



# Final Project Report

## Document information

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## Task contributors

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## **Abstract**

This Final Project Report summarises the achievements of P16.01.02 and in particular the D14 "Final Resilience Guidance Material for Safety Assessment (SRM) and Design" which is the synthesised output from the incremental and iterative development activity performed during the 16.01.02 project. P16.01.02 achieved to develop the resilience guidance material for safety assessment to be part of the Safety Reference Material developed by P16.06.01 but also provided initial resilience guidance material for design of operational services and technical solutions in WP4-15.

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None.

## Document History

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## Intellectual Property Rights (foreground)

This deliverable consists of SJU foreground.

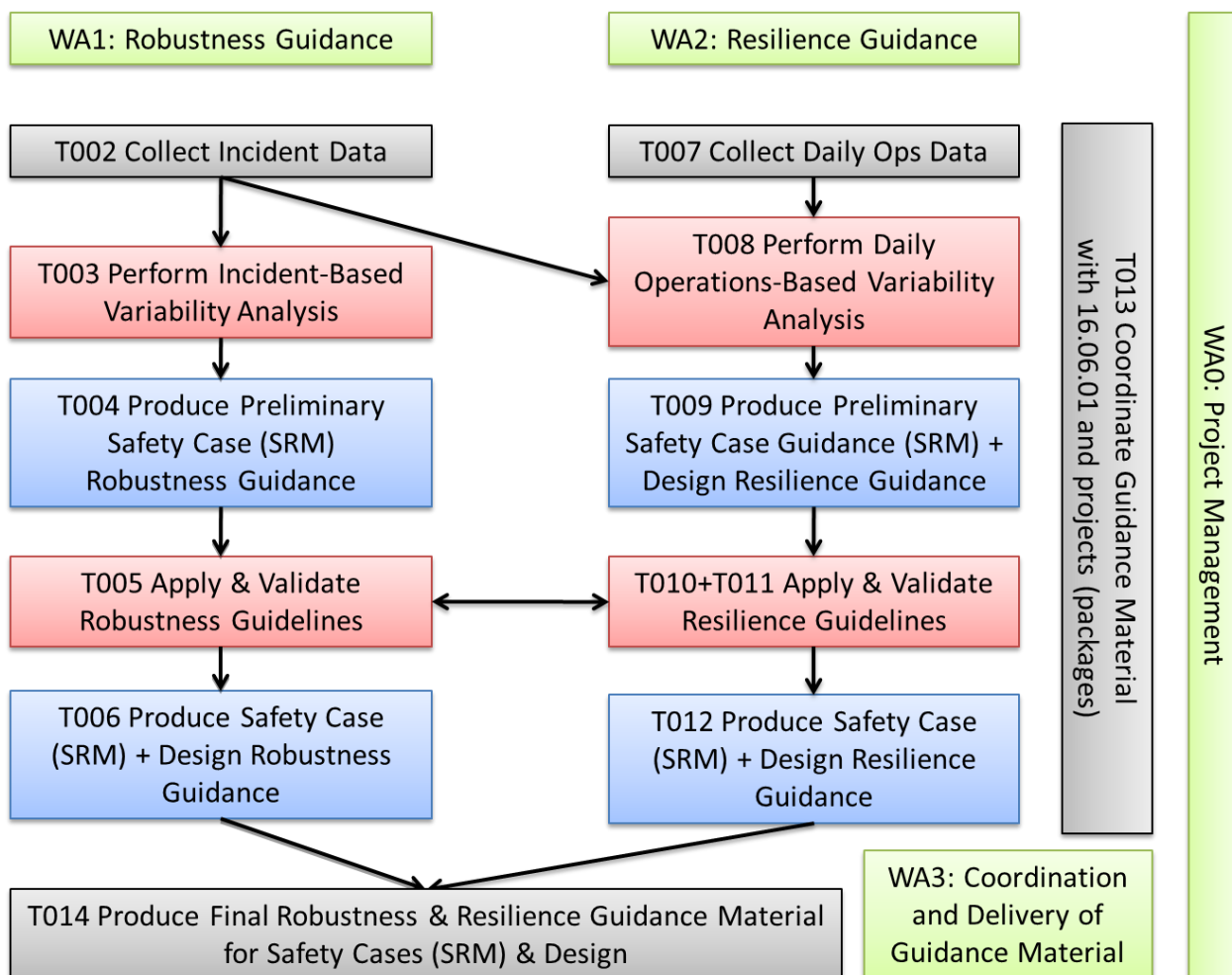
# 1 Final Project Report

## 1.1 Deliverables

The work began in 2011 looking at ATM incidents, everyday operational performance and unexpected and unwanted variations in the way the observed ATM system behaved. The whole project was incremental in its nature (see figure below) and informed and by valuable feedback from other actors that was received. A set of Robustness and Resilience principles were identified. These were validated on a SESAR project and a methodology and guidance on how to apply the method derived

At the end of 2013 the project delivered Final Resilience Guidance Material for Safety Assessment (SRM) and Design (D14) to 16.06.01 for inclusion in the SRM. In parallel the so-called re-allocation of resources within SESAR rendered a project (16.06.01b) that was launched in spring 2014. The work of 16.01.02 work is now continuing in close collaboration with 16.06.01. The ultimate output is to refine the application of resilience principles within safety assessment and design and by use of this, to enrich safety assessment mechanisms so as to contribute to an as smooth as possible implementation of SESAR improvements into the European Air transport System.

The illustration below shows the architecture and constituent activities of the 16.01.02 project.



The deliverables from the 16.01.02 project are:

Del. code	Del.Name	Description	Assessment Decision	Explanations
D 04	Preliminary Safety Case (SRM) Robustness Guidance	<p>This document presents the preliminary version of the Robustness Guidance for the SESAR Safety Reference Material (SRM).</p> <p>The main themes are:</p> <ol style="list-style-type: none"> <li>1. Identifying normal and abnormal conditions ,</li> <li>2. Conditions' adverse effect prevention and recovery, with special emphasis on the human contribution to prevention and recovery,</li> <li>3. Degraded modes and contingency planning ,</li> <li>4. Realistic assumptions and local environment descriptions .</li> </ol>	no reservation	
D 06	Safety Case (SRM) and Design Robustness Guidance	This document refines and enhances the Preliminary Robustness Guidance (D04) based on the outcomes of the application of the guidance to 06.07.01 Conformance Monitoring	no reservation	
D 10	Preliminary Safety Case (SRM) Resilience Guidance Application and Validation Results	<p>This document provides the Resilience Assessment Conclusions from applying the Resilience Assessment Guidance to an operational change (i.e. i4D + CTA OFA) in everyday operations, linking the Resilience Assessment to the Safety Assessment of the operational change as described in the SRM Guidance.</p> <p>From these conclusions, the benefits of applying the resilience guidance are demonstrated as a complement to the SRM, covering some gaps identified in the SRM methodology and enriching the Safety Assessment.</p>	no reservation	
D 14	Final Robustness & Resilience Guidance Material for Safety Cases (SRM) and Design	This deliverable is the main overarching and final deliverable on the Resilience Guidance Material for Safety Assessment and Design. It merges and integrates D04/D06 (Robustness Guidance) and	no reservation	

		D09/D12 (Resilience Guidance). It aims to be usable for and aligned with P16.06.01 (for Safety Assessment) and WP4-15/WP-B projects (for Design), in maintaining and enhancing the Resilience of ATM/ANS functional systems and services that SESAR develops.		
D 15	Final Report 16.01.02	This report		

## 1.2 Coordination and communication

External coordination and communication was found relevant to this project as the application of resilience to ATM is innovative and progressive development in safety thinking. Therefore papers, posters and presentations, in agreement with SJU, were developed and presented to various conferences, meetings when required.

Institutes like NLR and DLR also provided valuable feedback and comments. In coordination with SJU also FAA and NASA attended presentations within the AP15 framework. Presentations to the European Social Dialogue and the Professional Association forum were given.

The leading conference on Resilience Engineering accepted a paper with preliminary findings. A poster and a paper were presented at the 2<sup>nd</sup> and 3<sup>rd</sup> SESAR Innovation Days in 2012 and 2013, respectively. Eurocontrol Safety Team also received a presentation during 2013. Further additional SJU WPs took note of the content. It should be mentioned that two of the training and validation exercises for i4D/CTA P05.06.01 had a useful iteration of the Resilience principles as part of the evaluation.

## 1.3 The future

The future for Resilience looks promising but a few challenges can be identified. The first challenge is to further operationalize the resilience principles and further integrate them into safety assessment and refine the guidance to use them. The second challenge is to demonstrate, definitively, the benefits that the application of Resilience Engineering can bring. The third challenge is to increase the level of knowledge in general on Resilience Engineering in the ATM community and number of competencies in the subject. A familiarisation package was developed as part of the project, and this work continues within 16.06.01b to design a training course with accompanying material.

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