Contribution of the EC Project ASCOS to Flightpath 2050 & ACARE SRIA Safety goals

Self Assessment

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OPTICS is a Coordination and Support Action of the EC that aims to evaluate how well on-going and recent research and innovation is contributing to achieving the Safety goals of Flightpath 2050 and the ACARE Strategic Research and Innovation Agenda (SRIA). This document shows a self-assessment (by ASCOS members) of the contribution of the EC Project ASCOS to Flightpath 2050 and the ACARE SRIA, and gives interested parties the opportunity to review and comment this self-assessment.

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Acronyms

Acronym	Definition
AAT	Aeronautics and Air Transport
ACARE	Advisory Council for Aviation Research and Innovation in Europe
ASCOS	Aviation Safety and Certification of new Operations and Systems
CAA	Civil Aviation Authority
EASp	European Aviation Safety plan
ECCAIRS	European Co-Ordination Centre for Aviation Incident Reporting Systems
FDM	Flight Data Monitoring
NAA	National Aviation Authority
OPTICS	Observation Platform for Technological and Institutional Consolidation of research in Safety
R&TD	Research and Technology Development
R&I	Research and Innovation
SPI	Safety Performance Indicator
SRIA	Strategic Research and Innovation Agenda
TAS	Total Aviation System
TRL	Technology Readiness Level
WP	Work Package

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Summary

OPTICS is a Coordination and Support Action of the EC that aims to evaluate how well on-going and recent research and innovation is contributing to achieving the Safety goals of Flightpath 2050 and the ACARE Strategic Research and Innovation Agenda (SRIA). This document shows a self-assessment (by ASCOS members) of the contribution of the EC Project ASCOS to Flightpath 2050 and the ACARE SRIA, and gives the interested parties the opportunity to review and comment this self-assessment.

The OPTICS Consortium has made an initial assessment of the ASCOS Project [29], and provided this to the ASCOS Team in June 2014, together with a request to advise OPTICS on the Capabilities that ASCOS will serve. Initial advice was provided by the ASCOS Coordinator, after consultation of the ASCOS Project Management Committee, to OPTICS on 12 July 2014. So far, ASCOS has not received any feedback from the OPTICS Team.

In line with the request from the EC Scientific Officer for OPTICS [28], this Initial self-assessment therefore re-assesses the already identified Safety capabilities [29] and motivates identification of additional capabilities. This self-assessment may be used to draft recommendations with respect to safety research gaps to be filled.

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1 Introduction

Fundamental changes in the institutional arrangements for aviation regulation in Europe, the introduction of new technologies and operations, and demands for higher levels of safety performance call for the adaptation of existing certification processes. The objective of ASCOS is to develop novel certification process adaptations and supporting safety driven design methods and tools to ease the certification of safety enhancement systems and operations while, at the same time, increasing safety. The ASCOS project has followed a total system approach, dealing with all aviation system elements in an integrated way over the complete life-cycle.

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The structure of this document is as follows:

- Section 2 describes the ASCOS Project;
- Section 3 contains a mapping of the ASCOS project on the safety part of ACARE SRIA Vol.2 [3];
- Section 4 contains the self-assessment made by the ASCOS Team.

2 Project identification

2.1 Project Summary

Fundamental changes in the institutional arrangements for aviation regulation in Europe, the introduction of new technologies and operations, and demands for higher levels of safety performance call for the adaptation of existing certification processes. The objective of ASCOS is to develop novel certification process adaptations and supporting safety driven design methods and tools to ease the certification of safety enhancement systems and operations while, at the same time, increasing safety. The project has followed a total system approach, dealing with all aviation system elements in an integrated way over the complete life-cycle. To investigate how dealing with all safety and certification aspects in an integrated manner may be made possible using a new process, new methods and new tools, ASCOS contains work packages on Certification processes, Continuous Safety Monitoring, and Safety Risk Management. Four case studies are being conducted to validate the processes, methods and tools proposed. The case studies include the certification of aircraft failure management systems, a future ATM/CNS system for improved surveillance, aircraft systems for improved controllability in flight, and aircraft ground handling operations. A very strong already established User Group will keep the project focused and facilitate the uptake of project results. ASCOS will provide efficient and affordable certification process adaptations for new aeronautical systems and operations. ASCOS provides safety based design systems and tools that better account for the human element, already from the early stages of the certification process, thereby reducing consequences of human error and increasing safety.

2.2 Work Packages

The ASCOS project is based on the following work packages:

- WP1 Certification process (lead Thales Air Systems SA)
- WP2 Continuous safety monitoring (lead Avanssa)
- WP3 Safety risk management (lead EADS APSYS)
- WP4 Certification case studies (lead NLR)
- WP5 Validation (lead Deep Blue)
- WP6 Dissemination and exploitation (lead CertiFlyer)
- WP7 Management (lead NLR)

2.3 Specific objectives of the research

The main aim is to develop certification process adaptations, with supporting tools for safety based design and safety monitoring, so as to ease the introduction and certification of safety enhancement systems and operations. To achieve this, the six work packages address six specific research objectives:

- To analyse the existing European certification and rulemaking process and propose potential adaptations to ease certification of safety enhancement systems & operations;
- To develop a methodology and supporting tools for multi-stakeholder Continuous Safety Monitoring, using a baseline risk picture for all the parts of the total aviation system;

- To develop a total aviation system safety assessment method and supporting tools that can be used for safety based design of new systems, products and/or operations;
- To apply proposed certification process adaptations and the design systems and tools in case studies, so as to show how they can be used by operators and manufacturers.
- To validate key results: a) new certification approach, b) method and tools for Continuous Safety Monitoring, and c) all the supporting safety based design systems and tools.
- To inform air transport stakeholders on the proposed certification approach through promotion workshops, supported by exercises and an e-learning web-site environment.

2.4 Methodology and approach

The project is divided in five phases

I. The first phase will analysed existing European certification and rulemaking processes and identify potential shortcomings and bottlenecks in view of the foreseen regulatory changes and technological developments. Following this analysis, new and innovative approaches to certification were defined and evaluated. The results of this evaluation were used to select and further develop affordable innovative certification processes so as to ease certification while maintaining (or even increasing) aviation safety.

II. The second phase set up a baseline for the current risk level of the various parts of the total aviation system during its complete life cycle. Aviation safety data was used to establish a baseline risk picture for the main operational issues identified in the European Aviation Safety plan (EASp) using Safety Performance Indicators (SPIs). This risk picture was used as baseline to set up a process for continuous safety monitoring.

III. The third phase aims to establish a good view on potential emergent and future risks not present in today's aviation system. A total aviation system safety assessment method with supporting safety based design systems and tools will be developed. A proactive approach will be taken to ensure that potential future hazards and risks can be mitigated and safety will be maintained or even increased as compared to the baseline risk picture.

IV. The newly proposed certification process adaptations, and its supporting methods and tools for continuous safety monitoring and safety based design, will be applied in a number of case studies, already selected in co-ordination with ASCOS User Group members. This will be followed by a quantification of the overall safety impact (reduction of the accident rate) of introduction of selected new operations and systems in Europe.

V. The fifth phase deals with the validation of the scientific and technological advance that the proposed project is expected to bring:
   - New affordable certification processes to make certification easier;
   - Innovative safety based design systems and tools; and
   - New methods and tools to support continuous safety monitoring.

2.5 Consortium

Coordinator: Dr. ir. Lennaert Speijker
Air Transport Safety Institute
National Aerospace Laboratory NLR

Consortium Partners:
STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM
THALES AIR SYSTEMS & ELECTRON DEVICES GMBH
THALES AIR SYSTEMS S.A.
APSYS SA
CIVIL AVIATION AUTHORITY UK
INGENIERA DE SISTEMAS PARA LA DEFENSA DE ESPANA SA
CERTIFLYER BV
AVANSSA LDA
EBENI LIMITED EBE
DEEP BLUE SRL
JRC -JOINT RESEARCH CENTRE- EUROPEAN COMMISSION JRC
JEAN-PIERRE CLAUDE MAGNY
TECHNISCHE UNIVERSITEIT DELFT
INSTYTUT LOTNICTWA

2.6 User Group

European Aviation Safety Agency (EASA)
Federal Aviation Administration (FAA)
SESAR Joint Undertaking
European Organization for Civil Aviation Equipment (EUROCAE)
SAE S-18 Airplane Safety Assessment Committee
Safety Regulation Commission (SRC)
European Strategic Safety Initiative (ESSI)
European Organization for the Safety of Air Navigation (EUROCONTROL)
International Air Transport Association (IATA)
Future Aviation Safety Team (FAST)
European Society of Air Safety Investigators (ESASI)
Civil Aviation Authorities (The Netherlands, Poland, Italy, ...)
Aircraft manufacturers (Dassault Aviation, Rockwell Collins, ...)
TUV NORD CERT GmbH – Aviation
Luchtverkeersleiding Nederland (LVNL)
Koninklijke Nederlandse Luchtvaartmaatschappij (KLM)

2.7 Project details

EU Programme:	FP7 Transport - Aeronautics and Air Transport (AAT)
EU Activity	Ensuring customer satisfaction and safety (7.1.3)
EU Area/topic:	Operational Safety (7.1.3.4)
EU Sub Programme area:	Design systems and tools (AAT.2012.3.4-1)
Contract type:	Small or medium-scale focused research project
Total cost:	4702893 EURO
EU contribution:	3365884 EURO
Grant Agreement:	ACP2-GA-2012-314299-ASCOS
Starting date:	1 July 2012
Duration:	36 months

3 Mapping on ACARE SRIA

In this section the ASCOS project is mapped on the safety part of SRIA Vol.2. It is important to refer to Appendix-D of Reference 29, for the Capabilities and the adopted numbering. ASCOS Project activities already mapped (by the OPTICS Team) to the Capabilities listed in the SRIA Vol. 2 are addressed in sub-sections 3.1 to 3.4. This concerns Capabilities related to two Enablers [29]:

- Enabler 1 “System-wide Safety Management Systems”
- Enabler 6 “Standardisation and certification”

Additional capabilities - not recognized by OPTICS, but identified by the ASCOS Team - are listed in Section 3.5.

3.1 Capability 1.1: Understanding safety related influence factors

3.1.1 Description

Enabler 1:

- System-wide Safety Management Systems: The identification and implementation of a Safety Management System to operate throughout the whole chain of Air Transport activities.

Capability 1:

- Understanding the safety related influence factors on the overall air transport system and its connections with other transport nodes.

3.1.2 Rationale

ASCOS is outlining a proposed safety assessment methodology suitable to deal with the total aviation system and the entire life-cycle based, inter alia, on an example of a risk model as well as an example of a process to identify emergent risks [5, 9, 13, 18]. ASCOS is also developing and implementing supporting tools [14, 17].

3.2 Capability 1.2 Implementation of an operational risk management system

3.2.1 Description

Enabler 1:

- System-wide Safety Management Systems: The identification and implementation of a Safety Management System to operate throughout the whole chain of Air Transport activities.

Capability 2:

- Implementation of an operational risk management system which demonstrates the ability of the ATS to anticipate, react, respond and recover with respect to safety threats within a multi-modal transportation system.

3.2.2 Rationale

ASCOS is defining a process for safety performance monitoring including ICAO and regional principles [5, 17], ASCOS is also defining improvements for the in-service safety assurance guidelines and processes provided by e.g. EUROCAE and SAE [18] The existing User Group for ASCOS [4, 5, 6, 7] makes clear that the proposed risk mitigation processes are being discussed with the most relevant stakeholders, including regulatory authorities (EASA, FAA, JARUS, CAA Netherlands, CAA Poland), standardisation bodies (EUROCAE and SAE), and SESAR JU.

3.3 Capability 1.11 Safety performance indicators are linked to safety outcomes

3.3.1 Description

Enabler 1:

- System-wide Safety Management Systems: The identification and implementation of a Safety Management System to operate throughout the whole chain of Air Transport activities.

Capability 11:

- Safety performance indicators are systemically linked to safety outcomes, allowing measurement of system safety performance. Credible measurement of progress towards 2050 targets becomes possible.

3.3.2 Rationale

ASCOS is developing and validating a continuous monitoring process (and supporting tools) in which safety performance indicators for each stakeholder are linked with precursors for all the main operational issues for commercial air transport operations as identified in the European Aviation Safety plan (EASp). The ASCOS tools for continuous safety monitoring are being developed and implemented with the Joint Research Centre (JRC) of the European Commission [27], and are therefore consistent with (and use) the most recent version of the European Co-Ordination Centre for Aviation Incident Reporting Systems (ECCAIRS) software [5, 15, 16].

3.4 Capability 6.1 Innovative approach to standardisation, certification & approval

3.4.1 Description

Enabler 6:

- Standardisation and Certification
- Innovative approach to standardisation, certification and approval processes. Advanced methodologies including simulation tools applied to compliance demonstration of safety / security requirements at component, product, system and system of systems level, including human, social and technical aspects, leading to efficiency and shorter time to market of new products, services and operations. Improved methodologies for standardised approval and licensing.

Capability 1:

- Common framework for Certification / Approvals which embrace new technologies and their integration within the systems to be certified and the use of new technologies and methods in the certification / approval processes.

3.4.2 Rationale

ASCOS is defining and evaluating different options for improvement of the certification process. Various options are assessed, including the framework of a logical argument concept (as per EUROCONTROL arguments for Safety Cases) applied to the Total Aviation System (TAS) [4, 5, 6, 10, 19, 20, 21, 22]. ASCOS proposes as well application of a “common safety standard framework to all TAS stakeholders [18]. In particular, but not limited to, ASCOS starts to address the change between performance-based and compliance-based approach to certification/approval.

3.5 Additional identified capabilities

From Section 2, the ASCOS Public Website and the publicly available ASCOS documentation, it becomes clear that ASCOS also seems to contribute directly to the following additional Enablers (and associated Capabilities):

- Enabler 2 “Safety radar”
- Enabler 5 “Forensic analysis”
- Enabler 7 “Resilience by design”

Table 1 lists the additional capabilities identified by the ASCOS Team, and relates these to the Work Package in which the anticipated contribution takes place. Note that ASCOS also contributes to an additional capability (1.9) of Enabler 1 “System-wide Safety Management Systems”. Notable additional capabilities are related to:

- A method for identification of the safety precursors during the product development safety assessments (WP 3.2 and 3.5)
- The means to have an automatic safety precursor capture in operation (WP 3.5)
- A common safety standards framework to harmonize product development and Safety assurance processes in the Total Aviation System (TAS) and allow improve exchanges between TAS stakeholders.

The extent to which Project ASCOS contributes to the various identified enablers/capabilities varies. Further elaboration and clarification could result into a ‘priority’ ranking reflecting level of contribution to Capabilities.

Table 1 Additional capabilities identified by the ASCOS Team

No.	Enabler / capability	Contri-bution
1.9	1.9: Development of tools, metrics and methodologies to assess and pro-actively manage current and emergent risks in a multi-modal door-to-door environment. Data integration across the transport system links system antecedents to safety outcomes enabling calculation of quantitative risk assessments and measurement of risk reduction.	WP3
2.3	*2 Safety Radar: Safety Innovative methods, processes and services to ensure real time detection of deviations in safe performance within the total Air Transport System.* 2.3: Pro-active identification of the external hazards, development of models which enable the identification of their probability and impact	WP2.3 WP3.5
5.1	*5: Forensic Analysis: Tools, methodologies and processes which aim to automate the capture and analysis of aviation accidents, incidents and occurrences. Further improve the efficient identification of trends and emergent vulnerabilities aiming to mitigate the risks to aviation safety and security through design. The application in current and new developments of technology, system designs and operations and necessary requirements and regulations and their effects on human performance.* *5.1* Systematic analysis of Safety data (incident reports, flight data etc.) is utilised by stakeholders due to improved capture technologies, processes and safety culture across the ATS, which includes the General Aviation and Rotorcraft operators.	WP2 WP3
7.1 & 7.2	*7: Resilience by design: Methodologies and tools, products and services which ensure the air transport system is resilient by design and operation to current and predicted safety and security threat and hazard evolution.* 7.1: Systematic methods for ensuring results of safety/security analysis are fed back into design process 7.2: Systematic methods for ensuring in-service experience is fed back into the design and manufacturing process.	WP1.3 WP1.5 WP3.5

4 Project self-assessment

For each covered capability, the project will be assessed with respect to:

- Contribution to the capability (see Appendix D of reference 29),
- Maturity (see Appendix B of reference 29),
- Ease of adoption (see Appendix C of reference 29).

For each evaluation a rationale is provided.

Note that as far as maturity is concerned, Technology Readiness Levels (TRLs) 7, 8 and 9 are out of the OPTICS scope. In fact, OPTICS does not focus on the production phase.

Capabilities already identified (by the OPTICS Team) are assessed in the following sub-sections. This concerns Capabilities related to two Enablers:

- Enabler 1 “System-wide Safety Management Systems”
- Enabler 6 “Standardisation and certification”

ASCOS also contributes to the following other Enablers (and their Capabilities) (see Section 3.5):

- Enabler 2 “Safety radar”
- Enabler 5 “Forensic analysis”
- Enabler 7 “Resilience by design”

The contributions of the ASCOS Project to these Enablers (and the relevant Capabilities) are not yet assessed.

4.1 Capability 1.1 Understanding safety related influence factors

4.1.1 Contribution to capability

Score	Medium

4.1.2 Maturity

Score	Medium

4.1.3 Ease of Adoption

	Economic	Legal	Organizational
Score	Medium	Medium	Medium

4.1.4 Rationale for the contribution

It would appear that the capability is well addressed. Further details are required regarding deliverables and the granularity of the modelling to confirm initial assessment. However, the project, while supporting an argument-based approach to address various certification options [10], does not seem to consider a similar approach for the development of risk based design methods and tools [9, 13, 14]. The initial assessment of the

contribution of ASCOS to this SRIA capability may change if the remaining set of documents from ASCOS WP3 [17, 18] and results from validation exercises performed in ASCOS WP5 are also considered [15, 24, 25].

4.1.5 Rationale for Maturity

Intention is to provide methods, models and prototype tools based on different sources of risk methods and modelling (including the Future Aviation Safety Team methodology (FAST), also supported by EASA[1], and an improved Causal model for Air Transport Safety (CATS). The development of an integrated risk management framework building on a set of models for the various actors of the total aviation chain and addressing hazards and risk issues is therefore addressed by ASCOS. Proposed methods and tools are planned to be validated as part of ASCOS WP5 Validation [15]. Integrating the methods in the proposed certification approach appears to be targeted as well [10]. Improvements of the safety standards proposed by ASCOS WP3 consider the integration of the developed ASCOS tool for risk assessment in the process [18]. Further details are expected to be made public in 2015.

4.1.6 Rationale for Ease of Adoption

Costs are expected to relate to processes. From an organisational perspective, the data collection and processing complexity is high, with barriers expected due to confidentiality of data, legal constraints, unions, etc. Due to the fragmentation of EU aviation, its complexity and number of stakeholders, the organisational complexity is high. However, there are also clear safety benefits of adopting the proposed approach. If the perceived benefits are made sufficiently clear to the aviation stakeholders, this should increase ease of adoption. The fact that many stakeholders are already involved in the User Group will certainly help. ASCOS targets adoption in the aircraft domain through its active involvement in the EUROCAE WG-3 and SAE S-18.

4.2 Capability 1.2 Implementation of an operational risk management system

4.2.1 Contribution to capability

Score	Medium

4.2.2 Maturity

Score	Medium

4.2.3 Ease of Adoption

	Economic	**Legal**	**Organizational**
Score	High	Low	High

[1] M. Masson and Y. Morier, EASA, and the FAST; Methodology to Assess Future Risks, Presented to European Commercial Aviation Safety Team, EASp EME1.1 Final Deliverable, December 2012

4.2.4 Rationale for the contribution

While defining the high level components of a risk management process and using one example of a risk model to map SPIs to precursors, ASCOS does not yet seem to fully define the main aspects of a risk management platform that will provide the capability of an Early Warning System to, inter alia, (i) detect unsafe trends before a serious event or worse happens; (ii) suggest safety improvement areas (thereby supporting a 'risk-based' safety regulation); as well as (iii) reach all those needed to ensure the air transport system reaction if the problem is generic, or localised reaction if it is a localised issue. It is likely that the ASCOS WP2 Report "Continuous Safety Monitoring" [16] provides more clarity on the actual ASCOS contribution to this Capability.

4.2.5 Rationale for Maturity

The principles of a near-real time monitoring system, issues related to data feed and dissemination across the total aviation system are considered [4, 16]. ASCOS WP3 proposes a method to detect and code automatically aircraft system malfunctions [18]. This method can be extended to all the stakeholders in the total aviation system.

The tools developed in ASCOS WP2 are ECCAIRS compatible meaning that they can be used directly by the many ECCAIRS users across the world for continuous monitoring of their desired safety performance indicators. The developed tool for Continuous Safety Monitoring has been demonstrated at the ECCAIRS Steering Committee Meeting on 9/10 October 2014, with participation of most EU Civil Aviation Authorities, Safety Investigation Authorities, EASA, EC DG-MOVE, ICAO, EUROCONTROL, and other aviation stakeholders. The tool (and supporting material, including User Manual) is made available through the ECCAIRS web site (eccairsportal.jrc.ec.europa.eu). Further validation of the tool takes place in the ASCOS WP5.

However, the ASCOS Continuous Safety Monitoring methods and tools mainly build on the ECCAIRS software, and the usage of occurrence and incident/accident data. It appears difficult with ECCAIRS – if not impossible – to do any kind of flight data processing on operational data recorded on the aircraft for identification of event exceedences and routine events. Flight data obtained by Flight Data Monitoring (FDM) will be extremely valuable for providing more frequent risk monitoring. Developing tools that allow storage and processing of flight data in a Risk Observatory will make it easier to integrate FDM data with other data sources like occurrence reports. ASCOS does not seem to consider this. In this context, note that ECCAIRS in principle has the capability to store detected FDM related events. However, such storage requires a community agreed taxonomy of FDM events which is not (yet?) at hand. Once available, the updating of the ECCAIRS taxonomy to cater for such events should not be a problem. Specific issues have been addressed in the past – ranging from FOD reporting over volcanic ash issues to the transport of dangerous goods. Adding FDM events not seem to be an ECCAIRS/ASCOS related problem, more one of the maturity of the FDM analysis in the European context. Note that actual storage of FDM data in an ECCAIRS record, while possible, is not deemed a suitable approach. ECCAIRS can/should be used to record the results of the FDM analysis, the detected FDM events.

4.2.6 Rationale for Ease of Adoption

The identification and usage is not a significant challenge, but it is expected that difficulties will arise in obtaining the relevant data and regulatory acceptance. However, the new Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the reporting, analysis and follow-up of occurrences in civil aviation may make it easier to obtain and analyse relevant data since it e.g. requires occurrence reports to be compatible with ECCAIRS and ICAO ADREP and supports the development of a just culture environment. Incentives for voluntary sharing of data, showing the benefits to data providers, should improve the situation.

4.3 Capability 1.11 Safety performance indicators are linked to safety outcomes

4.3.1 Contribution to capability

Score	High

4.3.2 Maturity

Score	Medium to High

4.3.3 Ease of Adoption

	Economic	Legal	Organizational
Score	High	Low	High

4.3.4 Rationale for the contribution

The ASCOS framework for Safety Performance Indicators (SPIs) [8 ,11] is based on monitoring of 63 Safety Performance Indicators (SPIs) grouped at four levels (Technology, Human, Organisation, System of organisations) referring to different stakeholders of the Total Aviation System (Aircraft, Airframe, Board Systems, ATC/ATM, Airlines, MRO, etc.).

4.3.5 Rationale for Maturity

Indicators relating to safety are well developed. Precursors related to the improved Causal model for Air Transport Safety (CATS) are being considered [11]. The developed SPIs are related to the main operational issues identified in the European Aviation Safety plan (EASp), established by EASA. The catalogue of safety indicators that are used or could be used in ATM, developed in the context of the development of the SESAR Accident Incident Model (AIM), appears to have been considered [8]. However, it is not clear from the public documentation if and how this catalogues has been used. Elicitation of the required data from databases, necessary to quantify the SPIs, is already made possible by the JRC, which has already developed queries for all event based SPI's and to be able to compare a given State with the European experience (all in ECCAIRS 5 [16]).

There is, however, a remaining issue – the need to obtain European wide exposure data, in particular for light aircraft aviation and for helicopters. This is not an ECCAIRS issue.

4.3.6 Rationale for Ease of Adoption

The identification and usage is not a significant challenge, but it is expected that difficulties will arise in obtaining the relevant data and regulatory acceptance. However, the new Regulation (EU) No 376/2014 of the European Parliament and of the Council of 3 April 2014 on the *reporting, analysis and follow-up of occurrences in civil aviation* may make it easier to obtain and analyse relevant data since it e.g. requires occurrence reports to be compatible with ECCAIRS and ICAO ADREP and supports the development of a just culture environment. Incentives for voluntary sharing of data, showing the benefits to data providers, should improve the situation.

4.4 Capability 6.1 Innovative approach to standardisation, certification & approval

4.4.1 Contribution to capability

Score	Medium to High

4.4.2 Maturity

Score	Medium to High

4.4.3 Ease of Adoption

	Economic	**Legal**	**Organizational**
Score	Medium to High	Medium to High	Medium to High

4.4.4 Rationale for the contribution

ASCOS is clearly pioneering the study of various certification options, with, in particular but not limited to, the introduction of an argument-based approach to certification/approval as well as using the state of the art in argument modularisation and definition of assurance contracts. ASCOS has initially focused on defining the fundamentals of the approach [10], and is currently exercising them concretely. First results of the case studies are expected towards the end of 2014. Note that ASCOS does not intend to define the option of performance-based certification in terms of, for example, what would be a performance-based regulation framework by considering the different domains with their own specificities (e.g. ANSP, A.O and TC/STC holders), what are the KPIs and how to define and measure the “safety” performance in such framework (approach and methods). The latter is subject of a separate study (by NLR, with partners) on “Performance Scheme and Performance Based Approach in the context of aviation safety” for DG-MOVE, the results of which may be used by EC in the context of the Impact Assessment on the revision of Regulation 216/2008 (Basic Regulation).

ASCOS proposes adaptations of standards used for safety assessment in design, development, and operation (in-service) (e.g. the EUROCAE ED78A, the SAE ARP4754A, and the SAE ARP 5150):

- A method for identification of the safety precursors during the product development safety assessments (WP 3.2 and 3.5)
- The means to have an automatic safety precursor capture in operation (WP 3.5)
- A common safety standards framework to harmonize product development and Safety assurance processes in the Total Aviation System (TAS) and allow improve exchanges between TAS stakeholders.

4.4.5 Rationale for Maturity

The proposed certification approach [10], which has been reviewed by e.g. EASA, is currently being tested in case studies within ASCOS WP4 (i.e. Maturity Level is 4 = Medium). Verification of case study results is planned as part of ASCOS WP5 (results will become available by early 2015) [24]. A feedback mechanism is in place to ensure that an updated (consolidated) certification approach will be delivered [19]. This supports pick up by the relevant stakeholders, including policy makers (i.e. the Maturity Level at the end of the project is 5 = High).

4.4.6 Rationale for Ease of Adoption

For this one, the ease of adoption is provisionally set to 'Medium to High' since various options are currently being exercised within the four case studies in ASCOS WP4. This concerns:

1. Remotely Piloted Aircraft Systems (RPAS) failure management systems (WP4.1)
2. Automatics aircraft recovery system (WP4.2)
3. Certificate for de-icing (WP4.3)
4. ATM/CNS system for improved surveillance (WP4.4)

The early involvement of EASA and NAAs is clearly visible from the documentation available. The Civil Aviation Authority UK is in fact a partner is the ASCOS Project (and also co-author of the proposed certification approach [10] and several other relevant ASCOS publications, e.g. [9, 13]). EASA has hosted an ASCOS - EASA Dissemination Workshop on 19th of April 2013 in Cologne. EASA is a member of the ASCOS User Group, and receives all the ASCOS deliverables. From the public deliverables on the ASCOS web-site, it can be observed that EASA actually also provides comments and reviews key deliverables (including for example D1.3 [10]).

ASCOS is discussing adaptations of standards used for safety assessment pro-actively with the EUROCAE Working Group 63 on Complex Aircraft Systems (and counterpart SAE S-18). Airbus/APSYS represents ASCOS in these Working Groups and proposes adaptations of standards contained in ED78A, ARP4754A, and ARP 5150.

References

#	Authors(s), Title, Year
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3	SRIA Volume 2: http://www.acare4europe.com/sites/acare4europe.org/files/attachment/SRIA%20Volume%202.pdf
4	ASCOS Website: http://www.ascos-project.eu (checked on 12-12-2014)
5	ASCOS Brochure, 2012
6	ASCOS Flyer, 2012
7	ASCOS Dissemination Plan, 2012
8	Safety Performance Indicators for system of organizations, 2014
9	Risk models and accident scenarios in the total aviation system, 2014
10	Development new certification approach, 2013
11	Framework Safety Performance Indicators, 2013
12	Certification e-learning environment, 2013
13	Safety assessment methodology, 2013
14	Tool for risk assessment and user manual, 2014
15	Validation strategy and methodology, 2014
16	Final Report WP2 “Continuous Safety Monitoring, 2014
17	Tool for overall safety impact and user manual, 2014
18	Final Report WP3 ”Safety Risk Management”, 2014
19	Consolidated new certification approach, scheduled for publication in 2015
20	Final Report WP1 “Certification processes”, scheduled for publication in 2015
21	Evaluation of case studies, scheduled for publication in 2015
22	Final Report WP4 “Certification case studies”, scheduled for publication in 2015
23	Exploitation plan, scheduled for publication in 2015
24	Validation report, scheduled for publication in 2015
25	Final Report WP5 “Validation”, scheduled for publication in 2015
26	Publishable final report, scheduled for publication in 2015
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