

Strategy and Safety Management Director's office

AGENCY RESEARCH AGENDA 2018 – 2020

according to Pt. 3.2.1 of EPAS 2018-2022



Table of Contents

The Agency's Research Agenda 2018-2020

Table of Contents	2
1 Introduction and structure of the document.....	3
2 Airworthiness Standards.....	4
2.1 Aerostructure / Materials / Engines.....	4
2.2 Avionics / Airborne Software and Electronic Hardware / Flight Control Systems / Communication- Navigation-Surveillance.....	4
2.3 Rotorcraft.....	4
2.4 General Aviation.....	5
3 Flight Standards	6
3.1 Human Factor Issues Assessment and Training Methods.....	6
4 Weather Hazards Protection.....	6
5 Security	6
6 Environmental Protection Standards.....	7
7 New Operations / Processes / Products	7
7.1 RPAS	7
7.2 Flight monitoring.....	7
8 Health.....	8
9 Other	8

1 Introduction and structure of the document

The document provides the current list of research requests identified by the Agency experts in the fields of aviation safety, security and environmental protection. It is an extract of the EASA Research Plan.

The main general objectives associated to the research requests presented in this document are:

- Prepare the evolutions of aviation standards
- Support the development of new safety management concepts/methods/tools
- Investigate safety threats, support reactive safety management
- Obtain knowledge and data on novel products or technologies

The research topics have been grouped using the different aviation standards being addressed:

- Airworthiness Standards
- Flight Standards
- External Hazards / Weather Hazards Protection
- Environmental Protection Standards
- New Operations / Processes / Products incl. Drones
- Health
- Other

2 Airworthiness Standards

2.1 Aerostructure / Materials / Engines

New generations of aircraft under development introduce extensive use of new materials in damage-exposed applications, e.g. pressure hulls exposed to ground impact. In addition new engine designs increasingly require higher performance from the materials used.

#	Title	Short description
AW-01a	Ageing Composites - Phase I	Proposed projects are an evolution of existing ones involving significant EU partners and for supporting changes to standards
AW-01b	Blunt impact on composite structures	Proposed projects are an evolution of existing ones involving significant EU partners and for supporting changes to standards for primary structure elements of large aircraft
AW-04	Ageing Aircraft	Development of maintenance schedules for old GA aircraft (e.g. wood structures)
IN-02	Engine Damage Resistance	Develop new experimental methodologies for evaluating the extent and consequence of damage to engine rotor components

2.2 Avionics / Airborne Software and Electronic Hardware / Flight Control Systems / Communication-Navigation-Surveillance

New aircraft designs include items of integrated digital equipment with increasing level of complexity. As a result current practices and techniques used for design verification (integrity, dependability) and airworthiness certification need regular evolutions.

Changes to avionics or other aircraft systems due to the introduction of new concepts and technologies require that the safety assessment methods included in airworthiness standards are maintained as well as the related means of compliance are updated with the latest developments stemming from design methods.

#	Title	Short description
AW-02	Flight Control Systems Verification	New methods for verification of complex flight control laws and for error detection in air data systems
LOC-04	Air Data Enhanced Fault Detection & Diagnosis	Develop new fault detection & diagnosis (FDD) and fault tolerant control (FTC) methods of the following types: <ul style="list-style-type: none"> • Model-based analytical redundancy (e.g. virtual sensors), • Data-based (i.e. model free-methods), or • a combination of both types

2.3 Rotorcraft

The wide range of rotorcraft types and the often very different and specialised types of operation lead to a variety of incidents and accidents. Consequently, research areas for safety improvement are very diverse and include technical as well as operational issues. A practical way to identify such thematic areas is to review the applicability of technologies and operations which have proven to provide a safety gain on larger rotorcraft and/or even on fixed wing aircraft. Potential examples are: head-up displays, electronic guidance systems, night vision goggles used in conjunction with Night Vision Image System (NVIS), health and usage monitoring systems (HUMS) and helicopter Flight Data Monitoring (FDM).

(SM.0.1)

TE.GEN.00400-003 © European Aviation Safety Agency. All rights reserved. ISO9001 Certified.
 Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet

#	Title	Short description
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
RC-02	De-icing of smaller helicopters	Study the implementation of a rotor de-icing system for smaller helicopters
RC-04	Enhanced emergency floatation systems for helicopters	Enhanced emergency floatation systems for helicopters to enable post capsized floating attitudes that provide for a portion of the passenger cabin to remain above water to enable occupants to breathe whilst making their escape.
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.	<ol style="list-style-type: none"> 1. Enhancement for new design features of helicopter MGB and attachment, to prohibit at any time separation of the mast and main rotor from the helicopter, allowing in case of any major failure of the main gear box components, the helicopter to autorotate. 2. Study to understand threats to rotor drive system critical component integrity and methods to design and substantiate flaw tolerant critical component designs.
RC-06	Ditching in water or a Survivable water impact (SWI) for Rotary wing aircrafts (Helicopter, Tilt Rotor, Compound Rotorcraft)	Sufficient real floatation 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).
RC-07	Underwater Evacuation from Helicopters	A Review of Current Research Data and Possibilities for Enhancement: An initial review of the currently available research data regarding underwater escape from helicopters is required. Further to this, an assessment is to be performed of the feasibility of performing further focussed research aimed at correcting any shortfalls that may be identified in this initial review, if justified on the basis of safety gains versus costs.
IN-10	Rotorcraft Gearbox health monitoring - In-situ failure detection	New technologies for in-situ detection of helicopter gearbox failures

2.4 General Aviation

The proposed research actions are aimed at improving GA flight safety through new technical means as well as at preparing the deployment of new technologies.

#	Title	Short description
AW-04	Ageing Aircraft	Development of maintenance schedules for old GA aircraft (e.g. wood structures)

3 Flight Standards

3.1 Human Factor Issues Assessment and Training Methods

Assessment of human factor issues and development of training methods to cope with operational hazards or in the context of new technological developments.

Modern aircraft have an increasing amount of automation, which poses significant issues regarding the careful delineation of human-machine interactions, particularly covering unusual situations as well as the potential transfers between piloting and system monitoring skills.

In addition the training requirements for aviation personnel need to be adapted to new learning techniques and forthcoming safety challenges, taking also into account the potential shortage of available instructors to meet the increasing demand.

#	Title	Short description
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
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)

4 Weather Hazards Protection

Weather hazards have always been a challenge for aviation. Although aircraft designs have been improved to extend the operational capability of the aircraft facing known severe weather events associated risks may be influenced (positively, negatively, neutral) by a combination of the impact of climate change and the development of aircraft technologies and operations.

#	Title	Short description
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
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

5 Security

Security measures are meant to ensure the safety of flights and service / business continuity in the presence of acts of unlawful interferences. The needs to have secure systems, processes and procedures for the protection and responses to threats as well as enabling effective risk management are becoming more acute.

(SM.0.1)

TE.GEN.00400-003 © European Aviation Safety Agency. All rights reserved. ISO9001 Certified.
 Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet

#	Title	Short description
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
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-06	Composition of secure systems	Develop tools and methods for the assessment of the effects on security properties when adding or modifying a subcomponents in a complex architecture
SEC-07	Cybersecurity vulnerabilities and complex systems	Investigate the relationships between the number of cyber security vulnerabilities of a system and its level of complexity, incl. the analysis of combined effects of several vulnerabilities.

6 Environmental Protection Standards

The relevance of environmental protection matters to the aviation sector has increased significantly. This holds for both, noise and emissions. In view of the environmental challenges that face the aviation system, a comprehensive approach using all options to mitigate the negative environmental impact of aviation and promoting any positive impacts is needed in Europe and globally. In this respect one important cornerstone is environmental protection research.

#	Title	Short description
ENV-02	Aviation Emissions Support	Obtain high quality technical expert support on standardisation issues
ENV-04	Development of Particulate Matter (PM) regulations and guidelines	Acquire high quality PM data, analysis, modelling and expert support for regulatory action
No number	Market-based Measures (ETS and CORSIA) – ecolmpact II	Extension and updating 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.

7 New Operations / Processes / Products

7.1 RPAS (remotely piloted aircraft)

#	Title	Short description
RP-03	Vulnerability of manned aircraft to drone strike	Assess the potential MAC threat posed by drones to manned aircraft and validate its results by means of a complete set of activities including modelling and impact tests.

7.2 Flight monitoring

#	Title	Short description
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.

(SM.0.1)

 TE.GEN.00400-003 © European Aviation Safety Agency. All rights reserved. ISO9001 Certified.
 Proprietary document. Copies are not controlled. Confirm revision status through the EASA-Internet/Intranet

Page 7 of 8



8 Health

#	Title	Short description
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.

9 Other

#	Title	Short description
IN-15	Toxicity of failing non-rechargeable lithium batteries	Non-rechargeable lithium batteries are more and more present in the occupied compartment. TCH/applicants information on this aspect is very limited since basic knowledge is missing about the toxicity of burning "small" non-rechargeable lithium batteries.
FIR-02	Fire risks with large PED in checked luggage	Characterise fire risk (propagation, detection, suppression) for large PED transported in aircraft cargo compartment (checked luggage).
AW-05	Halon Replacement	Investigate Halon replacement including aircraft system integration level feasibility for engine/nacelle/APU fire extinguishing system due to banning by regulation the installation of halon firex system on aircraft