EASA
European Union Aviation Safety Agency

THE EUROPEAN PLAN FOR AVIATION SAFETY

(EPAS 2022-2026)

Foreword by the Executive Director

The aviation sector is emerging from the depths of the COVID-19 shutdown into a changed operating environment. Traffic has bounced back repeatedly, whenever the epidemiological situation allows, but what is certain is that no organisation is operating exactly as it did before.

It is already clear that even when passenger numbers return to normal, operating conditions will never return to the situation of 2019. EASA's Return to Normal Operations project, launched early in the pandemic, tested the system and found a certain agility and resilience. These characteristics will be tested repeatedly in the coming years, as we adapt to the lasting challenges of health safety and to the many other changes happening within the industry.

We are at a turning point when it comes to the introduction of completely novel aircraft, such as UAVs and air taxis. We are changing the way we fuel aircraft – adopting Sustainable Aviation Fuels more widely in a short-term bid to become more sustainable. In the longer term, we are looking at completely different fuel possibilities such as hydrogen, which can also lead to significant changes in the design of aircraft. Challenges will come from digitalisation and new ATM technologies. And all of this is happening with urgency and in parallel.

Adapting to and embracing all of this change will require considerable collective effort. It will be a further test to the agility and sustainability of the system. This 11th Edition of the European Plan for Aviation Safety (EPAS) is intended to guide the industry through this turbulent period and ensure that aviation emerges at least as safe as it was before. Alongside the more traditional safety management approach we will guide in the usage of risk-based safety management.

Safety is fundamental to the success of our industry today and citizens will not accept compromises to this in the future. I would like to invite you all to support these efforts and plan for a brighter tomorrow.

Patrick Ky
Executive Director

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(EPAS 2022-2026)

Volume I

Introduction & Strategy

European Union Aviation Safety Agency, 10/12/2021

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https://www.easa.europa.eu/sites/default/files/dfu/list_of_epas_acronyms_and_definitions.pdf

1. Executive Summary

1. Executive Summary

The focus of this 11th edition of the European Plan for Aviation Safety (EPAS) remains on a safe return to operations as the COVID-19 pandemic continues to have significant repercussions for the entire aviation sector. In April 2021 the Agency published a revised COVID-19 Safety Risk Portfolio and it continues to support industry and Member States through the Return to Normal Operations (RNO) project. Two new EPAS actions are proposed to support the various initiatives and activities in this field.

According to the latest projections, it is expected that full recovery in terms of traffic volumes may take another 2 years as a minimum. Therefore, the Agency proposes to postpone to 2022 the full review of EPAS strategic priorities for a post-crisis aviation system. Recovering from this crisis without adversely affecting the high level of safety performance is proposed as a new focus area in the existing strategic priorities.

The pandemic created a much stronger focus on environmental protection and sustainability of the aviation sector, now being key priorities for citizens, policy makers and the industry alike. The Agency is engaged in multiple initiatives, such as the ReFuel EU Initiative supporting the uptake of Sustainable Aviation Fuels (SAF), the Environmental Label programme, life-cycle analysis of aircraft, market-based measures, the exploration of electric-, hybrid- and hydrogen-powered aviation, and the need for further research on the climate impact of non-CO_2 emissions. Accordingly, the strategic priority 'Environmental protection' is reinforced in this edition, on the basis of the Agency's sustainable aviation programme. Also, in 2021 the Agency certified the first aircraft for CO_2 emissions. These new environmental certification tasks and more generally the assessment of environmental characteristics and sustainability for novel technologies will continue to grow in the near future.

With an increasingly complex and interconnected landscape of risks, a more integrated, collaborative approach to aviation risk management should be explored, starting with safety, security and cyber security risks. Effective risk management capabilities at European, State and industry level are more important than ever to cope with the multiple systemic and operational risks and wide-ranging effects of the crisis. Such capabilities will enable the transition to a more resilient aviation system. At the same time, risk management will increasingly need to be applied to risks other than safety and security, with public health entering the equation. The proposed approach to integrated risk management would build upon the outcomes of the ICAO High-level Conference on COVID-19 (HLCC 2021) which recognised the importance of an integrated approach to risk and resilience management and requested States to implement multi-sector collaboration.

In addition to the safety issues emerging from the COVID-19 pandemic, there are also clear opportunities for improvement and efficiency gains based on the multiple lessons learned, whereby the need for alternative solutions, or the increased use of digital solutions, should lead to the modernisation of our regulatory and oversight systems. Research, innovation and digitalisation are important pillars in this new reality. This EPAS edition includes 19 new research projects (RES), with many of them addressing innovative technologies, such as remote flight instruction, risk assessment of complex systems, use of machine learning (ML) in certification, electric and hybrid propulsion, or digital transformation. In addition, a new rulemaking task is included to create a European digital pilot licence system.

Other changes are the inclusion of 'Oversight' and 'Standardisation' as new sub-items within the strategic priority 'Systemic safety', the review of factual information to reflect recent developments and progress with key actions, roadmaps and related initiatives, as well as the removal of Section 3.2 'Strategic enablers', the latter in an effort to streamline the document and minimise the potential for overlap with other documents. Related subjects will be addressed in the next edition of the European Aviation Safety Programme (EASP) and are already addressed in the Agency's Single Programming Document (SPD).

In addition, Section 4.1 'Safety performance' was reviewed in response to Advisory Body (AB) feedback. It now provides a set of process-based indicators in the area of Standardisation and related to industry compliance with management system requirements.

Early 2021 the Agency initiated a review of its rulemaking procedure aiming at increased efficiency and effectiveness, in terms of output and lead times. The annual resource programming exercise for the EASA SPD 2022-2024 concluded in 2021Q3. Accordingly, planning milestones in Volume II were adjusted in the final EPAS 2022-2026. Following completion of 10 actions by the end of 2021, Volume II includes 183 actions, with 25 new actions, the majority of them being research projects.

Volume III, first introduced with EPAS 2021-2025, provides the latest set of domain Safety Risk Portfolios supporting safety management at regional, State and industry level. A total of 219 safety issues are described and prioritised (assess – mitigate – monitor). A dedicated COVID-19 Portfolio is included. For the first time, a Safety Risk Portfolio is provided for the rotorcraft domain.

2. Introduction

2. Introduction

The EPAS constitutes the regional aviation safety plan (RASP) for EASA Member States, setting out the strategic priorities, main risks affecting the European aviation system and the necessary actions to mitigate those risks to further improve aviation safety. The main objective of the EPAS is to further improve aviation safety and environmental protection throughout Europe, while ensuring a level playing field, as well as fostering efficiency and proportionality in regulatory processes. The EPAS is a key component of the safety management system (SMS) at European level, which is described in the EASP[1]. The regional approach complements national approaches offering a more efficient means of discharging State obligations for safety management in the EU aviation system.

The EPAS 2021-2025 set an aspirational safety goal to achieve constant safety improvement with a growing aviation industry. This aspirational goal indisputably remains a long-term goal for the EU aviation system. In consideration of the drastic reduction in traffic volumes due to the COVID-19 crisis and the new risks induced by its impacts, the EPAS aspirational goal is adapted for this edition to focus on **maintaining collectively the pre-pandemic high aviation safety level throughout the recovery phase and improving safety post-recovery** (refer to **Section 4.1**). Effective risk management capabilities at European, State and industry level are more important than ever to cope with the systemic and operational safety risks and wide-ranging effects of the crisis and constitute an important enabler for building back a more resilient aviation system.

Those risk management capabilities will increasingly need to be applied comprehensively for all risks affecting aviation safety; hence, a more integrated, collaborative approach to risk management must be explored, starting with safety, security with safety relevance and cyber security and cyber security risks with the ultimate objective of ensuring the maximum level of safety.

From the onset of the COVID-19 outbreak in Europe, realising that the impact on industry was closely linked to the level of coordination and harmonisation within Europe, the Agency initiated the project called 'Return to Normal Operations'. This project was still active in 2021 and, thanks to the intense cooperation with the European Member States, the aviation industry and international partners, continues to produce guidance and other deliverables to enable a safe and efficient return to operations. In 2020 a series of immediate measures to address the most acute phase of the crisis and support a safe return to operations while reducing the risk of infection for passengers and crews were taken. The aviation safety risks entailed by the COVID-19 pandemic continue to be assessed as part of a dedicated work stream within the RNO project which resulted in the compilation of a first COVID-19 Safety Risk Portfolio in the summer of 2020. It was subsequently included in the initial EPAS Volume III 'Safety Risk Portfolios' created for the 2021-2025 edition. The in-depth analysis of the various safety issues resulted in specific short-term mitigation actions not qualifying for inclusion in the EPAS 2021-2025. The COVID-19 Safety Risk Portfolio was reviewed during the first quarter of 2021 and an updated portfolio was published on 30 April 2021. The various safety issues identified were assessed as part of the European Safety Risk Management (SRM) process, and some resulted in new initiatives, such as the 'Ramp-Up – Be ready, Stay Safe Campaign'[2] that took place in June 2021 and was attended by over 2 500 participants. Moreover, two new EPAS actions are included in this EPAS edition in support of a safe return to operations.

While some uncertainty remains, there is consensus among aviation stakeholders that the path to recovery for the aviation industry will be longer than projected in 2020. The various forecasts available, e.g. those established by ICAO, IATA and EUROCONTROL, converge in their assessment that the pre-pandemic levels of traffic will be reached towards the end of 2023/early 2024 only, based on the most optimistic scenario[3].

The need to ensure a safe return to operations, while at the same time continuing to alleviate the regulatory burden on stakeholders, constitute the main priorities shaping this EPAS edition.

1 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015DC0599

2 https://www.easa.europa.eu/newsroom-and-events/news/ramp-be-ready-stay-safe-campaign

3 New EUROCONTROL 2021-2027 forecast dated 15 October 2021

Volume I – Strategic Priorities

Considering the expected duration of the recovery phase, the review and redefinition of the EPAS strategic priorities with the 2021 revision cycle, as announced with the EPAS 2021-2025, is postponed by another year as aviation stakeholders continue to be fully engaged in ensuring an efficient and safe return to operations. The outcome of the ICAO High-Level Conference on COVID 19 (HLCC 2021), among other developments, will feed the definition of such new EPAS strategic priorities for the 2022 revision cycle.

The European Green Deal sets an ambitious goal for EU to be climate neutral by 2050, which is reflected in the European aviation initiative 'Destination 2050 – A Route to Net Zero European Aviation'[4] . The pandemic and its drastic reduction in operations acted as a catalyst, leading to a significant push for a more sustainable aviation system, be it in the context of State aids and public relief packages for the aviation sector, the expectations of the travelling public or from industry itself. Coming under pressure from all those angles, industry is anticipating or accelerating their plans to adopt more sustainable solutions. The EPAS will be instrumental to ensuring that such solutions will not come at the expense of safety. An overall risk management framework supporting the identification of all factors that influence safety and addressing them systematically will be needed.

Against this background, changes in Volume I are limited to the following:

- Adding 'Safe return to operations' as a new focus area within the existing strategic priorities (refer to **Section 3.1.0** for further details on the specific COVID-19-related safety issues);
- Updating the information on the operational context in **Section 2.1**;
- Strengthening the strategic priority 'Environmental protection', on the basis of the Agency's sustainable aviation programme (refer to **Section 3.1.4**);
- Adding 'Oversight' and 'Standardisation' as new items under Strategic priority 'Systemic safety' (refer to **Section 3.1.1**);
- Removing **Section 3.2** 'Strategic enablers' to streamline the document and minimise overlaps with the EASP and SPD;
- Reflecting recent developments as well as progress with key actions, roadmaps and related initiatives;
- Moving the key indicators in terms of EPAS actions from the former Section 4.1 to Volume II; and
- Updating **Section 4.1** 'Safety performance' in response to AB comments, minimising the overlap with the Annual Safety Review (ASR) and Standardisation Annual Report (SAR).

Volume II – Actions

Since its 5th edition (covering 2016-2020), the EPAS incorporates the EASA Rulemaking Programme, thus creating a single repository for all programmed actions, supported by a single programming process. Early 2021 EASA launched an internal project with the objective of further enhancing efficiency, effectiveness and flexibility of its rulemaking process. This project delivered a first set of concrete measures aiming at increasing rulemaking output and reducing lead times, the effects of which are expected to materialise from 2023 onwards. For this reason, information provided on the detailed schedule of rulemaking deliverables is limited to those deliverables which are intended to be completed in 2022, or which are not affected by the project. The schedule of other rulemaking deliverables is provided with less detail, since it may be subject to a reassessment following the application of those efficiency measures.

4 https://www.destination2050.eu/

Volume III – Safety Risk Portfolios

To support the safety management efforts at regional, national and industry level, Volume III was introduced with the EPAS 2021-2025. Volume III provides visibility to the safety risks and underlying safety issues affecting the European aviation system and thereby provides valuable information for any SRM activity, be it at regional, State or industry level. The domain Safety Risk Portfolios are updated concurrently with the production of the ASR with the support of the Collaborative Analysis Groups (CAGs).

In addition to being developed in accordance with the processes, roles and responsibilities described in the EASP, the EPAS is consistent with the ICAO global plans in the area of aviation safety and air navigation and ensures alignment with the European ATM Master Plan (MP). Refer to **Section 2.2** for further details on the relationship between the various plans and programmes.

Regulation (EU) 2018/1139 (the 'Basic Regulation')[5] includes a dedicated chapter on aviation safety management, thereby creating a strong legal basis not only for the EASP and the EPAS, but also for the establishment and maintenance of State Safety Programmes (SSPs) and State Plans for Aviation Safety (SPAS) at Member State level.

Basic Regulation Article 8 requires EASA Member States to consider relevant risks and actions defined in the EPAS within their national safety management processes. In return, the EPAS defines a number of specific actions addressed to and owned by Member States, to act on some of the risks identified through the European SRM process. Risks and actions identified in the EPAS support the implementation of effective SSPs and SPAS.

The implementation of EPAS actions in the domain of systemic safety, including SSP and SPAS implementation, is supported by a specific stakeholder AB, the Safety Management TeB (SM TeB). Its main purpose is to provide a forum to exchange information and address implementation issues in the area of State safety management, as well as to provide input and feedback on EPAS implementation in regard to all systemic issues. The SM TeB also provides recommendations on further actions required to support EPAS, SSP and SPAS implementation. All EASA Member States are represented in the SM TeB, while non-EASA European Civil Aviation Conference (ECAC) States are invited to attend as observers.

5 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1139&from=EN

2.1 Operational context

2.1.1 Introduction

This section provides an overview of the current context in which the EPAS actions are deployed. It also includes information on the European aviation system in terms of size, nature and complexity, together with information describing the pre-COVID-19 situation, to serve as a reference for the recovery.

The information in this section has been obtained from the following sources:

- economic data related to the gross domestic product (GDP), aviation revenues, number of flights, etc. from ICAO, the International Monetary Fund (IMF), EUROCONTROL, IATA and ACI;
- data collected through the EASA Standardisation Information System (SIS) concerning the number and type of aviation organisations approved in EASA Member States; and
- intelligence available within EASA operational departments as regards the impact of the pandemic on the various domains.

This information will be consolidated and further developed in future EPAS editions to ensure that the prioritisation of EPAS actions takes due account of the challenges and risks the European aviation system is facing. Systemic, operational and environmental-protection-related challenges and risks are further described in Section 3.1 'Strategic priorities'.

2.1.2 Operational context — General

2.1.2.1 Worldwide perspective

After the year 2020 when the global economy experienced the worst crisis since the Great Depression as a consequence of the COVID-19 pandemic, the activity in 2021 rapidly recovered and the prospects for the following years are that this trend will continue. However, it is too soon to draw firm conclusions, considering the uncertainties on the evolution of certain threats (not only the pandemic, but also climate change, increasing public debts and geopolitical changes).

According to the last general IMF forecast available[6], GDP fell by 3.3 % in 2020 and is expected to rebound by 5.9 % in 2021, to continue with a growth rate of 4.9 % in 2022. Behind these global figures quite diverse situations are found in national economies due to differences in the pace of vaccine roll-out and the capability of States to offer financial support.

The pandemic also affected the job market, the employment conditions and other socio-economic factors. From a worldwide perspective, according to the International Labour Office, the unemployment rate grew by 1.1 point to 6.5 % in 2020, compared to 5.4 % in 2019, and will only slowly decrease to an expected 6.3 % in 2021 and 5.7 % in 2022[7].

6 https://www.imf.org/en/Publications/WEO/Issues/2021/10/12/world-economic-outlook-october-2021

7 https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_795453.pdf, Table 1.2 Employment-to-population ratio, unemployment rate

The evolution of the pandemic needs to be brought in this overall picture to complete the worldwide view. There is general agreement that a global pandemic picture is difficult to build because, on one hand, there is no single indicator to summarise the pandemic situation and, on the other, there is no reliable forecast on how the pandemic situation will evolve in the near future due to the very high complexity when modelling the evolution of the pandemic[8]. The start of vaccination campaigns at the end of 2020 and the steady increase in vaccination rates in 2021 are strong indicators for a recovery in the short term.

Vaccination rate status on 26 October 2021:

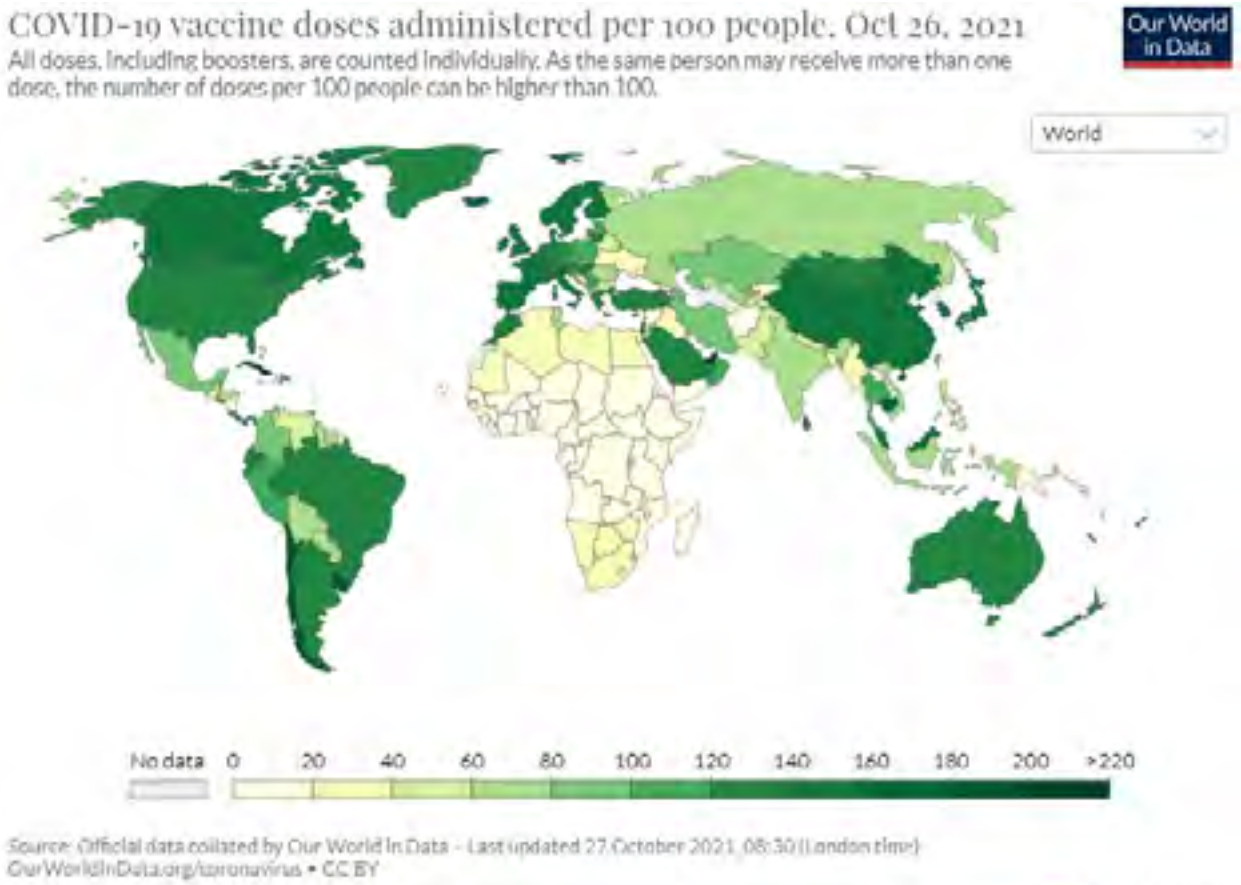
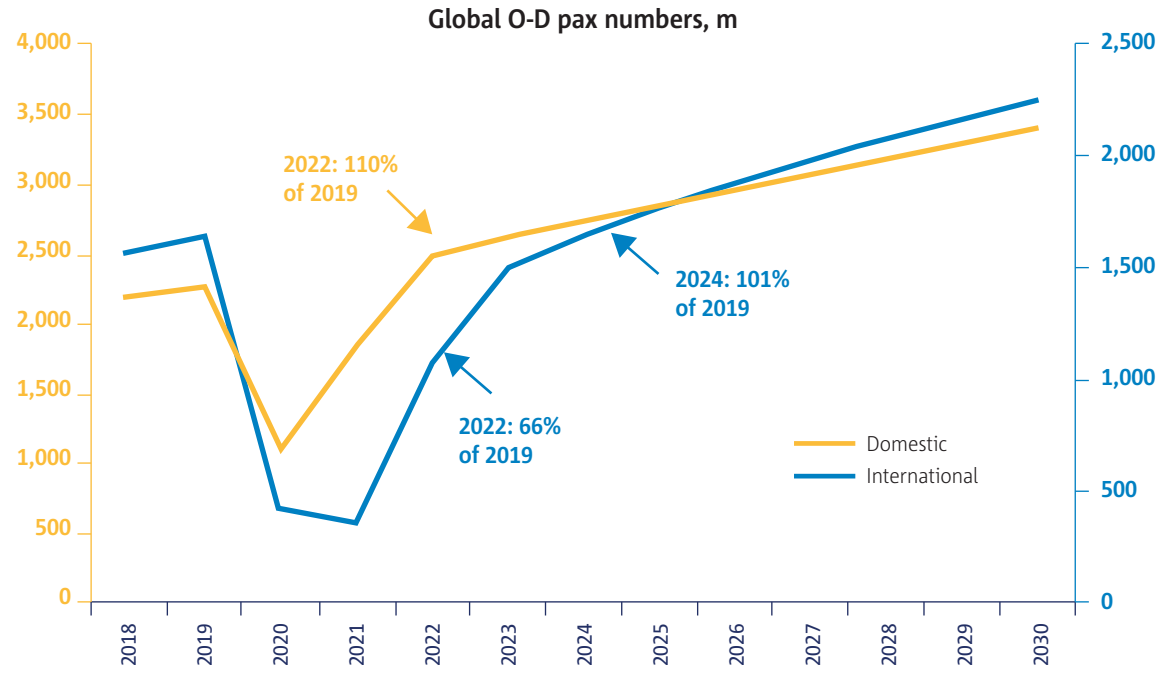


Figure 1: Vaccine doses administered per 100 persons (Source: OurWorldData)[9]

From a worldwide aviation perspective, large aeroplane commercial passenger flights, constituting the bulk of the aviation activity, showed an unprecedent drop in 2020 and started to recover in 2021. The closure of borders fundamentally contributed to this drop in traffic, hitting airline international traffic far more than domestic traffic. If the current positive trend of pandemic recovery continues, the domestic traffic in terms of number of airlines' commercial passengers would recover in 2022 in comparison with the 2019 level. International traffic would only recover in 2024.

8 For instance, modelling of the effect of vaccination coverage, scenarios with new variants, etc.

9 https://ourworldindata.org/covid-vaccinations



Source: IATA/Tourism Economics Air Passenger Forecast, July 2021

Figure 2: Number of large aircraft commercial passengers from 2018 to 2030 (Source: IATA)

However, the diversity of aviation is such that it is worth noting that other aviation sectors like cargo, business aviation and helicopter operations are in a much better situation compared with the passenger airline sector.

The aviation operational context per aviation domain from an EU perspective is described in **Section 2.1.3**.

2.1.2.2 European Union focus

The economic and social situation in the European Union is similar to the world outlook provided above.

Regarding the pandemic, by 31 August 2021 the EU had reached a crucial milestone with 70 % of the adult population fully vaccinated against COVID-19[10] . However, the threat of COVID-19 is not over as there remains an immunity gap, new variants are still possible and there are significant differences in vaccination rates globally and within the EU. The risk of new variants calls for a cautious approach.

In terms of aviation developments, the flight forecast as provided by EUROCONTROL[11] on 15 October 2021 follows the aviation worldwide pattern.

10 https://ec.europa.eu/commission/presscorner/detail/en/ip_21_4362

11 Instrument flight rules flights.

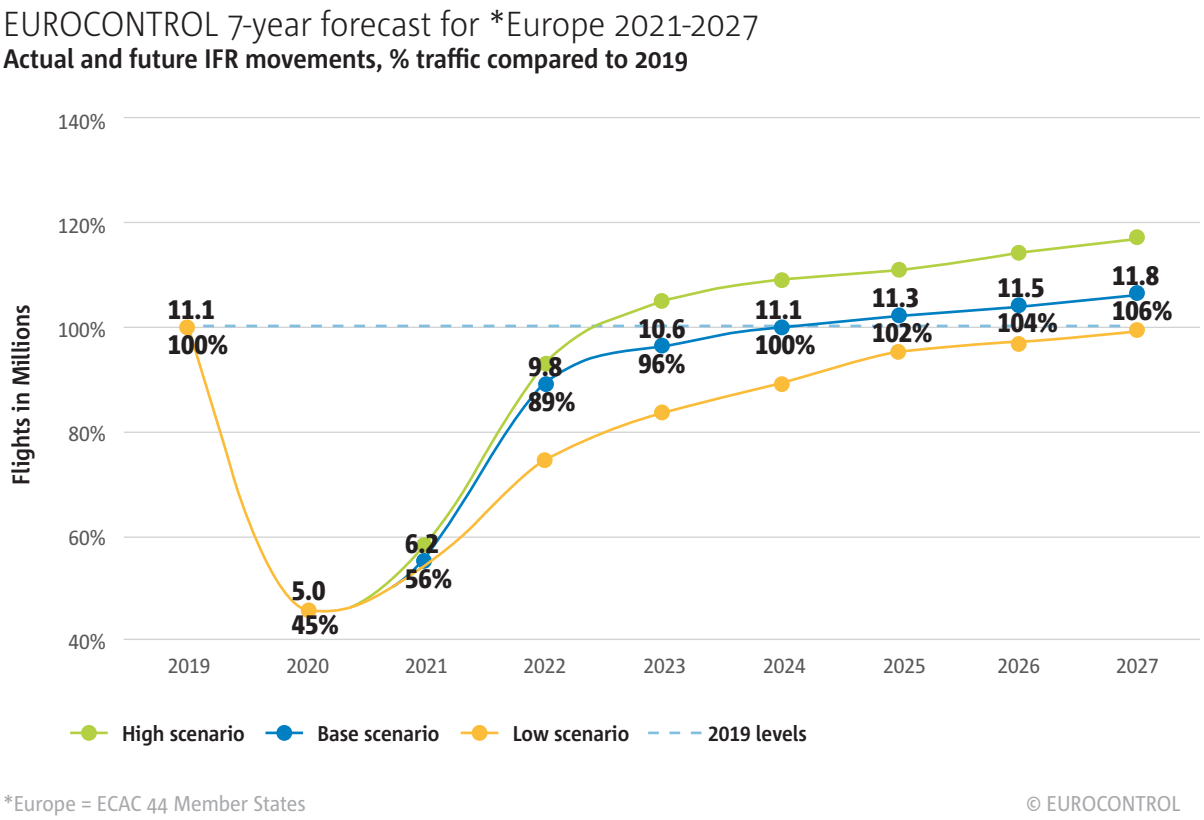


Figure 3: Forecast for Europe 2021-2027 (Source: EUROCONTROL)[12]

As noted earlier, the aviation market segments have responded with a wide diversity to the pandemic.

On the 1 October 2021 versus the 2019 level, the evolution of the IFR flights was:

- Flights for traditional airlines are still 40 % lower and 30 % lower for the so-called low-cost airlines than their 2019 levels respectively.
- Cargo and business aviation flights increased by 12 % and 29 % respectively.
- Charter flights showed a slight decrease (minus 6 %).

Note: Helicopters and General Aviation aircraft mainly fly in accordance with visual flight rules (VFR); there exists no consolidated data for those flights at EU level.

12 For updated information on the EUROCONTROL forecast for Europe, the reader is invited to consult the EUROCONTROL webpage https://www.eurocontrol.int/covid19.

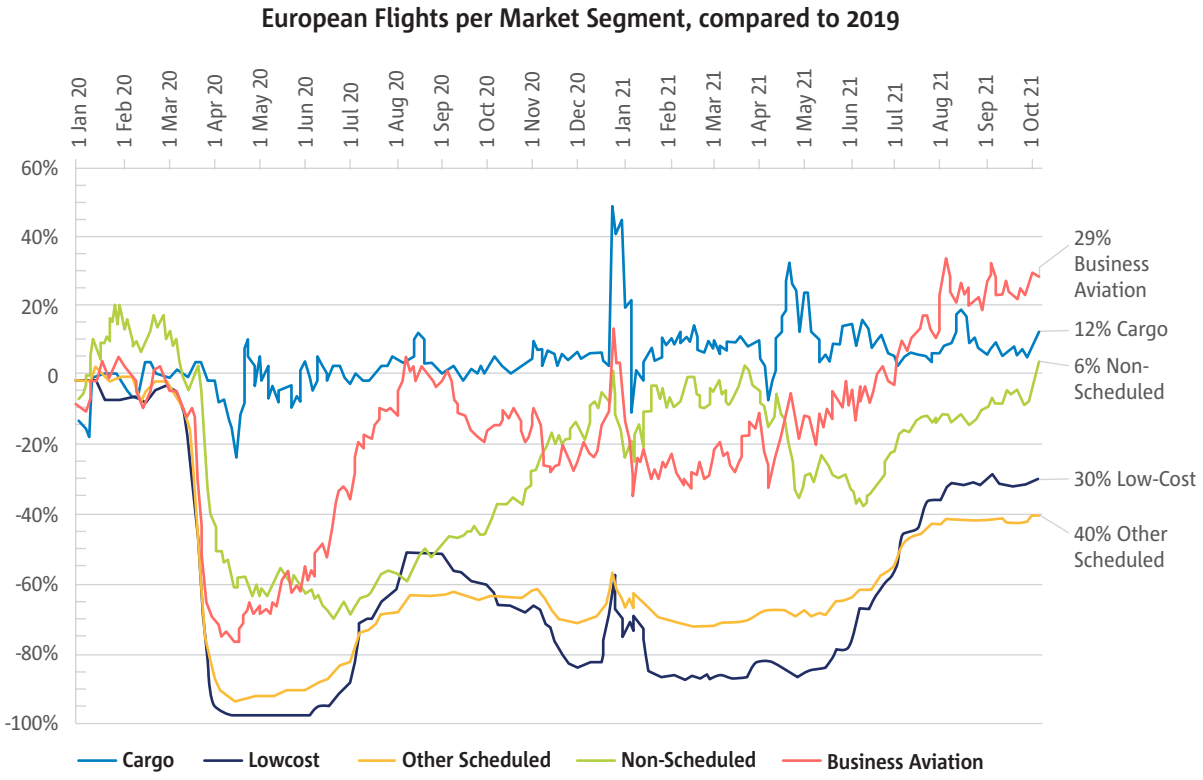


Figure 4: Market segments in the EUROCONTROL Network[13]

To conclude on the general context, it is worth noting that, in addition to the remaining uncertainties concerning the pandemic (vaccination coverage, new variants), there are other variables and uncertainties for the aviation sector and subsequently for EASA, which may influence the long-term recovery of the aviation sector:

- In Europe, Member States and the European Union provided an unprecedented budgetary effort which seems to have succeeded in mitigating the effects of the economic crisis. However, it is not yet known to what extent the various financial support programmes will be sustainable.
- The economic crisis is changing the way of living: teleworking, teleconferences, relocation of production centres closer to customer areas.
- The aviation sector value chain is facing a disruption subject to restructuration.
- Innovative solutions and new business models emerge to adapt to the new reality. These will have effects that are not yet known.
- The pandemic is also significantly shaping societal demands and it is safe to state that sustainability will play a much stronger role as regards public transport policies and the allocation of economic relief funds.

13 https://www.eurocontrol.int/sites/default/files/2021-05/eurocontrol-four-year-forecast-2021-2024-full-report.pdf

2.1.3 Operational context per aviation domain

2.1.3.1 Commercial air transport — aeroplanes

During 2021 the reduction in airline passenger flights due to COVID-19 continued, subsequently resulting also in lack of capacity to transport cargo in that aircraft The same can be stated for the complexity of operations, ranging from quarantine measures imposed on flight crews, disruption in training and scheduling, and the need to transport cargo in the cabin.

Airlines continued to have a large portion of their aircraft grounded, leaving flight and cabin crew members with uncertainty about the return to normal operations.

However, the recovery during the summer of 2021 was faster than expected. This was a positive development but led to difficulties for operators to cope with the increased demand, adding complexity in the return to service of aircraft and flight crews.

From the information available, it is difficult to estimate the number of operators ending operations or filing for bankruptcy. Nevertheless, according to the available EASA Standardisation data (Section 2.1.4), the overall number of air operator certificate (AOC) holders in the EU increased by 7.2 % in 2021 (625 in 2021 compared to 583 in 2020). A very limited number of operators modified their existing business model to re-centralise operations in their respective regions and to cease, even if sometimes temporarily only, part of their operations. Finally, some operators might have used the crisis to diversify or even modify their business model focusing on cargo activities.

2.1.3.2 Helicopter operations

Based on feedback from the rotorcraft community, it was observed that in 2020 the overall helicopter traffic in the EASA Member States decreased. This change in the level of flying activity was very different depending on the type of operation performed.

The decrease in activity was more pronounced in non-commercial operations due to the COVID-19 pandemic and the various lockdown measures, in comparison with the other domains.

For commercial operations, a slight decrease in the number of helicopter AOC holders could be observed over the period 2019 to 2021, whereas the number of helicopters performing commercial air transport remained relatively stable at around 2 400. The average number of helicopters per AOC holder in 2020 is between 8 and 9.

The first half of 2021 could be seen as the extension of 2020 due to the ongoing pandemic. Regarding the second half of 2021, going together with the abatement of COVID-containment measures, there were signs of recovery for all helicopter operations.

2.1.3.3 Non-commercial operations with complex motor-powered aircraft (NCC)

For the so-called business aviation in the NCC segment, data has shown a severe impact during the first half of 2020 with a quick recovery during the summer of 2020. The business aviation flight level at the end of the summer of 2021 was approximately 30 % above the 2019 level. This seems to confirm that the business aviation sector is taking opportunities arising from the new operational context created by the pandemic for airlines.

2.1.3.4 Aircrew and medical

Throughout 2020 the COVID-19 pandemic led to travel restrictions between states that resulted in flight and cabin crew as well as instructors and examiners not being able to reach their respective training facilities, or examination, testing checking venues, nor complete their yearly medical fitness examination. Where travel was possible, national COVID-19 measures on many occasions led to the closure of said facilities/venues or allowed only for limited training to take place. As a consequence, many crews were not able to fully complete or perform their required initial or recurrent training and/or checking events. Short-term blanket and standardised exemptions were therefore issued by the European aviation authorities, in coordination with EASA, to enable said stakeholders to continue to function in their roles, subject to various conditions and mitigations that ensured that an acceptable level of safety was maintained. Furthermore, the exemptions aimed to reduce the severity of the disruptions that would otherwise occur due to non-availability of a sufficient number of flight and cabin crew members to operate on behalf of their organisations. A similar approach was applied to holders of non-professional licences (PPL, LAPL, etc.). Towards the end of 2020, the number of exemptions was significantly reduced and only used in duly justified cases and limited to what was strictly needed. EASA continuously supported the aviation authorities and the industry during 2020 and 2021 with the issue of a variety of guidelines, notably covering exemptions, flight crew recency and virtual classroom instruction.

As regards the medical domain, the impact was significant with a large increased demand for medical experts. As a consequence, some authority medical assessors were requested to support clinical medicine work which reduced their involvement in the oversight of aeromedical centres (AeMCs) and aeromedical examiners (AMEs). Moreover, additional medical expertise was needed to support and monitor the physical and mental health as well as the well-being of aviation professionals. EASA medical experts were additionally called upon to support with a large number of COVID-19-related activities involving health and safety, in particular health and safety protocols for air operators and airports, flight crews and disinfection of aircraft.

As regards the oversight of organisations, including flight simulation training device (FSTD) certificate holders/operators and AMEs, 'desktop methodologies' via virtual communication were mostly used during the COVID-19 pandemic. In addition, some inspections and evaluations were postponed. However, the remote oversight methodologies had been progressively replaced or complemented in 2021 by on-site audits and inspections as normal, prioritised against risk.

In addition to the COVID-19, the departure of the UK from the EU led to a large number of legal uncertainties within this domain, notably as regards the validity/recognition of licences and certificates as well as the recognition of training and checking performed under the oversight by the UK CAA. EASA, in close collaboration with the European Commission (EC), held several meetings and provided a significant amount of guidance to support the aviation authorities with processing a large amount of licence transfer requests submitted by UK CAA licence holders or students undergoing training within the UK. A peak of requests was received a few weeks prior to 31 December 2020 with some further limited follow-up and support needs at the beginning of 2021.

On a more positive note, during 2020 and 2021, more emphasis was placed on enabling new innovative technologies, such as augmented reality (AR) and virtual reality (VR), for use in flight and cabin crew training, ultimately leading to the use of FSTD special conditions (SCs) to qualify a novel device in 2021 for use in initial helicopter licensing training. Further developments in this area are anticipated to cover not only helicopters, but also vertical take-off and landing (VTOL) aircraft, airship FSTDs and other training solutions.

2.1.3.5 General Aviation

In sport and recreational operations, a noticeable reduction of activity occurred in 2020 due to the pandemic and this domain started recovering in 2021.

In the area of aircraft production some reduction is expected due to the economic impact. When it comes to design, activities are expected to grow due to the innovation drive coming from the European Green Deal transitional measures, in particular where General Aviation (GA) provides a cradle for innovation. Pilot training, including instructors, is expected to have a shift due to the changes in operations, with little need for commercial pilots at first, and a surplus of commercial pilots that could fill the GA instructor shortage.

Overall, the economic recession and societal views on the environment are expected to put pressure on GA. The recent gas and fuel price developments are potentially also going to have a negative impact on aviation.

2.1.3.6 Design and production

One of the Agency's core tasks is the approval and certification of aeronautical products such as aircraft, engines and equipment.

This activity is highly correlated to aircraft deliveries and orders, which, in turn, are linked to air traffic. Regarding worldwide commercial air transport, aircraft orders dropped a sharp 46 % in 2020 compared to 2019 (with business aeroplanes and helicopters being less affected); aircraft deliveries overall showed a reduction of 27 % compared to the 2019 levels, with no major differences among products.

Focusing on the first half of 2021, data shows a reduction of 22 % in terms of orders and a reduction of 32 % in terms of deliveries compared to the first half of 2019. The increase in aircraft orders seems promising, although production rates are still suffering from COVID-19-related measures.

In the area of initial airworthiness of type design, the number of applications received and the number of certificates issued by the Agency provide an adequate estimate of the impact of COVID-19. In particular, overall, for the period January to September 2021, a reduction of 12 % was recorded for the number of applications received and a reduction of 27% for the number of certificates issued in comparison with 2019. Comprehensive 2020 data shows a reduction of 10 % in the number of applications received and a reduction of 16% in the number of certificates issued compared to 2019.

Regarding continued airworthiness of type design, the number of occurrence reports received and closed and the number of airworthiness directives (ADs) published constitute a fair indication of the impact of the pandemic. In particular, for occurrence reports received, an increase of 2 % could be observed for the period from January to September 2021 compared to the same period in 2019, with a 1 % reduction in the number of occurrences closed. Finally, the number of ADs published dropped by 7 % for the period from January to September 2021 compared to the same period in 2019. Comprehensive 2020 data shows a reduction of 9 % for the number of occurrences received, an increase of 31 % in the number of occurrences closed and a reduction of 8% for ADs issued versus 2019.

In 2020, the number of active production organisation approval (POA) holders remained at the same level as in 2019, and an increase in new applications could even be noted in 2021.

2.1.3.7 Maintenance and continuing airworthiness management

The demand for maintenance and continuing airworthiness management organisations' services is linked to the worldwide aircraft in-service fleet, which was drastically reduced in the first half of 2020 by the high volume of parked/stored/phased-out aircraft. A partial recovery started towards the end of 2020 and continued during 2021; however, still remaining below pre-crisis levels.

A similar trend is envisaged for demand in the maintenance domain. Airframe and engine maintenance activities are expected to recover first, compared to component maintenance not subject to calendar-life limitations, due to aircraft re-entering into service and the need to catch up deferred maintenance during storage.

The following list provides further details to complement the general considerations regarding demand:

- Maintenance and continuing airworthiness management organisations mitigated the effect of the crisis remaining in business by reducing staff numbers and scope of activities. Small organisations, particularly component workshops, suffered more resulting in either surrenders of approvals for some not belonging to larger corporate groups or merging of approvals between different entities.
- The majority of maintenance and continuing airworthiness management organisations followed adequate procedures when storing aircraft for long periods during the pandemic, thereby retaining the aircraft airworthiness status and requiring minor work to subsequently release the aircraft into operations. A related increase in the number of incidents in relation to the return to service of stored aircraft could be observed and was addressed by Agency Safety Information Bulletins (SIBs).
- The increase of cargo activities resulted in increased maintenance demand for passenger to cargo conversions. Additionally, a shifting towards narrow-body aircraft maintenance/related components materialised due to the reduction in international travel.
- An increased involvement of manufacturers is observed in the repair/overhaul activities.
- Regarding the working methods, perspective changes were implemented due to lockdown and similar constraints, which will remain post-crisis:
  - extensive use of distance learning affecting all continuing airworthiness organisations, but primarily the Part-147 training organisations and related Part-66 licensing processes, with major changes in procedures and increased involvement of the competent authorities;
  - use of remote auditing techniques for compliance verification not only within the approved organisations but also by competent authorities.
- The lack of proficiency and the associated skills degradation of maintenance and continuing airworthiness management staff, as a consequence of the significant reduction in traffic due to the COVID-19 pandemic situation, needed to be addressed by the organisations.

It is also worth noting that COVID-19 has shown the importance of interaction of maintenance and continuing airworthiness management organisations with competent authorities for business continuity and keeping the balance between support to the aviation industry and the need to avoid market distortion, namely:

- the need for the issuance of exemptions allowing the continuation of operations. The number of exemptions issued by the competent authorities has steeply increased during the crisis;
- adoption by competent authorities of new oversight methods, namely remote audits allowing for the continuation of the approvals in the context of travelling restrictions.

Brexit

Brexit was another factor with a significant impact on maintenance and continuing airworthiness management because UK maintenance and continuing airworthiness management organisation approvals and aircraft maintenance licences are no longer recognised by the EU. A large number of UK-approved organisations applied for an EASA approval, considering the absence of a bilateral aviation safety agreement (BASA) between the EU and the UK in this domain. EASA became the competent authority for approximately 250 maintenance and continuing airworthiness management organisations having their principal place of business in the UK, a number which is still growing with new applications coming in.

Transition to Part-CAMO/Part-CAO

An additional factor contributing to the peculiar operational environment during 2021 was the ongoing process of transition to the new regulatory framework brought by the amendment to Regulation (EU) No 1321/2014 introducing the new Part-CAO and Part-CAMO.

This process will be ongoing until March 2022 and is linked to the introduction of SMS in the continuing airworthiness management domain and the creation of a new combined organisation approval that is better suited to the needs of less complex aviation, compared to that for Part-145 and Part-M Subpart G approved organisations.

2.1.3.8 Air traffic management/air navigation services

During 2020 and 2021, COVID-19 had a high impact on the traffic levels as well as the related revenue for the air navigation service providers (ANSPs) and other actors in this sector. Consequently, a decrease in financial resources resulted for ANSPs, with a significant impact on ongoing and planned activities to maintain and further develop the ATM/ANS system. On the other hand, actions implemented during the COVID-19 crisis provided opportunities for more sustainable and flexible provision of services and for making ATM more resilient and scalable.

In general, principles and procedures for ATM/ANS provision remained untouched, with potential adjustments necessarily introduced to address specific issues. Further efforts will be required to achieve the desired harmonisation of ANS provision across the EU. Acknowledging the reduced investments due to the crisis, the focus of this sector will be on ensuring the necessary improvements of the systems in an economically sustainable manner.

The Agency, in a shared effort with other relevant stakeholders, contributed to this effort by identifying and addressing a list of safety issues related to the COVID-19 pandemic, several of which apply to ATM/ANS (e.g. ATCO competence, ATCO fatigue, personnel well-being, restarting a complex system, etc.[14]), that need to be monitored and addressed throughout the pandemic and the subsequent recovery period, with the recovery of traffic levels similar to or higher than those in 2019.

The recovery to normal traffic levels is expected to take place in the first years of the period covered by this EPAS 2022-2026, with the upper band of the forecasts predicting a recovery of the traffic to the 2019 levels as early as in 2024. This will require the industry, competent authorities and other stakeholders to be ready to adapt to a rapidly changing environment, while still coping with the effects of the pandemic, in terms of financial and operational impact.

14 https://www.easa.europa.eu/sites/default/files/dfu/review_of_aviation_safety_issues_from_covid-19_final_0.pdf

2.1.3.9 Aerodromes and groundhandling

Compared to the 2019 levels, 2021, despite some recovery in the second half of the year, was globally expected to generate a loss of 3.3 billion passengers or 61.4 % compared to the 2019 levels (ACI World, July 2021[15]).

Globally, aerodrome operators lost more than USD 125 billion in revenues from the start of the pandemic until October 2021, while 193 European airports are facing insolvency (ACI Europe Annual Conference 26-27 October[16]).

For European airports, ACI Europe estimates that airport revenues will remain EUR 29 billion lower than in 2019 with 64 % fewer passengers compared to 2019 and a full recovery not in sight until 2025.

The reduction in passenger flights and traffic volumes with fewer aircraft operating in Europe continues to have a negative effect also on groundhandling operations.

For the groundhandling industry, in 2021 the COVID-19 crisis led to some bankruptcies and an overall reduction of staff. Compared to the pre-pandemic era, the sector employed less than 50 % of its staff in July 2020 (ASA, Open letter to the air transport authorities, 03 July 2020[17]).

The recovery of the aviation market in the second half of 2021 only slightly dampened the overall negative economic impact in terms of loss in revenues. While the airport and groundhandling industry is recovering from the impact of the pandemic, it is also faced with the new challenge to prepare the existing airport infrastructure for the future needs of aviation regarding sustainability, e.g. for Sustainable Aviation Fuels (SAF) and the expected passenger growth.

In addition, new technologies and new types of operations, for example in the area of unmanned aircraft operations, will affect airport operations in terms of design and operations and will require new infrastructure. With regard to unmanned aircraft operations, the Agency will develop prototype technical specifications for 'vertiports' that will accommodate those operations in the future.

2.1.3.10 Drone operations

The EU drone market continues to grow rapidly, with drone services and operations materialising in numerous use cases. With a first EU regulatory framework already in place for drone operations in the 'open' and 'specific' categories, it is now important to successfully implement the EU's 'U-space' regulatory package and to complement the regulatory framework to enable operations of UAS and (manned) electric vertical take-off and landing (eVTOL) aircraft in the 'certified' category, including urban air mobility (UAM) applications.

COVID-19 had almost no noticeable effect on the development of UAS, drones and eVTOL aircraft. Several conceptual frameworks, platform architectures, methodologies and practical demonstrators continue to be developed at high pace across the EU. The COVID-19 crisis may have accelerated certain use cases of drones; for instance, in the medical sector for delivering samples and vital supplies to medical personnel, and for humanitarian aid and emergency/disaster response.

In the coming years EASA, contributing to the EC's wider 'Drone Strategy 2.0', will continue to foster the development of a drone ecosystem in Europe by further developing and supporting Member States' implementation of the common operations-centric, risk-based regulatory framework that addresses societal expectations related to environmental protection, safety, and cyber security.

15 https://aci.aero/2021/07/14/stark-impact-of-covid-19-on-global-traffic-persists-amid-improving-outlook/

16 aci-europe-events.org

17 https://asaworld.aero/media/1272/asa-open-letter-3-july-2020.pdf

2.1.4 Overview of the aviation organisations, personnel and products monitored

In order to carry out its Standardisation duties, the Agency collects information on the number of certificates, licences and declarations for various aviation domains. In addition to the general trends identified in the previous sections, the following table provides data on the number of organisations, aviation personnel and aircraft monitored in the EASA Member States. It compares 2019, 2020 and 2021[18].

Note: The below table considers SIS data collected in 2021Q4.

Item	2021 (Oct)	2020	2019
AIR OPERATIONS			
AOC (A)	635	583	595
AOC (H)	251	247	255
NCC (A+H)	452	454	490
SPO (A+H)	687	749	778
AEROPLANES	71 885	73 359	74 920
Annex I	15 002	14 914	15 308
CAT OPS	6 593	6 745	7 021
EU CofA	34 097	34 261	33 976
Valid ARC	16 193	17 439	18 615
HELICOPTERS	11 884	12 699	12 379
Annex I	2421	2 978	2 767
CAT OPS	2 115	2 034	2 010
EU CofA	4 653	4 673	4 521
Valid ARC	2 695	3 014	3 081
EASA flight crew licences	317 973*	237 316	225 303
Aeroplane licences	212 589*	183 125	179 562
Helicopter licences	17 536*	15 461	15 251
ATPL(A)	67 762	66 013	65 846
ATPL(H)	3 387	3 186	3 116
CPL (A)	44 161	41 334	39 015
CPL (H)	7 873	7 633	7 597
MPL	1 358	1 556	1 532
Other	87 848*	38 730	30 490
PPL (A)	99 330*	74 222	73 169
PPL (H)	6 276*	4 642	4 538
Approved training organisations (ATOs — flight crew)	1 353	1 304	1 368
FSTDs	900	1 051	981
AeMCs	87	84	86
AMEs	2 079	2 075	2 122

*Change in the statistical data collection in Germany in 2021 compared to previous years

18 Comparable data across the years (without UK data).

Item	2021 (Oct)	2020	2019
DESIGN AND PRODUCTION			
Part 21 approved design organisations (DOA)	323[19]	376	367
Part 21 approved production organisations (POA)	616	620	621
CONTINUING AIRWORTHINESS			
Part-145 approved maintenance organisations	1 613	1 600	1 597
Part M Subpart-F approved maintenance organisations	179	402	424
Continuing airworthiness management organisations	1 299	1 549	1 584
Part-147 approved maintenance training organisations	241	231	239
Part-66 EASA aircraft mechanic licences	62 799	60 155	54 343
AIR TRAFFIC MANAGEMENT/AIR NAVIGATION SERVICES			
Air traffic management / air navigation service providers	514	529	537
EASA licensed air traffic controllers	21 535	21 408	21 626
Air traffic controller training organisations	119	130	127
AERODROMES			
Aerodromes with more than 5 million passengers	43	74	73
Number of certified aerodromes within the EASA scope	392	402	398
Number of exempted aerodromes within the EASA scope	126	114	111
Number of heliports within the EASA scope	11	12	8
Movements in certified aerodromes	6 721 379	13 794 513	15 059 276
Movements in exempted aerodromes	752 826	836 107	974 918

Table 1: Overview of organisations, aviation personnel and aircraft monitored in EASA Member States

19 The drop in 2021 is due to the impact of BREXIT and the cancellation of all EASA DOAs located in the UK.

2.2 Global and Regional Plans and Programmes

The EPAS supports the objectives and priorities of the **Global Aviation Safety Plan** (GASP). The purpose of the GASP is to continually reduce fatalities and the risk of fatalities by guiding the development of a harmonised aviation safety strategy and the development and implementation of regional and national aviation safety plans. A safe aviation system contributes to the economic development of States and their industries. The GASP promotes the implementation of a State's safety oversight system by promoting a risk-based approach to managing safety as well as a coordinated approach to collaboration between States, regions and industry. One of the GASP goals is for States to improve their effective safety oversight capabilities and to progress in the implementation of SSPs. Thus, the GASP calls for States to put in place robust and sustainable safety oversight systems that should progressively evolve into more sophisticated means of managing safety. These objectives are mainly addressed in **Volume II Section 5.1**.

In addition to addressing systemic safety, the GASP addresses high-risk categories of occurrences, which are deemed global safety priorities. These categories were determined based on actual fatalities from past accidents, high fatality risk per accident or the number of accidents and incidents. The following high-risk categories were identified for the 2020-2022 GASP edition:

- controlled flight into terrain;
- loss of control in flight;
- mid-air collision;
- runway excursion; and
- runway incursion.

These are consistent with the key risk areas identified through the European SRM process[20]. The GASP global priorities are addressed in **Volume II** in the following **Sections: 6.1.1.1** Aircraft upset in flight, **6.1.1.2** Runway safety, **6.1.1.3** Airborne collision (mid-air collisions), and **6.1.1.4** Terrain collision.

The purpose of the **Global Air Navigation Plan** (GANP)[21] is to drive the evolution of the global air navigation system to meet the ever-growing expectations of all sectors in the aviation community by equitably accommodating all airspace user operations in a safe, secure and cost-effective manner while reducing the aviation environmental impact. To this end, the GANP provides a series of operational improvements to increase capacity, efficiency, predictability and flexibility, while ensuring interoperability of systems and harmonisation of procedures. The implementation of the GANP is enabled by promoting the effective implementation of safety oversight and a safety management approach to oversight, including SRM to permit innovation in a managed way. The European ATM MP addresses the priorities and objectives set in GANP (refer to **Section 2.3.1**).

The **European Aviation Safety Programme** (EASP) defines the aviation safety framework at European level. The objective of the EASP is to ensure that the system for the management of aviation safety in the EU delivers the highest level of safety performance, uniformly enjoyed across the whole Union, and continues to improve over time while taking into account other important objectives such as environmental protection. It explains the functioning of the European aviation system to manage the safety of civil aviation in the EU in accordance with the Basic Regulation.

In addition, it describes the processes, roles and responsibilities of the different actors and lays down general principles for European safety management, including safety action planning. The EASP functionally corresponds at EU level to the State Safety Programme (SSP) as described in International Civil Aviation Organization (ICAO) Annex 19 'Safety Management'. It is prepared by the EC, in consultation with Member States and EASA. An EASP update was initiated in 2021 and is expected to be delivered in 2022Q3.

20 EASA Annual Safety Review 2020 at https://www.easa.europa.eu/sites/default/files/dfu/easa_asr_2020.pdf

21 https://www4.icao.int/ganpportal

Since 2017 the ICAO Regional Office for the EUR/NAT region and EASA have been working together to develop a **Regional Aviation Safety Plan** (RASP) based on the EPAS, thus allowing all States that are part of the EUR/NAT region to benefit from this approach. The aim of the RASP is to facilitate the achievement of the GASP goals at a regional level. The first EUR RASP was issued in January 2019. This made EUR-NAT the first ICAO region having its RASP adopted. The second EUR RASP covering the period 2020-2022 was published in July 2020[22]. This second EUR RASP version is based on the EPAS 2020-2024 edition. Its reference period reflects the current GASP reference period 2020-2022. Work has been initiated to develop the third EUR RASP edition, in parallel with developing the EPAS 2022-2026. The EUR RASP further provides a set of EUR Safety Performance Indicators and targets derived from the GASP goals and targets. Safety performance monitoring within the scope of the European SRM process is more specifically addressed in **Section 4.1**.

To support the EUR-RASP planning process, the EPAS actions in Volume II provide references to corresponding GASP 2020-2022 Safety Enhancement Initiatives (SEIs) addressed to States or industry, covering both organisational challenges and operational risks. GASP SEIs addressed to the regions are considered implemented through EU Safety Management at large, as described in the EASP and implemented through the EPAS. Consequently, they are not specifically referenced in the EPAS.

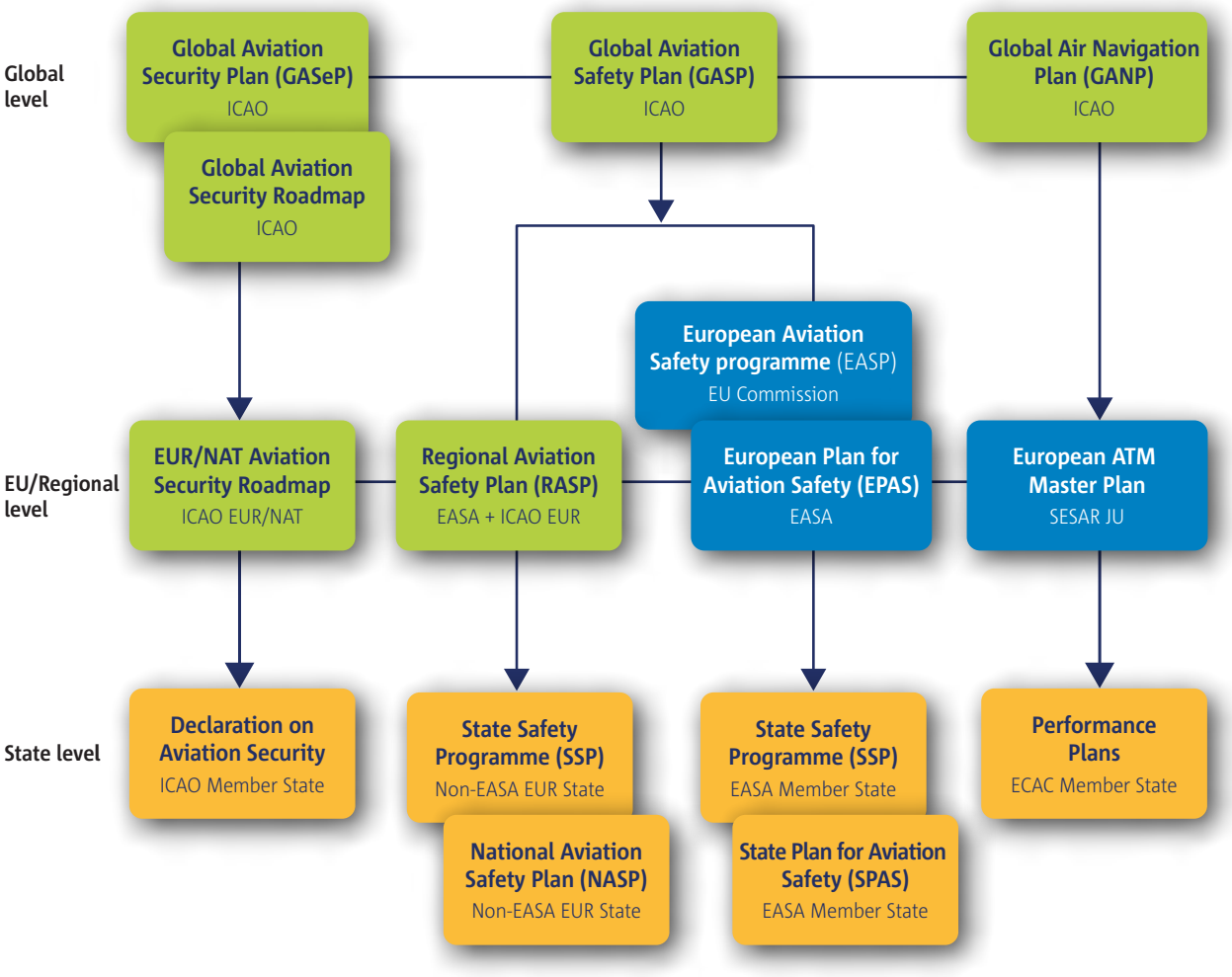


Figure 5: Relationship between the EPAS and other programmes and plans

22 EUR and NAT Documents (icao.int)

2.3 ATM priorities

2.3.1 The European ATM Master Plan (MP)

The **ATM MP**[23] is the main planning tool for setting ATM modernisation across Europe. It defines the development and deployment priorities needed to deliver the Single European Sky ATM Research (SESAR) of a fully scalable traffic management system capable of handling the growing air traffic. This MP is regularly updated, through strong collaboration between all ATM stakeholders, in order to respond to the evolving aviation landscape.

Considering Article 93(a) and (c) of the Basic Regulation which stipulate that the Agency shall, where it has the relevant expertise and upon request, provide technical assistance to the EC, in the implementation of the Single European Sky, in particular by conducting technical inspections, investigations and studies, as well as by contributing to the implementation of the ATM MP, including the development and deployment of the SESAR programme, alignment between the EPAS and the European ATM MP needs to be ensured.

This alignment requires the identification of those mature SESAR solutions that can mitigate related safety risks identified by the European aviation safety system, and the actions required to enable SESAR solutions.

In this context, in March 2021, EASA and the SESAR Joint Undertaking signed a Service Level Agreement (SLA). This SLA aims to ensure EASA's technical support in the implementation of the Single European Sky by contributing to the achievement of the European ATM MP, including the development and deployment of the SESAR projects needed to deliver the SESAR vision.

Commission Implementing Regulation (EU) 2021/116 of 1 February 2021[24] on the establishment of the Common Project One (CP1) supporting the implementation of the European ATM MP, amending Commission Implementing Regulation (EU) No 409/2013, addresses also the challenges of ATM modernisation. CP1 is a key contributor to the objectives of the EC's Sustainable and Smart Mobility Strategy by playing a critical role in decarbonising and digitalising ATM in Europe.

Furthermore, the signature of a Memorandum of Cooperation with EUROCONTROL in 2021 provides EASA and EUROCONTROL with the right instrument to collaborate on a long-term basis and reach the objectives of common interest in the fields of aviation safety, sustainable aviation and air traffic for the benefit of the aviation sector. To this end, the scope of the cooperation has been extended to a common digitalisation framework, which will boost the sharing of key aviation data sources between the two organisations and foster the collaborative development of data analytics as well as to the early on-boarding of EUROCONTROL as a technical partner of the Data4Safety Programme.

23 https://www.atmmasterplan.eu/

24 EUR-Lex - 32021R0116 - EN - EUR-Lex (europa.eu)

2.3.2 Future of the Single European Sky

In 2021 the EC issued the amended proposal on the implementation of the Single European Sky (the so-called SES II+ recast), proposing an upgrade of the Single European Sky regulatory framework and the EASA Basic Regulation, which comes on the heels of the European Green Deal.

Furthermore, to achieve the proposed goals for a 'Digital European Sky', the focus should be on a scalable system and on the development of digital technology and artificial intelligence (AI) that would allow for meeting the capacity on demand.

The proposal comes as the sharp drop in air traffic caused by the COVID-19 pandemic calls for greater resilience in air traffic management, by making it easier to adapt traffic capacities to demand. Not adapting air traffic control capacities would result in additional costs, delays and CO_2 emissions. Meanwhile, obliging pilots to avoid congested airspace, thus not allowing a direct flight path entails unnecessary CO_2 emissions, and the same occurs when airlines are taking longer routes to avoid charging zones with higher rates.

To secure both safe and cost-effective air traffic management services, the EC proposes actions such as:

- strengthening the European network and its management to avoid congestion and suboptimal flight routes;
- promoting a European market for data services needed for better air traffic management;
- streamlining the economic regulation of air traffic services provided on behalf of Member States to stimulate greater sustainability and resilience;
- developing digital technologies for a scalable and resilient network system — 'capacity on demand'; and
- boosting better coordination for the definition, development and deployment of innovative solutions.

The EC sent its SESII+ proposal to the Parliament and the Council for its first reading in September 2020. The Council's 'General Approach' was adopted on 3 June 2021. The SESII+ high-level objectives, such as strengthening the European ATM network management, establishing a European market for data services and ATM digitalisation based on new space-based systems, would call for further growing and stronger ATM oversight capabilities by EASA. At this stage it remains unclear what the outcome of those developments will be.

On the other hand, following the efforts put on mitigating the effects of the COVID-19 pandemic on the aviation industry and notably also on ANSPs, EASA continues to focus its efforts on supporting the return of aviation industry to normal operations. Regaining the previous scale of operations may still take considerable time, which may be used to prepare, in a constructive and forward-looking manner, for the 'new normal'.

In 2019 the Wise Persons Group on the future of the Single European Sky developed a set of 10 recommendations to enable additional ATM capacity in Europe, to be provided in a flexible and scalable manner, at reasonable costs, to deliver a more resilient ATM system, while continuing to ensure safety and security, as well as meeting environmental concerns. Thus, EASA wishes to use the time until the previous scale of operations is re-established to prepare for the new challenges the ATM industry will be facing and support the implementation of those changes with the best suitable regulatory and non-regulatory measures by e.g. simplifying the regulatory framework vis-à-vis future ATM needs and supporting the transition towards a more digital ATM environment.

In this context, EASA has identified the following recommendations as directly relevant for consideration in this and future EPAS planning cycles:

Recommendation 3: Implement a Digital European Sky based on an agreed roadmap building on the recommendations described in the Airspace Architecture Study (AAS)[25] managed by the Infrastructure Manager, ensuring resilience of the system.

25 https://www.sesarju.eu/node/3253

Recommendation 4: Create a new market for ATM data service providers as recommended by the AAS.

Recommendation 6: Facilitate the transition towards the Digital European Sky by reviewing current licensing and training requirements for ATCOs, with full involvement of staff representatives.

The AAS, complementing the Wise Person Group Report (WPGR), proposes a progressive transition strategy towards the Single European Airspace System in three consecutive 5-year periods, while building on known good practices and quick-wins, as well as existing initiatives such as SESAR.

In its initial analysis of the recommendations made both in the WPGR and in the AAS, EASA identified three main rulemaking topics:

- ATCO mobility and training (WPRG Recommendation 6, AAS Recommendation 2);
- Cyber resilience (WPRG Recommendation 3); and
- Evolution of the ATS common requirements & airspace architecture (WPRG Recommendations 3 and 4, AAS Recommendation 1).

In the context of the first topic, considering that these developments are also expected to allow more flexibility in the use of the ATCO resources, EASA aims to assist stakeholders in fully exploiting the current regulatory framework and in lifting all obstacles to enable new technologies and operational concepts, while maintaining a high level of safety. Ensuring a more harmonised level of training output, fostering the use of synthetic training devices and enhancing the mobility are amongst the envisaged goals. The experience gained during the pandemic has raised the need to consider distance learning and the use of new digital instructional means in a harmonised manner. A dynamic cross-border sectorisation can also enable the change towards a system-driven training and licensing that would allow the ATCOs to provide services outside the 'traditional' sector arrangements. Therefore, EASA will complement the already established regulatory tasks with non-regulatory actions in the form of a specific ATCO Action Plan.

The second topic is directly relevant for RMT.0720 'Management of information security risks', while the third topic will be dealt with through RMT.0719 'Regular update of air traffic management/air navigation services rules' as the proposal addresses the creation of a distinct layer of ATM/ANS services for the creation of a new market within SES for ATM data service providers (ADSPs). Finally, the relevant WPRG and AAS recommendations that could not be addressed by the already referenced RMTs can be implemented through RMT.0682 'Implementation of the regulatory needs in support of the SESAR deployment'. **The details of these RMTs may only be determined on the basis of an agreed implementation roadmap that is still subject to further definition.**

The European-wide harmonised implementation of the AAS architecture requires actions from many actors. The envisioned end result can only be achieved if all actions are taken in the right order. Not only the synchronisation between regulatory evolution and technical/operational evolution is key, but also interdependencies between various actions need to be respected within the technical/operational evolution and the involvement of Member States needs to be ensured.

The AAS proposes four high-level milestones for the 2025-2030 time horizon:

- Implement virtual centres and dynamic airspace configuration at large scale;
- Gradual transition towards higher levels of automation;
- Capacity-on-demand arrangements implemented across Europe; and
- New ATM data service provision model is implemented across Europe.

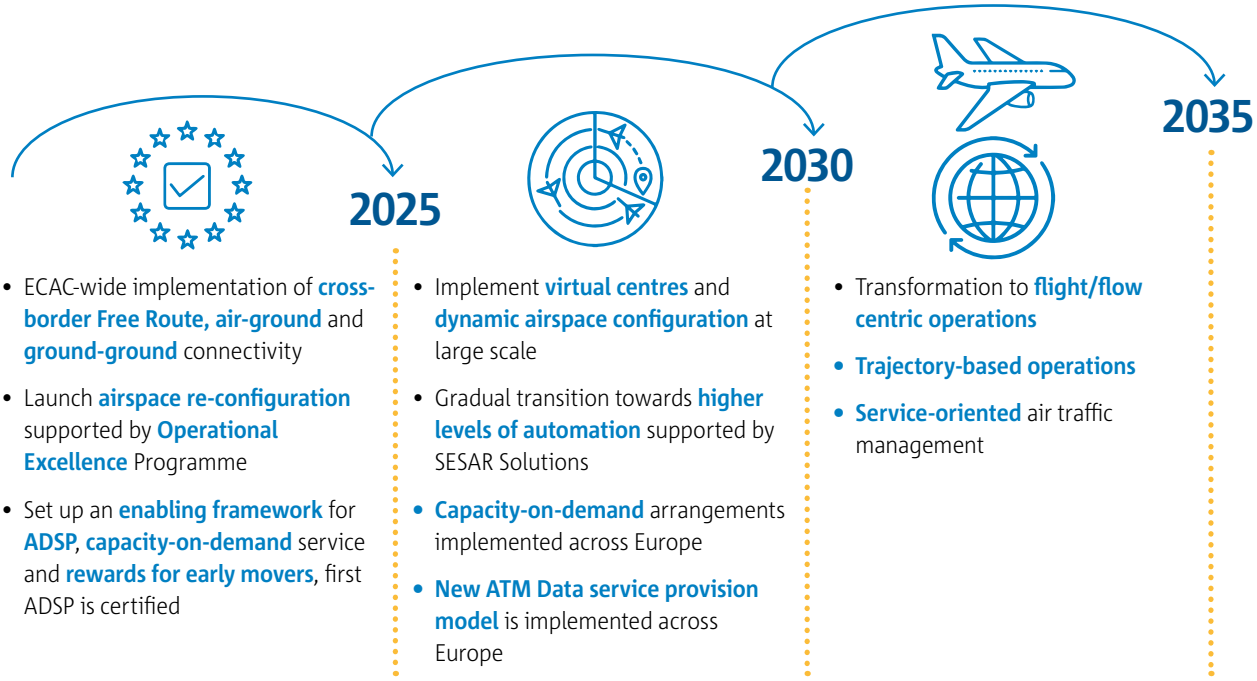


Figure 6: Airspace architecture transition strategy

AAS milestone	EASA action	Remarks
Implement virtual centres and dynamic airspace configuration at large scale	✓ Development of the amendment of Regulation EU 2017/373 in order to introduce the ADSP common requirements (e.g. new Part-ADS) after SES 2+ adoption ✓ EASA is currently developing the future rules on conformity assessment (RMT.0161) ✓ Regular update of air traffic controller licensing rules (IRs and AMC & GM) RMT.0668 Sub-task 6 ✓ Information security/Cyber security (RMT.0720) Standardisation: ✓ EUROCAE Working Group 122 Virtual Centre	Building on the new ATM data service provision model, the virtual centre is a key enabler for the resilience of the ATM system. Dynamic management of airspace would bring benefits when deployed and further benefits when coupled with optimised airspace organisation and attributes on how to commonly manage airspace. Both SESAR solutions are expected to be delivered through the SESAR 2020 programme.
Gradual transition towards higher levels of automation	✓ AI roadmap ✓ Support SESAR solutions on ATCO automation ✓ Information security/Cyber security (RMT.0720)	In the context of the SESAR 2020 programme, further automation solutions will gradually be made available before 2024. SESAR is researching how to overcome limitations of controller training and licensing in complex airspace by expanding the number of sectors that a controller can be validated for by providing automation support so that controllers' in-depth knowledge of the local area can be progressively complemented by the system. For instance, research is investigating how to validate controllers to work with a specific system and traffic complexity, regardless of the geographical area where the service is delivered.

AAS milestone	EASA action	Remarks
Capacity-on-demand arrangements implemented across Europe	✓ Development of the amendment of Regulation EU 2017/373 in order to introduce the ADSP common requirements (e.g. new Part-ADS) after SES 2+ adoption ✓ EASA is currently developing the future rules on conformity assessment (RMT.0161) ✓ Regular update of air traffic controller licensing rules (IRs and AMC & GM) RMT.0668 Sub-task 6	Capacity on demand is a complementary service enabling solidarity and cooperative mechanisms between Members States and their designated ANSP to provide additional capacity through re-allocation of controller resources and therefore allowing operations of a more resilient and performing aviation system while keeping a network-centric approach. The service relies on the new ATM data service provision model. The extension of capacity on demand and remote service provision functionalities, e.g. through virtual centres, in a static or dynamic manner, on a large or even systematic scale requires that a number of regulatory issues be addressed and that regulatory initiatives be taken and achieved. This includes the Network Manager capabilities to evolve in relation to management of an enhanced demand-capacity balancing process and capacity-on-demand management; oversight of the ATSP providing remote services; ATCO qualification and licensing; and finally an appropriate cost and pricing mechanism to be harmoniously integrated within the existing charging scheme avoiding double charging of the same costs.
New ATM data service provision model is implemented across Europe	✓ Development of the amendment of Regulation EU 2017/373 to introduce the ADSP common requirements (e.g. new Part-ADS) after SES 2+ adoption ✓ EASA is currently developing the future rules on conformity assessment (RMT.0161) ✓ Regular update of air traffic controller licensing rules (IRs and AMC & GM) under RMT.0668 Sub-task 6 ✓ Publication of Opinion No 03/2021 on management of information security risks	The need to access to data services supporting the new architecture will lead to the emergence of new actors. ADSPs will in that timeframe play an important role in supporting the transition towards a more resilient ATM system. The creation of ADSPs to serve any ATSP within Europe is expected to require certification of the ADSP.

Table 2: Airspace Architecture Study milestones

Furthermore, EASA aims to further develop the ATM regulatory framework to remove obstacles and enable the efficient recognition of new operational and technical improvements while maintaining a high level of safety. This will be achieved by creating a clear, consistent/harmonised and rationalised set of requirements, which creates a presumption of conformity with the essential requirements, in particular in terms of safety, seamless operation and performance for use by all stakeholders. Enhancing the level of harmonised system requirements at Union level would result in better efficiency and lower costs for system procurement and maintenance as well as in improved interoperable operation.

2.4 How the EPAS is developed

The EPAS covers a 5-year time frame. In line with Article 6(1) of the Basic Regulation, the EPAS is updated on a yearly basis. Hence, the EPAS is developed as a rolling 5-year plan in close cooperation with stakeholders, drawing increasingly from an evidence-based approach.

The development of the EPAS relies on dedicated stakeholder groups, in particular:

- the Member States' Advisory Body (MAB) that provides advice on strategic priorities;
- the Stakeholders Advisory Body (SAB) that reviews strategic orientation and performance indicators from an industry perspective; and
- the Technical/Sectorial Bodies (TeB, TeC, Sectorial Committees representing Member States and industry respectively) that provide technical and operational advice as well as feedback on implementation.
- The CAGs support the development of the Safety Risk Portfolios in Volume III.

The standard EPAS programming cycle foresees two distinct phases, each with a dedicated stakeholder consultation.

- During the first phase, the priorities derived from the EU Aviation Strategy (see **Chapter 3**) and safety priorities determined through the European SRM process are discussed and confirmed with the EASA ABs. MAB and SAB take the lead in consolidating inputs from their domain sub-committees and provide EASA with the Member State/industry views on the priorities.
- Based on these priorities agreed/confirmed with the EASA ABs, the planning milestones for individual EPAS actions are defined or updated in line with the EASA Single Programming process. A draft EPAS composed of Volumes I and II is then developed and provided to all ABs for detailed comments.

Note: Strategic priorities will be subject to a full review during the 2022 EPAS planning cycle.

The safety priorities feeding this edition were confirmed on the basis of key risk areas determined through the European SRM process (cf. ASR 2021).

Following the AB consultation and analysis of comments, the final draft EPAS is consolidated and Volume III included. This Volume is developed through the European SRM process, it is not subject to AB consultation. The final draft EPAS composed of all three Volumes is then presented for approval to the EASA Management Board (MB). Following its formal approval by the MB, it will be published on the EASA website[26].

More information on the EPAS development, including the application of the EC Better Regulation principles and information on the various groups having a role in the EPAS development can be found here:

- https://www.easa.europa.eu/sites/default/files/dfu/how_epas_is_developed.pdf
- https://www.easa.europa.eu/sites/default/files/dfu/Working groups and Bodies having a role in EPAS.pdf

26 https://www.easa.europa.eu/easa-and-you/safety-management/european-plan-aviation-safety

2.5 How the EPAS is structured

The EPAS comprises three distinct volumes with sequential page and chapter numbering:

- **Volume I** provides the executive summary as well as an introduction including information on the operational context and describes the strategic priorities. It consists of **Chapters 1** to **4**.
- **Volume II** contains the detailed list of EPAS actions. It consists of **Chapters 5** to **16** and a number of Appendices.
- **Volume III** provides the overview of the main safety risks affecting the European aviation system in the form of key risk areas (KRAs) and domain Safety Risk Portfolios. It consists of **Chapters 17** to **24**.

The three volumes are complemented by a number of supporting documents providing further details or assisting the reader, available on the EASA website[27] (refer to Section 2.4).

Volume I

Volume I provides an executive summary with the main highlights of each edition. This is followed by an introductory chapter (Chapter 2) where the link with other planning documents at European and global level as well as the operational context in which EPAS actions are to be deployed are explained.

The overall structure of **Chapter 3 'Strategy'** is described below.

Section 3.1 'Strategic priorities' addresses the following priorities:

- 3.1.0 Safe return to operations
- 3.1.1 Systemic safety
- 3.1.2 Operational safety
- 3.1.3 Safe integration of new technologies and concepts
- 3.1.4 Environment

Section 3.2 'Update on the Basic Regulation Roadmap' provides information on priorities guiding the implementation of the Basic Regulation, initiated with the EPAS 2019-2023.

Chapter 4 Performance provides key indicators for EPAS monitoring including:

- 4.1 Safety performance (with reference to the ASR)
- 4.2 Environmental performance (with reference to the EAER)

Note: Former Section 4.1 'Key indicators in terms of EPAS actions (and action completion)' is moved to Volume II (Appendix D).

Volume II

The structure of Volume II reflects the various domains defined within the European SRM process to provide a link with the corresponding safety data portfolios included in the ASR and the Safety Risk Portfolios in Volume III. The structure also facilitates the identification of actions relevant for different stakeholder groups:

- All systemic safety & competence of personnel issues are grouped within **Chapter 5** which is further subdivided to address the various action areas.

27 https://www.easa.europa.eu/document-library/general-publications/european-plan-aviation-safety-2021-2025

- All actions other than those related to systemic safety & competence of personnel, corresponding to drivers 'safety', 'level playing field' and/or 'efficiency/proportionality' are grouped per **domain** (see **Chapters 6** to **15**). Within each of those chapters, actions are grouped per driver. For the driver 'safety', a further grouping per key risk area is applied where a significant number of actions is included (this concerns **Chapters 6** and **8** mainly).
- Regular update RMTs are included in the respective **domain** chapter.
- All actions corresponding to the driver 'environment' are included in a separate **Chapter 16**.

The below provides an overview of the Volume II structure:

Chapter	Title
5	Systemic safety & competence of personnel
6	Flight operations — aeroplanes (CAT & NCC)
7	Rotorcraft
8	General Aviation[28]
9	Design and production
10	Maintenance and continuing airworthiness management
11	Air traffic management/air navigation services (ATM/ANS)
12	Aerodromes
13	Groundhandling
14	Unmanned aircraft systems and manned eVTOL aircraft
15	New technologies and concepts
16	Environmental protection

Within each chapter/section, actions are grouped per EPAS action type (RMT, SPT, RES, EVT, MST) and within each action type, they are listed in ascending order of the unique EPAS action reference number.

Where an action is relevant to more than one domain, its full description is included in the main domain Chapter, and a reference to it is added in the other domain Chapter(s).

Example:

An action for flight crew training in the rotorcraft domain is included with its full description in **Section 5.3** 'Competence of personnel'. In addition, a reference to it is provided in **Chapter 7** 'Rotorcraft'.

Appendices to Volume II

The EPAS Volume II is complemented by seven appendices with additional information in support of or for easy access to the information provided in Volumes I, II and III:

- Appendix A: Deliverables published in 2021
- Appendix B: Deliverables expected in 2022
- Appendix C: Overview of new actions, deleted actions, actions on hold and completed actions
- Appendix D: Key indicators in terms of EPAS actions
- Appendix E: Best Intervention Strategies overview
- Appendix F: Transposition of ICAO Standards and Recommended Practices (SARPs) in 2021
- Appendix G: Index

More information on the types of EPAS actions and the corresponding action templates can be found here:

– https://www.easa.europa.eu/sites/default/files/dfu/EPAS action types and templates.pdf

28 Non-commercial operations with aeroplanes with MTOMs below 5 700 kg, all operations with balloons and sailplanes.

Volume III

Volume III as included with the EPAS 2021-2025 is structured in accordance with the Safety Risk Portfolios as follows:

Chapter	Title
17	Introduction: The basis of EPAS safety mitigations
18	COVID-19
19	Aerodromes and groundhandling
20	ATM/ANS
21	Commercial air transport — aeroplanes (CAT A)
22	Human factors / human performance
23	Non-commercial operations — small aeroplanes
24	Rotorcraft

Within Chapters 18 to 24, safety issues are listed in alphabetical order thus not expressing any order of priority.

2.6 How the EPAS is monitored

Section 4.1 presents an outline for EPAS safety performance metrics reflecting the EPAS strategic priorities in the area of safety and the high-level safety objective set out in the Basic Regulation to 'establish and maintain a high uniform level of civil aviation safety in the Union'. Operational safety performance is monitored on the basis of the indicators set out in the ASR.

The efficiency of actions included in the EPAS in relation to environmental protection will continue to be monitored as part of the EAER (refer to **Section 4.2**). A new EAER will be published in 2022.

In accordance with Chapter II of the Basic Regulation, Member States are required to develop a SPAS, taking into consideration the actions they own in the EPAS and providing justifications when such actions are not considered relevant to them. These actions are identified as 'MST' actions.

Accordingly, SPAS remains the primary tool for Member States to report on action implementation. States are expected to review their SPAS at least annually and where their SPAS is not updated annually, to maintain records on the implementation of relevant EPAS actions, including justification where such actions are not considered relevant. SSP implementation, including the processes and outcomes of safety action planning at State level, will be monitored as part of the EASA Standardisation activities, formally starting in 2022.

In the near future, additional mechanisms to monitor action implementation may be provided in the context of the EUR RASP monitoring. For the remaining EPAS actions (RMT, SPT, RES and EVT), feedback on implementation is regularly provided during AB meetings. Most of the deliverables planned in the EPAS are published on the EASA website (see rulemaking process[29], safety promotion[30], research projects[31] and evaluation of rules[32]).

29 https://www.easa.europa.eu/document-library/rulemaking-process-overview
30 https://www.easa.europa.eu/document-library/safety-promotion
31 https://www.easa.europa.eu/document-library/research-projects
32 https://www.easa.europa.eu/document-library/general-publications?publication_type%5B%5D=2481

3. Strategy

3. Strategy

The COVID-19 pandemic, while first and foremost a humanitarian and public health crisis, is having unprecedented repercussions for the entire aviation sector. The economic impact of the crisis exceeds any of the events that had affected aviation in the past. Industry is still faced with a dramatic economic downturn and the path to a full recovery is conditional to a number of variables. Authorities and organisations have been experiencing significant strain for more than a year now owing to the multiple implications of this unprecedented crisis. Various sources provide projections on how the aviation sector may look like, once the spread of the virus is under control, borders will be open again and the public will be massively returning to travel by air. Still, it is expected that pre-pandemic traffic volumes may only materialise towards the end of 2023/early 2024 based on the most optimistic scenario.

According to EUROCONTROL, network flights had been stable since January 2021 at around minus 64 % compared to 2019, reaching minus 48 % for the period from 1 to 23 June 2021 (compared to the same period in 2019). While traffic clearly increased over the of summer 2021 with two-digit rises, this is largely due to lifting of restrictions within Europe over the holiday period. Compared to the reference year of 2019, traffic levels remain significantly subdued[33].

Accordingly, a new focus area within the strategic priorities is proposed to enable a safe and secure return to operations. Strong focus on aviation safety and awareness of possible trade-offs between survival/profitability and safety remain essential. This new focus area is included as 3.1.0 'Safe return to operations' to not affect the numbering of the existing elements in Section 3.1 and more importantly, to signal that this focus area may be removed from the EPAS once the specific risks emerging from the pandemic have been sufficiently mitigated and the aviation system reverts back to 'normal operations'.

3.1 Strategic priorities

3.1.0 New focus area: Safe return to operations

The COVID-19 pandemic resulted in an extreme reduction in operations that began in late March 2020. Recovering from this crisis without adversely affecting the high level of safety performance is proposed as a new mid-term EPAS strategic priority with consideration of the projections that full recovery may take 3 more years as a minimum.

In addition to the specific operational risks stemming from the crisis, there are currently a substantial number of exemptions and extensions granted; however, the use of flexibility provisions is diminishing. Overall, an erosion of the existing safety margins can be observed at all levels (refer to the latest Agency's COVID-19 Safety Risk Portfolio published in April 2021[34]). That means that the aviation system in 2020 and 2021 was not the same as the one which was operating previously and any perception of what can safely be achieved should be challenged. With the complex aviation system now in a state of significant change for more than a year, it is also likely that the system, when it returns to its normal capacity, will operate differently to that observed in 2019. For instance, within competent authorities and organisations, individuals may have changed roles, others may have had very different experiences and the supply chain may have been completely reconfigured. The connections between organisations and thus between the different elements in the system will have been broken and rebuilt differently. This means that all risk profiles, risk pictures and risk assessments reflecting the pre-pandemic situation require an in-depth review.

33 covid19-eurocontrol-comprehensive-air-traffic-assessment-2462021.pdf

34 https://www.easa.europa.eu/document-library/general-publications/review-aviation-safety-issues-arising-covid-19-pandemic-0

Accordingly, in 2020 EASA surveyed the Member States and industry partners to identify the new or emerging aviation safety issues arising as a result of the pandemic. Those issues that were considered to constitute the highest risk to the aviation system were assessed in detail across the summer of 2020. This detailed assessment resulted in a number of safety interventions and the publication of guidance material to support stakeholders with the management of the specific risks posed by the crisis. EASA's RNO project contributed to ensuring effective coordination among the various initiatives taken at regional, national or industry level. Most of these initiatives did not qualify for a formal EPAS action. The resources and guidance documents developed by EASA to support the aviation stakeholders with specific challenges that have arisen during the pandemic can be found on the EASA COVID-19 Resources webpage[35].

Taking into consideration the ongoing impact of the pandemic on the aviation system, there was an update in the identification of new or emerging safety issues resulting from the crisis, and the Agency published a revised COVID-19 Safety Risk Portfolio in April 2021. In addition to this work with Member States and industry partners, the occurrence data reported since March 2020 was reviewed, alongside with information regarding the number of exemptions in place in the European regulatory system. Together, these different sources of information provide a picture of the safety situation in European aviation. While a drastic reduction in traffic volumes occurred, it is important to bear in mind that for some parts of the industry workload has in fact intensified. This creates a situation where the risk profile for each Member State and organisation is very different to that of the system as a whole. In both 2020 and 2021, the overarching theme in relation to the safety issues identified in the COVID-19 Safety Risk Portfolio was the need for well-functioning management systems to identify and manage risks effectively. Whether the issue is a specific problem faced by one domain or a human factors' issue that affects all aviation personnel, it is vital that all actors focus on the goal of delivering safe operations throughout the recovery phase.

The duration of the pandemic also means that some of the safety issues identified in 2020 have been exacerbated. These include issues such as the risk of skills and knowledge degradation due to lack of recent practice, the well-being of aviation professionals, the impact of the long-term storage of aircraft and the overall effects of reduced finances on safety including loss of suppliers and the loss of operational and technical staff. Additional consideration must be given to circumstances where organisations will be working under time pressure to return their aircraft to service as well as to issues with supply chains' effectiveness.

Such supply chain aspects or the unavailability of parts bear the risk of cannibalisation, robbery of parts or the use of unserviceable or unapproved parts (refer to Volume III SI-5011). The following may support mitigation of the related risks:

- Guidelines: Return to service of aircraft from storage in relation to the COVID-19 pandemic[36]; and
- If outside the organisation: Suspected Unapproved Parts (SUP)[37]

New safety issues were included, such as an increase of cyber security issues related to the pandemic situation, because in organisations operating with reduced staff the capability to detect and react to cyberattacks may be reduced.

35 https://www.easa.europa.eu/easa-covid-19-resources

36 Guidelines: Return to service of aircraft from storage in relation to the COVID-19 pandemic | EASA (europa.eu)

37 Suspected Unapproved Parts (SUP) | EASA (europa.eu)

The systemic and operational safety issues identified and further described in the updated COVID-19 Safety Risk Portfolio are categorised under the following broad headings:

The safety issues identified in the updated COVID-19 Safety Risk Portfolio as bearing the highest risk are:

- Skills and knowledge degradation due to lack of recent practice (all domains)
- Reduced adherence to procedures in the new working environment (all domains)
- Crew fatigue due to unavailability of rest facilities and/or extended duty period
- Transfer of crews from one fleet to another resulting in low hours on type
- Extent and duration of COVID-19 exemptions and temporary rules
- Unusual approach profiles in the circumstances of the pandemic
- Increase in the scale and nature of global cyber security attacks exacerbated by issues related to the pandemic (all domains).

Throughout 2020 and 2021, in the context of the RNO project[38], EASA worked closely with Member States and industry partners to identify and assess the new or emerging safety issues induced by the COVID-19 pandemic and the resulting extreme reduction in operations. This led to the identification of many different safety issues across a wide range of operational activities, with a significant safety management and human factors component[39] . In recognition of those, EASA published a series of guidelines including on the role of operators' management systems in the COVID-19 recovery phase[40] and organised a Safety week for the ramp-up of operations to highlight the importance of a resilient management system and discuss the most significant risks to mitigate, including those linked to human performance. Moreover, ICAO also published a Handbook for CAAs on the Management of Aviation Safety Risks related to COVID-19 (Doc 10144[41]). In acknowledgment of the need for specific medium-term actions supporting the various safety initiatives already in place to ensure a safe return to operations, this EPAS edition includes one amended (MST.0028) and two new actions (SPT.0122 and MST.0039).

Key actions:

- Continued support to the aviation industry through COVID-19-related guidance and advice
- Safety promotion campaign 'Post COVID-19 Ramp-Up – Be Ready, Stay Safe' (new SPT.0122)
- Member States to update their State safety risk picture/risk portfolio and adapt oversight accordingly to cope with the risks posed by the pandemic (MST.0028)
- Member States to ensure their safety promotion reflects the need for a safe COVID-19 Ramp-Up (new MST.0039).

38 https://www.easa.europa.eu/the-agency/coronavirus-covid-19

39 https://www.easa.europa.eu/sites/default/files/dfu/review_of_aviation_safety_issues_from_covid-19_final_0.pdf

40 https://www.easa.europa.eu/sites/default/files/dfu/EASA%20Guidelines_Role%20of%20operators%20MS%20in%20COVID-19%20recovery%20phase%20Issue%202.pdf

41 https://www.icao.int/safety/SafetyManagement/Pages/COVID-19-Safety-Risk-Management.aspx

Most of the activities in the various work streams of the RNO project are now being handled as part of EASA's established processes, which have also evolved in order to adjust to the new realities. The RNO project concluded at the end of 2021 but its legacy will continue as part of the daily and future work of the core activities. As highlighted above, the various safety issues identified are now being assessed as part of the European SRM process, and some have already resulted in new initiatives, such as the 'Ramp-Up – Be ready, Stay Safe Campaign'. EASA will continue to address the interface between aviation and public health, until the pandemic will subside, in the context of EASA's emerging priority on health matters.

3.1.1 Systemic safety

3.1.1.1 Improve safety by improving safety management

Despite the fact that the last years have clearly brought continued improvements in safety across every operational domain, the latest accidents and serious incidents and the massive worldwide impact of the COVID-19 pandemic on the aviation system underline the complex nature of aviation safety and the significance of addressing human and organisational factor aspects.

Effective safety management including robust risk management policies and processes are essential in dealing with the multiple impacts of the pandemic on the aviation system, both at authority and organisation level. This is supported by ICAO Annex 19 and Regulation (EU) No 376/2014[42] on the reporting, analysis and follow-up of occurrences in civil aviation and when applicable, by flight data monitoring (FDM) requirements[43].

Examples of new safety issues identified as part of the dedicated COVID-19 risk assessment

- **SI-5003 Skills and knowledge degradation due to lack of recent practice**
  The 90 % reduction in traffic means that most aviation professionals are not performing their normal tasks, sometimes they are doing a substantially different job, and sometimes they are not working at all or at a substantially reduced frequency. Simulator and classroom-based training has also not been taking place. Together, this results in a reduction in the skills and knowledge of aviation professionals and poses safety risks.
- **SI-5008 Risk assessments based on previous normal operations no longer valid**
  Risk assessments performed by organisations and authorities are made in the context of specific operations and operating environments. The substantially changed and still-changing operating environment and the addition of 'new' types of operations mean that most risk assessments are no longer valid.
- **SI-5005 Restarting a complex system is challenging**
  The aviation system is highly interconnected, sophisticated and made up of people and technology, meaning that the consequences of shutdown and restart are not completely predictable. Organisations will need to prepare good communications and decision-making strategies, using personnel expertise, data, information and good internal and external coordination.
- **SI-5009 Reduced focus on, or prioritisation of safety**
  Multiple signals indicate that organisations may not be providing safety and safety management with the same level of attention and resources as was previously possible. These include stress at an individual level, dismissal or furlough of staff, and economic pressures. Focusing too much on returning to service and economic survival may reduce the minimum needed level of resources as well as the emphasis on human and organisational factors, to the detriment of safety.

42 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0376&from=EN

43 In particular, Regulation (EU) No 965/2012, Part-ORO, ORO.AOC.130 and Part-SPA, SPA.HOFO.145.

Key actions:

- Complete the introduction of safety management requirement into the initial and continuing airworthiness domains (RMT.0251) and support their implementation.
- Support States in implementing State Safety Programmes (MST.0001) and States Safety Plans (MST.0028).
- Encourage international harmonisation of SSP/SMS implementation and human factors/human performance principles (MST.0002 and SPT.0057).
- Encourage better implementation of FDM programmes by operators (SPT.0112, SPT.0113 and MST.0003) and update the AMC & GM to FDM rules (RMT.0392).
- Support the implementation of a robust oversight system across Europe (MST.0032).

See **Volume II Sections 5.1, 5.6** and **6.1**.

3.1.1.2 Human factors and human performance

EASA collects data and information relating to human factors and human performance from various sources, including through occurrence reports, feedback from stakeholders, the experts in the Human Factors CAG (HF CAG) and other regulatory and oversight activities.

Within the HF CAG EASA assesses such information to identify safety issues and determine the contribution of human factors and human performance to the various key risk areas.

Note: The EASA ASR[44] includes specific data relating to human factors and human performance in the domains of aeroplanes, helicopters, balloons, sailplanes, aerodromes and ATM/ANS.

As the aviation system changes, it is imperative that we ensure that human factors and the impact on human performance continue to be taken into account, both at service provider and regulatory levels. Resilience and a Safety-2 approach, where the number of intended and acceptable outcomes is as high as possible, shall be introduced alongside the Safety-1 approach.

'Human factors' and 'human performance' are terms that are sometimes used interchangeably. While both human factors and human performance examine the capabilities, limitations and tendencies of human beings, they have different emphases:

- Human factors (HF) — is concerned with the application of what we know about human beings, their abilities, characteristics and limitations, to the design of equipment they use, environments in which they function and jobs they perform[45].
- Human performance (HP) — refers to how people perform their tasks. HP represents the human contribution to system performance[46].

In 2019 the HF CAG prioritised a series of safety issues for a more in-depth analysis. These issues are systemic safety issues. Other CAGs address safety issues that also have HP elements[47]. In addition to this regular process, various human factors and performance aspects, including fatigue, are being addressed within the dedicated Safety Risk Portfolios created following the identification of COVID-19-related safety issues.

An overview of issues identified as part of the regular European SRM process, as well as the dedicated COVID-19 review, together with their current status, is included below:

44 https://www.easa.europa.eu/sites/default/files/dfu/easa_asr_2020.pdf

45 Human Factors and Ergonomics Society, 2008.

46 ICAO Doc 10151, Human Performance (HP) Manual for Regulators.

47 As a result, the HF CAG also provides expertise to assess HF-related safety issues identified by the other CAGs.

Safety issue assessments complete:

- **SI-3003 Human factors competence for regulatory staff**

  Without HF competencies, regulators cannot adequately oversee HF implementation in the aviation industry.

- **SI-3007 Design and use of procedures**

  It is imperative for procedures to be designed so that they are usable, but this is increasingly difficult in the context of a complex system.

The related safety issue assessments had been addressed in the BIS 'Human Factors competence for regulatory staff' and 'Design and use of procedures' respectively. The first BIS resulted in the inclusion of two new EPAS actions in the last EPAS edition:

- SPT.0115 **Provide Member States with a basis for training their staff in Human Factors**
- MST.0037 **Foster a common understanding, regulation and oversight of Human Factors**

The second BIS is still pending to be sent for consultation.. A number of new actions are proposed, mainly for safety promotion and research. Once confirmed, they will be included in the EPAS .

COVID-19-related safety issues

New HF safety issues were identified as part of the dedicated COVID-19 risk portfolio. The results of the in-depth analysis of these issues led to the development of short-term mitigation actions not qualifying for inclusion in the EPAS. More systemic issues or issues that are expected to remain in the medium to long term will be addressed as part of the regular European SRM process.

These COVID-19-related HF safety issues and corresponding mitigation actions are described below:

- **SI-5002 Aviation personnel fatigue**

  With redundancy and furlough reducing the available number of personnel, those left working may have to work additional hours. The preparation for and eventual return to (new) normal operations will require significant additional effort in comparison with actual normal operations, in particular from the operators and national competent authorities (NCAs). These may both contribute to rising levels of fatigue that need to be effectively mitigated by the operators and overseen by the NCAs.

  For this specific safety issue, the following resources are available:

  – Fatigue Management | EASA Community (europa.eu)

  – Flight Time Limitation - temporary exemptions under Article 71(1) of the Basic Regulation | EASA (europa.eu)

- **SI-5003 Skills and knowledge degradation due to lack of recent practice**

  Refer to Section 3.1.1.1 or Volume III for the full text of this SI.

  For this specific safety issue, the following resources are available:

  – https://www.easa.europa.eu/community/topics/skills-and-knowledge-degradation

- **SI-5006/5007 Decreased well-being of aviation professionals during shutdown**

  The pandemic is a significant source of anxiety, stress and uncertainty for almost everyone. Worries about unemployment for aviation staff and their relatives may be exacerbated. During the shutdown, with people working from home and therefore isolated from normal support, the personal well-being of professionals is likely to have suffered. For those working, this may lead to task distraction/interruption, workload/task saturation, instructions or requirements not followed. Regardless of whether personnel are working, are employed, furloughed or unemployed, we have a duty of care to support the wellbeing of aviation professionals.

Personnel will be returning to duty with a higher-than-normal psychological stress, potentially reducing staff performance and increasing safety risks. Organisations and authorities need to understand and develop strategies to mitigate these risks.

For these two safety issues, EASA has created a well-being resource hub to support aviation professionals throughout the pandemic and beyond:

– https://www.easa.europa.eu/community/content/wellbeing

Specific information about personal well-being can be found in the section 'Looking after yourself'.

– https://www.easa.europa.eu/community/content/information-looking-after-yourself

Another section of the well-being hub provides information on 'Managing others'.

– https://www.easa.europa.eu/community/content/managing-others

There is also a range of career support material in the section 'Managing the impact on your career'.

– https://www.easa.europa.eu/community/content/managing-impact-your-career

Further information on all HF/HP safety issues can be found in **Volume III**.

3.1.1.3 Competence of personnel

As new technologies and new business models or operational concepts emerge on the market and the complexity of the system continues to increase, it is of key importance for aviation personnel to have the right competencies and for training methods to be adapted to cope with new challenges, such as COVID-19.

It is important to recognise the positive contribution that aviation professionals can make in restarting a complex system. The ICAO Handbook for CAAs on the Management of Aviation Safety Risks related to COVID-19 (Doc 10144) advises the following:

'Identifying interfaces and establishing channels for communication provides access to expert opinion, which is valuable in understanding the available information in a dynamic situation. Responding under a crisis situation may require qualitative decision-making using a risk management approach and asking practical questions (e.g. What supporting evidence is available? What are the consequences of alternative options? How will delays in decisions impact? What is the risk tolerability for the specific situation? What are the available resources?).'

It is equally important for aviation personnel to take advantage of the opportunity presented by new technologies to enhance safety.

The safety actions related to aviation personnel are aimed at introducing competency-based training for licences and ratings and at facilitating the continued availability of competent personnel in NCAs. The Agency shall take due account of requests to introduce competency-based training and assessment (CBTA) for all categories of aviation personnel to whom the concept is addressed: aircraft maintenance personnel, pilots, ATCOs, air traffic safety electronics personnel (ATSEP) and flight operations officers. A phased approach to gradually reach the level of maturity required for the full implementation has been adopted. Moreover, for ATCOs, the existing European' performance objective is structurally very similar to an ICAO competency unit. The safety actions for the introduction of the new training concept initially address pilots, through training organisations and operators. In parallel to the ongoing introduction of CBTA, there is a need to ensure increased access to and availability of FSTD as well as VR/AR training solutions. These actions will contribute to mitigating related safety issues, which play a role in improving safety across all aviation domains. Training and education are considered key enablers.

Aviation personnel competency has also been raised as a safety issue arising from the COVID-19 pandemic. With significant reduction in air traffic most aviation professionals are no longer able to perform their normal operational activities on a regular basis. Some might be doing substantially different non-aviation related activities, and some might not be working at all. The extended period of low activity affects a larger number of aviation personnel when compared with sick or sabbatical leave periods. The pandemic also reduced the possibilities for training, as access to training facilities and FSTDs was severely restricted.

Language proficiency constitutes another focus area. The decision to address language proficiency requirements (LPRs) for pilots and air traffic controllers was first made by the 32nd Session of the ICAO Assembly in September 1998 as a direct response to several fatal accidents, including one that cost the lives of 349 persons, as well as to previous fatal accidents in which the lack of proficiency in English was identified as a contributing factor. The intent was to improve the level of language proficiency in aviation worldwide and reduce the communication breakdowns caused by a lack of language skills. LPRs have now moved beyond implementation (Assembly Resolution A38-8 refers), entering a phase of post implementation.

Despite the successful establishment of national LPR systems, there remains insufficient awareness, particularly in the selection of suitable and appropriate testing tools that meet ICAO LPRs, which may result in safety risks.

Therefore, EASA supports the continuation of the LPR activities as an important aviation safety element and joins efforts with ICAO, working together in order to streamline and harmonise the LPR activities and optimise support to Member States and the industry. Building on the successful joint endeavours, ICAO and EASA in close coordination conduct a joint ICAO/EASA activity on LPR implementation.

Key actions:

- Introduce evidence- and competency-based training and assessment in the domains of FCL and OPS, as appropriate (RMT.0194, RMT.0599 and SPT.0012).
- Modernise the European pilot licensing and training system (RMT.0194).
- Increase availability and access to FSTDs as well as foster greater use of VR training solutions (RMT.0194, RMT.01964, RMT.0587, RMT.0599)
- Raise awareness on language proficiency requirements implementation, together with ICAO, the industry and the Member States (SPT.0102)
- Share best practices to identify areas for improvement for the uniform and harmonised language proficiency requirements implementation (MST.0033)
- Safety promotion regarding skills and knowledge degradation:
  - https://www.easa.europa.eu/community/topics/skills-and-knowledge-degradation

3.1.1.4 Integrated risk management

General

Through revisions to its Basic Regulation, EASA's mandate has progressively expanded beyond safety and environmental protection certification to address wider threats to aviation such as security with negative impact on safety and information security. Most recently, health safety considerations entered the equation.

The COVID-19 crisis demonstrated that safety, security, health safety and other risks can no longer be managed in isolation. The aviation community has realised that continuing to develop tools and specific guidance for each situation and for each domain affected by transversal risks may delay not only the implementation of mitigation measures, but also the development of an enabling framework to support integrated, collaborative risk management. Collaboration between domains is vital at global, European and national level to look for synergies and maximise the use of resources. Operators also see the value in a single risk management system that views all risks together in a way that can present the result holistically, support decision-making and deploy the resources needed to mitigate risks effectively.

Some initial integration steps have already been taken in the safety and security domains — in accordance with ICAO Annex 17 and Annex 19 SARPs, the Contracting States are required to establish reporting systems for the analysis of security and safety information. States have been advised by ICAO[48] to consider aligning their security reporting mechanisms with existing aviation safety reporting systems, in order to allow for an integrated approach to the management of risks. This should also enable the use of existing safety tools and concepts especially in relation to the appropriate protection of data and of those reporting for the benefit of aviation security, as well as foster the implementation of a safety and security culture amongst States and stakeholders.

Management of security risks with safety impact

The Basic Regulation addresses some of the interdependencies between safety and security in civil aviation and requires the EC, the Agency and the Member States to cooperate on security matters, where interdependencies between civil aviation safety and security exist.

The implementation of aviation security measures can have a direct impact on safety aspects of aerodrome or aircraft operations. Airport security, aircraft security or in-flight security are the areas where the interdependencies are highly visible and where any security requirements should also consider possible impacts on aviation safety. Therefore, an integrated approach to management of safety and security risks across the spectrum of aviation activities would bring benefits such as a complete overview of risks, a better sharing of security information and the closure of gaps in the security system while focusing on increasing the overall level of safety. Consequently, this would allow ensuring synergies where security measures can have an impact on safety and vice versa; avoiding thus incompatible actions and strengthening the overall safety and security of civil aviation.

In order to achieve this objective, there is an opportunity to apply the existing European SRM process for the benefit of aviation security, focusing on any security risks with potential safety impact. The proposed mechanism would take full benefit of the existing regulatory framework enabling us to understand vulnerabilities in aviation security and safety consequences of security occurrences with the objective of proactively developing and implementing mitigation measures by competent authorities at State and EU level to address them, therefore contributing also to the overall level of aviation safety. It would also allow defining and analysing trends in aviation security in order to provide an additional opportunity to improve the system. Finally, it would foster the implementation of a safety and security culture amongst EU Member States and stakeholders.

Key actions:

- Ensure that security occurrences with safety relevance are fully integrated in the existing SRM, including their analysis, identification of trends and mitigation as part of European SRM when applicable.
- Ensure that EASA Member States establish appropriate coordination mechanisms between safety and security reporting systems, in order to allow for an integrated approach to the management of risks (MST.0040).

Cybersecurity

The global civil aviation ecosystem is accelerating towards more digitalisation. This implies that any exchange of information within any digital workflow of the aviation community needs to be resilient to information security threats which have consequences on the safety of flight or the availability of airspace and beyond.

Aware of the complexity of the aviation system and of the need to manage the cybersecurity risk along the horizontal functional chains and the respective vertical supply chains, EASA is committed to proposing EU rules to address information security risks in a comprehensive and standardised manner across all aviation domains.

48 Refer to ICAO AVSECP/30-WP/20.

Moreover, it is essential that the aviation industry and authorities share knowledge and learn from experience to ensure systems are secure from individuals/organisations with malicious intent. In light of this, EASA is supporting the European Centre for Cyber Security in Aviation (ECCSA)[49] whose mission is to provide information and assistance to European aviation manufacturers, airlines, maintenance organisations, ANSPs, aerodromes (ADR), etc. in order to protect critical elements of the system such as aircraft, navigation and surveillance systems, data links, etc.

On 11 June 2021 EASA published Opinion No 03-2021 with provisions for the management of information security risks by competent authorities and organisations in all the aviation domains, i.e. DOA holders and POA holders, AOC holders (CAT), maintenance organisations, CAMOs, training organisations, aero-medical centres, operators of FSTDs, ATM/ANS providers, U-space service providers and single common information service providers, aerodrome operators and apron management service providers. The objective is to efficiently contribute to the protection of the aviation system from cybersecurity (information security) attacks and their consequences. These provisions include high-level, performance-based requirements for an information security management system that will be supported by AMC & GM and industry standards. In anticipation of the adoption of the new information security management system legal framework, EASA will be working on developing an implementation support roadmap, in coordination with the European Strategic Coordination Platform (ESCP) to assist the industry and authorities with their efforts and ensure effective implementation of the future rules.

Key actions:

- Finalise the implementation of a regulatory framework for cybersecurity covering all aviation domains (RMT.0720).
- Support the roll-out of the new cybersecurity regulatory framework.
- Encourage aviation stakeholders to maintain a focus on cybersecurity resources investment.

Conflict zones

Since the tragic downing of Malaysian Airlines flight MH17 and the most recent incident with Ukraine International Airlines Flight 752 on 8 January 2020 there is a general consensus that States shall share their information about possible risks and threats in conflict zones. Numerous initiatives have been taken to inform the airlines about risks on their international flights.

Member States, European Institutions and EASA have established an alerting system with the objective of joining up available intelligence sources and conflict zone risk assessment capabilities in order to enable the publication of information and recommendations on conflict zone risks in a timely manner, for the benefit of all European Member States, operators and passengers. It complements national infrastructure mechanisms, when they exist, by adding, when possible, a European-level common risk picture and corresponding recommendations. EASA acts as the coordinating entity for activities not falling directly under Member States' or the EC's responsibility and initiates the drafting, consultation and publication of Conflict Zone Information Bulletins[50].

The tragic accident with the downing of Ukraine International Airlines Flight 752 highlighted once more the importance of information sharing and risk assessments. Noting the valuable actions already implemented at EU level during the past 5 years, there is a need to enhance the current capabilities for information sharing and risk assessments at EU level.

In that context, on 25 February 2021 the Agency launched a trial version of the European Information Sharing and Cooperation Platform on Conflict Zones (the 'Platform').

The trial version of the Platform was implemented with the objective of fine-tuning its scope and designing the required IT functionalities in partnership with the Members of the Platform.

49 https://www.easa.europa.eu/eccsa/general-news?page=1

50 https://www.easa.europa.eu/domains/air-operations/information-on-conflict-zones

The overall purpose of the Platform is to support the existing EU Conflict Zone Alerting System and particularly the 'Integrated EU Aviation Security Risk Assessment Group'.

The Platform provides a solution to exchange information on threats without delay between EU Institutions, EASA, Member States and air carriers. It also provides access to relevant, credible and accurate information for aviation operators and States, to complement their own risk assessments.

From 10 to 21 May 2021 the Agency together with the Members of the Platform (EU air carriers, EASA Member States and EU Institutions) conducted an assessment of the Platform which confirmed the usefulness of the mechanism to improve the risk assessments conducted by States and operators. Furthermore, the Members requested that continuity of the Platform be ensured, given its relevance for information sharing and risk assessments.

In this spirit, EASA envisages to implement a **European Information Sharing and Cooperation Platform on Conflict Zones** as a long-term solution for the period of 4 years (following the trial period that ended in December 2021), with the objective of supporting the cooperation between EU Institutions, national authorities and commercial/ business aviation operators so that any relevant information on threats and risks could be shared without delay for the primary benefit of airspace users and NCAs.

Key actions:

- Disseminate information to both air operators and NCAs in order to mitigate the risk associated with overflying conflict zones (SPT.0078).
- Ensure a long-term solution for the European Information Sharing and Cooperation Platform on Conflict Zones to improve information sharing and capacity building related to conflict zones or armed insurgencies.

Public and aviation health safety (AHS) risks

The COVID-19 pandemic has shown that harmonisation of health policies affecting aviation, and in particular in the CAT domain, has become an important topic to help overcome the pandemic. The objective is to minimise the impact of health safety threats in CAT. Health safety threats should be included in the integrated risk management.

COVID-19 is unlikely to be the last pandemic we will be faced with. It is crucial to continue supporting the European aviation industry competitiveness by offering the safest aircraft interior environment to reduce the risk of disease transmission between continents and States, restore public trust and facilitate future responses to events of similar nature.

An area for development is the enhancement of crisis resilience and the mitigation of health safety threats in aviation by engaging in 'Aviation Health Safety Certification'.

A number of actions were initiated following the start of the COVID-19 pandemic with specific focus on health safety, such as, but not limited to the EASA-European Centre for Disease Prevention and Control (ECDC) Aviation Health Safety Protocol, related Safety Directives, Safety Information Bulletins and Guidance Material, as well as standardised Passenger Locator Forms.

Future actions will include the development of certification standards for AHS certification. The Agency is considering assessing and recognising the performance of new sanitisation solutions when mature enough to be industrialised. The approach is similar to what was done in the past with 'design for security' gradually introducing design specifications in CS-25 after new potential security threats had been identified and confirmed. The Agency is currently active in setting up Innovation Partnership Contracts (IPCs) with industry and assessing the need for additional EU research activities to consolidate its knowledge in the domain before considering any future rulemaking.

Key areas for short-term development include the assessment of passive and active disinfection means, validation of new materials and air filtering technologies. Risks associated with various disinfection and cleaning methods implemented by operators is a growing concern to aircraft manufacturers.

For example, the risks of material degradation and potentially reduced fire resistance under prolonged exposure to ultraviolet light or aggressive chemicals should be assessed. Many other parameters remain unquantified and will need an in-depth assessment, not only for initial airworthiness aspects, but also for continued airworthiness and maintenance.

AHS will affect the following domains:

- aircraft certification process
- research & innovation
- institutional cooperation

The Agency's technical competencies will need to be consolidated accordingly.

Possible future wider actions:

- To avoid future disruption and keeping/restoring public trust in CAT, the need for an integrated, collaborative framework for safety, security and health risk management should be considered.

3.1.1.5 Impact of socio-economic factors on safety

Article 89 of the Basic Regulation requires the Member States, the EC, the Agency and other Union institutions, bodies, offices and agencies to cooperate with a view to ensuring that interdependencies between civil aviation safety and related socio-economic factors are taken into account. In particular, it tackles the need to address socio-economic risks to aviation safety. EASA is also required to consult relevant stakeholders when addressing such interdependencies and to publish a review every 3 years, which shall give an objective account of the actions and measures undertaken. The first study[51] was published by EASA on 08 December 2021.

In this perspective, the impact assessment methodology used under the BIS process has been significantly improved as regards social impact assessment and will be subject to continuous improvement throughout its implementation. Where relevant to the topic, such interdependencies are now part of the initial assessment of the issue, as it was the case, for instance, during the development of the Groundhandling Roadmap (see **Section 3.3**).

3.1.1.6 Data4Safety

Data4Safety (also known as D4S) is a data collection and analysis programme that aims at collecting and gathering all data that may support the management of safety risks at European level. This includes safety reports (or occurrences), flight data (i.e. flight parameters recorded on board the aircraft), surveillance data (air traffic data), weather data — these being only a few from a much longer list.

More specifically, the programme will allow us to better identify where the risks are (safety issue identification), determine the nature of these risks (risk assessment) and verify whether the safety actions are delivering the needed level of safety (performance measurement). It aims at developing the capability of discovering vulnerabilities in the system across terabytes of data. In that respect, D4S will enable and augment the capacities of authorities and organisations to implement the European SRM process.

An initial proof of concept (PoC) phase has been launched with a limited number of partners to test the technical challenges as well as the governance structure of such a programme. The PoC is planned to be completed beginning of 2021 and the programme will then open gradually the membership to the European aviation safety system stakeholders.

A number of key building blocks were achieved, in particular:

- The partnership principles were framed into a programme charter.
- The data protection rules were agreed upon and captured into the rules and procedures document, the data governance and the data sharing and protection agreement templates.

51 https://www.easa.europa.eu/document-library/general-publications/art-89-report-2021

- The use cases (safety performance indicators and directed studies) for the PoC phase were agreed upon and specified.
- The Big Data infrastructure was set up and a critical mass of data was already uploaded into the 'lake'.
- Data scientists are now working with aviation experts to design the algorithms that will support the agreed use cases.
- A first set of use cases was implemented on the platform by the Programme Members in a trust environment (e.g. 'metrics', 'blind-benchmarking' and 'directed studies').
- The remaining use cases to be implemented over the end of the PoC were reviewed and adjusted by the Programme Members to take into account the evolution of the risks for the sector as captured in the latest version of the COVID-19 Safety Risk Portfolio.

D4S is, in essence, a collaborative partnership programme that aims at inferring safety intelligence. This is done by organising a massive collection of safety data and, equally important, organising the analytical capacity amongst all European aviation safety system stakeholders. This will take the collaborative work with the industry at a scale never achieved before in Europe.

D4S will therefore directly respond to the GASP SEI 11A (GASP 2020-2022 Appendix A ORG Roadmap § 3.1.1) 'Work with industry stakeholders to leverage best practices with safety information analysis'.

Also, in line with Regulation (EU) No 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, the integration of ECCAIRS 2[52] with D4S will provide the European SRM process with increased capacities to leverage on the European Central Repository (ECR) for safety intelligence purposes (processing of the complete ECR, thanks to the D4S big data platform and data science capacities as well as possibility to fuse the ECR with other sources of aviation data; for example, the traffic data).

3.1.1.7 Civil-military coordination and cooperation

Closer cooperation is needed between the civil and the military aviation stakeholders, including at the level of State safety management, both to reconcile the airspace needs and to achieve a safe and efficient use of airspace as well as to protect fundamental principles such as security or interoperability. Indeed, airspace should be considered as a single continuum, planned and used in a flexible way on a day-to-day basis by all categories of airspace users.

Within Europe a good example of civil-military cooperation in the ATM area is the implementation of flexible use of airspace (FUA) which is now evolving towards a more advanced concept, the so-called advanced flexible use of airspace (AFUA). While this approach is desirable and commendable, it only accounts for the ATM aspects. A comprehensive approach could be introduced to address virtually all aviation areas.

Airworthiness

While military aviation is the prerogative and the responsibility of Member States, it would be beneficial to leverage and consolidate efforts by both the civil and the military in developing their aviation capabilities, by taking elements from the civil world.

Based on consolidated expertise and experience, EASA provides effective support to military and industry applicants by going beyond adequate and prioritised technical advice for appropriate airworthiness and safety solutions.

An increasing number of European military authorities have already recognised that the civil model can, in part or fully, be extrapolated to military air systems. In those circumstances, they may move towards an 'as civil as possible, as military as necessary' approach through gradual convergence to civil standards if not adopting them for the design, manufacture and maintenance of military aircraft.

52 ECCAIRS 2 is the software solution developed by EASA and provided to the authorities to organise the capture of the safety reports at national and European level into the ECR as per Regulation (EU) No 376/2014.

Safety intelligence and performance domains

The timely and accurate reporting of safety information at European level and beyond is critical to verify the achievement of global safety objectives and monitor the implementation of safety programme initiatives, such as the EPAS.

Reliable military safety data sharing, primarily for aerodromes open to public use (dual-use platforms) and civil derivative aircraft (fixed wings and rotorcraft) would provide perspectives that are both global in nature as well as specific to individual areas such as rotorcraft where a substantial percentage of the fleet is operated by the military.

Going forward, tools to allow for a comprehensive assessment of safety performance, including State and military aircraft, would be of strong benefit to the entire aviation system and would support the goal of ensuring the highest common level of safety and environmental protection for the European aviation system.

Aviation security (including cybersecurity)

There is a shared understanding and growing concern within the military community that security and especially cybersecurity may introduce considerable risk for aviation, as systems on board aircraft and the European ATM System rely on increased connectivity and system of systems integration.

Moreover, effectively mitigating cyber-related risks is key to enabling unmanned aircraft systems (UAS)/drones[53] integration into non-segregated airspace.

The strategic orientations adopted by EASA in developing its cybersecurity roadmap and the setting up of the ESCP provide the military with an opportunity to cooperate in an area of common interest in the wider context of the European aviation system.

Airspace, ANS, aerodromes open to public use

To meet the aerodrome challenges of delivering sufficient capacity, civil and military aerodromes will need to make progress to achieve a seamless airspace and globally harmonised ANS where civil-military cooperation is a crucial element to foster in the transition process.

Key to successful cooperation is the establishment of trust and transparency so that the needs and requirements of civil and military aerodromes and services providers could be fully understood and that over time an integrated model could be achieved.

With a regional approach in areas of highly fragmented airspace and aerodromes open to public use, certain facilities and services shall be arranged so as to ensure the safety[54], regularity and efficiency of civil aviation as well as to ensure that the requirements of military air operations are met, in particular by promoting a common understanding of key principles, sharing best practices and monitoring their practical implementation.

Key action:

- Member States to consider civil-military coordination aspects where relevant for their State Safety Programme (MST.0001).
- Member States to report on the implementation of 'due regard' for the safety of civil traffic over high seas (MST.0024).

53 Unmanned aircraft systems (UAS)' is the legal and technical term used in the EASA Basic Regulation as well as in the delegated and implementing acts adopted on the basis thereof. 'Drones' is the popular term used to be understood by persons with no aviation background. Both terms are used in the EPAS and refer to the same thing.

54 According to Article 2(5) of the Basic Regulation, when an aerodrome controlled and operated by the military is open to public use, Member States have to ensure that it offers a level of safety and interoperability with civil systems that is as effective as that resulting from the application of the essential requirements set out in Annexes VII and VIII to this Regulation (without prejudice to national security and defence requirements and Article 7(5) of Regulation (EC) No 550/2004).

3.1.1.8 Oversight[55]

The Agency is responsible for the approval and continuous oversight of design, production, maintenance, continuing airworthiness management, maintenance, training and flight crew training organisations outside the territory of Member States. Within the EASA Member States the Agency is responsible for design organisations and certain other organisation approvals if requested by Member States — such as, Airbus, Airbus Helicopter POAs, Wizzair, Masterjet AOCs/CAMOs or VR Motion, an organisation operating FSTDs. The organisation approval activities also include the approval and oversight of pan-European ANSPs, ATCO training organisations outside the territory of the Member States and the oversight of the Network Manager on behalf of the EC.

Through the application of the EU aviation safety regulations, the Agency established and maintains a robust oversight system inside and outside Europe, using extensively the oversight capacities of partner NCAs and also relying on the result of the oversight performed by its bilateral partners for the domains where such BASAs are in place.

To that end, it is essential that the Agency is capable of managing the safety risks identified when acting as the competent authority. This presumes that related hazards are identified through a process to collect and analyse data, the risks assessed and mitigated in an effective way, implying the measurement and monitoring of safety performance leading to continuous improvement.

The Agency is also supporting the development of innovative products such as VR-based simulators and their oversight.

In addition, the exchange of information and cooperation with partner NCAs, the effective implementation of the applicable management system requirements as part of the Agency's Integrated Management System as well as the availability of adequate personnel are essential enablers.

3.1.1.9 Standardisation

As safety is the Agency's core business, Standardisation is one of its main tasks, aimed at achieving and maintaining a high and uniform level of safety within the EU.

Standardisation activities entail assessing on a continuous basis the national competent authorities' ability to discharge their safety oversight responsibilities, as well as conducting Standardisation inspections as necessary to directly verify the implementation of the rules.

Such inspections are prioritised, planned and performed using a risk-based approach, based on the Agency's assessment of all available indicators.

What we want to achieve

The Agency conducts Standardisation activities to monitor the application by NCAs of the requirements of the Basic Regulation and of the delegated and implementing acts adopted on the basis thereof , as well as their uniform implementation, to allow for:

- passengers to fly safely across the EU,
- the EU industry to benefit from a level playing field,
- certificates issued by EU national competent authorities to be mutually recognised and trusted, and
- the EU system to be recognised by international partners.

55 'Oversight' means the verification, by or on behalf of the competent authority, on a continuous basis that the requirements of this Regulation and of the delegated and implementing acts adopted on the basis thereof, on the basis of which a certificate has been issued or in respect of which a declaration has been made, continue to be complied with (Basic Regulation, Article 3).

Currently identified weaknesses

The 2020 SAR identified the following areas of concern:

- **Lack of effective oversight.** As in the previous years, the most safety-related findings were raised in the areas of the NCAs' performance of certification and oversight tasks, showing that such essential functions remain the most challenging.
- **A two-speed system.** While some NCAs have reached a suitable and stable level of maturity, several others continue to underperform and/or struggle in achieving sustainable improvements.
- **Management systems.** While progress has been noted in the implementation of management systems at the NCAs' level, the lack of effective oversight of (safety) management systems at undertakings' level continues to be an area of concern.
- **COVID-19-specific issues.** The most critical issues observed since the onset of the pandemic relate to:
  - **oversight programmes:** undertakings' risk profiles not updated, oversight programmes not adapted;
  - **management of changes** caused by the pandemic, both at NCAs' and undertakings' level;
  - **management of flexibility provisions** (Article 71 of the Basic Regulation) and associated mitigations;
  - **oversight of remote activities**, i.e. activities conducted remotely due to the pandemic; and
  - **resources and staffing** due to budget cuts, loss of experienced staff and lack of on-the-job training.

A number of actions are presented in Volume II Section 5.6 to drive improvements in these areas of concern and more generally to support State safety management.

3.1.2 Operational safety

3.1.2.1 Address safety risks in commercial air transport (CAT) aeroplane operations (airlines and air taxi passenger/cargo) and NCC operations

During 2020 there were no fatal accidents involving European AOC holders performing CAT passenger/cargo. In this category there were 8 non-fatal accidents compared to 27 in 2019; the number of non-fatal accidents was below the average of the previous 10-year period (23.3). In 2020 the number of serious incidents in this category decreased with 42 serious incidents recorded in 2020 in comparison with the 10-year period average of 91.8. These statistics must be placed in the context of the COVID-19 pandemic situation that had an impact on the overall 2020 traffic levels which dropped to around 45 % of the previous year.

In the European NCC operations category, there were no accidents either fatal or non-fatal in 2020. One serious incident was recorded in 2020 compared with 12 in 2019 with an average of 5.5 per year over the previous 10-year period.

Work is progressing on the definition of mitigating actions to address the various safety recommendations (SRs) resulting from the B737 MAX accidents.

Although the area of focus is primarily on enhancing the Large Aeroplane Certification Specifications, its related AMC & GM and the Part 21 Changed Product Rule respectively, the resulting areas of improvement identified will also extend to other Product lines as deemed necessary.

The European SRM process identified the following as the most important risk areas for CAT aeroplane and NCC operations in the decreasing order of the aggregated risk score:

— Airborne collision

Airborne collision includes all occurrences involving actual or potential airborne collisions between aircraft, while both aircraft are airborne, and between aircraft and other airborne objects (excluding birds and wildlife).

In 2020 the highest-risk contributors were occurrences with loss of separation whilst performing a missed approach due to windshear encounter and several TCAS resolution advisories cases.

Key action:

- Mitigate the risk of airborne collision avoidance system (ACAS) resolution advisories (RA) not followed by pilots (SPT.0123).

See **Volume II Section 6.1.1.3**.

— Runway excursion

Runway excursion includes all occurrences involving actual or potential situations, when an aircraft leaves the runway or movement area of an aerodrome or landing surface of any other predesignated landing area, without getting airborne.

In 2020 the highest-risk contributors were occurrences with delayed rotation due to take-off incorrect centre of gravity and actual runway excursions.

Key actions:

- Promote and implement the Global Action Plans for the Prevention of Runway Incursions (GAPPRI) and Excursions (GAPPRE), in support of Regulation (EU) 2020/2148.
- Member States to address runway safety by taking actions at national level and measuring their effectiveness (MST.0028).

See **Volume II Section 6.1.1.2**.

— Aircraft upset in flight (loss of control)

Aircraft upset includes all occurrences involving actual or potential situations involving undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations, which might ultimately lead to an uncontrolled impact with terrain.

In 2020 the highest-risk contributors were occurrences with delayed rotation due to take-off incorrect centre of gravity, continued flights with undetected wing damages after a wing strike and tail strike on take-off.

Key actions:

- Review and promote training provisions on recovery from upset scenarios (RMT.0196 and SPT.0012).
- Member States to address loss of control in flight by taking actions at national level and measuring their effectiveness (MST.0028).

See **Volume II Section 6.1.1.1**.

3.1.2.2 Rotorcraft safety improvement

In 2020 there were 4 fatal accidents, 24 non-fatal accidents and 18 serious incidents involving rotorcraft. The number of fatal accidents and non-fatal accidents in 2020 reduced by 50 % in comparison with the average figures of the previous 10-year period (10.8 for fatal and 53.4 for non-fatal accidents), whereas the number of serious incidents was higher than the 10-year average (13.6). The number of fatalities (9) and serious injuries (3) in 2020 was also significantly lower than the preceding decade average. This significant drop in the number of occurrences should be interpreted cautiously, as the exact impact of the COVID-19 pandemic on the rotorcraft flying activity at European level is difficult to evaluate at present.

The vast majority (80 %) of all accidents and serious incidents involved rotorcraft performing non-commercial operations or specialised operations.

The **Rotorcraft Safety Roadmap** has been endorsed by EASA and is available on the EASA website[56]. The roadmap has been initiated by EASA that tasked a group of external experts from NCAs and industry to develop jointly with EASA a set of ambitious proposals. The roadmap contains proposals for actions in order to significantly reduce the number of rotorcraft accidents and incidents. The initial analysis of data showed that the activities need to focus on light conventional rotorcraft and small operators. The roadmap covers safety and transversal issues that need to be tackled through actions in various domains, including training and licensing, operations, initial airworthiness, environment and facilitation of innovation. The main elements of the roadmap have been presented in several fora including the Rotorcraft Committee (R.COM) and the EASA Rotorcraft and VTOL Symposium.

The vision of the roadmap is to **'achieve significant safety improvement for Rotorcraft with a growing and evolving aviation industry'**. The group analysed a significant amount of data and took a very close look at the European 'helicopter landscape' before defining its objectives and identifying the actions to meet these objectives.

The following objectives are defined in order to deliver the vision stated above:

- **Improve overall rotorcraft safety by 50 % within the next 10 years (starting January 2019):** Most of the accidents can be attributed to operational causes and it is recognised that influencing behaviour in the wider community is a complex process where step changes are difficult to achieve in the short term. However, for accidents caused by technical failures, an ambitious target is set to reduce the number of accidents caused primarily by technical failures by one order of magnitude.
- **Make positive and visible changes to the rotorcraft safety trends within the next 5 years:** The aim of this objective is to drive the rapid implementation of some actions that are identified and to rapidly progress a number of safety improvements. A key performance indicator (KPI) for the safety objectives is the number of rotorcraft accidents in Europe that result in at least a fatality or a serious injury.
- This KPI is monitored and published annually by EASA as part of the ASR. Additional KPIs will be based on the European risk classification scheme (ERCS) complemented by the data collection activity using D4S to build robust data on accident rates. Generally, helicopter safety performance indicators are published as part of the EASA ASR.
- **Develop performance-based and proportionate solutions that help maintain competitiveness, leadership and sustainability of the European industry:** This objective also aims at supporting the development of new business models and at encouraging innovation.

The Agency initiated a project to evaluate and integrate the recommendations contained in the Roadmap into the EASA work programme. It was decided not to launch new RMTs but to include the inputs from the Rotorcraft Safety Roadmap in current RMTs as much as practical. The aim was to optimise the use of rulemaking resources and eventually implement the changes at a faster pace.

56 https://www.easa.europa.eu/download/Events/Rotorcraft%20Safety%20Roadmap%20-%20Final.pdf

A review of the actions was performed to give priority on those supporting the industry during the pandemic. The external communication and events were cancelled, and the focus was shifted to the RNO project. Several actions of the Roadmap were put on hold or delayed. In addition, because of the need to make optimal use of rulemaking resources and prioritisation, the planning of the RMTs was shifted.

The main subjects of the Roadmap were organised in work streams and are described below:

- **Training safety and training devices:** Training is seen both as a risk area and as an opportunity. Many in-flight accidents happen during training. The use of FSTDs and the development of new training devices such as, but not limited to, VR has been strongly promoted for high-risk training scenarios. There is a wide consensus that better training is one keyway to improve safety. EASA will promote a safety briefing during recurrent training and focus actions on instructors. EASA will additionally promote the development of simpler and less expensive simulators for light helicopters. Finally, EASA, together with the Helicopter Expert Group members, will develop a proposal (including a training needs analysis) for an innovative approach enabling the use of affordable training devices and associated credit for crew licensing. The changes will feed and be implemented within the context of RMT.0194, RMT.0196, RMT.0678, RMT.0587 and RMT.0599.
- **Safety data:** This work stream was put on hold during most of 2020 and first part of 2021. EASA plans to engage with original equipment manufacturers (OEMs), operators and NCAs to collect and consolidate exposure data and other relevant statistics, such as flight hours or number of cycles of their products. A framework will be set up to exchange information with EASA in a manner which is mindful of personal data protection. In particular, the Network of Analysts (NoAs) will be used to facilitate the collection of data on fleet and flight hours from the NAAs. To enhance and promote reporting, new ways to report data, such as automatic reporting, will be investigated. The objective is to obtain enough data to enable us to work on accident rates instead of on numbers of accidents.
- **Safety promotion:** To establish a sustainable and effective safety culture including the sharing of best practices, safety promotion is a fundamental activity. Please refer to Volume II Chapter 7 for all safety promotion actions related to rotorcraft. The brand Together4Safety has been established. Its mission statement is: 'Reducing aviation risks by raising awareness, providing safety tips and engaging people in positive conversations about safety'.
- **Helicopter design improvements:** When it comes to design, the roadmap contains several actions discussed between EASA and the respective OEMs. This work stream resulted in several mandatory or voluntary design changes aiming to improve safety. Airbus Helicopter, Leonardo Helicopter and Bell have developed and submitted to the Agency voluntary product safety improvement action plans.
- **Certification Specifications modernisation:** This work stream will address the modernisation of the EASA CSs. Several RMTs have been initiated in that respect. EASA's rotorcraft team is engaged with industry and the other bilateral partner authorities on the modernisation of the CSs. Refer to Volume II Chapter 7 'Rotorcraft' and Chapter 9 'Design and Production' with the list of RMTs directly relevant to rotorcraft safety. Some of these tasks pertain to Part-26 requirements.
- **Simplification/reduction of administrative burden for small-helicopter operators:** The Agency has contracted the evaluation task EVT.0010, on helicopter operations, to collect data and assess the regulatory burden put on small and medium-sized helicopter operators. The evaluation report has been delivered and presented to stakeholders. An activity has been initiated to follow-up on the recommendations put forward in the report and a dedicated working group composed of industry members and NCAs has been formed.

This project supports the implementation of the Rotorcraft Safety Roadmap to reduce administrative burden on helicopter operators so they can focus on safety-related tasks and improve their performance. Considering the evaluation results, a list of recommendations for simplification of the regulatory framework providing other non-regulatory support to small-helicopter operators was prepared with the support from the industry and NCAs. These recommendations are reflected into the Best Intervention Strategy for 'Rotorcraft – small-helicopter operators' which is currently under development. They would form the basis for initiating regulatory and/or non-regulatory changes in order to achieve efficiency and support the objective of improving the safety performance of small-helicopter operators.

Evaluation of new concepts: The following new concepts have been proposed and are evaluated:

- **Net safety benefit:** A Certification Memorandum was published in July 2021. A phased approach has been taken with the publication of a first Certification Memorandum providing credit for development assurance levels. An updated Memorandum will be published in 2022 to extend the credit to high-intensity radiated field (HIRF) and lightning certification requirements.
- **Continued aviation education:** The Rotorcraft Safety Roadmap had suggested the introduction of a continued aviation education (CAE) scheme to various rotorcraft personnel playing key roles in safety — the proposal being to begin with accountable managers and nominated personnel.

  A kick-off meeting was held to start the activities just prior to the ensuing COVID-19 crisis. The first action was for the participants to familiarise themselves with existing continued medical education programmes. Yet, due to the crisis, the medical world had other priorities, resulting in the CAE work stream being put on hold for the time being.
- **Safety rating:** The next big concept proposed is the introduction of a voluntary rotorcraft safety rating scheme. Such a scheme is used in the automotive industry with the crash test programmes Euro NCAP[57]. This is a good way to give an incentive to the manufacturers to make safety improvements to their vehicles and differentiate themselves (from the competition). A comparative review of the current safety rating schemes of different industries has been conducted. It covered a wide range of test programmes used not only in transport but also in other industries — for example, in the food safety industry. The initial concept evaluation and feasibility study were performed in May 2020 and presented to international audience. It was agreed with the main stakeholders to create an international working group tasked to develop such a scheme. The work started early 2021 under the umbrella of the newly created international Vertical Aviation Safety Team (VAST). The team is co-chaired by EASA.

Key actions:

- Helicopter ditching and water impact occupant survivability (RMT.0120).
- All-weather operations (RMT.0379).
- Update of Subpart FC of Part-ORO (evidence-based training) (RMT.0599.
- Integrity improvement of rotorcraft main gear boxes (MGB) (RES.0008).
- Helicopter offshore operations – new floatation systems (RES.0009).

57 https://en.wikipedia.org/wiki/Euro_NCAP

3.1.2.3 Address safety risks in GA in a proportionate and effective manner

Note: Throughout this document, the term 'GA' is used to encompass non-commercial operations with aeroplanes having a MTOM below 5 700 kg, as well as all operations with sailplanes and balloons. Operations with rotorcraft, commercial and non-commercial, and for all types of rotorcraft, are addressed in **Section 3.1.2.2**.

Since 2020 was a very atypical year in terms of recreational aeroplane activity and actual flight numbers are unavailable, conclusions cannot be drawn regarding the trend in number of accidents and fatalities. The data for 2020 is provided for completeness, and as a reference the 10-year average is provided as well. Firm conclusions cannot be made at this time.

Between 2010 and 2019 accidents in Europe involving recreational aeroplanes, i.e. non-commercially operated small aeroplanes with MTOMs below 5 700 kg, led to between 91 and 132 fatalities per year. These figures exclude fatal accidents involving micro light airplanes, gliders and balloons. Fatal accidents during parachuting operations have also contributed to this high number of fatalities. This concerns flights which are specifically chartered/operated to transport parachutists (called 'skydivers' in sport parachuting) to a designated altitude for jumping out from the aircraft. These operations, usually entailing short flights, are exposed to a range of operational and organisational hazards (refer to SI-4023 in Volume III). The latest tragic accident occurred on 9 July 2021 in Sweden; all 9 occupants died on board the aircraft that crashed shortly after take-off.

As such, this sector of aviation has the highest average number of fatalities per year.

In 2020 there were 58 fatal accidents causing 97 fatalities involving recreational aeroplanes. 2020 shows a 7 % reduction of fatal accidents compared with the 10-year average. The reduction in non-fatal accidents is 2 % compared to the 10-year average. There were 9 % fewer serious injuries than during the preceding decade.

There were 16 fatalities in sailplane operations in 2020. This is a significant decrease when compared to the 10-year average. The number of serious injuries is however a bit higher than the 10-year average. The COVID-19 pandemic has significantly affected sailplane operations. Specifically, during the period from March to May 2020 the flight operations were significantly reduced. The European Gliding Union has estimated that, in general, sailplane operations were reduced by approximately 18-20 % within the EU and competition flying was negligible in 2020.

As concerns balloons in 2020, there were 3 fatal accidents with 3 fatalities, 16 non-fatal accidents and 2 serious incidents. These figures are slightly below the average for the preceding decade.

The GA roadmap is key to the EASA strategy in these domains. In order to support the monitoring of safety performance and prioritisation of EPAS actions in the area of GA, Member States are invited to collect data on their GA fleet, as well as on flight hours, to provide such data to EASA through the NoAs.

Although it is difficult to precisely measure the evolution of safety performance in GA due to lack of consolidated exposure data (e.g. accumulated flight hours), it is reasonable to assume that more initiatives and efforts are needed to mitigate risks leading to these fatalities.

Safety promotion is the backbone of the mitigations against accidents in the GA domain and the following actions have been achieved:

- Various Instagram Live sessions were organised with safety partners with over 4 000 attendees. To improve the dissemination of safety messages (MST.0025), in 2018 EASA launched the GA Community website[58] that now gets in excess of 25 000 views per month.
- The GA Community site was reinforced in 2019 with a new GA Safety Together Facebook. This evolved to become the 'Aviator's Club'[59] complemented by a dedicated Facebook group[60] with over 3000 followers.
- The 2021 GA Season Opener, which was attended by over 600 people from the GA Community.

58 https://www.easa.europa.eu/community/ga
59 https://www.facebook.com/easaaviatorsclub
60 https://www.facebook.com/groups/391437234972242

- A dedicated workshop for the Skydiving community was organised on 25 February 2021 as part of SPT.0121 'Improving the safety of parachuting operations'; at the same time, a dedicated Safety Promotion page for parachuting operations was launched on the GA Community Site. There will also be a Sunny Swift article published on parachuting and then a safety campaign with the skydiving community throughout 2022.
- There have now been over 30 Sunny Swift articles published up to November 2021.

Key actions:

- Improve the dissemination of safety promotion and training material by authorities, associations, flying clubs and insurance companies targeting flight instructors and/or pilots; to create a GA Safety Promotion platform (SPT.0092).
- Continue to deliver safety promotion material to improve the safety of parachuting aircraft operations, by highlighting the most common causes of accidents and providing good practices/operational procedures that can help to mitigate the most important risks (SPT.0121).
- A new Safety Promotion campaign (SPT.0125) for the development of content in coordination with NCAs and industry prior to each flying season and following each season to help maintain skills and currency – based on highlighting the most important safety issues identified through the European SRM process.
- Adapt design and production rules ('Part 21 Light') to become more proportionate to the risks (RMT.0727).
- Bring data to the GA cockpits: weather, flight information services (FIS) and traffic information data should progressively be made available in all GA cockpits (RES.0021).
- Support the implementation of new or amended regulations.

3.1.3 Safe integration of new technologies and concepts

This strategic priority supports the safe integration of new technologies, innovative solutions and operating concepts into the aviation system and facilitate the emergence of such new technologies and solutions.

Many of the technologies and innovations emerging in the aviation industry bear significant potential to further improve the level of safety, e.g. by improving the collection and analysis of operational data, better condition monitoring of aircraft for the purpose of preventive maintenance, improved accessibility and better quality of meteorological information, etc.

At the same time new operating concepts and emerging business models, novel aircraft or propulsion systems are emerging, and their specific features may not be addressed in existing certification specifications and operational regulations (including flight crew licensing, air operations, continuing airworthiness, aerodrome operations and ATM/ANS). Some new business models such as those responding to the increased demand for flying in the cities (e.g. urban air mobility) or those generated by the increased digitalisation in the aviation industry (VR/AR, digital twins, gamification, etc.), the possible introduction of more autonomous vehicles and platforms, single-pilot operations and completely autonomous cargo aircraft, will challenge the way authorities regulate and oversee the aviation system.

Digitalisation and automation are rapidly increasing in aviation systems. Whilst this has resulted overall in significantly improved safety, the trend towards increasing automation requires a renewed safety focus on the interactions between humans and automation. The next generation of automation will be using AI. This domain, no longer the province of science fiction, could well be the next 'game changer' for aviation[61]. In the near future, new EPAS actions will be required to maximise related safety benefits, while mitigating any threats induced by the implementation of these new technologies.

61 See AVIATION SAFETY – Challenges and ways forward for a safe future, Research & Innovation Projects for Policy, EC – Directorate General for Research and Innovation, January 2018: https://publications.europa.eu/en/publication-detail/-/publication/b4690ade-3169-11e8-b5fe-01aa75ed71a1/language-en/format-PDF/source-75248795.

AI, and more specifically the ML field of AI, bears enormous potential for developing applications that would not have been possible with the development techniques that have been used so far. As concerns EASA, AI will affect most of the domains under its mandate. AI not only affects the products and services provided by the industry but also triggers the rise of new business models and affects the Agency's core processes (certification, rulemaking, organisation approvals, SRM and standardisation). This may in turn affect the competency framework of EASA staff.

Further details on AI can be found in **Section 3.1.3.1**

In this fast-evolving context, EASA is putting significant efforts into preparing for the future with the identification of dedicated resources to research and innovation (R&I), such as the Agency-wide AI implementation project team, the 'EASA Innovation Cell', increasing support to the development of EU aviation & aeronautics research programmes and projects, etc. R&I is essential to reap the safety potential of new technologies and innovative solutions, while managing related risks.

Research Agenda

Regularly EASA experts and external stakeholders suggest or request research topics that are needed to tackle the issues identified. These topics are prioritised on a yearly basis and included in the Agency's 'Research Agenda[62]' which groups the requests for a given period even without having immediate funding. The Agency Research Agenda 2020-2022[63] encompasses a series of innovation- and efficiency-related actions besides safety-focused research.

EASA and the EC signed a new Contribution Agreement towards the end of 2021 for the management of research actions delegated to EASA in the Horizon Europe Work Programme 2021-2022. These research actions are planned to be implemented through 16 new research tenders. The list of research actions was published in the Horizon Europe work programme 2021-22 for 'Climate, Energy, Mobility', in section 'Indirectly managed actions'[64].

The research projects that become part of the EPAS derive from the list of prioritised research agenda topics for which a funding source has been secured or where it is likely that the project will be funded by the start of the reference period of the given EPAS.

This EPAS edition includes 19 new RES actions, as follows:

- RES.0034 Assessment for the provision of flight instruction outside FSTD (Off-board instructor OBIS)
- RES.0035 Helicopter under water evacuation
- RES.0036 Risk assessment tool
- RES.0037 Machine learning
- RES.0038 UAS standards
- RES.0039 Vortex ring state prediction and recovery
- RES.0040 Runway micro texture
- RES.0041 Mental health for pilots and ATCOs
- RES.0042 Pilot and ATCO fitness
- RES.0043 Flight control systems verification and air data fault detection
- RES.0044 PED — fire risks when transported in aircraft cabin
- RES.0045 Aerodrome 'Triple One' concept implementation
- RES.0046 Digital transformation — case studies to prepare the evolutions of aviation standards

62 EASA Research Agenda 2019-2021 rev 1

63 EASA Research Agenda 2020-2022

64 wp-8-climate-energy-and-mobility_horizon-2021-2022_en.pdf (europa.eu)
https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022wp-8-climate-energy-and-mobility_horizon-2021-2022_en.pdf

- RES.0047 Fitness to fly in commercial air transport operations of people living with HIV
- RES.0048 Impact of security requirements on operational safety and performance
- RES.0049 Non-CO2 emissions: assessment of climate impact and policy options
- RES.0050 Aircraft certification using modelling and numerical simulations
- RES.0051 Electric aircraft and hybrid propulsion
- RES.0052 Noise / emission standards for supersonic aircraft

Further information on the Agency's research activities can be found on the EASA webpage https://www.easa.europa.eu/easa-and-you/safety-management/research.

The Agency is active in various other areas. This may lead to the inclusion of additional EPAS actions in the foreseeable future to ensure the safe integration of the related technologies and concepts. The below provides information on the current state of work on those, complementing the information in **Sections 3.1.3.1** to **3.1.3.9** that provide information on those areas where activities and initiatives are more advanced.

— Virtual certification: modelling and simulation (M&S)

The aviation industry undergoes a digital transformation process which has a strong impact on how new technologies and innovations are developed and used, including the research and development, design, testing, certification, production/manufacturing, training, maintenance and oversight processes. M&S has the potential to accelerate the introduction of new technologies and innovative types of operation and is thereby contributing to the strategic objectives of the European Green Deal. Furthermore, it offers potential for cost efficiency gains for all involved parties. M&S tools can be automated and may benefit e.g. from ML solutions, in order to optimise a particular design by performing extensive simulations. What is more, M&S has the capacity to further improve product safety as it provides the ability to interrogate many different design and operating conditions beyond the practical limitations of physical testing.

The industry will need guidance and requirements from the regulator on how M&S techniques can be applied and accepted in certification processes in particular as regards the credibility of such techniques, including the verification and validation processes. The Agency therefore intends to establish an M&S roadmap which will describe the overall regulatory approach to modelling and simulation including an action plan for rulemaking and standards development, contributions to relevant R&I projects, the advancement of innovative compliance methods, the cooperation with other regulators, as well as competency management aspects. This roadmap will be closely coordinated with the AI roadmap. Once agreed, related actions in terms of rulemaking, research, safety promotion, etc. will feed into future EPAS editions.

— Higher airspace (HA) operations, including suborbital aircraft and space operations

There is currently a regulatory gap for operations in the 'higher airspace'. It is a dynamically evolving topic, driven by new technologies and demand. There is a need to further explore ways to tackle this gap, including but not limited to the definition of HA limits (upper and lower) as well as the regulatory framework for the ATM/ANS. This airspace would affect several types of aircraft including e.g. balloons, airships and high-velocity vehicles, manned and unmanned. In the short term, a concept of operations will be defined in the ECHO[65] project led by EUROCONTROL.

The outcome of this work will be analysed by EASA together with the support of the HA Operations Task Force to determine the need for regulatory activities in the medium/long term (2-4 years): this will be done in accordance with the High-Level Principles listed in the conclusions of the 2019 European Higher Airspace Operations Symposium[66]. The Task Force formed by representatives of several Member

65 https://www.eurocontrol.int/project/european-concept-higher-airspace-operation
66 https://www.eurocontrol.int/sites/default/files/2019-07/2019-04-09-ehao-symposium-conclusions.pdf

States and European institutions supports EASA in the preparatory work for a European regulatory framework for HA operations, including also setting regulatory principles and contributing to the development of the impact assessment.

A European framework on HA operations would also ensure avoiding risks and challenges of fragmentation and would contribute to a level playing field. Furthermore, any regulatory development in this domain would need to cater for the operation of suborbital and space operations, transiting through the airspace. Suborbital and space operations will have an impact on more areas than just airspace operations.

Air operations regulations, for example, would need to be adapted for suborbital aircraft and space operations and the impacts on the ATM system will need to be addressed in both the current airspace management and HA. Moreover, as suborbital aircraft are currently envisaged to use rockets to reach the fringe of space, fuelling of such rockets would require the installation of dedicated, protected areas as well as take-off and landing sites ('spaceports') either at certified aerodromes or at specific sites. This new type of operations will also call for further civil-military cooperation and coordination. Currently some EU Member States are interested in developing horizontal spaceports to operate such suborbital aircraft. Several other aspects of these future operations will need to be assessed, such as for instance the cyber-security elements.

In addition to the development of the regulatory framework, EASA is following up related EU research projects and is prepared to provide advice and support to European industry as necessary through appropriate IPCs or technical advice contracts (TACs).

— Extended minimum-crew operations and single-pilot operations

Part-ORO (Annex III to Regulation (EU) No 965/2012[67]— the Air OPS Regulation) contains conditions and limitations addressing crew composition, FTL regimes and crew training, based on long-established safety principles with the appropriate proportionality depending on the type of operation. In the future, technological developments may allow the possibility for large passenger aeroplanes conducting CAT to be safely operated by a single pilot, initially during the cruise phase of the flight and later for the whole flight, provided that effective mitigations (e.g. advanced cockpit with workload alleviation means, capability to cope with an incapacitation, ground assistance, etc.) are in place, in order to ensure an equivalent level of safety in each of the relevant areas affected. Should new RMTs be required or existing ones need an extension of their scope to enable these types of operation, EASA will engage with all relevant stakeholders via the established channels.

To study the feasibility of these new concepts of operations, EASA is currently running an internal project aiming to evaluate the impact of required changes on a variety of aspects, including changes to the regulatory framework, interaction with ICAO, as well as changes in operators' business models and social impacts. A RES action was also initiated in 2019 to support this project (RES.0028).

67 https://eur-lex.europa.eu/legal-content/de/TXT/?uri=CELEX%3A02012R0965-20160825

3.1.3.1 AI Roadmap implementation

EASA has developed an AI Roadmap that aims at creating a consistent and risk-based 'AI trustworthiness' framework to enable the processing of AI/ML applications in any of the core domains of EASA, from 2025 onwards. The first version of this document was published in February 2020 and is available on the EASA website under https://easa.europa.eu/ai.

Scope of the EASA AI Roadmap

The current breakthrough is the use of data-driven learning techniques (ML/deep learning (DL)), which are disruptive and, by opposition to development techniques, cannot be addressed through traditional approaches. They raise the need for developing novel methods.

Version 1.0 of the EASA AI Roadmap focuses on ML techniques using, among others, learning decision trees or neural network (NN)[68] architectures. Further development in AI technology will require future adaptations to this Roadmap.

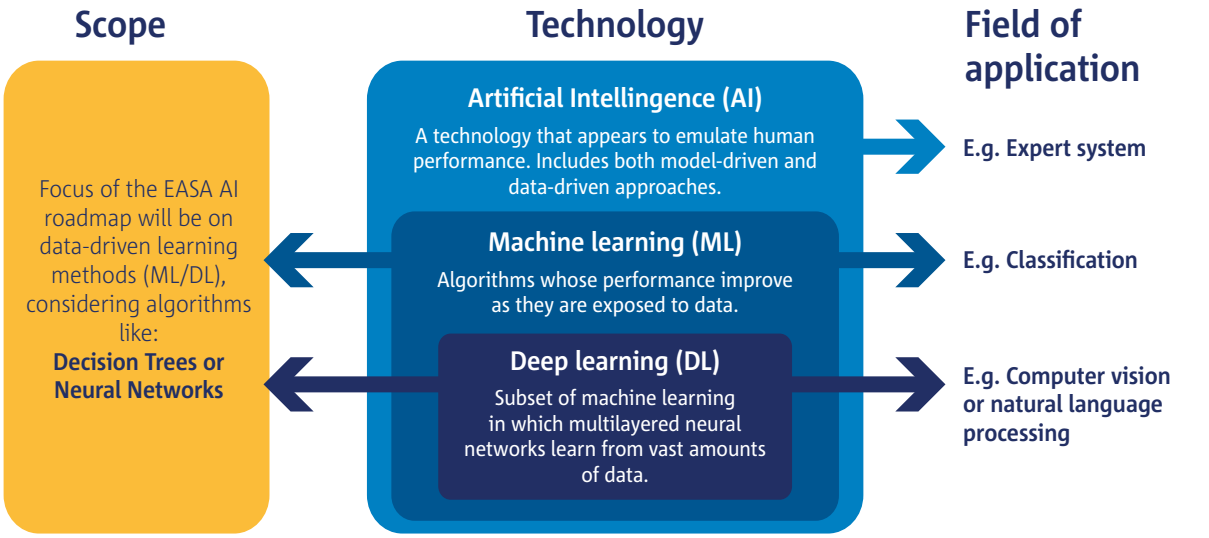


Figure 7: AI taxonomy in the EASA AI Roadmap

Challenges

The power of ML lies in the capability for a system to learn from a set of data rather than requiring development and programming of each necessary decision path. It also involves a consequent number of challenges, including:

- adapting assurance frameworks to cover learning processes and address development errors in AI/ML components;
- creating a framework for data management to address the correctness (bias mitigation) and completeness/representativeness of data sets used for the ML items training and their verification;
- managing the bias in data-driven approaches;
- elaborating pertinent guarantee on robustness and on absence of 'unintended function' in ML/DL applications;

68 Neural network (NN) — A computational graph which consists of connected nodes ('neurons') that define the order in which operations are performed on the input. Neurons are connected by edges which are parameterised by weights (and biases). Neurons are organised in layers, specifically an input layer, several intermediate layers, and an output layer.

- coping with predictability and explainability aspects of the ML application behaviour, considering their statistical nature and the ML model complexity;
- managing the mitigation of the residual risk in the 'AI black box'; and
- enabling trust by end users/operators.

Building blocks for the EASA AI Roadmap

The EASA approach is driven by the concept of 'AI trustworthiness' that was introduced by the EC High Level Group of Experts on AI.

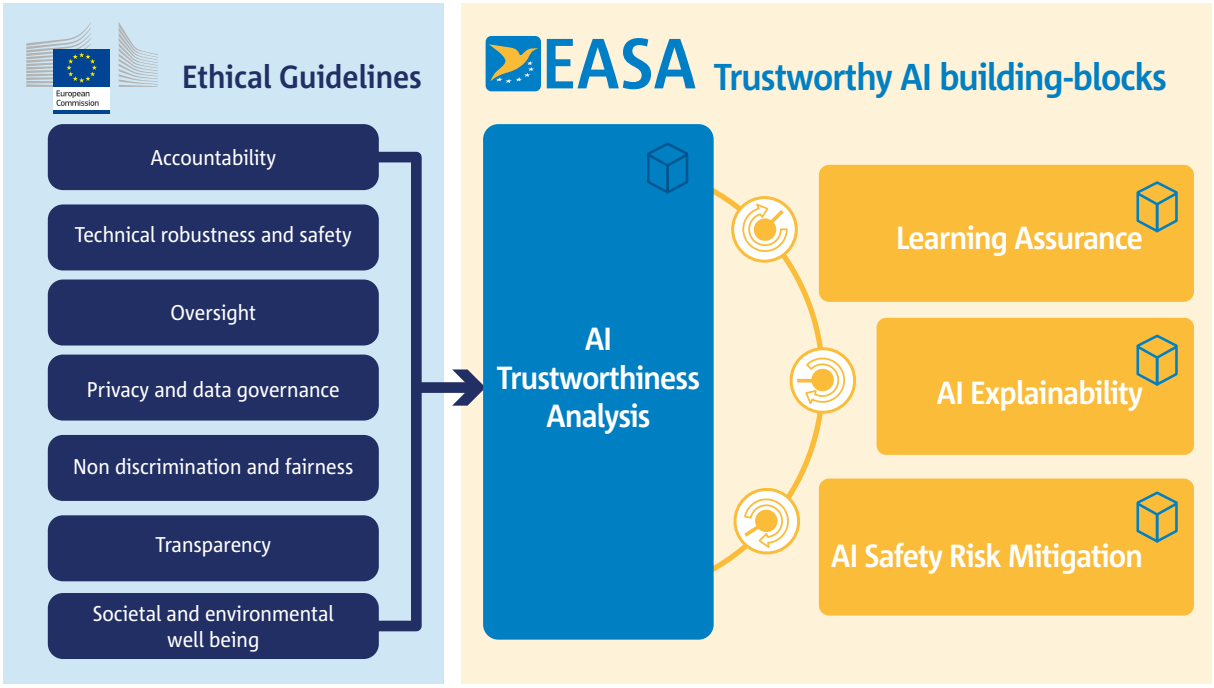


Figure 8: EASA AI trustworthiness building blocks

All four building blocks are of importance in gaining confidence in the trustworthiness of an AI/ML application.

The ***AI trustworthiness analysis*** is an essential gate that aims at characterising the AI application through various analyses and that enables the definition of proportionality for the other building blocks, as represented on Figure 8 through a set of potentiometers. This block encompasses the well-proven safety and security assessments, and also triggers the novel ethics-based assessment which consists in a translation of the ethical guidelines[69] from the EC High Level Group of Experts on AI in the specific context of civil aviation.

The objective of ***learning assurance*** is a major innovation brought about by the use of data-driven approaches. It aims at gaining confidence at an appropriate level that an ML application supports the intended functionality, thus opening the 'AI black box' as much as practicable. It is outlined through the so-called W-shaped learning assurance process.

69 https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=60419

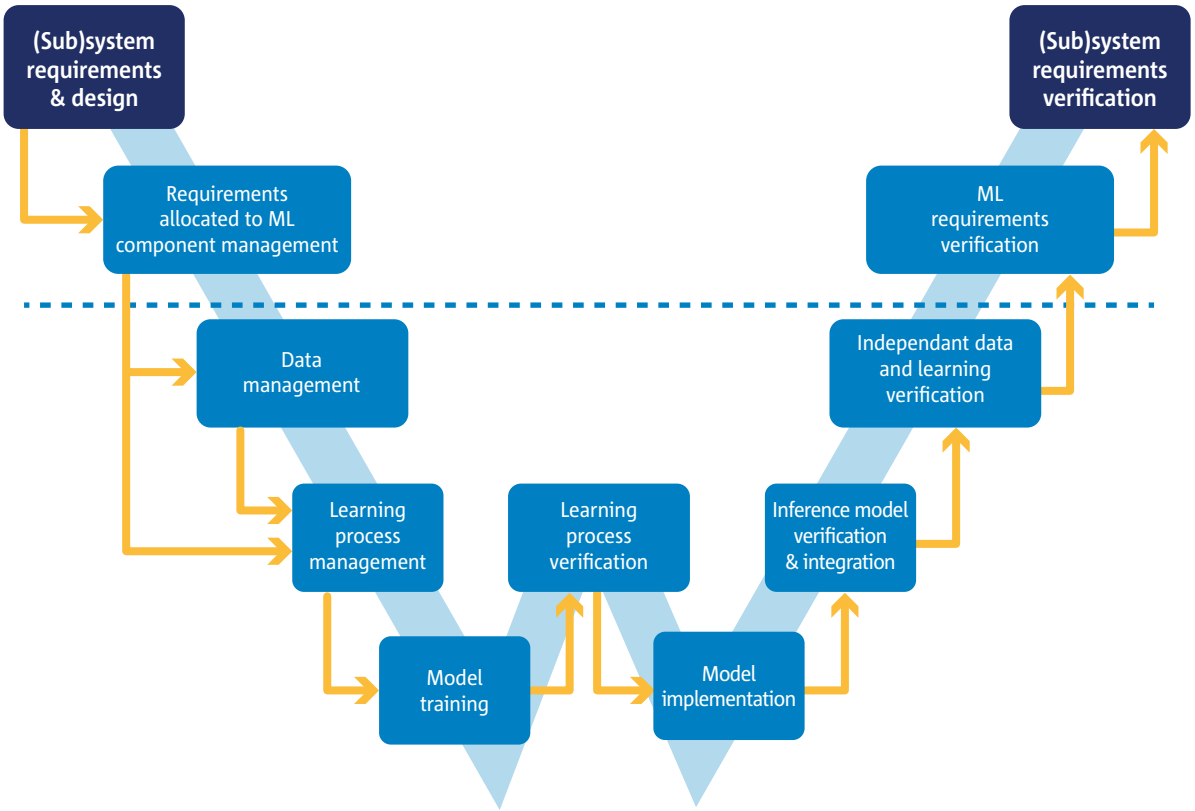


Figure 9: EASA learning assurance W-shaped process

Explainability of AI is a human-centric concept that deals with the capability to provide relevant and understandable information to the human(s) on how an AI application is coming to its results.

AI safety risk mitigation is based on the anticipation that the 'AI black box' may not always be opened to a sufficient extent and that the partial coverage of objectives from the other building blocks could result in a residual safety risk that should be accommodated by implementing appropriate mitigations.

Timeline

The EASA AI Roadmap v1.0 foresees a phased approach, the timing of which is aligned with the industry AI implementation timeline. ***Phase I*** will consist in developing a first set of guidelines necessary to approve first use of safety-critical AI, in partnership with the industry, mainly through IPCs, support to research, certification projects and working groups. ***Phase II*** will build on the outcome of Phase I to develop regulations, AMC and GM for certification/approval of AI. A ***Phase III*** is foreseen to further adapt the Agency processes and expand the regulatory framework to the future developments in the dynamic field of AI.

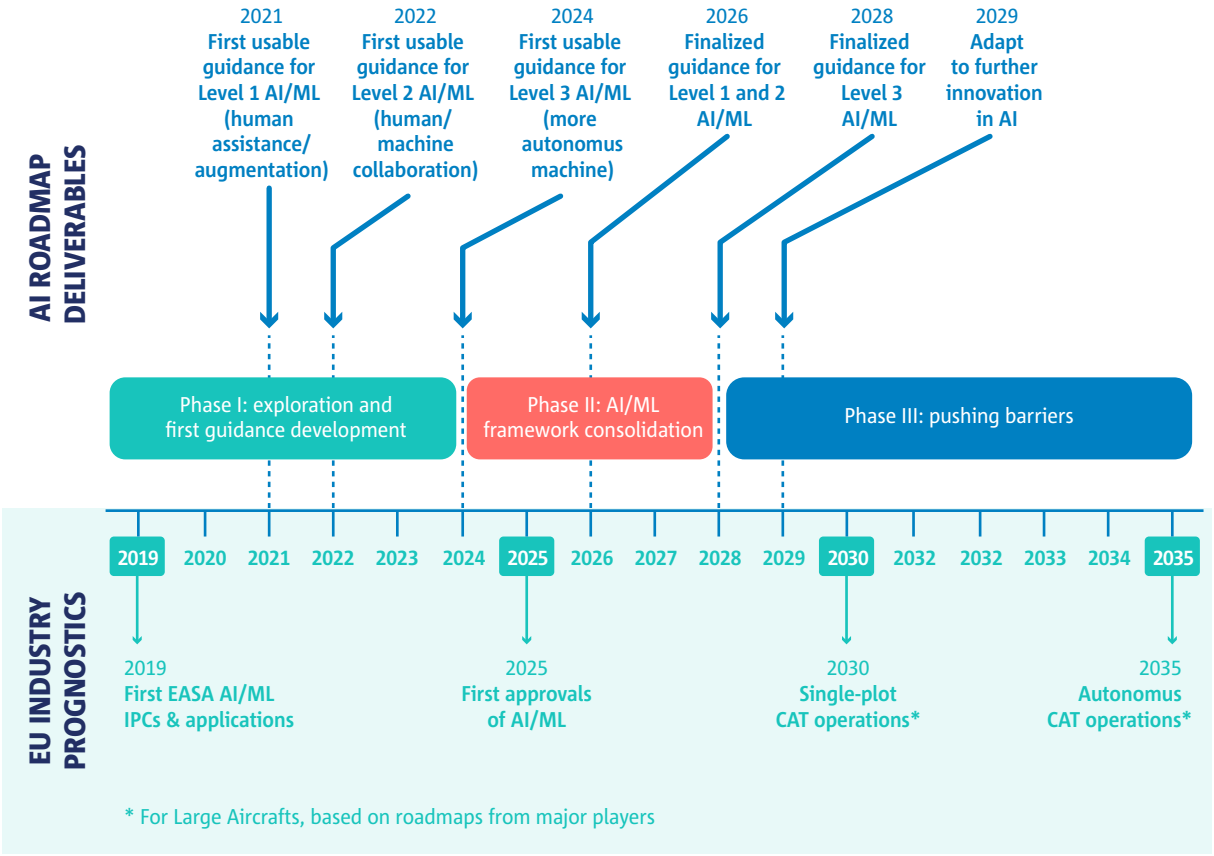


Figure 10: AI Roadmap phased approach

AI Roadmap deliverables

On 21 April 2021 EASA published for consultation the first AI Roadmap deliverable, a concept paper on 'First usable guidance for Level 1 ML applications'. The scope of this document is focused on an initial set of AI/ML techniques (non-adaptive supervised learning) used in safety-related or environmental protection applications. The goal of this document is twofold:

- to allow applicants to have an early visibility on the possible expectations of EASA with respect to the implementation of AI/ML solutions; and
- to establish a baseline for Level 1 AI applications that will be further refined for Level 2 and Level 3 AI applications.

EASA will inform stakeholders on the progress of the AI Roadmap implementation and seek for feedback on further deliverables through public consultations.

3.1.3.2 Engine/aircraft interface and certification

In 2016 EASA, together with the FAA, initiated a joint Engine/Aircraft Certification Working Group (EACWG) to look at improving engine/aircraft interface certification practices on the large transport category aircraft powered with turbine engines. The group was tasked to conduct an in-depth review of current certification practices and processes, as well as to develop recommendations for EASA and FAA leadership on changes that would streamline and improve the overall certification process.

An effective and efficient certification process, combined with streamlined certification requirements and standards, will have clear safety benefits.

The EACWG identified a total of 29 recommendations in the following areas:

- conducting a certification programme;
- understanding and developing the regulatory requirements;
- understanding if the engine/airframe certification interface is working effectively; and
- addressing specific rule and policy gaps.

A number of recommendations made were outside the scope of the EACWG, such as reviewing the operational regulations to determine whether discrepancies exist between these and certification regulations.

The list of recommendations is included as Appendix D to the final report issued by the EACWG in June 2017[70].

EACWG also recommended the formation of a follow-on joint EASA/FAA/industry group to monitor the successful implementation of the recommendations. In September 2018 the Certification Management Team (CMT) following a request from EASA and the FAA approved the creation of the Engine Aircraft Certification Tracking Board (EACTB). Through this endorsement the composition of the group is extended to the four authorities in the CMT (EASA, FAA, TCCA, ANAC).

The objectives of the EACTB are to:

- establish a forum and process for engine and aircraft airworthiness authorities and industry to review conflicts and gaps between engine and aircraft regulations in order to eliminate them and to proactively review regulatory change opportunities;
- track the completion, implementation and effectiveness of the (29) EACWG recommendations; and
- develop an efficient process for conducting certification programmes, defining multiparty project reviews with engine/aircraft applicants and regulators early in a certification effort to list, detect and resolve regulatory gaps, overlaps and independencies, so that manufacturers can communicate conflicting regulatory requirements to the engine and aircraft authorities, escalate and resolve them.

Since its constitution, the EACTB has managed to progress effectively on 20 of the 29 recommendations, with high focus on the CMT 'top three', on the additional three EACTB recommendations that are deemed of high priority by the group, and with ad hoc responsiveness to other engine/aircraft interface conflicts which have emerged.

The EACTB has also deployed efforts in the direction of settling the appropriate forum for resolution of potential regulatory difficulties in the engine/aircraft interfacing.

Top-three CMT items:

- Recommendation R-2.8: Issue Papers to Policy
- Recommendation R-4.6: Fire Prevention
- Recommendation R-4.7: Electrical Wiring Interconnection System (EWIS)

70 https://www.easa.europa.eu/sites/default/files/dfu/EACWG_final_report_June_2017.pdf

Additionally, three items identified by the EACTB:

- Recommendation R-4.1: F&R Testing
- Recommendation R-4.5: Inhibit Engine Protection Systems
- Recommendation R-4.4: Extended Range Operation with Two-Engine Aeroplanes (ETOPS)

These efforts will be continued during the next period and the EACTB will be coordinating with the Certification Authorities for Propulsion (CAPP) and with the Certification Authorities for Transport Airplane (CATA) for the pursuing and progressing on the recommendations, and the fulfilment of the EACTB objectives.

EASA will consider these recommendations for future rulemaking actions, which would be incorporated into the EPAS once the CMT has agreed to the conclusions of the EACTB.

3.1.3.3 Ensure the safe operations of UAS (drones) and manned eVTOL aircraft

Enabling the safe integration of the fast evolution of the emerging novel market segment of UAS, also commonly called 'drones', including the development of eVTOL aircraft, intended for UAM operations, continue to be one of the high-priority EASA activities, and one that is largely unaffected by the COVID-19 pandemic. Following the applicability of EU regulations for the 'open' and 'specific' (the smaller) UAS categories, EASA will now include these regulations in its standardisation activities. Following the adoption of the U-space regulatory package, EASA in a next phase is focusing on supporting Member States and industry in their forthcoming implementation of U-space services and continues developing a comprehensive EU regulatory framework for the 'certified' UAS category.

In addressing risks from the unauthorised operation of drones, EASA continues with the completion of certain ongoing tasks of its Counter-UAS Action Plan.

Common European rules for UAS operations and registration

Common European rules contribute to the development of a common European market while ensuring safe operations, providing a level playing field, as well as respecting the privacy and security of EU citizens.

In February 2019, Europe got one step closer to harmonised rules for safe drone operations as the EASA Committee voted unanimously to approve the EC's proposal for an implementing act to regulate the operations of UAS in Europe and the registration of drone operators and of certified drones. Commission Implementing Regulation (EU) 2019/947[71] accompanied by Commission Delegated Regulation (EU) 2019/945[72], defining the technical requirements for drones, were published in June 2019. The Delegated Regulation was immediately applicable while the Implementing Regulation will become gradually applicable within 3 years from publication. By the end of 2023 the transitional period will be completed, and the Regulation will be fully applicable.

These Regulations were amended by Commission Implementing Regulation (EU) 2020/639[73], accompanied by Commission Delegated Regulation (EU) 2020/1058[74], introducing two European standard scenarios allowing the use of a declaration submitted by the UAS operator to the NCA. The applicability date of the European standard scenarios was set to 2 December 2021. The EC together with the Member States decided to postpone the applicability date to 2 December 2023.

With the above Regulations the proposed EASA general concept establishing three categories of UAS operations ('open', 'specific' and 'certified' — with different safety requirements proportionate to the risk) is adopted at European level and will be implemented.

71 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1570893991756&uri=CELEX:32019R0947
72 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1570894011520&uri=CELEX:32019R0945
73 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R0639
74 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32020R1058

Following the publication of the above-mentioned EU Regulations, EASA published in October 2019 the related AMC and the GM — see ED Decision 2019/021/R[75]. These AMC & GM include:

- a revised version of the draft AMC and GM that were published with Opinion No 01/2018[76];
- the specific operations risk assessment (SORA) as an AMC to the risk assessment that is required in the 'specific' category;
- the first predefined risk assessment to assist operators when applying for an authorisation in the 'specific' category; and
- explanations resulting from the discussions held with stakeholders during the approval of the regulation.

U-space

In March 2020 EASA published its Opinion No 01/2020 proposing a regulatory framework for the U-space to create and harmonise the necessary conditions for manned and unmanned aircraft to operate safely in the U-space airspace, to prevent collisions between aircraft and to mitigate the air and ground risks. The EC adopted the U-space regulatory package in April 2021. This is a major achievement for the implementation of the EU drone policy and Smart Mobility Strategy.

The U-space regulatory package consists of three regulations:

- Commission Implementing Regulation (EU) 2021/664 of 22 April 2021[77] on a regulatory framework for the U-space;
- Commission Implementing Regulation (EU) 2021/665 of 22 April 2021[78] amending Implementing Regulation (EU) 2017/373 as regards requirements for providers of air traffic management/air navigation services and other air traffic management network functions in the U-space airspace designated in controlled airspace; and
- Commission Implementing Regulation (EU) 2021/666 of 22 April 2021[79] amending Regulation (EU) No 923/2012[80] as regards requirements for manned aviation operating in U-space airspace.

The applicability date of the Regulations is 26 January 2023.

Key actions:

- The NPA 2021-09 amending the AMC & GM to address the definition of geographical zones, the standard scenarios (STS) and the syllabus for training modules for remote pilots operating in the 'specific' category has been published in Q2 2021 with consultation period until 30 September 2021.
- An NPA to cover operations of manned VTOL aircraft carrying passengers or cargo in congested (urban) and non-congested (non-urban) environments, as well as UAS operations in the 'specific' high-risk categories. This comprehensive NPA is expected in Q1-Q2/2022 under RMT.0230. The subsequent related Opinion will address several aviation domains (initial and continuing airworthiness, aircraft operations, aircrew licencing, ATM/ANS and rules of the air).
- An NPA including the necessary AMC/GM in support of the implementation of the U-space regulations is expected to be published towards the end of 2021. EASA continues to assess the need for action in the field of UAS, in particular in relation to the harmonised implementation of the adopted regulations for the 'open' and 'specific' categories, the development of the necessary regulations for the 'certified' category and the safe and harmonised development and deployment of U-space across the EU.

75 https://www.easa.europa.eu/document-library/agency-decisions/ed-decision-2019021r

76 EASA Opinion No 01/2018: Introduction of a regulatory framework for the operation of unmanned aircraft systems in the 'open' and 'specific' categories

77 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0664

78 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0665

79 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32021R0666

80 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012R0923&qid=1637155067940

Types of UAS operations considered here

There are three types of UAS operations as follows:

- Operations type #1: Instrument flight rules (IFR) operations of UAS for the carriage of cargo in airspace classes A–C (ICAO airspace classification) and taking off from and/or landing at aerodromes falling under the Basic Regulation.
- Operations type #2: operations of UAS taking off and/or landing in a congested (e.g. urban) environment using predefined routes in the U-space airspace (part of the operation could be in a non-congested, e.g. rural environment). These include operations of unmanned VTOL aircraft carrying passengers (e.g. air taxis) or cargo (e.g. goods delivery services).
- Operations type #3: same as for type #2 operations with VTOL aircraft with a pilot on board, including operations out of the U-space airspace. While this task will include considerations also for emerging technologies such as electric and hybrid propulsion as integral part of the drones' design, the dedicated RMT.0731 will address in particular the CAW aspects related to these technologies.

The safe integration of all new entrants into the airspace network will be one of the main challenges in relation to the integration of UAS technologies and related concepts of operation.

Manned eVTOL aircraft

At the end of 2018, following receipt of applications for the certification of small VTOL aircraft, EASA launched a public consultation on its proposal for an SC that included suitable airworthiness standards to enable the certification of small VTOL aircraft. The number and the nature of the comments received provide an indication that such aircraft may have to be treated as a new product category which would fit neither the CS-23 nor the CS-27 product category. Following the public consultation, EASA finalised and published the SC. This SC for the certification of those aircraft is intended to represent the first component of the regulatory framework to enable the safe operation of air taxis and eVTOL aircraft in Europe.

With regard to the environmental compatibility of VTOL, in anticipation of future air taxi operations in urban areas, a number of different designs of drones and small eVTOL have been noise-tested in the course of 2019 and 2020. The aim was to assess the particularities of the individual noise signatures through recordings of different overflights and stationary flight phases. Raw noise data was recorded for multiple flights based on which the Agency will assess the accuracy, repeatability and representativeness of different candidate noise measurement procedures as well as the suitability of potential noise assessment metrics and noise assessment reference points.

EASA UAM Study Task Force

When EASA started its work on developing new and amending existing regulations to allow more regular UAM operations, it became clear that societal concerns and citizens' expectations for this new mobility applications needed to be fully understood and addressed by the regulator, so that the right level of regulatory objectives and actions are established. It was for that reason that EASA conducted a comprehensive study on the societal acceptance of UAM operations across the European Union to guide its work. The study was carried out together with the consulting firm McKinsey & Company and the Arup Sound Lab between November 2020 and April 2021, with the final report published in May 2021[81]. As a follow-on activity to action the main outcomes and conclusions of the UAM Study, EASA established a dedicated EASA UAM Study Task Force, comprised of various relevant stakeholder groups, tasked with developing an action plan with additional or complementary actions to the existing ones that EASA could take to enable safe, secure, efficient and sustainable implementation of UAM in the EU. The TF's deliverable is expected in Q1 2022.

81 EASA publishes results of first EU study on citizens' acceptance of Urban Air Mobility | EASA (europa.eu)

Vertiports

For their operations VTOL-capable aircraft will use aerodromes, heliports and the so-called vertiports. 'Vertiport' means an area of land, water or structure used or intended to be used for the landing and take-off of VTOL aircraft. Based on Article 2 of the Basic Regulation, which delineates the scope for aerodromes, vertiports are classified as aerodromes for the purpose of aerodrome and vertiport regulations.

A common European approach to vertiports will be established in the scope of the drone programme. The development will be based on EASA certification specifications for heliports, ICAO Annex 14, Volume II Heliports SARPs, adjusted with VTOL-capable aircraft performance data and manufacturers' requirements.

At the first stage, for the manned VTOL-capable aircraft operations (type #3), EASA is developing Prototype Technical Specifications (PTS) for the design and operations of VFR vertiports. Member States will be able to use PTS for developing their national regulatory framework for vertiports. Besides the positive effect of fostering the European VTOL-capable aircraft and vertiport design technology as such, the resulting harmonisation is particularly important for vertiport operators and small and medium VTOL-capable aircraft manufacturers who would have an easier access to EU markets, where vertiports have common design and organisational features.

At the second stage, for vertiports within the scope of the Basic Regulation Article 2, which are open to public use, serve commercial air transport and use instrument approach and departure procedures, and for the VTOL-capable aircraft operations type #2 and operations type #3, EASA will develop a full package of regulations for the design and operations of vertiports, including requirements for the authority, vertiport operators and operation of vertiports, along with the certification specifications for the design and certification of vertiports.

The NPA concerning the design and operation of vertiports within the scope of the Basic Regulation will be published along with other NPAs for the 'certified category' in 2023 (RMT.0230), with the associated Opinion expected early 2024.

VTOL-capable aircraft operations type #2 and type #3 can be conducted at aerodromes when using the runways and manoeuvring areas, or vertiports designed for such purposes, while the operations at heliport facilities at aerodromes or at stand-alone heliports may only be used provided that the VTOL-capable aircraft dimensions and performance meet the design characteristics of the heliport intended to be used.

EASA Counter Drone (C-UAS)[82] Action Plan

The analysis of the events in Gatwick in December 2018 identified the need to support aerodrome operators, ATS providers and aircraft operators in preventing and managing incidents of unauthorised drone operations in the surroundings of aerodromes, while at the same time keeping operational disruptions at a minimum.

As not all European airports are equally prepared for unauthorised drone encounters, guidance material is needed on how to assess this risk, how to set up a drone incident management process, and how to best clarify the roles and responsibilities of the different actors with an active role during such incidents. Clarity is also required regarding the occurrence reporting requirements in relation to drone incidents. And last but not least, an overview over the types of counter-drone technologies ranging from detection, classification and tracking to neutralisation of unauthorised drones.

In order to avoid a diversity of national measures, EASA had proposed to act as the European coordinator of an action plan containing five objectives and to collaborate with the affected stakeholders, namely the Member States (including NCAs and law enforcement authorities), aerodrome operators, aircraft operators, ANSPs, EUROCONTROL and the EC. The C-UAS Action Plan is subject to periodic review and amendment. Issue 1 of the proposed action plan was distributed to the stakeholders for review, contribution and endorsement, after which Issue 2 was published in July 2019 which took the feedback and proposals into account. The latest Issue 3, published in September 2020, includes numerous amendments to the C-UAS Action Plan as the work on the implementation progresses.

82 Counter-unmanned aircraft systems.

The Action Plan is articulated around five objectives:

#	Objective	Deliverable	Timeline/ Status
1	**Educate the public** to prevent and reduce misuse of drones around aerodromes	1.Safety promotion material to create public awareness and understanding of the existence and purpose of geographical zones https://www.easa.europa.eu/sites/default/files/dfu/easa_printmotif01_version005.pdf; https://www.easa.europa.eu/document-library/general-publications/infographics-drones 2. AMC & GM defining a common unique digital format for UAS geographical zones.	1. Completed 2. In progress
2	Prepare **aerodromes** to mitigate risks from unauthorised drone use	EASA guidance material (in the form of a manual) describing the roles and responsibilities of the actors, and best practices on how to respond to unauthorised drone operations in the surroundings of an aerodrome: https://www.easa.europa.eu/sites/default/files/dfu/drone_incident_management_at_aerodromes_part1_website_suitable.pdf	Completed
3	Support the assessment of the **safety risk of drones** to manned aircraft	Paper (Input to Objective 2) addressing the consequences of drone collision with manned aircraft	In progress
4	Ensure that **C-UAS measures** are swiftly considered and implemented from a global safety perspective	Contribution to the development of International Standards to support the safe and harmonised implementation of Counter-UAS Systems into an airport environment and ATM/ANS systems	In progress
5	Support adequate **occurrence reporting**	1. Define high-level criteria to classify airprox events. 2. Evaluate compatibility of existing occurrence reporting procedures for inclusion of occurrences involving UAS. 3. Develop a suitable action plan to integrate UAS in common occurrence reporting procedures.	1. In progress 2. In progress 3. In progress

Table 3: C-UAS Action Plan

The output from the above actions takes the form of guidance material complementing EASA's rulemaking activities on U-space and the EASA implementation plan for Commission Delegated Regulation (EU) 2019/947 and Commission Implementing Regulation (EU) 2019/945.

Other actions of non-regulatory nature on drones

- Coordinated safety promotion to create understanding and awareness of the rules and to support safe UAS operations in the long term (SPT.0091)
- Aircraft drone collision research action (RES.0015)
- Conduct a series of webinars with Member States on different topics related to Regulations (EU) 2019/945 and (EU) 2019/947 in order to promote common understanding and harmonised implementation.
- Develop PTS for the design of vertiports (RMT.0230) to support the establishment of a coherent and harmonised system of design criteria for vertiports, which can be applied by Member States for those vertiports to which national rules would apply.

3.1.3.4 New air mobility

Until now, the air travel over urban areas has been limited to very special operations, such as police operations or HEMS. New actors are seeking new business models to provide more services to citizens, ranging from parcel delivery by air within the cities to flying air taxis. These new business models and operations need to be performed in a safe and secure manner to maintain the confidence that citizens have in the air transport system. EASA has a key role to play in this area.

To this effect, EASA conducted in 2020-2021 a study to measure the societal acceptance by EU citizens of future urban air mobility operations[83]. The results reveal a general positive attitude by citizens and a readiness to try out these services, in view of the benefits they can offer in terms of faster, cleaner and better-connected mobility. However, they also highlight citizens' concerns on safety, security, environmental impact and noise of these operations that will need to be addressed. The Agency will take these results into account in its rulemaking activities and will develop, with the Member States, the EC and local authorities, an Action Plan on UAM public acceptance.

After gyroplanes and tilt rotors (new subtasks in RMT.0731 'New air mobility' introduced for the EPAS 2021-2025) airship and flying car developments are now being closely monitored and are currently subject to a BIS; in particular, to determine when to start the corresponding rulemaking work:

— Airships

There are a number of airship projects in Europe. These lighter-than-air aircraft are likely to be used in commercial operations in the medium term; for instance, with more than 60 tons payload for cargo transport. The existing flight crew licensing, air operations and continuing airworthiness regulations will need to be adapted to incorporate this type of operation.

— Flying cars

There are currently a number of 'flying car' projects under certification by EASA. These flying cars are dual-transport mode aircraft capable of being operated both as a flying machine and as a terrestrial vehicle. The aviation safety regulations (e.g. air operations regulation, continuing airworthiness regulation) will need to be adapted to incorporate this type of aircraft.

Key actions:

- Develop rules or amend existing ones, where necessary, to address new technologies and operational air transport concepts (RMT.0731 'New air mobility'). This now includes new subtasks to develop flight crew licensing and operational rules for gyroplanes and tilt rotors.
- Develop an Action Plan on public acceptance of UAM with the Member States, the EC and local authorities.

83 https://www.easa.europa.eu/sites/default/files/dfu/uam-full-report.pdf

3.1.3.5 Electric and hybrid propulsion

Innovation in any industry is a key factor influencing its competitiveness, growth and employment potential. With this strategic priority in mind and looking at the increasing number of new aircraft manufacturers and suppliers working on aircraft using electric propulsion (and increasingly electric systems), it becomes apparent that there are very strong prospects as well as demand, from industry and governments, to have hybrid propulsion and eventually fully electric aircraft. The market potential is therefore considered significant with related effects on wealth and job creation. The use of electric and hybrid propulsion systems has the potential of significantly reducing the aviation environmental footprint in terms of both gaseous emissions and noise. However, to ensure that this objective is met, the full life cycle of the product needs to be taken into account as well as the energy mix used.

To encourage the safe integration of new technological advancements in the wider electrical aviation sector overall, flexibility in the approach on all types of concepts, variations and design types will be enhanced.

To allow for the projects to thrive, a number of complex issues need to be tackled from a regulatory perspective.

In terms of rulemaking for aircraft design requirements, EPAS actions will be included once enough experience will have been gained on the use of SCs. The use of performance-based and non-prescriptive specifications is already laid down in the SCs for VTOL and electric and hybrid propulsion and may be embedded also in the future CSs, as already used for e.g. CS-23.

EASA has also developed a dedicated set of SCs, which will be applied together with existing airworthiness codes (CS-E, CS-23, CS-27, etc.) for the certification of aircraft with electric and hybrid propulsion, and on a case-by-case basis for each application.

Moreover, in order to enable standardised type certification of electric and hybrid propulsion systems (EHPS), either in the case of having a separate engine type certificate (TC) for the EHPS, or in the case where the EHPS would be integrated into the aircraft TC, a set of technical specifications have been established in a dedicated SC for EHPS. The proposed SC-EHPS was published for public consultation on 27 January 2020 and the consultation ran until 19 June 2020. EASA received 501 comments and provided a final version with a comment-response document (CRD) in April 2021[84]. As the definition of EHPS interfaces would depend on specific aircraft application, the possibility to further define EHPS requirements to ensure a two-step approach (step 1: requirements for engine TC not related to a specific platform; step 2: requirements for engine TC relevant to a specific platform integration) will continue to be studied in 2022.

The first small aircraft type model with fully electric propulsion system was EASA type-certificated on 15 June 2020.

Likewise, in electric and hybrid aviation EASA aims to continue building up knowledge on emerging technologies, to establish TACs or IPCs to identify certification challenges in innovative products, and to continue liaising with relevant industry and standardisation working groups. EASA is also engaged through providing technical training to its staff.

In terms of rulemaking actions for other aviation domains, RMT.0731 will lead to different streams of activities, one of them being to address the regulatory gaps identified in the existing regulations with regard to electric and hybrid propulsion.

Key actions:

Adapting existing regulations to support the introduction of aircraft with electric and hybrid propulsion systems will be done through a number of actions, as follows:

- RMT.0731 (New air mobility) for continuing airworthiness requirements for all types of aircraft[85]
- RMT.0230 (Drones), also addressing manned e-VTOL electric propulsion aspects related to the ADR, ATM, FCL and OPS domains

84 https://www.easa.europa.eu/document-library/product-certification-consultations/final-special-condition-sc-e-19-electric

85 Terms of Reference: https://www.easa.europa.eu/document-library/terms-of-reference-and-group-compositions/tor-rmt0731

- RMT.0678 (FCL) and RMT.0573 (OPS), addressing a first set of FCL and OPS electric propulsion-related requirements for other aircraft types that are not covered by RMT.0230
- RES.0048 to assess the feasibility, the environmental benefits and the certifiability of proposed designs for aircraft propulsion systems with integrated hybrid/electric engines and power generation architectures as well as sub-systems' enablers.

The environmental protection requirements regarding emissions and noise with electric and hybrid propulsion will be assessed with the existing RMT.0727 (Alignment of Part 21 with Regulation (EU) 2018/1139, including simple and proportionate rules for General Aviation), RMT.0230 (Drones) and RMT.0514 (Implementation of the CAEP amendments: Climate change, emissions and noise).

Potentially more streams to cover other future projects could be added in RMT.0731 including the development of CSs based on experience gained in certification projects applying SCs such as for VTOL or electric and hybrid propulsion.

3.1.3.6 Hydrogen powered technologies

In order to meet the environmental targets for climate neutrality by 2050, there is an increased focus by the industry on the potential of using hydrogen as an energy carrier in aviation that could then either be used by fuel cells to produce electricity or burnt in a combustor in a similar way to kerosene today. The properties of hydrogen raise a number of challenges from storage and distribution right through to conversion into the final energy used to propel the aircraft. Some industry actors have declared their intention to have a CS-23 aircraft certified as early as 2023 while Airbus have publicly stated for their ZeroE initiative that their objective is to have a transport aircraft certified by 2035.

In 2021 EASA nominated a focal point for hydrogen to help coordinate the Agency's efforts to be ready for the introduction of hydrogen and in particular prepare a competency roadmap for hydrogen to build its competency in this domain such that it will be able to support industry requests while remaining confident in the level of safety achieved.

3.1.3.7 Enable the implementation of new operational solutions developed by SESAR

The EPAS also caters for the regulatory and implementation needs of the SESAR essential operational changes and other new technological advancements (such as but not limited to U-space technological solutions, virtualisation, cloud-based architecture and remote tower operations).

Global interoperability, civil-military cooperation and compatibility with other regions' development plans, such as the FAA NextGen, form an integral part of EASA's work. Furthermore, the EPAS provides a proactive and forward-looking view to support the implementation of the essential operational changes required to achieve the SESAR vision.

The future rulemaking activities will further consider SESAR ongoing R&D work and Airspace Architecture Study recommendations on:

- **virtualisation and ATM data as services**, to allow transition to virtual centres and a common data layer allowing more flexible provision of ATM services;
- **dynamic management of airspace**, to facilitate dynamic grouping and degrouping of sectors and managing the staff resources accordingly;
- **capacity-on-demand** agreements, to ensure the continuity of air traffic services by enabling more dynamically a temporary delegation of the provision of air traffic services to an alternate centre with spare capacity;
- **trajectory-based operations**, to enable airspace users to fly their preferred flight trajectories.

Such activities should avoid requiring specific technological solutions; instead, they should specify clear performance and competence requirements as appropriate to the anticipated operations.

Furthermore, EASA will consider additional implementation support activities that facilitate the achievement of operational improvements and new ATM operational concepts. These activities should approach the implementation needs in a comprehensive manner, thus facilitating the safe, secure and interoperable implementation of cost-effective solutions considered as necessary. Such solutions could include 'enabling infrastructure' that encompasses GNSS (incorporating dual frequency multi-constellations), SATCOM, and other satellite-based CNS solutions or others emerging from the telecommunications field.

Key actions:

- Support the development of data link operations through RMT.0524, expanding the current Commission Regulation (EC) No 29/2009[86] to enable the use of alternate data link technologies compliant with performance requirements.
- Support the implementation of performance-based navigation in the European ATM network as per Commission Implementing Regulation (EU) 2018/1048[87] (SPT.0108).
- Support the implementation of the regulatory needs in support of the SESAR deployment (RMT.0682). This encompasses regulatory actions at rule level and validation of industry standards and complements RMT.0161 which will allow the establishment of additional detailed specifications applicable to ground systems and their constituents, whenever necessary.
- Support the implementation of the air traffic data services provision by amending the current Commission Implementing Regulation (EU) 2017/373 to enable these services (RMT.0719).
- Assess SESAR R&D Solutions related to ATC provision (e.g. dynamic cross-border sectorisation, virtual centre concept, capacity-on-demand services) and consider their implementation by amending the applicable regulations (e.g. Commission Regulation (EU) 2015/340) via RMT.0668, as an enabler for increased ATCO mobility.
- Assist stakeholders in implementing the virtual centres concept and dynamic cross-border sectorisation, where the need arises by exploring the means to enable moving towards a system-driven ATCO training and licensing that would allow the ATCOs to provide services outside their sector through RMT.0668.

3.1.3.8 Enable all-weather operations

The European industry should have the capability to take full advantage of the safety and economic benefits generated through new technologies and operational experience. This represents a widely recognised interoperability subject touching on a wide range of areas, including performance-based aerodrome operating minima (PBAOM), related aerodrome equipment to support such operations, and procedures for both CAT and GA.

Aircraft operations have always been influenced by the weather. Whilst modern aircraft design and the availability of weather observations and forecasts contribute to a predominantly very safe flying environment, there remain occasions where severe weather events have been identified as being a contributing factor in the causal chain of accidents and incidents. Such events remain of concern within the aviation community and corresponding SRs have been addressed to EASA by accident investigation authorities.

Since 2015 EASA has increased its focus on weather-related challenges and, as part of that work, has sought to identify whether the meteorological information available to pilots could be enhanced. Accordingly, EASA organised a first workshop on 28-29 October 2015 dedicated to 'Weather information provided to pilots'.

Following the workshop and the acknowledged need to take further action, EASA integrated the 'Weather Information to Pilots' project within the activities of RMT.0379 'AWO'. A project team put together in April 2016

86 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1570907047400&uri=CELEX:32009R0029

87 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32018R1048on

— involving representatives from international organisations, associations and industry — was tasked with an assessment of the situation and this resulted in the 'Weather Information to Pilots Strategy Paper'[88] issued in January 2018. The EASA Strategy Paper focuses on the weather phenomena that introduce risks to aviation, describes the current mitigation measures, the deficiencies and how to overcome them. The scope of the paper is focusing on CAT aeroplanes.

The EASA Strategy Paper proposes nine recommendations to further improve weather information and awareness. The recommendations are detailed on the Weather Information to Pilots webpage[89] and on pages 28-29 of the Strategy Paper itself.

They are summarised below:

- **Recommendation #1:** Education and training: weather hazards, mitigation and use of on-board weather radar
- **Recommendation #2:** Improved weather briefing presentation: promote improvements to the presentation of weather information in-flight briefing
- **Recommendation #3:** Promotion of in-flight weather information updates: promote the use of the latest information available to ensure up-to-date situational awareness
- **Recommendation #4:** Pan-European high-resolution forecasts: support the pan-European developments regarding the provision of high-resolution forecasts for aviation hazards (e.g. CAT: icing, surface winds, cumulonimbus (CB), winter weather)
- **Recommendation #5:** Use of supplementary 'Tier 2' weather sources for aviation purposes: develop the necessary provisions to support the use of supplementary 'Tier 2' meteorological information by pilots
- **Recommendation #6:** Development and enhancement of aircraft sensors/solutions: promote the development of intrinsic aircraft capabilities to facilitate the recognition and, if required, the avoidance of hazardous weather
- **Recommendation #7:** Connectivity to support in-flight updates of meteorological information: promote deployment of connectivity solutions (uplink and downlink) to support the distribution of meteorological information to pilots
- **Recommendation #8:** Provision of enhanced meteorological information: promote provision of high-resolution observed and forecast meteorological information, particularly data with high spatial and temporal resolution such as imagery derived from satellite and ground weather radar sources
- **Recommendation #9:** On-board weather radar installation of latest generation equipment: promote the installation of the latest generation of on-board weather radars, with emphasis on including capability for wind shear and turbulence detection

To support the above, a BIS 'Weather Information to Pilots' was produced in 2020 and consulted with the ABs, which led to the inclusion of a new safety promotion task in the 2021-2025 edition of the EPAS.

During 2021 EASA published Opinion No 02/2021 'All-weather operations and review of crew training requirements', a major milestone of RMT.0379.

Key actions:

- Review and update the AWO rules in all aviation domains (RMT.0379), supported with relevant safety promotion activities.
- Promote the availability of enhanced meteorological information and uplink connectivity (SPT.0114).

88 https://www.easa.europa.eu/sites/default/files/dfu/EASA-Weather-Information-to-Pilot-Strategy-Paper.pdf
89 https://www.easa.europa.eu/easa-and-you/air-operations/weather-information-pilots

3.1.3.9 Digital licences for aviation pilots (dLAP)

The Digital Licences for EU Aviation Pilots (dLAP) project aims to introduce digital pilot licences into the European aviation domain with the objective of providing a safe and easy-to-use service and enabling flight crew to carry their licences, including medical certificates, in a fully digitised format displayed on their own personal electronic devices.

The envisaged IT platform used to support dLAP should provide a digital signature workflow for electronic identification (eID) in accordance with the applicable European standards to enable secure verification of the identities of the flight crew members. The said platform should also enable the NCA-authorised flight examiners and aero-medical examiners as well as SAFA/SACA inspectors to update, validate and/or authenticate respectively the licences in real time. The said platform should be complemented by a web portal with multiple interfaces to be viewed in a standard web browser for the aforementioned users. dLAP should also have an interface with the repository of information in accordance with Article 74 of the Basic Regulation thereby enabling effective cooperation between EASA and the NCAs. The platform should further ensure prevention of fraudulent or forged licences as well as incorporate robust security measures for authentication and access control.

During the EASA MB meeting of June 2018 the MB expressed support for the project and approved the financing of the first PoC-phase (refer to MB Decision No 13-2018[90]) to prepare the planning for the development of a future dLAP platform. With the unfolding of the COVID crisis the work was put on hold during most of 2020.

In April 2021 EASA re-assessed the prospects and risks of the dLAP project and the way forward. In order to expedite the transposition of ICAO SARPs into the EU regulatory framework and ensure faster entry into service of dLAP, EASA concluded that the best strategy going forward is to commence with a rulemaking task for setting mandatory requirements regarding the introduction of dLAP into the Aircrew Regulation (Regulation (EU) No 1178/2011). The said task incorporates the upcoming amendment to ICAO Annex 1 regarding the implementation of an electronic personnel licensing system envisaged for applicability from 3 November 2022. This RMT also mitigates the uncertainties on its financing and will modernise the EU personnel licensing system through efficiency and security gains. In parallel EASA, in coordination with the ICAO Electronic Personnel License Task Force (EPL-TF) aims to amend the European regulatory framework to enable dLAP as an alternative to the paper licence.

Rule changes will ensure that there will be a unique EU pilot licence verification system and, more importantly, will guarantee the interoperability of this digital format in:

- combining pilot licences and medical certificates stemming from various EASA Member States displayed on a common and unique EU mobile digital pilot licensing format instantly updatable on a self-contained mobile personal electronic device;
- providing a unique EU pilot licence verification system (QR code); and
- enabling as part of the fully operational dLAP licensing service the management of pilot licences by flight examiners from different EASA Member States, thereby supporting the standardisation of examiners.

It is anticipated that NCAs (and eventually pilots/industry) will benefit from substantial cost savings due to a fully digital administration (reduced cost for printing/storing paper; reduced working time for licence processing). This is further supported by making the needed data available in the repository of information (REPIF) by 2022, to ensure effective cooperation between EASA and the NCAs as per Article 74 of the Basic Regulation.

90 https://www.easa.europa.eu/sites/default/files/dfu/EASA%20MB%20Decision%2013-2018%20adopting%20dLAP%20financing%20decision.pdf

Once the rulemaking work is progressed with a mandate that guarantees the legal and financial sustainability of the digital pilot licence, EASA intends to seek nomination from EASA Member States regarding the establishment of a dLAP Steering committee. This committee will monitor the development and entry-into-service of dLAP mainly through:

- steering the dLAP development and adjusting the technical tasks, budget management and tenders during the implementation phase;
- being accountable for EASA Member State's investments and resources management; and
- revising the number of pilot licences of the dLAP partners and, as necessary, adjusting the operational recurring cost accordingly on a yearly basis.

In the medium and long term, further licences can be added into the software solution (aircraft mechanics, ATCOs) at low cost.

Key action:

- New action RMT.0737 'Digital licence for aviation pilots' to address the mandatory requirements regarding the introduction of dLAP into the Aircrew Regulation

3.1.4 Environment

Environmental protection and the sustainability of the aviation sector has been growing in importance over the years and is a key priority for citizens, policymakers and the industry.

EASA has an explicit mandate to protect the environment, climate and human health. In 2019, as a follow-up to the initial 2017 Environmental Strategy, the Agency stepped up its actions towards a cleaner, quieter and more sustainable aviation system by broadening the scope and ambitions of the strategy through the launch of the Sustainable Aviation Programme with the following main objectives:

A. Facilitate the decarbonisation of the aviation system through Agency initiatives

B. Act towards sustainable aviation through environmental certification and standards

C. Act towards sustainable aviation through effective transversal actions

D. Act towards sustainable aviation through a flight standards environmental action

Some key initiatives developed under Objective A are:

	**Reduction of aircraft emissions** through facilitating and monitoring the use of **sustainable aviation fuels (SAF)** within Europe and support to the ReFuelEU initiative. The Agency will cooperate with stakeholder in order to facilitate the uptake of SAF, in particular focusing on removing technical barriers for new fuel suppliers trough the concept of an EU Clearing House for SAF. As such a stronger role for the EU in the SAF approval processes is envisaged.
	Promotion of **low-emission solutions** through facilitating the introduction of **electric, hybrid and hydrogen-powered aviation** such as the certified first fully electric GA aircraft type, the contribution to Horizon Europe's R&I programme (e.g. Clean Aviation), as well as related innovation partnerships with stakeholders.
	**Reduction of aviation's environmental footprint** through the development of an **Environment Label ('EcoLabel' – a voluntary initiative)** for aviation, by providing harmonised, reliable and easily understandable information for more **sustainable choices**, coordinated within EASA Member States. It should allow rewarding those air transport operators making efforts to reduce their environmental footprint and help increase the effectiveness of other measures like the ReFuelEU initiative, zero pollution, the Environmental Noise Directive, etc.
	Aiming to **reduce the climate impact from aviation**, the Agency is engaging through involvement in environment-related research activities such as the further investigation into the issue of the climate impact of non-CO_2 emissions from the aviation sector, as well as the necessary research facilitating new sustainable aviation fuels.

3.1.4.1 Act towards sustainable aviation through robust, efficient and innovative certification

In the area of aircraft and engine technology, the Agency's product certification activities ensure that products are as quiet and clean as possible, thereby reducing negative impacts on the health of citizens. At the same time, the Agency innovates to develop **the most cost-effective environmental certification process in the world**, thereby contributing to the competitiveness of the European industry.

EASA has for the first time certified an aircraft for CO2 emissions, applying a new process and methodology in 2021. These new environmental certification tasks will continue to grow in the following years.

Supersonic and hypersonic aircraft

It is likely that supersonic transport (SST) aircraft will be operated in Europe in the medium term.

Specific landing and take-off noise regulations will need to be adapted for supersonic aeroplanes, safeguarding thus the high level of environmental protection in Europe. In order to ensure a level playing field with subsonic aircraft, these supersonic landing and take-off noise regulations will be guided by the international noise certification standard for subsonic aeroplanes.

It is expected that SST aeroplanes will be restricted to fly at supersonic speeds over high seas in order to avoid unacceptable situations to the public —sonic booms to begin with. There is a long-term ambition to work on the definition of a sonic boom noise certification standard for 'low-boom' SST aircraft that will safeguard that no such unacceptable situations will be present. This is one precondition to facilitate supersonic flights over land. As regards emissions certification standards, SST aircraft and engine emissions regulations need to be developed and updated respectively, to ensure environmental compatibility of supersonic aircraft.

Key actions:

- The Agency has a new mandate to collect and **verify aircraft noise and performance information** for noise modelling around airports, as per Regulation (EU) 598/2014[91] Article 7.
- A number of **novel technologies** are rapidly approaching market maturity. In order to respond proactively to these technologies and allow for smooth certification based on robust environmental assessments, a dedicated activity will be launched to assess their environmental characteristics and sustainability. This will include the electric propulsion project as well as the sustainability assessment of alternative fuels. The success of this activity will be ensured by engaging traditional stakeholders as well as aviation environment non-governmental organisations (NGOs).
- The Agency will develop environmental protection requirements for supersonic transport aeroplanes (RMT.0733).

3.1.4.2 Act towards sustainable aviation through technical leadership for smart and proportionate standards

The Basic Regulation makes direct reference in Article 9 to the relevant Volumes of ICAO Annex 16.The Agency's effective involvement upstream in the ICAO-CAEP process, ensures availability of environmental standards based on EU Better regulation principles.

Key actions:

- A key priority from the European perspective is the CAEP work on supersonic transport to safeguard that the current high level of aviation environmental protection in Europe does not deteriorate and a level playing field between subsonic and supersonic jets is ensured. Furthermore, the environmental certification requirements for supersonic transport must on the one hand not undermine the historic environmental improvements that have been achieved by subsonic aircraft, and on the other hand help to avoid potential operating restrictions that affect the wider sector.

91 https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1570907778872&uri=CELEX:32014R0598

- EASA expertise in ICAO standard setting will continue to be made available to the EC for ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).
- As the Basic Regulation permits Europe to create environmental standards in those areas where no ICAO standards are available, efficient rulemaking will focus on areas where Europe would like to take the lead (e.g. hybrid; electric and hydrogen-powered aircraft).
- Smart standards are also synonymous with 'data-informed' standards. In this regard, EASA continuously improves the quality of its impact assessment capabilities by collecting and analysing flight data (Data4Safety) and developing state-of-the-art tools to monitor and forecast aviation's noise and emissions as well as the costs of candidate policies to mitigate those (Horizon Europe).

The Agency will bundle its efforts on digitalisation of its environmental activities under the EASA Environmental Portal. The Portal aims at achieving efficiency gains inside the Agency, as well as for NCAs (e.g. in issuing noise certificates), manufacturers, operators and aerodromes (e.g. in collection of noise certificates). [92]

3.1.4.3 Act towards sustainable aviation through effective transversal actions at European level (Article 87 implementation)

The Basic Regulation contains a broadened mandate for the Agency on environmental protection with an objective to 'prevent significant harmful effects on climate, environment and human health' (Article 87(1)). As this is a new requirement stemming from the EASA Basic Regulation, currently there is no process defined. It is proposed to anchor this activity to the EASA quality system and create a related core process.

The EC, EASA, other EU institutions as well as Member States are called to cooperate on environmental matters including on the EU Emissions Trading System (ETS) and on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)[93] (Article 87(2)). This cooperation is implemented through bilateral agreements of the Agency (e.g. the MoU with the European Chemicals Agency (ECHA) on REACH) and pan-European structures, like the ECAC European Aviation Environmental Group (EAEG).

Key actions:

- The Agency assists the EC with the definition and coordination of policies and actions (Article 87(3)). Current actions are, for example, related to CORSIA and the study on non-CO2 effects of aviation on climate.
- The Agency is newly mandated to perform and publish an environmental review which shall give an objective account of the state of environmental protection relating to civil aviation in the Union. Said review shall also contain recommendations on how to improve the level of environmental protection in the area of civil aviation in the Union (Article 87(4)). As the EAER developed with the European Environment Agency (EEA) and EUROCONTROL and published in January 2019 contains already the 'objective account' with the best available data, the Agency will now publish the recommendations with the next edition of the report in 2022.
- Based on the outcome of the 2019 work on circular economy indicators and life cycle assessments of novel technologies, the Agency will support the use of life cycle assessments for traditional airline activities as well as new urban air mobility concepts through investigations in the frame of the environmental label programme

92 Current Module 1: Noise data and certificates; Potential future modules: 2: Emissions data including CO2; 3: Impact assessment models; and 4: CORSIA

93 Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

- Based on its technical expertise and independence, the Agency is ideally placed to provide expertise and strategic steer to international cooperation and research activities (Horizon Europe, Clean Aviation, Sesar3). As part of this, EASA can act as a contract manager or as a technical partner to the EC to support the implementation and monitoring of environment-related research projects. Similarly, EASA will support ECHA by providing aviation technical expertise into the REACH process.

3.1.4.4 Act towards sustainable aviation through actions for increased operational efficiency

The Agency will perform further analysis to more clearly identify room for related regulatory or non-regulatory actions, focusing on areas including:

- monitoring ATM environmental performance and reviewing/identifying adequate environmental performance indicators to support regulatory and ATM environmental performance improvement initiatives at EU level;
- supporting more sustainability in flight crew training operations;
- identifying actions to improve sustainable aerodrome operations including a review of the impact of operations of novel aircraft concepts;
- identifying and removing regulatory barriers;
- supporting elements for hybrid and electric and hydrogen operation; and
- optimising operational procedures, such as abundant fuel carrying.

3.2 Update on the Basic Regulation Roadmap

On 10 April 2018 the EASA MB requested EASA to present a roadmap outlining the priorities for the implementation of the Basic Regulation. The roadmap received the MB's support during the June 2018 MB meeting. It identified the areas of the Basic Regulation where work was to be initiated or start in the range 2019-2021.

The roadmap identified not only rulemaking activities, but also certification- and standardisation-specific projects, involving policies' or procedures' drafting, initiatives with roadmaps, support to Member States, etc.

When it comes to rulemaking and policy setting, the following activities identified in the Basic Regulation were already included in the previous EPAS editions and will continue to be delivered:

- Development of a regulatory framework for drones and urban air mobility (RMT.0230, RMT.0730 and RMT.0731)
- Work on cybersecurity (RMT.0720) – Opinion No 03-2021 published on 11 June 2021
- ATM/ANS (Article 44) interoperability issues:
  - RMT.0679 — Surveillance performance and interoperability: completed, see Commission Regulation (EU) 2020/587 of 29 April 2020; and
  - RMT.0524 — Data link Services: Opinion for Subtask 2 rescheduled to 2023.

Under RMT, EASA published Opinion No 05/2021 on 22 October 2021 for simpler and more proportionate rules for aircraft used for sport and recreational aviation, including the use of declarations instead of certificates and approvals. This RMT is a key action in the context of the GA Roadmap 2.0. Furthermore, the Agency is working on a proposal for the implementation of other items introduced or amended by the Basic Regulation, such as non-installed equipment, permit to fly, restricted certificate of airworthiness, etc.

In the areas of groundhandling and on new aspects of environmental protection (not covered by ICAO Annex 16), the following activities will be undertaken:

- **On groundhandling** (Articles 33 & 37), in 2021/Q2 EASA relaunched RMT.0728 on the groundhandling with the Opinion expected to be delivered in 2023/Q1. RMT.0728 continued its work with a dedicated group of experts from the groundhandling industry, airlines and competent authorities' experts after it had previously been put on hold owing to limited availability of those experts due to the COVID-19 pandemic. The RMT will develop detailed requirements for the provision of groundhandling-related services, their oversight and the interface with airlines and aerodromes where the services are being provided. Those detailed requirements will be based on the essential requirements of the Basic Regulation. An SPT was also added with the EPAS 2021-2025 to address any non-regulatory groundhandling matters (SPT.0102).
- **On environmental protection**, EASA redefined its strategy including the implementation of Article 87, where EASA will engage in developing a measurement methodology for novel technologies (supersonic aircraft, electric propulsion/urban mobility) as well as in updating the EAER. See **Section 3.1.4**.

Moreover, the Basic Regulation in **Chapter II** 'Aviation safety management' Article 7 requires States to establish and maintain an SSP in accordance with international SARPs (ICAO Annex 19) and with the EASP. Basic Regulation Article 8 requires States to complement their SSP with a SPAS. Such a plan shall include the risks and actions identified in the EPAS that are relevant for the Member States concerned.

A new EPAS action was created with the EPAS 2019-2023 to account for this new requirement (see MST.0028). A dedicated repository for Member States' SSP documents and SPAS was made available to facilitate the dissemination of such documents[94]. With the EPAS 2020-2024 EASA communicated its expectation for Member States to have a SPAS available by the end of 2020. Considering the dramatic impact of the COVID-19 pandemic on the aviation industry and the additional workload created for Member States by the need to deal with the public health aspects within their SSP, adapt their oversight to the new situation and more generally to support the safe return to operations, the target for the related EPAS action was the end of 2021, in consideration of the extension of EASA Standardisation activities to SSP and SPAS implementation, from 2022 onwards.

In order to better encapsulate and reflect in the EPAS the new areas introduced by the Basic Regulation, the strategic priority **'Safe integration of new technologies and concepts'** was introduced with the EPAS 2019-2023 (see **Section 3.1.3**).

The development of new technologies, new business models and more generally speaking economic/social/societal changes may have an impact on aviation safety. It is important for the Agency to have a clear vision on those changes that can potentially affect safety. Stakeholders and **EU Aviation Social Partners** should help to build this vision.

According to Article 115 of the Basic Regulation, when consultation relating to military aspects is deemed necessary, the Agency will consult the European Defence Agency (EDA) and other competent military experts designated by the Member States.

Article 74 of the Basic Regulation requires EASA to develop a **repository** which aims at facilitating the exchange of information between the NCAs, EASA and the EC. Considering the huge quantity and complexity of information as well as the obligation to comply with data protection requirements, the MB decided to set up a dedicated Task Force which falls under MAB. The Task Force will focus on specifications per domain, the global architecture and the governance of the future platform. In 2019 the domains to be addressed were mainly drones, exemptions and aero-medical data. The technical solution shall rely on the EASA CORAL outputs. CORAL was initiated as an emergent programme with the purpose of harmonising projects through system integration and end-to-end digitalisation. The implementation of additional domains (e.g. licences, opt-outs, opt-ins) will be done step by step and in line with the CORAL milestones, with the ultimate goal of having all domains covered by 2025.

An important milestone was reached with the inclusion of drones in 2020.

As from 2021 Q2 the Task Force will also act as the Rulemaking Group for the Repository and will proceed with the drafting of the future regulation — to be consulted with the MAB in 2022 Q3 (as per the ToR for RMT.0732).

Article 89 of the Basic Regulation requires EASA to consult relevant stakeholders when addressing interdependencies between civil aviation and related socio-economic factors. EASA is therefore enhancing the cooperation with EU aviation social partners in order to reinforce its capacity to assess potential social impacts of the EU aviation regulations and to address socio-economic risks to aviation safety. Refer to **Section 3.1.1.5**.

Paragraph 2 of **Basic Regulation Article 140** stipulates that 'Not later than 12 September 2023 the implementing rules adopted on the basis of Regulations (EC) No 216/2008 and (EC) No 552/2004 shall be adapted to this Regulation.' Moreover, EASA aims to further develop the ATM regulatory framework to remove obstacles and enable the efficient recognition of new operational and technical improvements while maintaining a high level of safety. This will be achieved by creating a clear, consistent/harmonised, and rationalised set of requirements intended to align the former rules for interoperability (based on the repealed Interoperability Regulation (EC) No 552/2004) with the EASA Basic Regulation in an objective and performance-based manner, while integrating the need for certification and declaration of ATM/ANS systems and ATM/ANS constituents.

94 https://imf.easa.europa.eu/case/eab/mabtebs/SSPDocuments/Forms/AllItems.aspx

4. Performance

4. Performance

4.1 Safety performance

This section presents an outline for the EPAS safety performance metrics reflecting the EPAS strategic priorities in the area of safety and the high-level safety objective set out in the Basic Regulation to 'establish and maintain a high uniform level of civil aviation safety in the Union'. With the 2019-2023 edition the EPAS introduced an 'aspirational goal' to 'achieve constant safety improvement with a growing aviation industry' as an alternative to the GASP aspirational goal of 'zero fatalities in commercial operations by 2030 and beyond'. Considering the impact of the COVID-19 pandemic, the aspirational goal is adapted for this EPAS edition:

'maintain collectively the pre-pandemic high aviation safety level throughout the recovery phase and improve safety post-recovery'

This goal is deemed 'aspirational' as it represents an ambition of achieving an ever-safer aviation system. It is intended to address all operational domains. It is complemented by a specific safety objective defined in the Rotorcraft Safety Roadmap (refer to Section 3.1.2.2) to:

'improve overall rotorcraft safety by 50 % within the next 10 years (starting January 2019)'

A key performance indicator (KPI) for this specific safety objective is the number of rotorcraft accidents in Europe that result in at least a fatality or a serious injury. This KPI is monitored and published annually as part of the ASR.

The EPAS SPIs serve to monitor the impact of EPAS actions on safety performance. Safety performance monitoring may also support the identification of new safety issues feeding the European SRM process. In accordance with Article 6 of the Basic Regulation, EPAS shall specify the level of safety performance in the Union, which the Member States, the EC and EASA shall jointly aim to achieve. Considering the aspirational safety goal, the baseline level of safety performance is that shown in the SPIs contained in the ASR 2020 that reflects the pre-pandemic safety performance in the Union, both for the aviation system as a whole (cf. Chapter 1 'EASA Member States Cross Domain Safety Overview') and for the various domains (cf. Chapters 2 to 7).

Principles for establishing EPAS SPIs and targets

SPIs and targets shall monitor both safety **outcomes** (such as accidents, incidents and injuries) and the enablers, in terms of **systems and processes**[95] required to maintain effective safety management at authority and organisation levels. Outcome-based indicators shall consider as main inputs:

- the number of fatal accidents;
- the number of fatalities; and
- the number of non-fatal accidents and serious incidents.

95 The efficiency of systems and processes established and implemented by EASA will continue to be monitored through the EASA SPD related indicators.

This is aligned with the high-level ICAO safety metrics, thereby facilitating comparison of European performance with that of other regions or with global averages. The number of fatal accidents and fatalities provide the highest level of safety outcome monitoring, while the non-fatal accidents and serious incidents combined provide monitoring of higher-risk events. These can subsequently be reviewed to identify key risk areas that inform EASA's safety priorities. With the upcoming implementation of the ERCS across the Member States, an additional indicator that monitors high-risk occurrences may be considered. This could be in addition to or instead of monitoring non-fatal accidents and serious incidents. The data portfolios published in the ASR include incident data sourced from the European Central Repository for accident and incident reports in aviation (ECR) under Regulation (EU) No 376/2014. As the implementation of Regulation (EU) No 376/2014 improves, EASA expects to be able to integrate more incident data into the monitoring framework.

Monitoring systems and processes

It is proposed that related SPIs be defined and monitored in three areas:

1. Member States' oversight capabilities

This is related to 2020-2022 GASP Goal 2 and the EPAS strategic enabler 'Standardisation'.

Monitoring is based on the EASA Standardisation rating as an alternative to the ICAO USOAP Effective Implementation (EI) indicator. The Standardisation rating is used for the prioritisation of Standardisation inspections. It aims at emulating the expert's confidence in the NCA's ability to discharge its safety oversight capabilities. The Standardisation rating considers elements related to size, nature and complexity of the State authorities and functions, the number and type of open Standardisation findings, as well as the State's reactivity in relation to findings closure, once the final report has been sent. Member States are regularly provided with their Standardisation rating.

In 2020 the EASA Standardisation rating has been significantly affected by the flexibility measures that were implemented in the context of the COVID-19 pandemic, including, for example, the extension of due dates for findings that did not raise safety concerns. Furthermore, during the acute phase of the crisis the situation largely differed among Member States. Some States went into full lockdown, with no commercial activity besides essential cargo and helicopter emergency medical services (HEMS), whereas others continued to operate at least domestically.

From June 2020 onwards, aviation activities started to recover, and the Agency worked closely with competent authorities to monitor how they were coping with the new risk picture. It is still considered too early to capture this via specific indicators. For these reasons, the Standardisation ratings for 2020 cannot be used as a reliable indicator of the level of standardisation within EASA Member States and are not provided. Relevant information for 2019 per domain is included instead, to serve as a pre-COVID-19 reference and the latest domain Standardisation rating figures are shown in addition, with an indication of the evolution.

Domain	min 2019	min 2021		Avg 2019	Avg 2021		<Avg 2019	<Avg 2021		>Avg 2019	>Avg 2021	
AIR	76.8	**85.4**	↗	93.0	**94.9**	↗	35 %	**40 %**	↗	65 %	**60 %**	↘
OPS	73.1	**76.2**	↗	90.6	**92.4**	↗	45 %	**37 %**	↘	55 %	**63 %**	↗
FCL	74.3	**73.7**	↘	94.3	**94.9**	↗	42 %	**33 %**	↘	58 %	**67 %**	↗
MED	87.8	**84.1**	↘	95.8	**96.0**	→	52 %	**47 %**	↘	48 %	**53 %**	↗
FSTD	78.7	**77.4**	↘	95.5	**95.5**	→	35 %	**43 %**	↗	65 %	**57 %**	↘
ATM/ANS	78.4	**77.8**	↘	91.9	**93.2**	↗	42 %	**43 %**	→	58 %	**57 %**	→
RAMP	66.5	**73.9**	↗	90.0	**90.2**	→	39 %	**47 %**	↗	61 %	**53 %**	↘

Table 4: Standardisation rating information per domain — 2019 & 2021 figures [96]

2. Member States' progress with SSP implementation

This is related to GASP Goal 3 and the EPAS strategic priority 'Systemic safety'.

Related indicators will mainly be based on data available through ICAO iSTARS. Feedback provided by Member States will also be considered. In the future this monitoring area will consider results from the EASA Standardisation of the implementation of Basic Regulation Articles 6 (SSP) and 7 (SPAS) — starting in 2022.

The objective is aligned with the 2020-2022 GASP requiring States to achieve an effective SSP as appropriate to their aviation system complexity by 2025.

3. Effective implementation of SMS in aviation organisations

This partially addresses 2020-2022 GASP Goal 5; it also addresses the EPAS strategic priority 'Systemic safety' and the requirements in the Basic Regulation.

Monitoring the implementation of SMS in industry should focus on compliance with relevant requirements and effectiveness of SMS key processes. To develop a common set of indicators and targets on effective implementation of SMS, an agreed methodology for assessing SMS as well as a method to score and aggregate related assessment results would first need to be developed and implemented. Such an assessment and scoring methodology is currently only available in the ATM/ANS domain, as part of the SES ATM Performance Scheme.

It should also be considered that SMS requirements are not yet applicable in the initial airworthiness domain and not fully applicable in the continuing airworthiness domain. Moreover, while the EASA Management System assessment tool is promoted through EPAS action MST.0026, EASA has not yet received sufficient feedback on the use of the tool.

For the above reasons, no detailed EPAS indicators and targets are proposed on SMS effectiveness (for domains other than ATM/ANS since here this indicator is monitored in the context of the European ANS Performance Review). However, it is proposed to monitor the following:

(a) the extent to which the EASA Management System assessment tool (or similar) is being used by Member States; and

(b) the status of compliance with the EASA Management System (SMS) requirements.

96 The maximum Standardisation rating was 100 % in each domain, both in 2019 and 2021.

EASA's monitoring is based on oversight data provided by NCAs covering the following management system requirements for those domains where ICAO Annex 19 SARPs have already been introduced into the EU regulations:

- Changes to the organisation;
- Management system;
- Contracted activities;
- Personnel requirements; and
- Record-keeping.

No data/information on individual organisations is requested. EASA converts numbers into rates based on the data Member States provide regularly through the SIS on the number of organisations under their oversight. The following two tables provide information on compliance with management system requirements based on the latest SIS data collection. The first table is based on data collected in 2020Q4 (thereby including data from the UK). The second table provides the latest available data, excluding data from the UK.

INDICATOR	AOC holders (A+ H)	CAMOs (Part M/G)	ATOs (A+H)	ATSPs	ATCO TOs	Aerodrome Operators
(1) ORG total	924	1774	1409	232	112	443
(2) ORG L1	9	0	13	1	1	19
(3) ORG L1 %	1.0 %	0.0 %	0.9 %	0.4 %	0.9 %	4.3 %
(4) L1 findings nb	18	0	17	1	2	8
(5) ORG L2	317	35	195	64	25	154
(6) ORG L2 %	34.3 %	2.0 %	13.8 %	27.6 %	22.3 %	34.8 %
(7) L2 findings nb	975	102	673	359	129	683
(8) % ORG EOC	13.1 %	0.0 %	11.4 %	0.9 %	2.7 %	40.2 %
(9) % ORG ROC	8.5 %	0.9 %	7.5 %	4.7 %	8.0 %	6.5 %

Table 5: Compliance with management system requirements — status 2020Q4

The next table provides information on compliance with management system requirements based on the latest SIS data collection performed in 2021Q2:

INDICATOR	AOC holders (A+ H)		CAMOs		ATOs (A+H)		ATSPs		ATCO TOs		Aerodrome Operators	
(1) ORG total	762		1198		1173		104		65		339	
(2) ORG with L1	9		0		9		0		1		1	
(3) ORG with L1 %	1.2 %	↗	0.0 %	→	0.8 %	→	0.0 %		1.5 %	↗	0.3 %	↘
(4) L1 findings nb	17		0		16		0		2		1	
(5) ORG with L2	158		78		140		58		19		112	
(6) ORG with L2 %	20.7 %	↘	6.5 %	↗	11.9 %	↘	55.8 %	↗	29.2 %	↗	33.0 %	↘
(7) L2 findings nb	763		170		513		307		43		621	
(8) % ORG EOC	10.9 %	↘	0 %		12.3 %	↗	0 %		0 %		50.4 %	↗
(9) % ORG ROC	13.4 %	↗	0.8 %	→	10.1 %	↗	5.8 %	↗	13.9 %	↗	15.9 %	↗

Table 6: Compliance with management system requirements — status 2021Q2[97]

Legend:

(1) Number of organisations as reported by the NCA for this data collection exercise
(2) Number of organisations with open level 1 findings at the date of the report
(3) Percentage of organisations with open level 1 findings at the date of the report
(4) Total number of level 1 findings open at the date of the report
(5) Number of organisations with open level 2 findings at the date of the report
(6) Percentage of organisations with open level 2 findings at the date of the report
(7) Total number of level 2 findings open at the date of the report
(8) Percentage of organisations with an extended oversight planning cycle (EOC)
(9) Percentage of organisations with a reduced oversight planning cycle (ROC)

The results of safety performance monitoring in the above three areas will be presented and discussed at regular AB meetings. Once sufficient data is available on the status of compliance with management system (SMS) requirements and experience is gained with collecting and consolidating such data, the Agency in close cooperation with the SM TeB may propose more advanced indicators to measure SMS effectiveness in industry.

Alignment with the ATM Performance Scheme

Significant effort has been invested by the Agency, Member States and industry to ensure that the Safety Key Performance Area of the SES Performance Scheme aligns with the principles and technical direction of EASA's performance monitoring framework. The performance indicators for Reference Period 3 of the Performance Scheme were designed by an Agency-led working group in 2019 and then associated AMC and GM were published in 2020. These indicators measure the effectiveness of safety management at organisation level and then monitor safety outcomes via untargeted tier 2 performance indicators, using the European Central Repository as the data source.

97 This table does not include data from two Member States (Cyprus, France).

Outcome-based indicators

Monitoring safety outcomes addresses 2020-2022 GASP Goal 1 and the EPAS strategic priority 'Operational safety'. Indicators related to key risk areas are identified through the European SRM process and described in the ASR. EASA, in cooperation with the European NoAs, has developed a safety performance framework that identifies different tiers of SPIs.

- **Tier 1** transversally monitors all the domains and the overview of the performance in each domain. Tier 1 considers the number of fatal accidents and fatalities in the previous year compared with the average of the preceding decade.
- **Tier 2** covers the key risk areas at domain level. Tier 2 provides the number (and where available, the rate) of fatal accidents and the ERCS risk level for each domain in the ASR, divided into the key risk areas.

These 'operational' safety indicators will continue to be monitored through the European SRM process. Likewise, reporting on those will continue to be done through the ASR.

4.2 Environmental performance

The efficiency of actions included in the EPAS in relation to environmental protection will continue to be monitored as part of the EAER[98].

The report is led by EASA with support from the EC, the EEA and EUROCONTROL. EAER provides a valuable source of objective and accurate information on the environmental performance of the aviation sector and sets the scene for Europe's ambition to make the sector more sustainable. It includes performance indicators that provide an overview of the sector's environmental performance over time. This includes technology/design, sustainable aviation fuels, air traffic management/operations, airports, market-based measures and the latest scientific understanding on environmental impacts from aviation.

EASA published the 2nd edition of the report in January 2019 and, in line with EASA's expanded environmental protection remit, is responsible to update the EAER every 3 years. EASA is working on the 3rd edition of the report, which is expected to be published by mid-2022, allowing to fully take into account the environmental performance data of the aviation sector covering the years 2019-2021. The 3rd edition will also contain recommendations aiming to improve the environmental performance of the civil aviation sector in the Union.

98 https://www.easa.europa.eu/eaer/downloads

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