EASA
European Union Aviation Safety Agency

RESEARCH

EASA Research Agenda 2021 - 2023

An Agency of the European Union

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RESEARCH

EASA Research Agenda 2021 - 2023

EXECUTIVE SUMMARY

The EASA Research Agenda 2021 – 2023 edition provides an updated list of research needs and requests identified by the Agency's experts and external stakeholders in the fields of aviation safety, security, environmental protection, public health risks, as well as economic intelligence.

This Research Agenda complements the European Plan for Aviation Safety (EPAS)[1], which also details the top-level priority research needs identified by the Agency.

The general objectives of the research requests presented in this document include:

- preparing for the evolution of aviation standards,
- supporting the development of new safety and security management concepts/methods/tools,
- investigating safety, security and environmental threats, as well as health risks linked to air transport,
- supporting pro-active and reactive risk management in these domains, and
- obtaining knowledge and data on novel products, technologies or new types of operation in order to prepare their entry to service.

The EASA Research Agenda is updated on an annual basis by the EASA Research and Innovation Committee (RIC).

The research requests from previous editions that have been removed or modified are presented in the annex.

[1] EPAS 2021-2025 Edition is available at: European Plan for Aviation Safety 2021 - 2025 | EASA (europa.eu)

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1. Introduction

The document provides the updated list of research requests identified and reviewed by the Agency's experts, the Research & Innovation Committee and external stakeholders in 2021 in the fields of aviation safety, security, environmental protection and public health risks.

The main objectives associated with the research requests presented in this document include to:

- Prepare for the evolution of aviation standards
- Support the development of new safety and security management concepts/methods/tools
- Investigate safety, security and environmental threats
- Support both proactive and reactive safety management
- Obtain knowledge and data on novel products, technologies or types of operation

The research requests presented in the document have been grouped using the following different aviation topics:

- Airworthiness Standards
- Flight Standards
- ATM / Aerodrome Standards
- New Operations / Processes / Products incl. Drones
- Operational safety and human factors
- External hazards, weather hazards protection
- Aviation Security, incl cybersecurity
- Environmental Protection Standards
- Public / Occupational Health issues
- Economic Intelligence

The set of research actions are marked with the symbol * when integrated into EPAS Edition 2022-2026[2], with the symbol ** when integrated within EPAS and the EU 'Horizon Europe' work programme 2021-2022 for Climate, Energy and Mobility[3] under the section 'Indirectly managed actions'.

Annex A provides the list of research topics from previous editions of the EASA Research Agenda that have been removed or modified.

[2] Edition 2022-2026 will be available at: https://www.easa.europa.eu/domains/safety-management/european-plan-aviation-safety

[3] Horizon Europe Workprogramme 2021-2022 'Climate, Energy and Mobility', available at: https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/cluster-5-climate-energy-and-mobility_en

2. Research Topics Per Domain

2.1 Safety

2.1.1 Airworthiness Standards

Reference	Project title	Project Short Description
LOC-04**	Air Data Enhanced Fault Detection & Diagnosis	Develop new fault detection & diagnosis (FDD) and fault tolerant control (FTC) methods of the following types: • Model-based analytical redundancy (e.g. virtual sensors), • Data-based (i.e. model free-methods), or • a combination of both types
AW-01a	Ageing Composites - Phase I	Identify specific potential ageing composite aircraft structure issues (baseline structure (including bonded joints) and repairs) in existing (and developing) fleets.
AW-01b	Blunt impact on composite structures	The proposed impact test projects are an evolution of existing ones involving key EU partners and are for supporting changes to standards for the primary structural elements of large aircraft.
AW-01c*	Sandwich structured composites	Develop further insight and guidance for the consistent and standardised design and safe use of sandwich structures in aviation. The results of the research shall be used to further complement the Composite Materials Handbook-17 and to refine regulatory material for initial and continuous airworthiness.
AW-02**	Flight Control Systems Verification	Develop new methods for the verification of complex flight control systems and for real-time error detection (via independent monitoring).
AW-04	Ageing Aircraft	Development of maintenance schedules for old General Aviation aircraft (e.g. wood structures).
AW-06	Hybrid Structure Certification	Better understand and standardise approaches to certifying hybrid structures, i.e. made of different materials (e.g. metallic, non-metallic) and their assembly techniques.

Reference	Project title	Project Short Description
IN-25	Safety Implications Resulting from the Introduction of Additive Manufacturing (AM) into Aviation	Support the introduction of Additive Manufacturing applications for aircraft structures. The main objectives are: - rapidly identifying the key methods likely to reach maturity in aviation applications, particularly those likely to be used in more critical applications. - identifying a common optimised strategy regarding the definition of involvement for each method in each of EASA's regulatory activities, e.g. the level of certification checklist necessary to ensure that safety is maintained, the extent of knowledge expected of EASA POA auditors etc.
IN-13	COTS IP certification	Develop certification guidance for the use of pre-designed blocks inside complex electronic programmable devices (Commercial Off-The Shelf Intellectual Property - COTS IP)
RC-02	De-icing of smaller helicopters	Study the implementation of a rotor de-icing system using innovative technological solutions for smaller helicopters.
RC-10**	Helicopter Underwater Evacuation follow-up research	Follow-up the Helicopter Underwater Escape research study, commissioned by EASA, which provided a comprehensive review of currently available information on underwater escape, identified shortfalls and recommended further work to rectify the lack of information.
RC-11**	Helicopter vortex ring - Exit manoeuver	Test proposed manoeuvers for Helicopter Pilots to exit vortex ring situations through dedicated flight tests, namely traditional vs 'Vuichard' techniques (back to back assessment)
IN-15	Toxicity of failing non-rechargeable lithium batteries	Establish the toxic threat posed by failing non-rechargeable lithium batteries, which are more and more present in the occupied compartment. TCH applicant information on this aspect is very limited since basic knowledge is missing about the toxicity of burning "small" non-rechargeable lithium batteries.
IN-17	Virtual testing tools	Perform an independent assessment and trials of off-the-shelf analytical tools (virtual testing methods) used by DOAs in certification.
IN-18	Test and Analysis of Pyramid Statistics	Define small dataset strategy for the airworthiness certification of structures, establishing the link between statistically credible simple base pyramid coupon datasets and the higher pyramid more complex test items.

2.1.2 Flight Standards

Reference	Project title	Project Short Description
OP-07**	Reduced Crew and Single Pilot Operations - risk assessment framework	To support the risk assessment associated with future reduced crew and single pilot operations on large aeroplanes, ensuring an equivalent level of safety to two-pilot operations.
OP-03	Group Operations – assess regulatory obstacles and social implications at EU and international level	Assess the impact of airlines' group operations for regulatory and safety oversight. Operators perform the consolidation of their business at the level of multi-national airline groups. This is essential for their commercial viability on an international scale and in a fully liberalised market. However, most of the existing rules, including ICAO SARPs are State-centric. Fitting such business set-ups within the existing regulatory framework leads to inefficient redundancies and generates unnecessary complexity. A multi-domain study analysing all regulatory barriers, as well the associated social implications, would be beneficial as a starting point to establish an adequate regulatory framework for multi-national group operations.
FIR-03**	Complete assessment of PED fire risks in the aircraft cabin	Assess PED fire/smoke risks when transported in the aircraft cabin. Passenger provisions do not currently establish limits in terms of the amount of items that can be brought on board. The limits on the power of batteries is not based on any scientific data.
FS-04	Compliance monitoring effectiveness	Measure the performance of a compliant system in the context of FCL, MED, FSTD regulations, in terms of qualitative and quantitative methods/tools for use in continuous monitoring.
HF-07	Assess the efficacy of pilot training as a safety barrier in the context of EFVS operations	Confirm assumptions surrounding the use of Enhanced Flight Vision Systems (EFVS), which may be operated without the prior approval of the competent authority; who assumes that the flight procedures, equipment and pilot safety barriers are sufficiently robust. The scope of this research is to test the readiness level of pilots with no or little exposure to EFVS to use such equipment.
HF-09	Pilot fatigue in helicopter operations, in particular HEMS and HOFO	Assess fatigue risks in the context of specialised helicopter operations such as emergency medical services (HEMS) and offshore operations (HOFO)
TRN-02	Competency Based Training and Assessment (CBTA)	Within pilot training domain, prepare the move towards less prescriptive hour-based requirements, putting the focus on assessing pilot competence against a set of standard competencies based on observable behaviours.
TRN-05	Training media allocation: Simulator vs. actual flying	Assess the targeted allocation of training media in pilot licensing through scientific research to determine the effective value of on-aircraft flight training considering the evolution of training media and the pedagogical development of flight training.

Reference	Project title	Project Short Description
OP-05	Passenger mass survey	Assess the need to update the standard passenger mass figures used in Air OPS rules, in the context of mass and balance calculations, which prescribe the use of "standard passenger masses", which were taken from previous JAA materials. A survey was conducted in 2008 showed that the standard masses need to be updated; however such an update was not included in the Air OPS regulatory package as the scope at that time was mainly geared towards transposing EU-OPS.

2.1.3 ATM / Aerodrome Standards

Reference	Project title	Project Short Description
OP-04**	Implementation of the "triple one" concept at aerodromes (or one runway, one frequency, one language)	Assess the use of a single frequency for communication purposes with regards to runway operations to improve the situational awareness of the actors active in the airport movement area. Main objectives: - look at the current situation in Europe with regard to this issue, identifying the various concepts currently in use; - substantiate the safety benefits of the implementation of the "triple one" concept and identify the prerequisites for its implementation; - identify the operational or other reasons for the non-implementation of the triple "one concept"; - identify other solutions and best practices that increase situational awareness and which are not based on the use of the "triple one" concept; - preliminarily assess the impacts that the introduction of the "triple one" or other concepts may have on the affected stakeholders.
OP-09**	Practical use and validation of high-resolution surface laser scanners for assessing runway micro texture	Assess the practical use and validation of high-resolution surface laser scanners for assessing runway micro texture. Runway surface micro texture is essential for ensuring good wet runway braking friction performance. Poor runway micro texture has resulted in numerous landing overruns occurrences on wet surfaces. There are currently no acceptable methods for airports to accurately assess the micro texture characteristics. The proposed research assesses the practical use and validity of high-resolution surface laser scanners to determine the runway micro texture characteristics. A better understanding of these characteristics can reduce the number of runway excursions.

Reference	Project title	Project Short Description
OP-06	Conversion of Visibility to Runway Visual Range for Approach Ban Purposes	Assess the Conversion of Visibility to Runway Visual Range for Approach Ban Purposes. The currently used conversion factors used to calculate 'Converted Meteorological Visibility (CMV) from a 'visibility' have been challenged. The background is that the original conversion factors were based upon 'Meteorological Optical Range', and this is different to 'Visibility for aeronautical purposes', as has been specified by ICAO since 2001. The assumptions and science behind Meteorological Optical Range are not the same as those behind 'Visibility for aeronautical purposes, and give overestimates of the Runway Visual Range if applied.
IN-27	Definition of 'acceptable level of safety'	Identify best practice and propose a methodology for supporting the MS when establishing the 'acceptable level of safety'. The EASA Basic Regulation (Article 36,2a,d) sets an obligation for MS to establish 'acceptable level of safety' for the ANSP and to ensure oversight and enforce compliance to it.

2.1.4 New Operations / Products / Processes

Reference	Project title	Project Short Description
IN-37**	New standards for drones and U-Space	Research actions to support the preparation of new standards to be considered by EASA as AMC for the U-space regulation (2022) and for UAS autonomous operations (2023)
IN-38	Monitoring weather hazards for urban air transport	Assess the provision of a dedicated service about urban weather hazards service for drone and VTOL flying in urban environments, including a gust nowcast service
IN-40	Determination of the ground risk posed by UAS operation	Define a methodology to identify in a dynamic way the actual or estimated number of people present in one area of urban environment
IN-42**	Drone digital twin concept for compliance verification	Assess the drone digital twin concept for compliance verification. Through integrated high-fidelity physical models of the as-built structure, the concept of Digital Twin for drones may provide the means to assess design robustness and compliance with safety requirements.
IN-30**	Machine learning	Explore the methods and tools that safety regulatory authorities should have to ensure the integrity of the certification / approval processes for machine learning, which is one branch of artificial intelligence. In order to qualify machine learning techniques for safety-critical or sensitive applications (for example involving decision-making processes) there is a need to get visibility on the functioning of the neural network.

Reference	Project title	Project Short Description
LOC-03	Landing and take-off monitor	Assess means to assist the flight crew in: - preventing runway overun and managing aircraft total energy - monitoring the actual acceleration of the aircraft during the take-off run to detect mismatch between V1 and the actual remaining runway distance.
IN-31**	GA collision risk - Interoperability of e-conspicuity systems	Assess the feasibility of achieving full interoperability between the different e-Conspicuity devices/systems in use (e.g. operated by aeroclubs) through ground network connectivity whilst respecting data privacy requirements.
OP-08	Study on RAMP methodology	Advise EASA on opportunities to improve the current safety audit methodology used for ramp inspections, with the aim to: • Establish a more stable indicator • Analyse the data at a lower granularity • Establish a better process to determine the impact on safety of the various non-compliances (the finding category)
IN-29**	Risk modelling tools specifically designed for novel technologies	Develop risk modelling tools that can support the assessment of novel technologies. New technologies emerge at an accelerated pace, challenging the established conventions (e.g. new aircraft categories: multi-rotors, VTOLs, new propulsion: electrical and hybrid, new operating concepts: single pilot large jets, remotely piloted aircraft, new applications: urban mobility). Irrespective whether they fit in the existing regulatory framework (most have no established means of compliance), before they can be operated EASA will need to answer the question “is this safe?”. A bespoke, risk modelling tool, that is not entirely technology specific should help EASA to answer such a question. The research project should focus on developing such a tool that is not dependent on high amounts of “in-service” data.
EQ-01	Ram-Air-Parachutes as Emergency Parachutes	Explore the use of ram-air parachutes as emergency parachutes, reducing the opening time and increasing the maximum operating speed, while allowing a more controlled landing site selection.

2.1.5 Operational Safety and Human Factors

Reference	Project title	Project Short Description
HF-06	Support for aviation professionals for new products / concepts	Develop support for aviation professionals in coping with new procedures and increasingly complex technologies (e.g. via new training methods)

Reference	Project title	Project Short Description
HF-08	Human factors in maintenance documents (ICA)	Assess and develop best practice addressing human factor issues in maintenance documents (Instructions for Continued Airworthiness). There is only limited knowledge, especially scientifically supported knowledge, about how to produce handbooks, instructions and procedures in a way that it suits the human nature of the mechanic. There are several documents that standardise the layout and the content, but they are not based on the needs of the human mechanic. There are a lot of guidelines for good authoring practice for aviation documents (e.g. by FAA), but these are not based on any research into what is best suits the needs of a human mechanic: they are basically generic good practice for any type of writing, and they are at a very high level (e.g. “describe complicated systems by illustrations, not by text”). A lot of research has gone into ergonomics of the workspace, but very little into the ergonomics of manuals/documents. This research should also take into account the current trend away from printed handbooks to electronic documents with much better options for possible layouts and arrangements (e.g. hyperlinks for cross references, videos, virtual reality). It is totally unclear whether all this new technology is really helping the human mechanic, or just produces overload and confusion.

2.1.6 External and Weather Hazards

Reference	Project title	Project Short Description
WE-02	Atmospheric turbulence hazards	Characterise phenomena and analyse their impact and mitigations for aviation safety.

2.2 Security

Reference	Project title	Project Short Description
SEC-05	Cybersecurity: common aeronautical vulnerabilities database	Develop a vulnerability database collecting, maintaining, and disseminating information about discovered vulnerabilities targeting major transport information systems.
SEC-12*	Aviation Resilience - Cybersecurity Threat Landscape	Assess the safety impact of cybersecurity threats to aviation users, support the development of mitigation measures and specific training actions, identify and mitigate the vulnerabilities of aviation products and the required changes to aviation standards
SEC-06	Composition of secure systems	Develop tools and methods for the assessment of the effects on security properties when adding or modifying a subcomponent in a complex architecture

Reference	Project title	Project Short Description
SEC-07	Cybersecurity vulnerabilities and complex systems	Investigate the relationships between the number of cybersecurity vulnerabilities of a system and its level of complexity, incl. the analysis of combined effects of several vulnerabilities.
SEC-08	Aviation Cybersecurity Grand Challenge	Organise white-hat challenge for hacking / defending teams on flight systems
SEC-09	New organisational structures for aviation security	Develop methods and tools to assess organisational structures for security risk management of critical transport infrastructures (e.g. airport), with focus on inter-organisation processes
SEC-10	New detection techniques for physical threats to aviation security	Assess new threat detection techniques (e.g. behavioural analysis) for critical transport infrastructures (e.g. airports), including the identification of unusual movements of humans or vehicles (incl. drones) combined with visual and electronic signals
SEC-13**	Impact of security requirements on operational safety and performance	Assessment of the impact of security requirements on operational safety and performances
SEC-14	Assess potential of screening developments (equipment and human factors) to leverage security procedures for safety improvement	Development of new detection capabilities for the screening of air cargo items, incl. dangerous goods
SEC-15	Assess aircraft design requirements against known security threats and detection capabilities in service	Assess aircraft design requirements against known security threats and detection capabilities in service
SEC-16	CBRN threats and cabin air quality	Assessment of potential Chemical-Bacteriological-Radiological-Nuclear threats to aircraft cabin air quality
SEC- 17	Integrated safety-security risk management	Develop methods and tools for integrated risk management to strengthen the resilience of air transportation against existing and emerging risks
SEC- 18	Safety oversight principles in support of security compliance mechanisms	Conduct critical analysis which safety oversight elements (national and international) could be best leverage in ensuring robust security oversight
SEC- 19	Safety culture and risk management principles in support of aviation security outcomes	Conduct critical analysis to determine which safety culture and SMS components could be best leverage in maturing security culture and SeMS

2.3 Environmental Protection Standards

Reference	Project title	Project Short Description
ENV-10	Sustainable Aviation Fuels (SAF) Monitoring System & EASA SAF Facilitation Initiative and fuel icing	Develop the set-up of a Sustainable Aviation Fuels (SAF) Monitoring System, which will establish a cost effective, robust data stream to monitor the use and supply of SAF, as well as the associated emissions reductions, at European level. In addition to SAF monitoring, it will also encompass the monitoring of the general aviation fuel specification for fuel provided/used in Europe. This will also prepare for the EASA SAF Facilitation Initiative, which will incentivise the approval and use of SAF as 'drop-in' fuels that can be safely incorporated into existing airport fuelling systems, including the assessment of fuel icing issues.
ENV-07	Impact Assessment and Validation of Future Aviation Concepts	Develop innovative methodologies, scenarios, data streams and tools to quantify the life-cycle environmental impacts and costs of future concepts of aircraft/engine technology and design, aircraft operations, alternative fuels and market-based measures. Enable the Agency to fulfil its roles under ICAO CAEP, EAER and State Action Plans in a consistent and efficient manner, and to prepare to support the future Clean Sky programme. Anticipate and monitor progress towards international / EU environmental goals.
ENV-13*	Non-CO_2 Emissions: Assessment of Climate Impact and Policy Options	Consolidate scientific knowledge and reduce uncertainties related to the climate impact of aviation non-CO_2 emissions Support the coordination of on-going and planned research initiatives addressing the gaps in scientific knowledge and the identified mitigations to the climate impact Enhance quantification methods and tools used for non-CO_2 emission inventories, environmental impact assessment and policy option evaluation
ENV-08	Drone & eVTOL Noise Measurement	Conduct noise flight test measurement campaigns for a wide range of products using different technologies in order to develop and improve future noise certification requirements for drones and eVTOL, as well as set appropriate noise limits.
ENV-09	Drone & Air Taxi Noise Impact	Assess the potential noise impact and acceptance by the public of drone and air taxi operations in order to develop a robust technical understanding of these aircraft that can support future decisions on appropriate noise limits for product certification as well as operational procedures.
ENV-11	Development of tools and methods for the end-to-end assessment of 'Green Deal' related actions (incl. data analytics)	Develop harmonised impact assessment methods adapted to proposed actions supporting the 'Green Recovery' and building on the analysis of operational data and the use of big data technologies from the EASA Data4Safety programme.
ENV-12	Assess the impact of the introduction of new SAF fuels (e.g.	Perform a comprehensive assessment of the main changes to the aviation standards and regulatory framework for the deployment

Reference	Project title	Project Short Description
	hydrogen) on aviation safety and regulatory frameworks	of new SAF fuels (non drop-in fuels) currently being developed by the manufacturing industry.

2.4 Public / Occupational Health

Reference	Project title	Project Short Description
HE-06	Vector control for public health concerns	Assess the possibilities of various vector controls on aerodromes, as well as the possibility of preventing the import, via aviation, of insects and animals (vectors) from endemic areas into Europe and especially those areas where they could become acclimatised. Currently climate change is enabling a shift in the presence of certain vector-born diseases which has led to locally developed malaria and yellow fever in certain areas in Europe (Italy, Netherlands)
HE-07	Limitation of spread of airborne infectious disease in the aircraft environment	Investigate the possibilities to further reduce the spread of airborne infectious agents within the aircraft environment by improving filtration systems, recirculation systems and cabin airflow, including individual air supply nozzles, to ensure that passengers are not adversely affected by air travel. As we know, and was again demonstrated with the SARS-CoV-2 outbreak, aviation constitutes the fastest mean of transport for long distances, but at the same time constitutes the fastest means for spreading contagious diseases
HE-16	New health safety measures in aircraft	Assess health safety measures such as: Filtration of 70 -150 nm nanoparticles in aircraft and airports; Review of effective chemical and non-chemical disinfection methods that are safe to use in an aviation environment; Safe use of microbial repellent materials in cabin design; Assessing the potential of spread of microorganisms from a contaminated passenger onboard via inanimate surfaces
HE-05**	Monitoring pilot health during the active life and after retirement	The objective of an assessment of the pilots' health is to evaluate if the specific risk factors are properly mitigated and what pathologies should be more closely monitored in order to ensure flight safety as well as a safe career for the pilots. The monitoring of the pilot health along his/her career would support the medical decision of allowing pilots to be involved in CAT operations beyond their 65th birthday whilst maintaining at least the same level of safety.

Reference	Project title	Project Short Description
HE-08**	Mental Health of Pilots and ATCOs	To assess the applicability of existing mental health assessment methods for use in aviation, to develop and validate mental health assessment methods for Pilots and ATCOs that address the issues identified and incorporate operational context. Already before the GermanWings accident it was understood that the human mind is the most difficult system to assess when looking at the essential needs for a pilot or an ATCO to discharge their tasks safely. Furthermore, performing mental health assessments may have more than one goal, some assessments are intended to evaluate the overall fitness to perform, others are intended to evaluate the synergy between the pilot/ATCO profiles and a specific type of operations, while other assessments are intended to identify certain sequelae after special circumstances (involvement in an accident/serious incident, loss of a family member, etc) which may affect their overall performance.
HE-09	Radiation Effects on crew members	Assess the current levels of radiation to which the crew members are subject while flying and the relevance of the existing mitigating measures. Throughout the history of aviation there have been several studies on the cumulative effects of cosmic radiation on aircraft crew members. Nevertheless, 20 years ago most of commercial aircraft were flying at Flight Level (FL) 310 or 320 whilst currently certain airliners can cruise at FL 380. Furthermore, the level of cosmic radiation is dependent on latitude and longitude as well as on season. In the context of the changes to cruise FLs, the climate and ozone layer, as well as changes in on board technology, the levels of radiation and their cumulative effects are raising concerns amongst both flight crew community and frequent travellers.

Reference	Project title	Project Short Description
HE-10**	New cardiology treatment and diagnostic measures	Assess new cardiology treatments and associated diagnostic measures for use on-board aircraft (crews and passengers). New technologies have been released on the market providing improved curative or supportive treatments in terms of medication and supportive equipment (implantable or external) that considerably improve the quality of life for cardiac patients. Some types of equipment, although performing very well at ground level, are potentially pressure dependent, which may lead to in-flight malfunctions (either during a regular flight or in the case of a sudden decompression). A study of such types of equipment will support decision making for crew members, particularly on their fitness to perform their duties, but also for passengers having such devices even if flying only occasionally. In a similar way, new medication has been developed to alleviate certain pathological conditions, nevertheless for some of them their side effects may be worsened by the on-board environment to a level incompatible with flying. In the case of medication, this issue has a greater impact on the fitness of the crew members rather than on occasional passengers. Nevertheless, in order to have scientific evidence to amend the medical requirements and include new developments in the current safety regulatory framework, a research study aimed at the use of medical solutions in the aviation environment is needed.
HE-11**	Diabetes mellitus	Assess the effectiveness of new diabetes treatments and associated diagnostic measures for use by pilots. New diagnostic measures are being developed that allow reliable continuous blood glucose level monitoring. Furthermore, the medical industry has developed automated insulin pumps that allow equipment to monitor the glucose level and administer the insulin dose needed in an automated manner. Nevertheless, the sensors used by all these types of equipment may be affected by pressure changes and the aircraft's on-board environment. There are no research studies available currently to assess the possibility of their safe use in aviation environment and in order to alleviate the requirements imposed to pilots with such pathology.

Reference	Project title	Project Short Description
HE-12	Colour vision requirements in the new full glass cockpit environment and modern ATCO consoles	Refine visual performance needs for pilots and ATCOs and assess existing diagnostic methods for issues with colour vision. The colour vision needs for pilots and ATCOs have been studied throughout the history of aviation, but with no development in the last 20 years. Recently, major progress has been made in aircraft design as well as in the development of ATCO consoles, namely through the introduction of 'full glass' cockpit, LED displays and other solutions. As a result, in order to increase situational awareness and decrease reaction times, a lot of information provided to pilots and ATCOs is colour-coded. As no measurements of the actual needs in terms of colour vision to ensure that the information received is correctly perceived are available, the objective of project is to measure the colour characteristics of information presented on the ground and in flight, in different moments of the day with different intensity of ambient light for most common aircraft types and in a similar way for ATC operational displays. Following these measurements, the visual performance needs should be defined and the existing diagnostic methods should be assessed in terms of the relevance of their results.
HE-15**	Impact of HIV seropositivity for Pilots	Assess the impact of HIV seropositivity, including the impact of the side effects of combination antiretroviral treatment, on the fitness to fly and general health and wellbeing of pilots holding a Class 1 medical certificate.

2.5 Economic Intelligence

Reference	Project title	Project Short Description
IN-35	Methods and tools for economic performance analysis (business intelligence) in the context of air transport crisis recovery	The development of a series of economic performance indicators for the air transport sector is required to support the assessment of key short-term actions aiming at supporting recovery from the COVID-19 crisis, as well as to better assess the impact of aviation regulatory changes in light of the current financial situation.
IN-41	Air Navigation Services – Performance assessment – extension to resilience, interoperability	Develop the assessment framework for extension of performance assessment to the new areas of resilience and interoperability

Annex A Previous topics removed or modified

The table below provides the list of research topics from previous editions of the Agency' Research Agenda that haven been removed or modified.

#	Title	Short description	Justification
Airworthiness Standards			
FIR-02	Fire risks with large Personal Electronic Devices (PED) in checked luggage	Characterise fire risk (propagation, detection, suppression) for large PED transported in aircraft cargo compartment (checked luggage).	Project launched
AW-05	Halon Replacement	Investigate Halon replacement including aircraft system integration level feasibility for engine/nacelle/auxiliary power unit fire extinguishing system due to banning by regulation the installation of 'halon firex' system on aircraft	Existing project(s) identified
Rotorcraft			
IN-10	Rotorcraft Gearbox health monitoring - In-situ failure detection	New technologies for in-situ detection of helicopter gearbox failures	Existing project(s) identified
IN-20	Transmission reliability and safety standards	Preparation of an integrated strategy for improving transmissions reliability and safety standards with advent of new technologies (e.g. new materials), looking at cert procedures, regulations, research, DOA, POA, 145.	Project launched
RC-01	Power reserve for rotorcraft	Demonstration of the technical feasibility of equipping a helicopter with a reserve of power to be utilized in case of an engine failure	Existing project(s) identified
RC-04	Enhanced emergency floatation systems for helicopters	Enhanced emergency floatation systems for helicopters to enable post capsize floating attitudes that provide for a portion of the passenger cabin to remain above water to enable occupants to breathe whilst making their escape.	Project launched
RC-05	Rotorcraft main gear box (MGB) design to guarantee integrity of critical parts and system architecture to prevent separation of the main rotor following any MGB failure.	Recent continued airworthiness events have shown that failure of Critical Parts of helicopter Rotor and Rotor Drive Systems represents a significant risk for helicopter airworthiness. Deeper investigation of the critical design parameters and characteristics of Critical Parts, the threats they face during their service life and the methods used to substantiate the integrity and flaw tolerance of these parts, is proposed in order to investigate opportunities to minimize the likelihood of failure. Additionally, Rotor and Rotor Drive System architecture concepts should be reviewed that could reduce exposure to catastrophic failure modes	Project launched
RC-06	Ditching in water or a Survivable water impact (SWI) for Rotary wing aircrafts (Helicopter, Tilt Rotor, Compound Rotorcraft)	Sufficient real flotation time (2-3 Minutes) before any capsizing or side floating movement to provide opportunities for the occupants to escape a rotary wing aircraft, taking into consideration sea state 6 conditions (irregular waves), in case of ditching in water or in the event of a survivable water impact (SWI).	Project launched

Flight Standards			
HF-01	HF issues and Training methods for complex automation in cockpit	Support aviation safety development in coping with new procedures and increasingly complex technologies - starting with flight path management	Existing project(s) identified
FS-01	Effectiveness of FTL	Continuous review of the effectiveness of the provisions concerning flight and duty time limitations and rest requirements (FTL), initially for commercial air transport (CAT) by scheduled and charter operators)	Project launched
IN-04	**Quick recovery of flight data recordings**	**Assess means to recover flight recorder data quickly after an accident for the purpose of faster corrective actions, their limitations as well as the related challenges for standardisation and deployment.**	**Project launched**
IN-28	Rules adaptation for New technology training devices	Assess adapting the existing regulatory framework to incorporated the new world of training devices, which is fast growing, using "out of the box " thinking which does not fit in with the classic regulatory framework, i.e. is not included in the Certification Specifications (CS) for Flight Simulation Training Devices (FSTD). There is therefore a need to innovate in the area of FSTD qualification, aiming first at their added value, i.e. pedagogic added value. A study aiming a making best use of those training devices in the framework of FCL and OPS regulations (e.g. mission training) is therefore necessary.	Replaced by TRN-05
New operations / products / processes			
IN-22	New landing aid	Standard for simple flight director/auto-landing for single engine airplanes and helicopters, adapted to the specific aircraft and enabling automatic choice of field to land based on GPS database adapted to identify possible emergency landing sites following engine failure.	Existing project(s) identified
Weather Hazards			
WE-01	Icing hazard	Characterisation of phenomena and analysis of impact/mitigation for safety (ice crystal icing or super-cooled large droplet icing) in order to participate in the development of means of compliance with the new ice protection regulation	Existing project(s) identified
IN-16	Ice crystal detection	Ice crystal icing phenomenon is still posing a severe threat to high altitude flying, in particular to new engine designs. Pilots have little or no means to detect and/or avoid it, especially at night. A research is proposed in order to better detect the presence of ice crystal icing and to develop an equipment suitable to detect such a phenomenon	Existing project(s) identified
LOC-06	Fuel icing	The engine exposure to continuous fuel icing threat (saturated fuel + 200 ppm free water) can potentially affect the engine operation. It is now known that the ice concentration (specified in the Accepted Means of Compliance) is not the only pertinent parameter (ice particle size and structure have an influence on engine system operation) The proposed research aims to characterise and reproduce test conditions more representative of the fuel icing threat generated by the aircraft system at the inlet of the engine	Topic merged
Drones			

RP-03	**Vulnerability of manned aircraft to drone strike**	**The Project assesses the collision threat posed by drones to manned aircraft and validates its results by means of a complete set of activities including modelling and impact tests**	**Project launched**
Security			
SEC-01	Tamper-resistant Aircraft Localisation	Ensure a fail-safe localisation of an aircraft whatever the outcome of an abnormal situation and covering aircraft tracking, autonomous distress tracking and automatic deployable flight recorder	Existing project(s) identified
Environmental Protection Standards			
ENV-02	Aviation Emissions Support	Obtain high quality technical expert support on standardisation issues	Project launched
ENV-04	Development of Particulate Matter (PM) regulations and guidelines	Acquire high quality PM data, analysis, modelling and expert support for regulatory action	Project launched
ENV-06	Market-based Measures (ETS and CORSIA) – ecoImpact II	Extend and update of existing capabilities for assessment of Market-based measures notably to cater for new traffic data and forecasts, handling of novel scenarios and measures, ensuring their fitness-for-purpose and credibility for supporting critical policy-making both at European (EC, Member States) and international (ICAO) level.	Project launched
Public Health Issues			
HE-01	Research study on cabin air quality	Investigation of the quality level of the air inside the cabin of large transport aeroplanes and its health implication. The work aims at demonstrating, on the basis of a sound scientific process, whether potential health implications may result from the quality of the air on board commercially operated large transport aeroplanes.	Project launched
HE-03	Cabin Air Quality (fume events) - Comparative Epidemiology study	Assess the needs, feasibility and resources required for the performance of a large comparative epidemiology study involving flight crews, with an intervention group and a defined medical protocol used for fume event reporting.	Existing project(s) identified
HE-04	Cabin Air Quality (fume events) - toxicological analysis	Expand the toxicological analysis of cabin air contaminants originating from engine/APU oil leakage, using in-vitro lung toxicity, neurotoxicity assessment and human exposure study.	Project launched
HE-13	Cabin Air Quality (fume events) - assessing potential health risks and mitigations	What are the health risks associated to fume events ? How effective are mitigation strategies such as air filtration and sensors to improve cabin air quality ? - Intervention (filters in passenger aircraft) - Inflight air quality characterisation (UFP, VOCs, CO …) - Health follow-up (questionnaire) - Bleed air and ventilation simulation - In vitro toxicology	Project launched

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