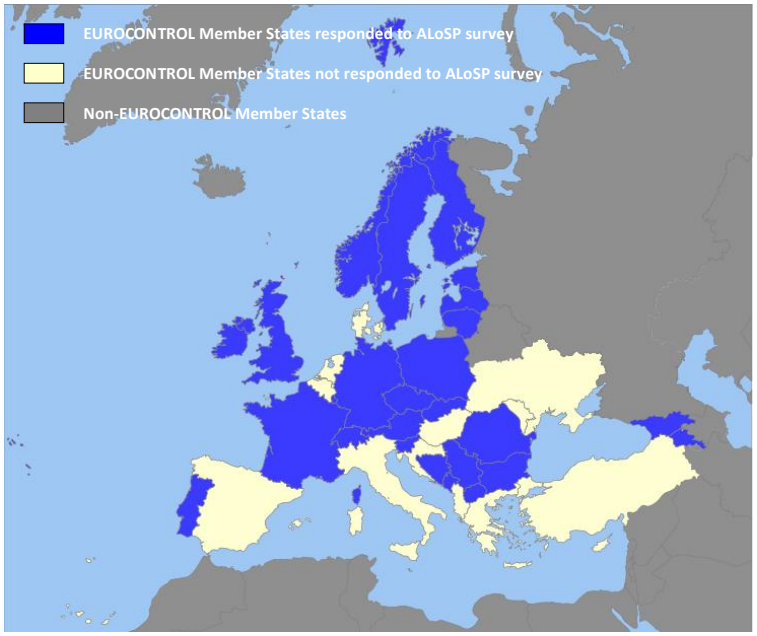

Figure 1: Geographical coverage of states responding to the survey

Sources of information included the ICAO Integrated Safety Trend Analysis and Reporting System (iSTARS), publicly available state information (web searches), state-published SSPs, ICAO documents and presentations, etc. Overall, the ALoSP survey responses were combined with complementary information whenever necessary, in order to build the most complete picture possible.

Based on this complementary research, information about SSP and ALoSP implementation was added, for those EUROCONTROL Member States that did not respond to the survey wherever possible.

For six (6) EUROCONTROL Member States it was not possible to determine neither SSP nor ALoSP implementation levels using publicly available information (Albania, Cyprus, Lithuania, Moldavia, Monaco, and Ukraine). Those states were therefore, not included in the results of this analysis.

Nevertheless, using all available information (survey responses plus additional desktop analysis) the analysis covers 85% of EUROCONTROL Member States (35 out of 41 states) which is considered to be a representative coverage for the study.

1.4 Influencing factors

Comprehensive analysis also included an evaluation whether a different complexity of the air transport system (ATS) and/or different levels of SSP maturity (based on ICAO SSP implementation level categorisation) have any impact on the ALoSP implementation levels or challenges that states are facing.

The logic was that states with complex ATS (the higher complexity suggests more ATS providers, thus it is more demanding to define complete lists of SPIs, their targets and alerts) have the ALoSP concept at best partially implemented. Also, it was assumed that states with an advanced SSP implementation have already established the ALoSP concept in accordance with ICAO requirements.

ATS complexity was determined as the number of service providers included within the scope of SSP of each state. Figure 2 shows the geographical distribution of EUROCONTROL Member States by ATS complexity.

This number was approximated as the sum of the number of air navigation service providers (ANSPs), the number of airports and the number of airlines in each state. Information about the number of providers was collected from web-sites of national aviation authorities.

Based on the number of service providers per state, the EUROCONTROL Member States were grouped into three categories:

- high ATS complexity (more than 50 service providers);
- medium ATS complexity (between 11 and 50 service providers);
- low ATS complexity (up to 10 service providers).

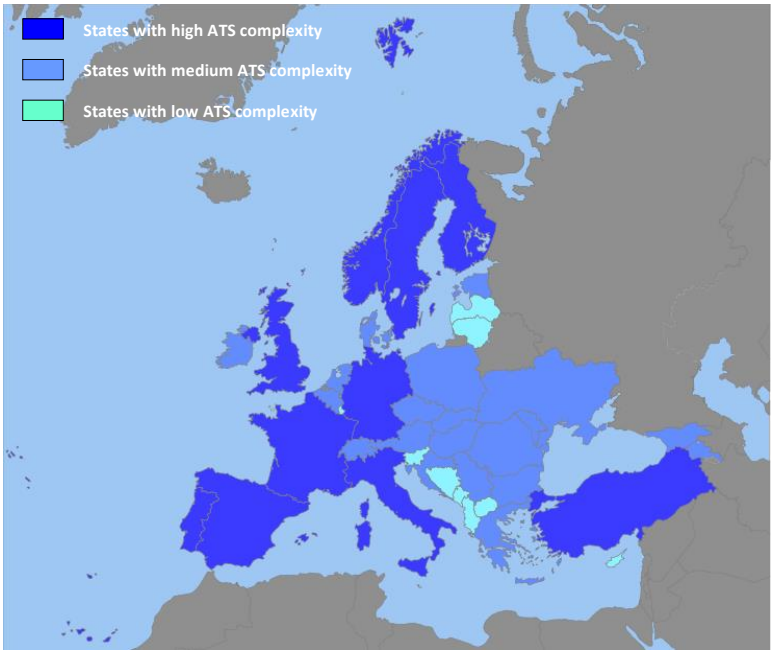

Figure 2: ATS complexity

2 SSP and ALoSP implementation

In summary, the purpose of this survey and additional analysis performed was to achieve a deeper and more comprehensive understanding of the ALoSP concept and its implementation in EUROCONTROL Member States; in terms of the concept definition, scope, and implementation challenges

2.1 SSP implementation status

In order to evaluate the SSP implementation status in EUROCONTROL Member States, the survey feedback on SSP development and its maturity, SSP framework, the existence of SSP implementation plans, and the establishment of ALoSP was analysed.

Roughly two thirds of the states responding to the survey (69%) stated that they have established their own SSP. Additional 23% reported partially established SSPs, explaining that their SSP is in the process of finalisation which is planned for the second half of 2017. Only two states responded that they do not have an established SSP but that their SSP development is ongoing and delayed due to lack of resources and coordination.

Overall, based on the survey results, it seems that the majority of states should be able to comply with the Global Aviation Safety Plan's (GASP) objectives [Ref. 2] – i.e. states with an Effective Implementation (EI[2]) rate above 60% shall have an SSP implemented by 2017.

The complementary desktop research was used to expand the scope of the analysis, i.e. for EUROCONTROL Member States that did not respond to the survey, information about the SSP implementation status was added, based on information available from the ICAO iSTARS portal and publicly available SSP information.

Moreover, desktop research was used to investigate potential inconsistencies between survey responses and additional publicly available information. In case of inconsistencies between the survey data, iSTARS data, and SSP public data available, an expert assessment was made to determine the most likely SSP implementation level.

The complementary research suggests that there is potential for over- or underestimation in the self-assessed SSP implementation status of the respondents. In most cases, the states' self-assessment has shown to be over-optimistic, which was also the finding of the recent EASA exercise after they have performed reality checks on-site [Ref. 5].

Taking the complementary research into account, the estimated SSP maturity/implementation levels are shown in Table 1. It shows that the majority of EUROCONTROL Member States (for 35 states where information was available) have still not closed all actions and fully implemented their SSP.

Table 1: ICAO SSP implementation level/maturity categories

ICAO SSP impl. level	Description	States	%
Level 1	Started a GAP analysis	7	20.0%
Level 2	Reviewed all the GAP analysis questions	11	31.4%
Level 3	Defined an action plan for all non-implemented questions	16	45.7%
Level 4	Closed all actions and fully implemented their SSPs	1	2.86%

[2] *ICAO EI is a measure of the State's safety oversight capability and is shown for each of eight critical elements: legislation, organisation, licensing, operations, airworthiness, accident investigation, ANS and aerodromes.*

Based on survey results, among states with high ATS complexity, 4 out of 10 reached Level 3 or 4. For states with medium ATS complexity, 12 out of 20 reached Level 3. Finally, among low ATS complexity states, only 1 out of 11 states reached Level 3. It is interesting to note that in the case of medium and low ATS complexity states, none have reached Level 4.

The analysis suggests that states with an advanced SSP implementation (ICAO Level 3 and 4) do not necessarily have a fully established ALoSP in accordance with ICAO requirements (only 7 out of 15 states that are above Level 3). This finding is in line with the PRU qualitative analysis of SSPs implementation carried out in 2011 [Ref. 6], that revealed that even states with an advanced SSP implementation, had not fully established ALoSP in accordance with ICAO requirements. This was typically explained that the approval of the state ALoSP awaited the development of a common European approach to ALoSP.

No visible correlation could be made between the ATS complexity and the SSP level of implementation which suggests that ATS complexity does not necessarily impact on the implementation levels of SSP and hence ALoSP. Moreover, it was identified that states with mature SSPs (Level 3 and 4) have similar problems implementing ALoSP as those that are only at the beginning of the process

2.1.1 SSP implementation monitoring

The number of SSP revisions in the past and in the future can give an indication of the state's focus on maintaining and enhancing their SSPs which also includes components such as the ALoSP. As the revisions have to be carried out by the state, the responses may furthermore reveal whether the SSP revision is perceived as a burden to the states or a formality they have to fulfil because it is a requirement, or as a real benefit for the system.

Nine (9) EUROCONTROL Member States did not provide information regarding the SSP revision frequency. The remaining 15 were classified into three categories based on the time when the SSPs were reviewed: annual or less than annual review, review every 24months, no specific schedule (periodically between 6 and 60 months).

When asked about SSP revision in the future, three categories of states emerged: those states who intend to review their SSPs annually, (majority of states), those who intend to review their SSPs every 24 months or more, and states that have not yet adopted the timeframe or the timeframe is unknown.

The heterogeneity of answers about the revision of SSP in the past and in the future could be connected with the maturity of SSP (e.g. less frequent revisions for mature SSP), however no correlation could be found based on the survey data.

Another important factor in stimulating the progress of the SSP implementation are external audits. When asked about their most recent audits, the majority of states responded that their audits were conducted recently, most of them in the period 2016-2017, with only a few done in 2015 and one obsolete one in 2012. The majority of states (19) reported that they have been audited by EASA, while five (5) were audited by ICAO.

It seems like the revision frequency of SSPs can be stimulated by external SSP inspections/audits, carried out periodically by ICAO and EASA. Frequent audits could point out to inconsistencies with respect to ALoSP requirements and identify the necessity to adjust an SSP. Those audits could present an incentive for states to continue with further development of SSPs and ALoSP as one of its most important components.

For this reason, EASA should proactively use its findings collected during 2015 and 2016, when they have carried out field evaluations of both the European Plan for Aviation Safety (EPAS) and SSP implementation, to identify Member States that require additional help to implement ICAO Annex 19, and hence ALoSP concept as well.

2.2 ALoSP concept implementation

ICAO states that an ALoSP should be expressed by multiple indicators and targets as well as by safety requirements in the form of remedial actions [Ref. 1]. Although ICAO provides significant guidance on the concept of an ALoSP, there remains uncertainty among states as to what constitutes an ALoSP and how to establish one.

Results of the survey suggest that the ALoSP concept is fully established in 42% of the responding EUROCONTROL Member States. States that had only partially established the ALoSP concept (27% of states replying) indicated that either the lack of safety targets and alerts for chosen SPIs, or the lack of SPIs for all/some service providers were influencing factors for this. States that have not established the ALoSP concept yet (31% of states replying) stated this to be mostly under development or review. Of those states that have reported that no ALoSP has been implemented, two (2) did not have SSP implemented either (8%).

EUROCONTROL Member States that reported a partially established ALoSP concept either defined only high level SPIs (e.g. rate of accidents) with corresponding targets, or defined SPIs defined without targets, or SPIs and corresponding targets were defined for a limited number of service providers. On the other hand, all EUROCONTROL Member States that reported not to have established the ALoSP concept expect to develop it in the next version of their respective SSPs.

The majority of states, that have reported that the ALoSP concept is not fully implemented, reported plans to define the ALoSP concept during 2017 (consistent with ICAO requirements for the establishment of SSPs during 2017) and 2018, to define ALoSP monitoring by the same or later dates (from 2017 to 2019), as well as to implement ALoSP monitoring over a similar timescale.

Seven (7) out of 18 states (total replies to this question) had used the ICAO definition of ALoSP, while the rest had their own interpretation or did not provide a clear answer.

The lack of a consistent use of ALoSP definition and development in EUROCONTROL Member States clearly suggests that harmonised implementation of the ALoSP concept could be a missed opportunity if in the next two years a common approach is not introduced and suggested to the states.

Overall, results obtained from the analysis of the ALoSP implementation questions imply that the ALoSP concept has been subject of some lack of clarity. The responses outline the need for the new harmonised approach of the ALoSP concept with a clear set of indicators and targets against which the oversight performance of civil aviation authorities could be assessed.

Similarly to the analysis of the SSP implementation, a further desktop analysis was used to complement survey results related to the question of the ALoSP establishment within the SSP. The thorough desktop analysis of the ALoSP implementation status was performed using all available information, such as survey results, SSP and ALoSP implementation timelines (key dates), dates of the last audits, information from ICAO iSTARS and publicly available states' SSPs.

Desktop analysis revealed some inconsistencies and therefore an expert assessment was made to determine the "more realistic" status based on all available information. For example, two (2) states that reported that they had fully implemented SSP (Level 4) also reported that implementation of ALoSP was not fully completed, which can either suggest that they have overestimated their SSP implementation level, or have misunderstood ALoSP definition and implementation requirements.

Moreover, analysing information on SSP implementation and its progress, and bearing in mind the minimum time frame necessary to finalise each phase of SSP implementation [Ref. 4], led to the conclusion that the plans of several states for ALoSP implementation are probably not realistic (4 States). This also raises a concern about the understanding of the ALoSP implementation processes by the state representatives completing the survey.

Figure 3 shows the validated AloSP implementation in EUROCONTROL Member States, based on the combined results of the survey and the desktop analysis (results for 35 states).

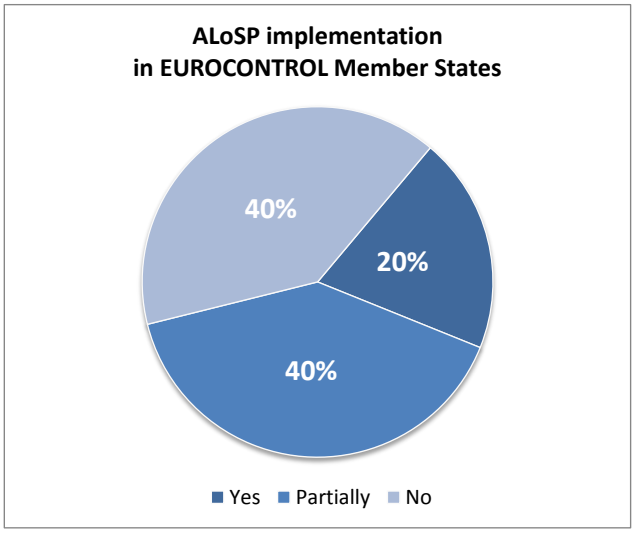

Figure 3: ALoSP implementation level within EUROCONTROL Member States

The analysis shows that 40% of the EUROCONTROL Member States (for which information was available) still do not have ALoSP implemented. This information is of greater concern if the additional 40% of states that have only partially implemented ALoSP within their SSP are added.

Overall, it is estimated that 80% of EUROCONTROL Member States will still have to work hard to meet the ICAO 2017 target – i.e. to have their SSP and ALoSP implemented.

When analysing whether ATS complexity impacts on the implementation levels of ALoSP it was found that among states with high ATS complexity, six (6) out of 10 states have either fully or partially established the ALoSP concept (3 fully and 3 partially). For states with medium ATS complexity, 13 out of 20 have fully or partially established ALoSP (9 partially and 4 fully). For states with low ATS complexity, only two (2) out of 11 have partially established ALoSP, while there are no states with fully established ALoSP.

Although it was assumed that it would be harder to establish ALoSP for states with high ATS complexity, analysis shows the opposite results. Among low ATS complexity states, none have fully established ALoSP and most of them have not yet established the ALoSP concept at all.

2.2.1 Challenges in ALoSP definition and implementation

The biggest sole challenge was reported as "defining the targets for safety performance indicators" (83% of interviewed EUROCONTROL Member States highlighted this problem). This was followed by "selecting the appropriate SPIs" (79%) and by “inefficient/incomplete historical data required to determine the safety targets” (46%).

The majority of interviewed EUROCONTROL Member States (three quarters) reported problems in both "selecting the appropriate safety performance indicators" and "defining the targets for safety performance indicators" in order to properly define and implement ALoSP within SSPs. These issues seemed to be interrelated.

For selected SPIs it is necessary to set the targets, for which it is a prerequisite to have available historical data. In order to have such data it is necessary to have a mandatory and/or voluntary occurrence reporting system in place.

There were no observed differences related to challenges in ALoSP implementation between states with different level of SSP implementation. The maturity of the SSP did not eliminate the basic challenges.

These findings are further supported by results of the recent EASA evaluations (during on-site visits) of SSP implementation [Ref. 5] where the progress of the implementation of SSP elements showed that the least advanced elements of SSP implementation were still related to the :

- establishment of SSP implementation plan - 28 %;
- establishment of safety performance monitoring process - 24%;
- establishment of SPIs for all domains - 17 %; and,
- establishment of targets and alert levels for all domains - 10%.

A lack of guidance on these issues probably still plays a part in the lack of implementation of these critical elements.

2.2.2 Guidance material challenge

Twenty-three (23) states stated that they had used some of the guidance material to help them in defining/implementing the ALoSP concept in their SSPs. The majority (22 states) were using ICAO documentation. This is followed by use of EASA documents and/or the SSPs of other states (not mentioning which ones). All three sources have been used as a "sufficient" basis for defining/implementing ALoSP by 48% of states (11 out of 24 that have responded).

The frequent use of different types of guidance material could point to the need for uniform documentation containing all necessary information upon which the ALoSP concept could be effectively built.

Lastly, there was no great difference related to guidance material used between states with different complexities of air transport system (ATS) or states with different SSP implementation levels.

The majority (87%) of surveyed EUROCONTROL Member States have shown an interest in getting support with the implementation of ALoSP in the following specific areas:

- examples of implementation (best practice);
- selection and definition of appropriate SPIs;
- selection and definition of SPI targets and alerts; and
- definition of SPIs in environment that lacks historical data (especially related to/important for the smaller states and states with less complex ATS).

2.2.3 Safety performance indicators and targets criteria

In order to facilitate the process of development and implementation of the ALoSP concept within states' SSPs, EASA recommends a "three-tier" approach encompassing a common set of SPIs [Ref. 5 and Ref. 7]. The survey results show that roughly half of the states that responded to the survey fully adopted the three-tier approach while the rest were either partially consistent (approximately one quarter) and only four (4) were not consistent with this approach at all. Those EUROCONTROL Member States that were partially consistent reported that they were at the beginning of the SPI definition process, while others were either using other approaches or have some doubts or different views related to the three-tier approach.

The number of SPIs defined within SSPs, reported by states, range between zero (0) and 75, as well as the number of SPIs for which target levels were defined (0 to 75). However, the number of SPIs with defined targets tends to be lower than the number of SPIs in most States.

When the number of service providers is also considered only two (2) States with complex ATS (high number of service providers and high number of SPIs) have reported that they have fully defined targets for their set of SPIs.

Overall results show that target setting becomes a challenging issue with an increasing number of SPIs defined within the SSP.

The criteria used by EUROCONTROL Member States (that participated in the survey) for setting safety targets were also different. States were mostly relying on “data from mandatory and/or voluntary occurrence reporting systems”, “individual service providers' SPIs” as well as “best practices”. Those findings were consistent with the specific areas in which states were interested in getting support. States also reported using expert judgement, safety reports, and global accident data to complement the main criteria used. The analysis of the survey responses also showed that defined targets were either quantitative or qualitative, while the list of SPIs used was quite diverse.

Clearly there is no uniform approach used in setting both indicators and its targets and opportunities to share best practice information might be lost in the future.

Lastly, if a state has established the SSP with a defined ALoSP, then it seems to be logical to monitor these defined SPIs with a certain frequency. However, only half of the EUROCONTROL Member States that responded to the survey indicated that they had an established mechanism for monitoring their SPIs to assure that they were in accordance with target levels. Those EUROCONTROL Member States having partially established mechanisms stated that they did not have targets for SPIs, although mechanisms existed, or they only monitored accidents and serious incidents.

When asked about the monitoring frequency, the majority of states reported that the monitoring of SPIs was on an annual basis (or less). Similarly, most of the interviewed states reported they also plan to monitor their SPIs on an annual basis in the future. However, when considering the overall SSP revisions frequency, there was no clear correlation found between monitoring of SPIs and the actions taken to revise/amend SSP.

The analysis of correlations between the use of individual service providers' SPIs and their transposition into SPIs within states’ SSPs showed that if states were using service providers’ SPIs, it was plausible that they had established ALoSP and targets for those SPIs.

Overall, the close cooperation between states’ authorities and service providers is evidently helping in the definition of SPIs and their associated targets, and to the ultimate definition of ALoSP within state’s SSP.

2.2.4 Service providers’ safety performance

The analysis of the survey responses showed that the number of service providers communicating/reporting their SPIs to the state was less than or equal to the total number of service providers.

Ideally, it was expected that states with an established ALoSP should automatically have the service providers obliged to report on agreed SPIs, which would allow states to compare reported SPI values with targets set and potentially in the case of satisfactory outcomes adjust target values (probably making them more demanding).

Roughly half of the responding states declared that the reporting on agreed SPIs by service providers was mandatory. It seems that this trend is independent of the different SSP implementation levels. The frequency of this type of reporting varied between 3 to 12 months.

One third of the responding states reported that they had not adopted a mandatory mechanism for reporting. However, the majority of states (both having mandatory reporting introduced or not) stated that they were performing periodical revisions of the service providers' SPIs.

When asked how service providers' safety targets were established, states with high ATS complexity reported that this was mainly done by the service provider alone. This seems to be natural due to a high number of service providers within the SSP, and hence a high number of SPIs and corresponding targets to be set. In states with low ATS complexity, target setting was reported to be done either jointly by the regulator and the service provider, or by the service provider alone.

3 Best practices

In order to determine best practices related to the establishment and implementation of the ALoSP, an analysis of the SSPs of six EUROCONTROL Member States and seven non-European states was carried out. The Non-European States were analysed to capture the geographical and economic diversity in which air transport systems exist, to reveal their progress in terms of the ALoSP concept development, and implementation within their respective SSP.

It was possible to identify several commonalities and differences, and extract best practices that could potentially be used by EUROCONTROL Member States to achieve a better harmonised implementation of ALoSP.

The selection of States' SSPs to be analysed was made based on SSP availability (publicly available in English) and high ICAO EI of the State SSP (i.e. EI above 75% for European States and EI above 65% for non-European States). Overall, selected states, spread across different regions, significantly differ in terms of air transport system maturity and their respective levels of SSP and ALoSP implementation.

The research of the SSPs showed that the development of the ALoSP concept was highly related to safety data collection and analysis. As expected, states that have developed a well-structured safety occurrence database in line with analysis capabilities should be in a position to represent the level of safety performance in greater detail than states that have not done so. It becomes evident that datasets with significant time-series data are a valuable tool in the process of ALoSP establishment and implementation.

Overall, it can be concluded that the availability of safety information received via various reporting systems (mandatory and/or voluntary) plays a key role in defining the appropriate set of SPIs. The importance of analysing large databases in order to define adequate SPIs within ALoSP has been identified by many states. The introduction of SPIs serves to identify the areas of increased risks and therefore it is very important that they are based on empirical analysis derived from safety datasets. Non-punitive cultures and the long-standing practice of reporting systems form the basis of defining SPIs within the ALoSP concept.

An intense collaboration between operators and authorities also seems to be of crucial importance in defining the set of key SPIs. The Civil Aviation Authorities (CAAs) in all analysed states systematically manage their safety actions through regular meetings and open discussions with operators.

Lastly, despite the fact that all states defined the ALoSP concept in a very similar, or even the same, manner as "*a set of SPIs with their respective target and alert levels*", its implementation still remains very immature for the majority of them.

Some common **best practices** are summarised below:

- safety information received via various reporting systems (mandatory and/or voluntary) play a key role in defining the appropriate set of SPIs;
- the ALoSP indicators, targets and alert levels should be defined on the basis of key safety data that have been systematically collected over a period of many years through mandatory and voluntary occurrence reporting systems; the lack of safety occurrence databases is one of the major obstacles in the proper selection of SPIs and implementation of ALoSP;
- the quality of safety occurrence data highly depends on the establishment of non-punitive cultures in the states;
- the cooperation between representatives of various stakeholders through free discussion about current safety issues is very important; and,
- the tight collaboration and discussion (an opportunity for open dialogue) between service providers/operators and civil aviation authorities seems to be the area of crucial importance in selecting the set of key SPIs and their targets and alert levels (which are later on used to define ALoSP).

4 Findings and conclusions

An acceptable level of safety performance is a crucial part of every SSP. According to ICAO Annex 19, each state shall establish an SSP for the management of safety in the state, in order to achieve an ALoSP in civil aviation. However, effective SSP implementation is a gradual process, and it requires time to mature fully. Factors affecting the time required to establish effective SSPs include the complexity of the air transportation system as well as the maturity of the aviation safety oversight capabilities of the state. Therefore, even the implementation of ALoSP should be considered as a gradual process.

In its most recent Performance Review Report, the PRC raises the concern that the definition and guidance on the development of the ALoSP is currently not available in Europe. Therefore, to achieve a deeper and more comprehensive understanding of the ALoSP concept and its implementation among EUROCONTROL Member States the PRC has conducted this comprehensive research.

Twenty-six (26) EUROCONTROL Member states responded to the specially designed survey to investigate the ALoSP concept in terms of its definition, scope, and implementation challenges. The survey results were very heterogeneous in many aspects: in terms of implementation of ALoSP, overall SSP maturity, and problems defining the ALoSP concept within the SSP. This clearly indicated a lack of a common methodology for the establishment of a national ALoSP.

In addition, to expand the scope of the study a further desktop analysis (analysis of all available information, such as ICAO safety-related documents, ICAO iSTARS portal information, and available state SSPs) was carried out to validate and complement survey responses and get a more comprehensive picture of the status of SSP and ALoSP implementation in EUROCONTROL Member States.

In general, the results of the analysis show that the ALoSP implementation is still an on-going process. Forty (40%) percent of the states (for which information was available) have not established the ALoSP concept, whilst an additional 40% have established it only partially. This

means that 80% of EUROCONTROL Member States will still have to work hard to meet the ICAO 2017 target – i.e. to have their SSP and hence ALoSP implemented. In many cases, it was also clear that this target will not be met. The low implementation levels of ALoSP are not surprising, bearing in mind that the overall SSP implementation is still an open issue (SSP being only partially established or have not established at all).

The results of the analysis suggest that even states with an advanced SSP implementation level (Level 3 and 4) do not necessarily have a fully established ALoSP in accordance with ICAO requirements. In addition, the analysis also shows that ATS complexity (simply defined) does not necessarily impact the level of ALoSP implementation as originally suspected and that states with mature SSPs have similar problems with the implementation of ALoSP compared to those that are only at the beginning of the process. The maturity of the SSP did not eliminate the basic challenges. In other words, states with different complexities (and size) are facing common implementation challenges and the problems in terms of definition and implementation of ALoSP.

The most common problems and challenges identified during ALoSP implementation were related to the definition of SPIs, their selection for target setting, lack of historical data needed to determine the safety targets and a lack of uniform guidance material on how to do this. Those problems naturally leading to a diverse use of SPIs among the states and to a limited implementation of ALoSP, as the target-setting process is found to be a challenging issue. Naturally, with an increase in the number of SPIs defined within SSPs, target setting was becoming a more challenging issue. This is in line with the ALoSP survey findings that have identified the target-setting process as one of the main challenges in ALoSP implementation.

Lastly, the results of the survey also indicated that there is quite some diversity in the definition of ALoSP across the EUROCONTROL Member States; many states have their own interpretation and have not used ICAO recommendation as guidance. The frequent use of different types of guidance material could point to the need for action to develop uniform documentation containing all necessary information upon which the ALoSP concept could be effectively built. Overall, the ALoSP concept is still the subject of a lack of clarity. This presents the possibility that the harmonised implementation of the ALoSP concept in EUROCONTROL Member States could be a missed opportunity if a common approach is not introduced and suggested to the states within the next two years.

Overall, it can be concluded that the work on implementation of ALoSP among EUROCONTROL Member States is at its early stages and that its successful continuation will rely on the availability of guidance material that will allow a harmonised implementation. This new harmonised approach of implementation (with a set of proposed indicators and clearly described ways on how to set associated targets, against which performance will be measured) will consequently allow the identification of the real risks in the aviation system in Europe.

Finally, the PRC is of the opinion that a thorough monitoring of ALoSP implementation within Europe should be organised as soon as possible in order to identify challenges in further implementation and provide support to the states, where needed.

5 Recommendations and way forward

Bearing in mind that the purpose of this survey and analysis was to achieve a deeper and more comprehensive understanding of the ALoSP concept and its implementation among EUROCONTROL Member States, in terms of the concept definition, scope, and implementation challenges, several recommendations and potential ways forward in terms of future work needed, are listed in the next sections.

5.1 General recommendations

In order to avoid different interpretations of the **ALoSP definition** prevailing and to support the ALoSP implementation process, it is necessary to offer a unique ALoSP definition across EUROCONTROL Member States, compliant with the ICAO definition.

The **ALoSP scope**, i.e. which ATS providers/operators should be included within the ALoSP concept, should be determined by states based on their own ATS complexity. The states would need to pre-define a set of specific SPIs of interest for different ATS providers/operators (airlines, airports, air navigation service providers) and oblige ATS provider/operators to use, monitor, and report SPIs as agreed. Using this stepwise approach, states will hopefully be able to speed-up the ALoSP implementation process.

In order to be able to overcome one of the main challenges identified in the ALoSP implementation (target setting for SPIs), states will need to make sure that historical safety occurrence data is available. Therefore, the establishment of quality occurrence reporting system(s) under a non-punitive (just) culture is necessary.

It is considered reasonable to first establish high-level SPIs (which correspond to the first tier of the ICAO three-tier approach) that could apply to all areas of the aviation system at a national level (which could also be aligned with specific indicators used at the European level).

5.2 Specific recommendations

Recommendations related to **SSP implementation:**

- SSP implementation within EUROCONTROL Member States should be faster;
- states should establish their SSP, SSP framework and implementation plans as soon as possible;
- states should review their SSP more frequently (e.g. twice a year) in the future;
- external audits of SSPs could present an incentive for states to continue with the further development of SSPs, and ALoSP as one of its most important components. Through frequent inspections, EASA or ICAO could Identify activities that support the implementation of ICAO Annex 19 and hence ALoSP.

Recommendations related to **ALoSP implementation:**

- a harmonised approach to the implementation of the ALoSP concept within Europe should be adopted; it should also be supported by a thorough monitoring of its implementation;
- a European ALoSP concept, containing a set of predefined indicators and methodology and principles of how targets should be established, should be developed as soon as possible;
- the state ALoSP concept should be clearly defined (without ambiguities) and easy to implement;

- successful continuation of ALoSP implementation will rely on the availability of guidance material that will allow a harmonised implementation; guidance material (a common methodology) will help states in defining/implementing/establishing the ALoSP concept within their SSPs; it should be based on a combination of ICAO and EASA documents and enriched by SSP examples;
- guidance material should encompass all areas in which support is most needed, such as: examples of successful implementation; how to select and define appropriate SPIs, how to determine SPI targets and alert levels; how to establish mechanisms for monitoring SPIs;
- as the lack of safety occurrence information (and corresponding databases) was identified as one of the major obstacles in the selection of appropriate SPIs and the implementation of ALoSP, the establishment of safety data collection and the use of safety information received via various reporting systems (mandatory and/or voluntary) has a key role in defining the appropriate set of SPIs; the quality of safety occurrence data will highly depend on the establishment of non-punitive cultures in states;
- lack of historical data (especially related to/important for the smaller states and states with low ATS complexity) should be overcome by using a common safety occurrence database (such as the European Co-ordination Centre for Aviation Incident Reporting System - ECCAIRS); this could establish common criteria and allow easier target setting;
- during SPI, target and alert setting processes, the close collaboration and discussion between service providers/operators and the state authorities should be fostered as it seems to be an area of crucial importance in selecting the set of key SPIs, targets and alert levels;
- communicating/reporting SPIs should be made mandatory for ATS providers/operators;
- safety targets for every SPI should be established jointly by the regulator and the service provider regardless of state ATS complexity.

List of acronyms

ALoSP	Acceptable level of Safety Performance
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATS	Air Transport System
CAA	Civil Aviation Authority
EASA	European Aviation Safety Agency
EASP	European Aviation Safety Plan
EI	Effective Implementation
ECCAIRS	European Co-ordination Centre for Aviation Incident Reporting System
FAA	Federal Aviation Authority
FDM	Flight Data Monitoring
GASP	Global Aviation Safety Plan
ICAO	International Civil Aviation Organization
iSTARS	ICAO Integrated Safety Trend Analysis and Reporting System
MOR	Mandatory Occurrence Reporting
PC	Provisional Council
PRC	Performance Review Commission
PRU	Performance Review Unit
SARPS	Standards, Recommended Practices and Procedures
SMM	Safety Management Manual
SMS	Safety Management System
SPI	Safety Performance Indicator
SPM	Safety Performance Measurement
SSP	State Safety Programme

Appendix 1 - Web-based survey

Welcome message and explanatory notes

The independent Performance Review Commission (PRC) advises the Permanent Commission of EUROCONTROL through the Provisional Council on all matters related to ANS performance review in Europe.

In their most recent Performance Review Report (May 2016), the PRC raises the concern that the definition and guidance on development of the Acceptable Level of Safety Performance (ALoSP) concept (as defined by ICAO) is currently not available in Europe. Due to the importance of this issue, the PRC would like to investigate this further through a review of the ALoSP concept in EUROCONTROL Member States.

A common approach to measuring and managing safety performance will ultimately ensure harmonised implementation of State Safety Programmes (SSPs) and facilitate the exchange of safety information in the future.

An ALoSP is the combination of several performance targets, that are measured using safety indicators, and the action plans needed to achieve the set targets. An ALoSP is part of both an SSP and a service provider's Safety Management System (SMS). As the ICAO requirements for ALoSP leave room for interpretation in choosing the best way to implement the concept the EUROCONTROL Member States could demonstrate leadership in filling such a gap by the development of a harmonised approach.

The objective of the PRC questionnaire is to:

I. review the current level of ALoSP implementation in EUROCONTROL Member States;

II. present the different approaches used in EUROCONTROL Member States;

III. identify common problems facing in the implementation of ALoSP;

IV. identify and share existing best practices so that others can also adopt and implement such an approach; and

V. possibly present a proposal for an initial definition and guidance to support the implementation of ALoSP in EUROCONTROL Member States in a harmonised way.

We would thus be most grateful if you would take approximately 15-20 minutes to complete this questionnaire.

Should you have any questions regarding the survey, please do not hesitate to contact us at: PRU-Support@eurocontrol.int.

The data collected will be kept confidential.

Questionnaire

Support to reviewing the implementation of the Acceptable Level of Safety Performance (ALoSP) concept in EUROCONTROL Member States

Name:
_____
___
Organisation:_____
_____
Function:
_____
_
Country:
_____
__
E-mail address:
_____
Phone number:
_____

In 2013, ICAO adopted new regulations (a new Annex 19) requiring contracting States to prepare a State Safety Programme (SSP) as standard. Effective implementation is a gradual process, requiring time to mature fully.

1. Does your State have an established SSP?

[ ] Yes

[ ] No

[ ] Partially (please explain): _____

If No, please explain why not? _____

If No, please go to the Question 24.

2. Do you have an SSP framework in place?

[ ] Yes

[ ] No

3. Does your State have an SSP implementation plan in place, which includes a timeframe for the implementation of actions?

[ ] Yes

[ ] No

4. In which phase of development is your SSP currently (by ICAO categorisation)?

[ ] Level 0: States not having started a gap analysis

[ ] Level 1: States having started a gap analysis

[ ] Level 2: States having reviewed all the gap analysis questions

[ ] Level 3: States having defined an action plan for all non-implemented questions

[ ] Level 4: States having closed all actions and fully implemented their SSPs

Please select the appropriate level.

5. How often is your SSP reviewed?

In the past: approximately every [ ] months / [ ] not known

Planned for the future: approximately every [ ] months / [ ] no such plan / [ ] not known

Please complete (a) and (b)

6. When was the last time your State was audited [MM/YYYY]? _____?

By whom?

[ ] ICAO

[ ] EASA

[ ] Other: _____

ALoSP is defined by ICAO as "*the minimum level of safety performance of civil aviation in a State, as defined in its SSP, or of a service provider, as defined in its SMS, expressed in terms of safety performance targets and safety performance indicators*".

7. Have you established the ALoSP concept within your SSP?

[ ] Yes

[ ] No

[ ] Partially (please explain): _____

If No, please explain why not? _____

If No, please go to the Question 9.

8. How do you define the ALoSP in your SSP? *Please specify:*

_____

9. What is the achieved/expected date to:

Fully **define** ALoSP? [MM/ YYYY] / [ ] not known

Fully **define** ALoSP monitoring by the State? [MM/ YYYY] / [ ] not known

Fully **implement** ALoSP monitoring by the State? [MM/ YYYY] / [ ] not known

Please complete each item

10. What are/were the major challenges in defining and implementing ALoSP?

[ ] Lacking a conceptual SSP framework

[ ] Lack of arrangements with service providers

[ ] Selecting the appropriate safety performance indicators

[ ] Defining the targets for safety performance indicators

[ ] Inefficient/incomplete historical data required to determine the safety targets

[ ] Other (please specify): _____

Please tick all that apply

11. Have you used any guidance material that helps/helped you in defining/implementing ALoSP in your SSP?

[ ] Yes

[ ] No

12. If YES please indicate which guidance material you have used / are using

[ ] ICAO

[ ] EASA

[ ] SSPs of other countries

[ ] Other (please specify): _____

Please tick all that apply

13. Would you be interested in getting support with the implementation of ALoSP?

[ ] Yes

[ ] No

Please tick one option

If YES, please specify the area where the support is most needed _____

14. EASA recommends a 'three-tier' approach encompassing a common set of safety performance indicators - SPIs (e.g. first-tier SPIs refer to the number of accidents and serious incidents; second-tier SPIs measure the functionality of the system and focus on certain crucial issues, third-tier SPIs are developed by reflecting on the causal factors of second-tier incident types).

Are your SPIs consistent with the three-tier model recommended?

[ ] Yes, fully

[ ] Yes, partially

[ ] No, they are not consistent in this manner

Please tick one option only

*If "*Yes, partially" *please explain why:*_____

15. How many safety performance indicators (SPIs) have been defined within your SSP?

Please write in the number [ ] / [ ] not known

For how many SPIs have you defined target levels?

Please write in the number [ ] / [ ] not known

Please also specify them:_____

16. Based on which criteria have safety targets for these SPIs been determined by the State?

[ ] Data from mandatory/voluntary occurrence reporting systems

[ ] Practice of neighboring states

[ ] Best-practices

[ ] A research/consultancy process

[ ] Individual service providers' SPIs

[ ] Other criteria (*please specify)*: _____

Please tick all that apply

17. Does your State have an established mechanism for monitoring the SPIs to assure that they are in accordance with targeted levels?

[ ] Yes

[ ] No

[ ] Partially (please explain): _____

If YES: How often do you monitor Key SPIs?

In the past: approximately every [ ] months / [ ] not known

Planned for the future: approximately every [ ] months / [ ] no such plan / [ ] not known

Please complete (a) and (b)

18. How many SPIs within your SSP are based on individual service providers' SPIs?

Please write in the number [ ] / [ ] not known

Factors that affect the time required to establish an SSP include the complexity of the air transport system.

19. How many service providers are included within the scope of your SSP?

Please write in the number [ ] / [ ] not known

20. How many service providers are communicating/reporting their SPIs to the State?

Please write in the number [ ] / [ ] not known

21. Are service providers obliged to report agreed SPIs to the State?

[ ] Yes

[ ] No

[ ] Don't know

Please tick one option only

If YES, please go to the Question 21, else go to the Question 22.

22. How often are service providers required to report agreed SPIs to the State?

Approximately every [ ] months / [ ] not known

23. Are the service providers' SPIs periodically reviewed by the State to ensure that they remain relevant and appropriate?

[ ] Yes

[ ] No

[ ] Don't know

Please tick one option only

24. How are service provider safety targets established?

[ ] Set by the national regulator alone

[ ] Set by the service provider alone

[ ] Set jointly by the regulator and the service provider

[ ] Other (p*lease specify)*: _____

Please tick one option only

25. Please write here any (remaining) comments that you consider appropriate:

_____
_____
_____
___

Thank you. We appreciate your time and effort in participating in this survey.

Appendix 2 - Letter of invitation to participate on the survey

Performance Review Commission

Commission d'examen des performances

EUROCONTROL

Date : 19 December 2016

Our Ref. : PRC/16/11

Subject : **ALoSP Implementation**

Contact : Tamara.Pejovic@eurocontrol.int

Direct Line : + 32 (2) 729 3804

Dear Sir or Madam,

The Provisional Council (PC) of EUROCONTROL, at its 45th Session (May 2016):

(i) requested the PRC to review the implementation of the Acceptable Level of Safety Performance (ALoSP) concept in EUROCONTROL Member States;

(ii) requested the Member States to assist the Performance Review Commission (PRC) to conduct this review;

(iii) asked the PRC to report back to the PC/47 (June 2017).

The PRC proposes to review the implementation of (i) above by means of an online questionnaire.

The PRC will use the results of the questionnaire to:

- review the current level of ALoSP implementation in EUROCONTROL Member States;
- present the different approaches used in EUROCONTROL Member States;
- identify common problems facing in the implementation of ALoSP;
- identify and share existing best practices so that others can also adopt and implement such an approach; and
- possibly present a proposal for an initial definition and guidance to support the implementation of ALoSP in EUROCONTROL Member States in a harmonised way.

In order to report our initial findings to the 47th Session of the PC (June 2017) the PRC invites all relevant bodies to complete and return the online questionnaire (link is given on next page) by **27 January 2017**.

European Organisation for the Safety of Air Navigation

Organisation européenne pour la sécurité de la navigation aérienne

Rue de la Fusée, 96
1130 Bruxelles
Tél. : +32(0)2-729 39 56
e-mail: pru@eurocontrol.int

We kindly ask you to forward this message and the link giving access to the online questionnaire to the national Safety Focal Point, or equivalent body with responsibility for the implementation and day-to-day management of the State Safety Programme (SSP).

It would also be appreciated if you would provide the updated contact details of the above national representatives to the PRC via this questionnaire.

The link to the online questionnaire is as follows:

https://www.surveymonkey.com/r/Eurocontrol-ALoSP

Should you have any questions, please do not hesitate to contact me via PRU-Support@eurocontrol.int.

Kind regards,

Ralph Riedle

Chairman

Performance Review Commission

1 International Civil Aviation Organization (2013). Safety Management. Annex 19 to the Convention on International Civil Aviation (first edition). Montreal, Canada.

2 International Civil Aviation Organization (2016). Global Aviation Safety Plan 2017-2019. Document 10004 (second edition). Montreal, Canada.

3 EUROCONTROL (2016). Performance Review Commission Performance Review Report PRR 2015.Brussels, Belgium.

4 International Civil Aviation Organization (2013). Safety Management Manual (SMM). Document 9859/AN474 (third edition). Montreal, Canada.

5 European Aviation Safety Agency (2017). Supporting Member States to implement Annex 19. Cologne, Germany.

6 EUROCONTROL (2011). National Safety Performance Programmes and Plans Review. Brussels, Belgium.

7 European Aviation Safety Agency (2016). EASA SKPI RP3 S(K)PI Working Group, Indicator Proposals for RP3. Cologne , Germany.

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About the Performance Review Commission

The Performance Review Commission (PRC) provides independent advice on European Air Traffic Management (ATM) Performance to the EUROCONTROL Commission through the Provisional Council.

The PRC was established in 1998, following the adoption of the European Civil Aviation Conference (ECAC) Institutional Strategy the previous year. A key feature of this Strategy is that "*an independent Performance Review System covering all aspects of ATM in the ECAC area will be established to put greater emphasis on performance and improved cost-effectiveness, in response to objectives set at a political level*".

Through its reports, the PRC seeks to assist stakeholders in understanding from a global perspective why, where, when, and possibly how, ATM performance should be improved, in knowing which areas deserve special attention, and in learning from past successes and mistakes. The spirit of these reports is neither to praise nor to criticise, but to help everyone involved in effectively improving performance in the future.

The PRC holds 5 plenary meetings a year, in addition to taskforce and ad hoc meetings. The PRC also consults with stakeholders on specific subjects.

Mr. Laurent Barthelemy
Mr. Juan Bujia-Lorenzo
Captain Hasan Erdurak
Ms. Marja Hutchings
Mr. Antero Lahtinen **Vice Chairman**
Mr. Ralph Riedle **Chairman**

PRC Members must have senior professional experience of air traffic management (planning, technical, operational or economic aspects) and/or safety or economic regulation in one or more of the following areas: government regulatory bodies, air navigation services, airports, aircraft operations, military, research and development.

Once appointed, PRC Members must act completely independently of States, national and international organisations.

The Performance Review Unit (PRU) supports the PRC and operates administratively under, but independently of, the EUROCONTROL Agency. The PRU's e-mail address is pru-support@eurocontrol.int

The PRC can be contacted via the PRU or through its website http://www.eurocontrol.int/prc/publications.

PRC PROCESSES

The PRC reviews ATM performance issues on its own initiative, at the request of the deliberating bodies of EUROCONTROL or of third parties. As already stated, it produces annual Performance Review Reports, ACE reports and ad hoc reports.

The PRC gathers relevant information, consults concerned parties, draws conclusions, and submits its reports and recommendations for decision to the Permanent Commission, through the Provisional Council. PRC publications can be found at http://www.eurocontrol.int/prc/publications where copies can also be ordered.

EUROCONTROL

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