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Safety Forum 2023

## Knowledge Skills and Experience for Safe Operations

Summary and Conclusions

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SAFETY FORUM

KNOWLEDGE, SKILLS AND EXPERIENCE FOR SAFE OPERATIONS

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The 2023 Safety Forum, which was held 7-8 June 2023 at EUROCONTROL headquarters in Brussels, focused on the knowledge, skills and experience necessary to ensure safe operations as the industry continues to recover from the COVID-19 pandemic, sees the introduction of new technologies and players, and seeks to attract a new generation of personnel.

As demonstrated by the COVID-19 crisis, resilience and vitality in the aviation industry are in many respects constrained by the availability of suitably trained, qualified and experienced staff. This issue affects everyone—people at the sharp end of flight operations, maintenance, ground handling, air traffic control and airport personnel, as well as managers and other personnel at the blunt end.

There has also been a loss of experience through normal retirement and through the many cases in which alternative employment has proved more attractive than returning to aviation. At the same time, new realities in the industry and society, including paradigms for sustainable development, technological advances, new business models and new generations, are bringing new demands for particular skills and knowledge.
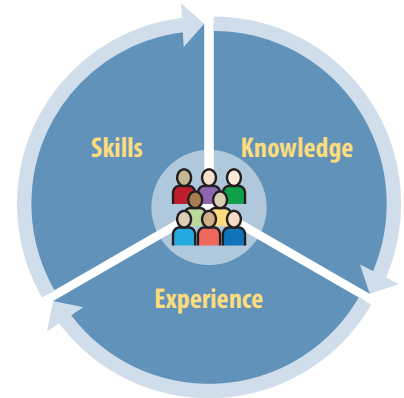
Safety Forum participants discussed several important questions, such as how to attract and retain the needed personnel and how to achieve a diversity of thought that could lead to safety improvements and enhance resilience. Topics included human factors in training, safety culture and regulatory issues.

The conclusions of the 2023 Safety Forum reflect the understanding that there will be different pressures on the aviation system related to the current and future availability of knowledge, skills and experience necessary to ensure safe operations. The identified generic types of pressures can have safety effects if the aviation system is not resilient enough to properly manage them. We discussed typical aviation system resilience capabilities to counterbalance the different types of pressures. This is not the end but the beginning of a structured and comprehensive conversation that needs to take place in the industry.

The following are typical safety pressures related to the current and future availability of knowledge, skills and experience necessary to ensure safe operations. They have been grouped into the following sections for ease of reading:

- Attracting and retaining personnel;
- Renewal of skills, competencies and training;
- Rethinking models, designs, procedures and technologies; and,
- Mental health, well-being, workload and fatigue.

The identified pressures and example resilience capabilities are not guidelines or recommendations but represent a factual summary of what was presented and discussed during the 2023 Safety Forum. Aviation organisations are encouraged to review the information contained in this document and to assess the relevance of this information against their local conditions and specific context.

1. Attracting and retaining personnel

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLES / RESILIENCE / CAPABILITIES
Generalised staffing difficulties, especially staff shortage (ageing workforce, higher entry requirements, personal choices, maintaining competence).	• Engage the aviation industry into long-term plans and activities such as STEM (science, technology, engineering and mathematics) or youth engagement via collaborations with universities. • Use role models for the integration of young professional generations with the more experienced ones (mentorship, professional diversity). • Open traditional recruitment schemes by investing in new talent pools, developing apprenticeships, accepting that each job today can lead to multiple career paths. • Gather professionals with different sets of skills: Diverse teams made of diverse professionals result in more efficient solutions. Diversity positively influences safety. • Develop staff retention schemes. A good organisational human resources policy could advise, in some contexts, retaining and securing the professionals they already have, instead of cutting personnel at the first downturn (see importance of investing in people as an investment in the company's future). • Put diversity, inclusion and equity policies in place, including policies for recruiting into management positions.
Regional characteristics and roles specialisation make recruitment even more challenging. Regulators struggle to address a variety of sources of staffing problems.	• Need to open new perspectives and be particularly proactive to provide solutions adapted to local issues. • Encourage global and innovative solutions to attract both new and returning employees. Examples: digital transformation, redefinition of flight operations roles. • Foster collaborative efforts between regulators and companies: The regulators can provide a regulatory scheme that helps the companies to obtain/allocate/specialise the required professionals optimising resources (time/money).
The aviation sector struggles to remain attractive.	• Invest in strong leadership to help the employees to follow their desired professional path. • Increase the number of women in leadership roles across the aviation industry (e.g., the International Air Transport Association (IATA) "25by2025" initiative, with the target of 25 percent of senior positions filled by women by the year 2025). • Need for mentorship perspectives. A contextualised training/mentorship can help to retain talent as it allows professionals to fulfil their goals. Example: "My professional career is going where I want, so I will stay". • Create responsibility and connection beyond the pure job role to foster loyalty within the organisation. • Communicate about sustainability and decarbonisation to promote the future of aviation.

2. Renewal of selection, skills, competencies and training

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
Selection specialists have little knowledge of what safety in aviation means.	• Invest in developing tangible knowledge of selection and safety (safety as cornerstone in selection), and in teaching safety to selection psychologists. Surveys show that correct selection levels match with safety records. • Balance hard and soft skills in competency-based selections.
Difficulties with updating and renewals of some selection processes.	• Update selection processes to adapt to changes in society, such as diversity and new career paths. • Harmonise the selection schemes; even if some activities already have similar processes, efforts need to be made to implement common taxonomy and processes in the whole aviation community. • A high level of adaptability is required for all selections to address current mid-career challenges and identify new needed skills (e.g., flexibility to unlearn, and to learn new things as an answer to continuous environment changes).
Diversity and its influence on the workforce and the needed social skills have remained below the radar. There is a lack of concrete guidelines to answer the diversity challenge.	• Integrate demographic changes that have an influence on the workforce (nationality representation, social influences). • To benefit from the advantages of such demographic changes, identify and integrate the needed new social skills, such as "diversity ability" (develop open-mindedness, ability to adopt others' view). • Empower role models to break stereotypes and prejudices, as well as promote team training that helps in developing collective intelligence (e.g., ability to listen to others). • Recognise the need for regulations to evolve along with society. Rely on an accurate picture of what the aviation community is made of today and push forward for what it should be tomorrow. • Support further studies on the influence of diversity on safety to develop practical solutions.
Lack of a holistic approach.	• Consider a career to be a journey that includes selection, development, training and peer support for all aviation-sensitive personnel (holistic approach).
The evolution of the tasks, the impact of artificial intelligence and the increase in automation create a demand for new competencies.	• Integrate competency-based training assessment (CBTA) as a tool to address some of these problems. • Cooperate with regulators to help set up related standards and guidance. • Provide training on typical human reactions such as the startle effect to improve chances that these reactions will be recognised when they occur. • Consider different sources of data for the construction of training programs to expose the workforce to a greater diversity of situations and thus reinforce the capacity to cope with the unexpected: operational data, training organisations' data, reports, shop talks. • Train on automatic actions that can be memorised, as well as basic skills.
Management core skills are insufficiently addressed.	• Develop management and leadership core knowledge and culture. Challenges are numerous: inconsistency between what people say and what people do, blame as a systematic reaction, improper safety management system (SMS) perception. • Commit to improve management training from a technical perspective (e.g., standard operating procedures (SOPs), policies, regulation) and a human perspective (e.g., philosophy, safety leadership). • Promote mentoring to accompany the diversity challenge. Both mentor and mentee may gain 'diversity ability' (develop open-mindedness, ability to adopt others' view …) as a social skill.

3. Rethinking models, designs, procedures and technology

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
Standards rarely take diversity into account. Strong social organisations enforce social perception of other groups, enforcing biases and prejudices.	• Regulations must evolve along with society. Rely on an accurate picture of what the aviation community is made of today and push forward for what it should be for tomorrow. • Define the meaning of 'diversity', and consider that diversity can be visible, invisible or both at the same time. • Support further studies on the influence of diversity on safety to develop practical solutions.
Difficulties setting up proper safety climate and safety environment may impair the safety benefit.	• Develop psychological safety within organisations to allow employees to be their authentic selves, a key to building a safety environment. • Consider safety climate and safety environment as predictive of safety performance. The lack of one of them may lead to 'safety silence'.
Procedures are insufficient to ensure full safety, and blind compliance might endanger safety: lack of a shared philosophy among most aviation stakeholders.	• Procedures cannot cover every context. Following the procedures by the book to have the job effectively done is an illusion. Pay specific attention to malicious compliance as an organisational bias. • Design procedures holistically to reduce errors and improve compliance: determine where procedures are needed, create discretionary spaces relying on operators' expertise, develop operators' empowerment and self-confidence. • Understand the complexity of operations in order to design good procedures and integrate the expertise of well-trained operators as interactions of technology, human and environment. • Strive for a shared and well-known philosophy, as this is what will guide operators' actions in situations not foreseen in the procedures. • While less experienced operators mainly rely on compliance with procedures, more experienced operators rely more on their expertise. Policies and philosophy are the common denominator for crew with uneven levels of experience. Pay continuous attention to their staff characteristics and set up the adapted level of flexibility towards SOPs. • Create the right incentives: The key to providing guidance is sincerity in the management approach. Values must be sincere, and the principles, such as just culture, must be applied to the entire system at every level.
Humans' role in resilience is often denied or overlooked.	• Acknowledge that the most resilient part of the system is the human. For example, during economic crisis, cuts may affect technology, but humans will ensure the system's resilience. • Consider humans as a resource for system resilience and therefore as a value for the global system: While 100 percent of accidents are due to human limitations (and not human error), 100 percent of safety is due to human capability.

3. Rethinking models, designs, procedures and technology (continued)

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
There is no shared vision of 'what good looks like'.	• Develop a shared vision of the philosophy aspect of 'what good looks like' by developing indicators that integrate inputs and all aspects of compliance/SMS, and connect commercial and safety success. What is being done well on one side can be exported to other areas. • Make sure to agree collectively, inside and outside the company, on 'what good looks like', to set up a level of management that puts people in the context in which they can *do* what good looks like and scan all hazards that may prevent them from reaching that goal. For example, define and develop good professional standards to allow staff to become good professionals. • If "good" is defined, we can train for the "good", and we can also detect what is "not good" so we can re-define training for it to match the required standards. Hence, training can be a contributing factor for how key performance indicators (KPIs) evolve within an organisation. • Remove pressure on scores and use input indicators to ensure that people with the right skills are in the right place at the right time. This way, the whole system might be set up for success.
The potential for an integrated management system to reap both safety and commercial benefits remains largely untapped.	• See safety as way to save money and an element of good business rather than a costly liability. Good safety means good business. • Maturing an organisation's integrated management system to an effective level will produce great commercial and safety performance and normalise safety risk management as part of the day job. • Leaders and managers require specific skills to mature their organisation, including the integration of safety performance and safety thinking into general business management, and to deliver a genuine, committed and protected just culture implementation.
Most resources are spent on 'what went wrong', which makes up a small part of operations; established methods to learn from normal operations are often lacking.	• Integrate "Learning From All Operations" (learning from both failure and success) key tools for risk analysis. • Set up flight observations that look for resilience performance as the level of proficiency. • Conduct guided one-to-one pilot interviews that aim to extract learning opportunities. • Spend resources on the biggest part of operations (i.e., the ones that go well). • Conduct surveys that help the experience and knowledge transfer from senior to junior operators. • Define methods that enable 'normal operations' data analysis and determine learning opportunities. Address possible 'weak signals'. • Encourage and promote safety reporting. • Creating opportunities for employees by giving them space/time to participate might be also a key for their involvement.
Address difficulties in harmonising risk analysis techniques, both on global scale and per data type.	• Consider defining a common taxonomy and developing data standardisation to improve safety data sharing (authority, stakeholders, manufacturers …) • Integrate both quantitative and qualitative data (one-to-one interviews) to design complete information ('design knowledge').

3. Rethinking models, designs, procedures and technology (continued)

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
Human-machine interaction is an old-fashioned way of dealing with technology.	• Consider human-smart machine integration. Technology becomes a partner and no longer a tool, questioning its effect on safety. • Consider human-machine automation to embrace both the flexibility and the complexity of the work. • Implement interconnectivity step by step by progressively joining one dot after another. • Apply a holistic approach by focusing on human-machine integration at the early stages of the design. • Consider investigating a multi-agent system and go from a technology (machine)–people (human)–organisation (regulation) model to a human integration system (HIS).
Disparities between concepts to be taken into account when designing procedures or implementing technological innovations.	• Distinguish between the terms *complex* and *complicated*: A complex system does not mean it should be complicated. If a system gets complicated, it means that it is not well designed. • Integrate a global contributing factors survey into error analysis. In-situ observations may help in understanding the root causes and reveal professional situations in which compliance is not achievable. • Develop internal quality assurance processes for continuous improvement and procedures adequacy with the effective on-the-job context.

4. Mental health, well-being, workload and fatigue

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
Resistance to reporting psychological or emotional issues and absence of corresponding support and guidance lead to disengagement.	• Concentrate on building a positive learning environment that offers psychological safety to people. • Providing support and guidance to employees at every step of their career is the key to building trust within a company. • Provide guidance, support and development programs with a peer-centred approach at every career step, but also an everyday support through peer support programmes for all safety-sensitive personnel. • Apply a holistic approach to promote (psychological) well-being and resilience. • Build and promote trust in good times, to get things right in bad times.
There is prejudice and misunderstanding of the definition of mental health.	• Define the meaning of mental health. It is omnipresent throughout people's lives and keeps fluctuating. • Focus on developing schemes to accompany people on their mental health journey throughout their career, instead of trying to select candidates on doubtful criteria.

4. Mental health, well-being, workload and fatigue (continued)

PRESSURES / PROBLEMS	SOLUTIONS / EXAMPLE / RESILIENCE / CAPABILITIES
Weaknesses on identification of fatigue factors and challenges in fatigue predictability.	• Improve the understanding of fatigue factors from numerous sources (e.g., time of the day, workload, social factors) at a reactive level by implementing reports and interviews at a proactive level by enabling questionnaires and analysis, and at a predictive level using data-driven models. • Acknowledge that workload can contribute to fatigue hazard without being a safety risk under most conditions, but when combined with low alertness, excess cognitive demand can exceed cognitive capacity, leading to potential errors. • Data analysis shows that the predictability of fatigue factors is variable in terms of exposure and severity. In addition to the standard 3-process model, try to integrate other factors such as workload. • Consider unaddressed frequently cited fatigue factors such as noise, for which mitigations rely nowadays on limiting exposure, (e.g., promote the use of headsets).
Mitigating fatigue or workload risk by taking safety margins is a costly decision in such a competitive sector.	• Taking safety margins in fatigue management has a cost, but it can help retain people longer and in better condition. It may be part of the staffing challenge to attract and retain people. • Consider other solutions such as the "work smarter, not harder" principle: capture and use some of the underload period to limit workload growth at other moments and therefore avoid overload. • Consider a fatigued workforce as a possible indicator of weakness within the organisation, or poor resource management.

The broad conclusions reached by the Safety Forum delegates are illustrated below:

✔ **Safety is made by people.**

✔ **Learn from all operations.**

✔ **Diversity is an opportunity.**

Skills   **Knowledge**

Experience

✔ **Connect the dots.**

✔ **Foster a psychologically safe environment.**

✔ **Integrate continuous professional development (holistic approach).**

The Flight Safety Foundation Safety Forum, hosted by EUROCONTROL, is presented in partnership with EUROCONTROL and the European Regions Airline Association, and powered by SKYbrary.

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