OPTICS Workshop Highlights

From Hazard Management to Operational Resilience

28-29 April 2015, Toulouse

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Are we doing the right research? Are our priorities right?

OPTICS Workshop Prioritises Research in Aviation Safety for FlightPath 2050

On 28 and 29 April, the second OPTICS Expert Workshop was held at ONERA in Toulouse, attended by around 50 experts in Aviation Safety. Their task was to determine the major Research & Innovation (R&I) priorities for aviation safety, to consider the research pathway laid out by ACARE's Strategic Research & Innovation Agenda (SRIA), and to determine if any significant research avenues were missing. The 2nd Expert Workshop was ambitious, dealing with four safety focal areas grouped together in the SRIA cluster called 'Air Vehicle Operations and Traffic Management':

- How to guarantee safe operations in adverse weather conditions?
- What is needed to allow safe access to airspace of non-commercial operations, UAS and increasingly autonomous systems?
- Operational monitoring and making the best use of data: which challenges need to be overcome?
- From health management to self-healing: how to achieve progress towards a resilient air transport system?

Experts were asked to (1) confirm challenges, assess progress and identify gaps in research dedicated to aviation safety, (2) identify smart solutions and priorities for innovation in aviation safety, (3) offer advice upon strategic avenues for safety research and innovation.

Opening speeches were delivered by ONERA and OPTICS. The agenda of the two-day meeting included 4 keynote speeches and 2 slots for dedicated working sessions for each of the four focal areas.

Dr. Pascal Traverse of Airbus provided the first keynote. His starting point was that aviation is safe and is improving. To continue to improve the industry needs: (1) to collect and analyse data, (2) to improve pilot Competences & Training, (3) to better assess human performance and (4) to afford aircraft modifications.

Mike Lissone of EUROCONTROL gave a presentation on RPAS integration into SESAR. Mr. Lissone shared the roadmap for European RPAS research. Several issues were presented, amongst which were: safety perception, lack of organisation, and a mix of airspace users. Safety considerations in autonomy were shared in the keynote of **Dr. Guillaume Brat** from NASA AMES Research Center and focussed on three of NASA's strategic thrusts: safe, efficient growth in global operations, real-time system-wide safety assurance, and assured autonomy for aviation transformation.

EASA's head of safety intelligence and performance - **Rachel Daeschler** - gave the fourth keynote. She gave an introduction to EASA's safety intelligence activities. She also sketched an image of the future by looking ahead to the use of data from the European Central Repository, and even further ahead by presenting a possible future safety exchange programme for Europe.

For the workshop session the experts broke up into four groups. The sessions were facilitated and moderated by OPTICS team members. Each group was intentionally diverse, with representation from a broad spectrum of the aviation stakeholders, drawn from universities and research institutions, regulators, airframe manufacturers, airlines, air navigation service providers, system suppliers, etc. Before the workshop each expert was asked to state their

two highest priorities for each focal area in the context of Aviation Safety. While the approach in each individual group varied, the discussions homed in on similar issues.

The Second OPTICS Expert Workshop succeeded in finding the top priorities for research directions in the four safety focal areas (see box on next page). The top priorities are structured around the following four 'driving forces' in aviation and aviation research today:

- UAS/RPAS integration into airspace is coming fast, but we are hardly prepared, and have an insufficient research basis for its integration.
- Real-time data analysis on human and system behaviour, including the performance of the human-automation team, should offer significant safety advantages.
- The necessity to improve the resilience of the air transportation system, and in particular the safety performance, as the socio-technical system grows in complexity.
- The integration of resources, knowledge and advanced technologies is now a must to ensure safe, fair and cost-effective aircraft operations under adverse weather conditions.

Further analysis of the top 10 priorities shows that there are recurring themes. These recurring themes are:

Enabling future operations with advanced technology. Advanced technology is available, but non-technical issues stand in the way of full spread implementation. The advanced technology might also require a complete redesign of how to operate. Technologically advanced systems require rethinking on how we verify and validate safety. Increased reliance on advanced software also poses challenges in the assurance of safety.

Resilience. Making aviation resilient to non-nominal situations is a recurrent theme, which is underpinned by the reliance on the provision of comprehensive high quality operational data needed to assure safety in an ever more complex environment.

Data and information. Sharing data over stakeholders is believed to be a top priority. The following challenges have to be met: harmonization, quality assurance, traceability of data, security etc. Advanced weather data can be collected to distribute the information to relevant actors in order to increase weather hazard awareness. Enhanced weather information can be used in decision making processes for optimizing operations.

A full report of the workshop - detailing the top research priorities - is available on the OPTICS website.
The entire OPTICS team would sincerely like to thank all the experts who participated, and also to thank the four keynote speakers, for their invaluable contributions to the event.

TOP 10

1. Develop a new CONOPS that accommodates RPAS/UAS and their impending integration into airspace.
2. Develop real-time data analysis capability of human and system behaviour in order to detect precursors to adverse events.
3. Demonstrate the safety benefits to aviation and air transportation through the application of resilience in complex socio-technical systems.
4. Increase the resilience of operation in adverse weather conditions.
5. Derive a new and more agile V&V (Verification and Validation) approach for RPAS/UAS.
6. Develop advanced models of shared situation awareness and collaborative and dynamic decision-making for RPAS/UAS.
7. Determine the success factors in automation and its development cycle that lead to human trust in automation.
8. A new, fast-track system for feeding back operational data into design needs to be developed.
9. Develop affordable technologies to go beyond current flight limitations in adverse weather conditions.
10. Use the weather knowledge in the decision chain to optimize the interest of each aviation actor while ensuring safety and global fairness.