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Background paper

CHALLENGES TO SAFETY

The ATM system goal is to facilitate the flow of air traffic in as seamless, efficient and expeditious way, in as safe a manner as possible by controlling safety risks, although in practice developments are often dominated by changes made to improve capacity, efficiency and cost of the system. ATM safety has improved over the past decades for many reasons, including better equipment, more efficient operations and additional safety defences and mitigation tools. However, any further improvement of current safety performance, and even maintaining the current levels, will be extremely demanding due to numerous technological and institutional changes in the future and rising levels of traffic. Moreover, recent political priorities and calls for action raise several concerns and questions that would need to be addressed before they are officially accepted and implemented in any shape and form.

As safety in aviation and in ATM is a priority; the challenge for the European ATM stakeholders is to determine what (potential) threats to safety are of concern, how these can be measured and what analyses are needed to ensure acceptable safety levels with any new developments and changes in operational concepts. Therefore, it is important to identify challenges to future ATM safety, and besides identifying how to assure the safety of the systems, processes and procedures, to also define methods and tool which would allow monitoring of the safety performance of the new system.

This short paper serves as an opener for such discussion while highlighting potential challenges to the Air Traffic Management (ATM) safety that should be addressed before changes to the current system are introduced along with proposed methods to assess those risks. It should be seen as a basis for dialogue between ATM bodies and Stakeholders in order to (1) properly [identify the key risks to ATM safety](#) in the light of the changing ATM environment and (2) to [formulate performance approach](#) in a risk environment, which could help in assessing safety performance in the future.

1 THE FUTURE

1.1 A network-centric approach

The Wise Persons Group (WPG) report in one of its recommendations proposes more power to be given to the EUROCONTROL Network Manager (NM) and also identifies potential new roles (such as Capacity Manager). However, at the moment, there is no safety assessment of the proposed changes specified in the WPG report. Such safety assessment should indicate the potential impact on safety and provide certain assurances that any new roles would allow continuous delivery of safety within the network.

For example, if NM is given more power to move/“relocate” traffic, will safety responsibility also change? Who will “own” safety responsibilities for separation of traffic? Another important question of legal liability rises if responsibility for moving/relocating traffic is transferred from local Air Navigation Service Providers (ANSPs) to NM. Furthermore, it is unclear at the moment how any new roles of the NM will be certified (one by one or all at once) which could also add to the complexity of the potential impact on safety.

The Performance Review Commission (PRC) is of the opinion that all these questions and more will have to be answered before concrete proposals for change are put in place. For example, if Air Traffic Controllers (ATCOs) should remain responsible for separation of aircraft, and any new role given to NM must reflect this and a clear division of responsibilities between the NM and the ANSPs is needed in order to address who is responsible for the safety aspects, and at what level.

A CLEAR DIVISION OF RESPONSIBILITIES BETWEEN THE NM AND THE ANSPs IS NEEDED.

From the safety performance perspective however, besides getting more insight into future changes and the relationship of these changes with safety, including changes in responsibility of the key players in the future ATM system, we will also need to look at the future performance of the network. This would include development of new methodologies, tools and performance indicators that could allow that.

1.2 Implementation of a digital European sky

The introduction of digital European sky will affect safety of the future ATM system. The concepts of a digital European Sky assume an essential role for data-link and will impact on the work of Air Traffic Control (ATC) and its staff. Some of the changes, such as different Communication Navigation Surveillance (CNS) data, the introduction of the ATM data service provider (ADSP) concept (as in the SESAR proposal for the future Airspace Architecture Study (AAS)), all need to be considered from a safety perspective before they enter into a system.

If the ADSP concept is brought to life, which data will be considered, trajectory information, surveillance? If this concept is not precisely defined it will be difficult to determine the changes in performance and to analyse the safety impacts. This is also needed to address responsibilities for the integrity and safeguarding of data from a safety perspective. Moreover, the introduction of future ADSP providers poses a big risk if not properly assessed, considering issues such as certification and licencing (who will certify those and based on which criteria?), reliability (how data quality will be guaranteed; do we need to define trusted users?) and liability (who is responsible in case of an accident?; will there be required economic leverage?).

FROM A PERFORMANCE REVIEW PERSPECTIVE, IT WOULD BE INTERESTING TO SEE HOW CYBER SAFETY/RESILIENCE CAN BE MADE OPERATIONAL AND ITS PERFORMANCE MEASURED.

At the moment the European Commission is considering the introduction of competition law from other sectors into aviation data sharing. Another important aspect is to address the security of the data, as cyber security risks may have a substantial impact on safety. Insight into existing and potential risk of inadequate data protection is needed to ensure the adequate safety levels.

However, if those changes happen, they will need to be assessed and where needed addressed in the Single European Sky SES2+ proposal and in the EASA Basic Regulation. Analyses of these safety impacts of the ADSP concept may lead to conclusions to be addressed in EASA's Data4Safety programme. Regardless what the future unfolds, from a performance review perspective, the PRC believes that it would be interesting to see how the ADSP concept, including cyber safety and cyber resilience, can be made operational and its performance measured.

1.3 Evolving role for people delivering the ATM services

The modernisation of European ATM will inevitably lead to a new organisation of the work and workplace. The proposed future ATM changes will have an impact on the people delivering the ATM services and the "human" role in the system. The identification of the future role of the human in delivering safety and how ATM safety can be protected is essential.

From a safety performance perspective here is a need to first get a better understanding of the performance of the future ATM system, how work will be organised, the role of the human factor, and potential safety impacts of the changing role of the human factor. However, so far the "human dimension in digitalised ATM" is widely unanswered.

As the future system will rely on a very high level of automation, therefore, one particular area of regulatory focus will be to review safety assessment and certification requirements, considering the changed role of the human in the overall system. For this to happen, a clear insight is needed in the changes in performance of the existing system towards the new system. To achieve this, the new methods and performance indicators that could allow measurement of future performance will be needed.

THERE IS A NEED TO STOP LOOKING AT THE HUMAN IN ISOLATION AND LOOK AT THE PERFORMANCE OF THE FUTURE ATM SYSTEM FROM A JOINT HUMAN-MACHINE POINT OF VIEW.

Overall, digitalisation and automation will surely transform ATC and ATM over the coming 10 to 20 years. Therefore, there is a need to stop looking at the human in isolation (human-centric system view) and look at the performance of the future ATM system from a joint human-machine point of view. The PRC believes that the future will surely not be human centric, rather it will be joint machine/human as otherwise the Artificial intelligence (AI) and new technologies will not bring any benefits.

1.4 Simplifying the regulatory framework

The requirements of the SES are also to develop adequate policy and regulation to accommodate capacity, efficiency, safety and cost effectiveness of the future aviation and ATM system. Safety will

IS THE PERFORMANCE SCHEME IN ITS CURRENT FORM FIT FOR PURPOSE IN THE NEW INSTITUTIONAL ARRANGEMENTS?

have to have a prominent place in any new regulatory framework, especially in view of a possible independent economic regulator (as envisaged by the WPG report) which would oversee the performance of service providers. Such a regulator would have to take into consideration the interdependencies between safety and other key

performance areas (KPA's). Unfortunately at the moment there are no accepted methodologies that allow this. Moreover, there are questions as to whether the SES Performance Scheme in its current

form and the current safety performance indicators are fit for purpose (e.g. due to high maturity of the system, inability of current indicators to further drive performance improvement).

1.5 Future technology and procedural improvements

Several technological and procedural improvements proposed by SESAR could impact safety of the ATM system, such as: the development of data-link; the implementation of Free Route Airspace (FRA) concept; the implementation of Flexible Use of Airspace (FUA) and advanced FUA; the integration of drones into the ATM system; High level airspace operations; the implementation of AAS. Implementation of these concepts should be monitored using properly defined safety performance indicators. The PRC believes that the currently available safety performance indicators are not suitable for this purpose, and that it would be also be important to take into consideration the interdependencies between safety and other KPAs.

Ultimately, as specified in the AAS transition plan, the quantified impact safety assessment of AAS implementation is not performed at the moment. A progressive transition strategy towards the Single European Airspace System is not currently aligned with the European Plan for Aviation Safety (EPAS). This clearly poses a challenge and safety concern as it opens an avenue to have changes implemented without prior safety considerations.

2 THE PROBLEM

Safety analysts, experts and decision-takers have to carry out safety assessments of future operational concepts and changes based on a large set of assumptions, statistically incomplete and sometimes maybe even biased evidence. If future risks cannot be estimated with precision, it is questionable how safety is ensured with traffic growth, operational and technological changes. What do we mean by safe in the future? How is safety delivered in the operation of the future system? What will be the roles and responsibilities of different players in ATM? What are the implications of not having correct indicators to measure the future performance? How can we demonstrate that implementation of the new ATM concepts and systems designs are indeed 'safe'?

Being "safe" in the future system will be essential for survival in the industry. Safety however should not be looked upon in isolation anymore, rather as the part of a very complex system. We would need to take into consideration the interdependencies between safety and other KPAs as it will be difficult or even undesirable to analyse safety performance without taking into account these interdependencies. So how should we measure future safety performance?

3 INITIATIVE

The ATM community will have to look deeper into unanswered questions related to the future challenges to ATM safety. The PRC advocates to engage with various aviation Stakeholders and the overall ATM community in a discussion and work that will, in the beginning, assess the pressures to deliver safety in a perspective way, however will at the end provide the means and tools to assess the "post operational" impact and will ultimately set up adequate performance analyses to contribute to the implementation of future changes.

This is an **extremely complex undertaking**, however, a prerequisite for measurement of safety performance in the future ATM environment.

4 REFERENCES

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A s part of its mandate, the PRC is always looking for new ways of analysing the safety performance of the ATM system in perspective of (potential) future changes. This requires insight into the development of existing safety performance, drivers for change, and the (potential) impact on ATM safety.

The PRC role is not to demonstrate that new ATM system designs are 'safe' (this is a task for EASA and system manufacturers), but rather to offer identification of potential risks and propose measures (performance indicators) that could monitor performance of the European network and the effectiveness of implementation of new concepts, technologies and processes from a safety perspective.
