EUROCONTROL

The Future of Safety Culture in European Air Traffic Management

A White Paper

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Disclaimer:

Introduction

Air Traffic Management (ATM) has always been one of the safest components of aviation, itself recognised as the safest form of transport. Although safety culture – shared values, norms, and practices for ensuring safe operations – had been in existence in other industries as a safety work area since the Chernobyl accident in 1986, it did not really gain attention in ATM until two tragic accidents occurred (Milan Linate in 2001 and the Überlingen mid-air collision in 2002). In their aftermath, the Advisory Group on ATM Safety (AGAS) recommended the development of a safety culture approach for ATM. This resulted in a three-year research programme to tailor an approach based on lessons learned from safety culture studies and tools used in nuclear power and oil and gas domains. In 2005 the first version of the EUROCONTROL Safety Culture tool was rolled out. Since 2005, thirty-three ANSPs have used the approach at least once to gain an evaluation of their organisation's safety culture. The programme as a whole amounts to more than 30,000 individual staff member responses, and represents a pan-European drive to improve safety culture in the European ATM industry.

In ATM today, safety culture is seen as an essential counterpart to a strong safety management system (SMS) for avoiding accidents and ensuring public safety in ATM, and carrying out a safety culture survey is a requirement for reaching a certain level of safety management maturity. It is fair to say, therefore, that ATM has bought into the concept of safety culture and the practice of safety culture surveys. But after fifteen years of application of the approach, and given certain changes and economic pressures on the industry that can affect or limit an ANSP's ability to run surveys, it is appropriate to take stock, and determine the best ways forward for ATM to continue to maintain a strong and positive safety culture. This White Paper therefore considers the impact of the EUROCONTROL safety culture programme on the ANSPs who participated and the wider aviation sector, and considers how – with a rapidly changing industry – it should evolve.

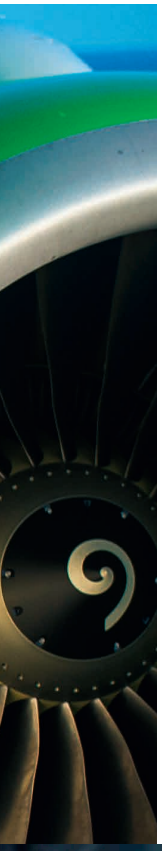
In order to help envision the future of safety culture in ATM, seven ANSPs representative of the European ATM spectrum and having first-hand experience of the safety culture assessment process, responded to a survey asking them for their organisation's evaluation of the benefits of the safety culture survey programme, and their insights and desires for the way forward. Their responses on the added value of the programme range from helping to tackle existing and known issues, to changing the culture of the organisation. All see benefits from the European Safety Culture Workshops that have been held annually to aid learning and practice-sharing between ANSPs. But some are looking for a different approach to the surveys in the future, while others are wondering if the survey approach should be broadened to include additional related elements such as security and wellbeing.

This White Paper summarises the ANSP responses, and considers the best ways forward for European ATM to continue to maintain a strong and positive safety culture.

Outline of the white paper

This White Paper is structured in terms of the past, present, and future of the EUROCONTROL safety culture programme. The past considers the history of the programme, and why it came about. The present considers what ANSPs have learned through the programme, how their organisations have been changed by it, and also the EUROCONTROL perspective on how it has shaped the industry. The future considers where the programme should go next, and what will be required to achieve this.

Who is this white paper for?



Although the principal focus is on ATM, since that represents the evidence base for this White Paper, there is growing interest and application of safety culture approaches in other aviation sectors including airlines, airports and airframe manufacturers.

CEOs and Boards of Directors

It can be hard at the top to know what the safety risks are, how protected and supported staff feel, and how close they are to an accident. One of the primary benefits of the safety culture approach for those at the top, as stated by participating CEOs themselves, is to gain a true appreciation of the real safety risks in their organisation. What has been less well-documented until now is the sustainable impact of the safety culture improvement approach, particularly when multiple surveys are carried out over an extended period. A CEO embarking on the safety culture approach can leave behind a legacy for safety that will continue well into the future, engendering organisational resilience that goes beyond safety.

Safety Specialists

For those working in safety, safety culture survey results often allow them to understand the bigger picture and connect survey insights with other safety data sources such as investigations and other safety indicators. Their insights, and the staff engagement that often follows surveys, can lead to the resolution of long standing or stubborn safety issues, and constructive discussion around issues seen as 'elephants in the room' that otherwise remain unaddressed.

Middle managers and all staff

The safety culture process is inclusive, from the very top of the organisation, through the middle management layer, to all other managers, supervisors, operational, engineering and support staff. Most staff are concerned with day-to-day issues that affect them and affect safety, as are typically raised in safety culture surveys. This White Paper, however, offers more of a wide-angle view of the benefits to organisations and their staff, over longer timescales.

Regulators

Whilst regulators are typically (and perhaps necessarily, to ensure openness) outside the safety culture survey process, this White Paper aims to give them a better understanding of what the process can deliver for safety. The results can be subtle, but are often quite tangible, giving clear insights into front-line staff perceptions of risks. In the continuing challenge of balancing safety against other goals in an increasingly cost-conscious industry, safety culture assessment has something unique to offer. Additionally, it reinforces just culture – essential for reporting and safety learning – which although enshrined in European law in aviation, needs the right motivation, understanding and capability to see it enacted throughout an organisation.

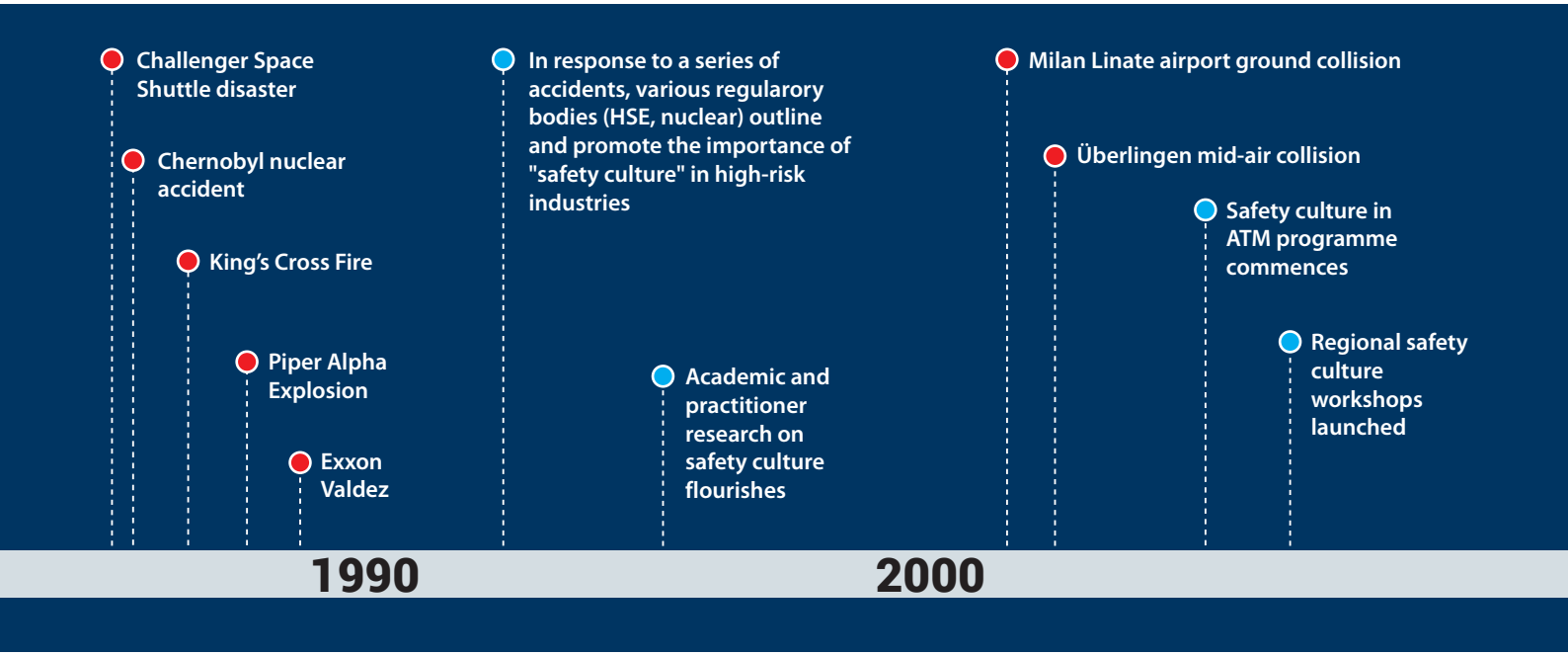
Past: building the ATM safety culture programme

What is safety culture?

The concept of safety culture emerged in the late 1980s in order to account for the social factors contributing to a series of catastrophic accidents (e.g., Bhopal, Chernobyl, Piper Alpha, Challenger)[1]. Research, initially, focused on the trade-offs between safety and productivity, and found that production pressure affected employee risk taking and the neglect of safety by managers. From this analysis, the safety culture construct emerged, whereby explicit and deep commitment among employees and managers to ensuring safe operations is conceptualised as essential to avoiding accidents[2]. Rather than safety and productivity being seen as competing demands, safety is considered integral to all operations, and is recognised as a precondition to sustainable organisational success.

While definitions of safety culture vary, they generally relate to the shared beliefs, norms, and practices within an organisation for ensuring safety and avoiding harm to employees, the public and other stakeholders[3]. A strong safety culture is where employees and managers have agreed on the importance of safety in relation to other priorities (e.g., productivity), with commitment to safety emerging from organisational systems (e.g., incident reporting and learning), decision-making (e.g., on safety resourcing, institutional targets), and social practices (e.g., leadership, collaborating on safety, being able to raise concerns). In such organisations, the likelihood of accidents is believed to be generally lower due to reduced risk-taking, heightened sensitivity to hazards, and greater ability to adapt to emerging threats.

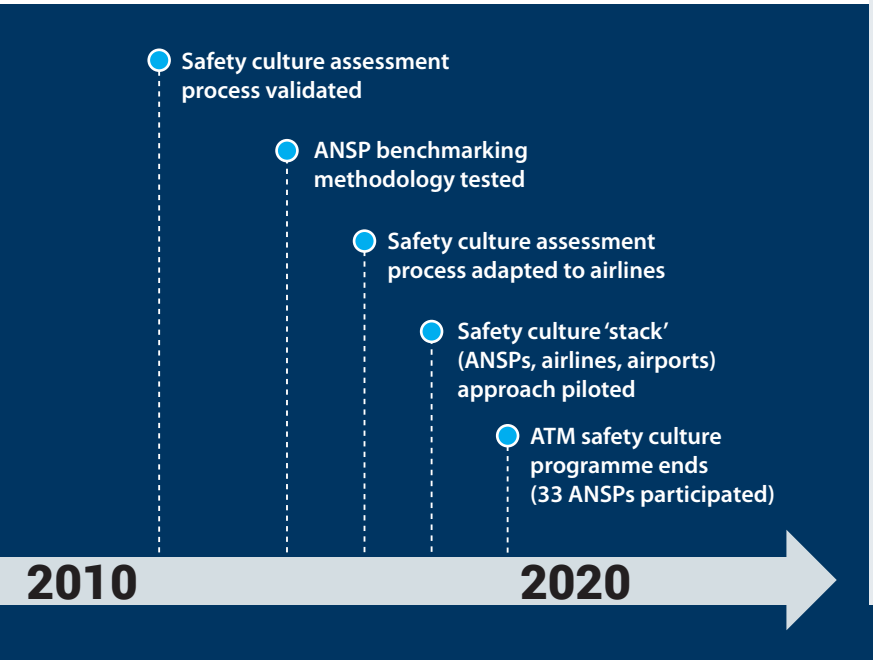
1- Pidgeon, 1998
2- Cox & Flin, 1998; Guldenmund, 2000
3- Bisbey et al., 2019



How has safety culture evolved?

It is useful to see the ATM safety culture approach in a broader multi-industry perspective, as shown in the figure below, and the associated 'Seven Phases' box. Whereas safety culture began formally in the nuclear industry following Chernobyl, and in the Oil and Gas industry following Piper Alpha, in the past decade these working areas of safety culture have changed relatively little. In contrast, ATM safety culture approaches have been continually evolving and, more recently, reaching out to broader aviation (e.g., airlines and airports in particular).

Considering industry more generally, the scope of safety culture can be seen as moving through seven phases over the past five decades, and although ATM is clearly invested in safety culture, there remain points of debate, as suggested in the 'Dozen Debates' on page 8.



The seven phases of safety culture development

1 "Inspectors (and accidents) tell us when we get it wrong. That's why we have insurance." (E.g., The chemical and process industry in the 1970s.)

2 "We have a safety department. They look after safety and the interface with the regulator so the rest of us can get on with making money." (E.g., The oil and gas industry in the early 1980s.)

3 "The front-line workers (operators and maintenance) need to be concerned with safety." (e.g., The first wave of ATM safety culture studies in the mid-2000s.)

4 "The top management, especially the CEO and directors, need to lead safety in the organisation." (E.g., The impact of corporate manslaughter legislation in the past two decades as well as lessons from accidents such as Deepwater Horizon; ATM CEO workshops from 2010 onwards; safety intelligence and safety wisdom initiatives in the 2010s.)

5 "Everyone in the organisation needs to be actively concerned with safety, so that it runs through the entire organisation, it's reflected in how we think and act." (Although sometimes more an aspirational goal than a fully-realised reality, this has been the consistent aim of a number of ANSPs.)

6 "We should not compete on safety. We can learn key lessons about safety from similar organisations to ourselves." (E.g., The European safety culture regional workshops facilitated by EUROCONTROL.)

7 "Aviation is a highly connective 'system-of-systems'. If we have good arrangements in place for safety but our partners don't, then we have a problem. We need to work together on safety, especially as many incidents happen at the interfaces between organisations, and we all have our blindspots." (E.g., The Safety Stack – see later in this White Paper.)

The Dozen Debates
Common Debates on Safety Culture

1. **Safety culture is poorly defined** – there are more than thirty definitions of safety culture, but ultimately it is about the priority of safety in daily work, at all levels. The work in ATM has helped to understand and improve safety culture, via specific factors and associated survey questions to gain a reasonable picture of an organisation's safety culture, and its strengths and weaknesses. These factors and questions have been scientifically validated, and management and staff alike find these factors and questions meaningful.

2. **You can't understand safety culture with science** – there is some truth in this. A safety culture survey by questionnaire alone gives a snapshot of the safety climate, rather than the enduring organisational safety culture. However, the subsequent (less scientific) workshops that explore the survey results with staff and managers, as recommended in the EUROCONTROL approach, go deeper and do tap into these enduring aspects.

3. **Certain parties will use the survey to get what they want, to further their own agendas** – surprisingly, this doesn't tend to happen, at least not when the survey is company-wide. There will always be personal agendas, but statistically they tend not to be significant or affect the results. Of course, this depends to an extent on the approach to the survey, and the experience of those leading the survey.

4. **People won't trust the survey or survey team, or be open and honest with them** – there was some evidence of this in the early years of the programme. However, as more surveys occurred leading to positive change, the survey teams came to be seen as truly independent and trustworthy in terms of protecting the anonymity of participants.

5. **Electronic surveys can be hacked or biased by 'attacks'** – over the years there have been attempts to influence the results of an international survey. They were intercepted and neutralised. This is why we use survey organisations who have counter-measures against such attacks.

6. **Safety culture surveys can get it spectacularly wrong** – this arose following an offshore platform accident that had just received very positive safety culture scores. However, the respondents to the survey knew that if they gave poor (and true) responses, they might have lost the contract.

7. **Safety culture only tells us what we already know** – sometimes this is true, but the survey process can find new ways forward, and lead the organisation to look in the mirror and ask if they really want to improve.

8. **Safety culture evaluation and improvement is expensive!** The typical response to this is that it is not nearly as expensive as a major accident. Nevertheless, this is a concern, especially in times of cost pressures on the industry.

9. **Safety culture evaluation is a heavy process** – again there is some truth in this, especially if workshops are used (and these are always recommended). A typical survey can take 6-12 months from start to finish, if you count the preparation time until delivery of the final report. But safety culture is not about quick fixes (though sometimes it finds them). It is strategic, for sustainable safety.

10. **Doing a safety culture survey is just another tick in a box** – Some organisations do carry out surveys for reasons of compliance. Some of these organisations still learn something from the survey. Interaction with peer or partner organisations who take a more serious approach to safety culture can help here.

11. **After several surveys we've got survey apathy, it's no longer adding any safety value for us** – This is where working with partner organisations can really help, to breathe fresh life into the process or share good practice.

12. **Why just safety? What about security, wellbeing, etc.?** – The questionnaire has only been validated for safety culture. So far, attempts at adding additional areas and questions, e.g. on security, have not fared well, as they do not have the same research base as for safety culture.

The EUROCONTROL Safety Culture Programme

The EUROCONTROL ANSP safety culture programme began in 2003 through a research project to consider the adaptation of safety culture approaches from nuclear and other industries to ATM[4]. This was followed from 2006 through a formal programme of research to develop a methodology for measuring safety culture, and applying this to ANSPs throughout Europe. (See earlier figure for the timeline for the programme development.)

Safety Culture Methodology

The safety culture methodology consisted of the following:

- a survey of all ANSP staff using the EUROCONTROL safety culture questionnaire
- presentation of results to ANSP management workshops with all staff and management groups to interpret and broaden the questionnaire results
- development of an action plan to address concerns raised, or to share good practices
- aftercare to examine how things have proceeded after the survey, and possibly resurvey.

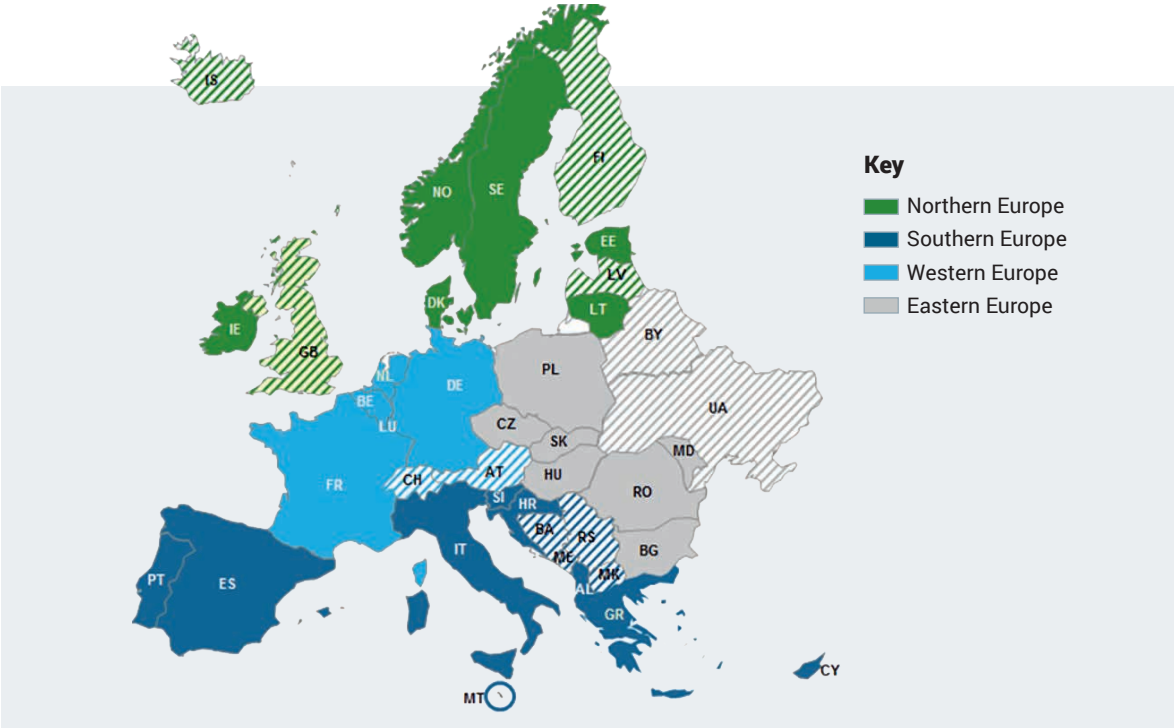
The methodology above was developed iteratively via interviews and focus groups with ATM specialists, and the iterative application and development of the questionnaire (developed in partnership with the University of Aberdeen and the London School of Economics). The assessment process draws on principles in the academic safety culture literature, techniques for psychometric testing, and insight from subject matter experts. The approach that emerges is tested (qualitatively and quantitatively) in terms of the reliability and validity of data produced. The methodology was first established in the scientific literature in 2013 (Mearns et al., 2013), and this has been essential for demonstrating the long-term credibility of the assessment process to ANSPs and executives (e.g., to engage them), and the wider Human Factors and safety community.

Subsequent research established the safety culture questionnaire and workshop process and the conceptual model used to structure and interpret analyses, across multiple countries (Reader et al., 2015). The safety culture key themes validated through the methodology are listed in Table 1.

Table 1 – Six validated safety culture elements

Management commitment to safety	Extent to which management prioritise safety
Collaborating for safety	Group attitudes and activities for safety management
Incident reporting	Extent to which ANSP staff believe it is safe to report safety incidents
Communication	Extent to which staff are informed about safety-related issues in the ATM system
Colleague commitment to safety	Beliefs about the reliability of colleagues' safety-related behaviour
Safety support	Availability of resources and information for safety management

4- Gordon et al, 2007



Improving Safety Culture

The aim of the safety culture programme was to help each ANSP understand its own safety culture, and take action to maintain or improve. The process of improvement occurred by:

- embedding the concept of safety culture within ANSPs (through the assessment process),
- reflection on the assessment findings (e.g., by management),
- suggestions for improvements, and
- cross-industry learning (between ANSPs).

In total, 33 ANSPs, comprising the main ATS provider in 32 EUROCONTROL Member State plus MUAC, with over 30,000 survey respondents and over 2,000 focus group participants, have participated in the programme.

Since 2006 EUROCONTROL has been involved in the development of several 'White Papers' attempting to demystify and advance the understanding and improvement of safety culture, and a number of ANSPs have opened up about their individual experiences of safety culture[5][6][7][8].

Impact of the Programme

Given the high level of engagement over many years, by ANSPs and their staff with the EUROCONTROL safety culture programme, it seems important to consider its impact on ATM operations in Europe. How has it shaped attitudes towards safety, decision-making, operational work, learning from incidents, collaboration within and between organisations, and relationships with regulators and EUROCONTROL? To explore this, we collected observations from safety managers on how the programme has influenced their ANSPs, and their hopes for the future.

5- https://www.skybrary.aero/index.php/NATS_Safety_Culture_Journey_2
6- https://skybrary.aero/bookshelf/books/4736.pdf
7- https://skybrary.aero/bookshelf/books/4735.pdf
8- https://skybrary.aero/bookshelf/books/4732.pdf
9- Kirwan and Shorrock, 2014

Present: impact of the safety culture programme

The EUROCONTROL safety culture programme has engaged with tens of thousands of controllers, engineers, managers, and support staff across Europe. Collectively, their responses to safety culture surveys and insights provided through interviews and focus groups have led to a pan-European multi-organisational participatory exercise for improving safety within ATM. ANSPs, and their employees, have engaged with the topic of safety culture, shared their insights, and had opportunity to shape organisational policies, procedures and practices. The validated safety culture survey[10] has enabled a conversation on safety culture to emerge in many organisations and groups[11]. (This has also led to awards, with the EUROCONTROL safety culture programme being awarded the President's Medal by the Chartered Institute of Ergonomics and Human Factors.) To better understand the impact of the programme, and to reflect on its future, we interviewed safety managers at 7 ANSPs, about safety culture at their ANSP from 2013 to 2018.

Questions on the impact of the safety culture programme

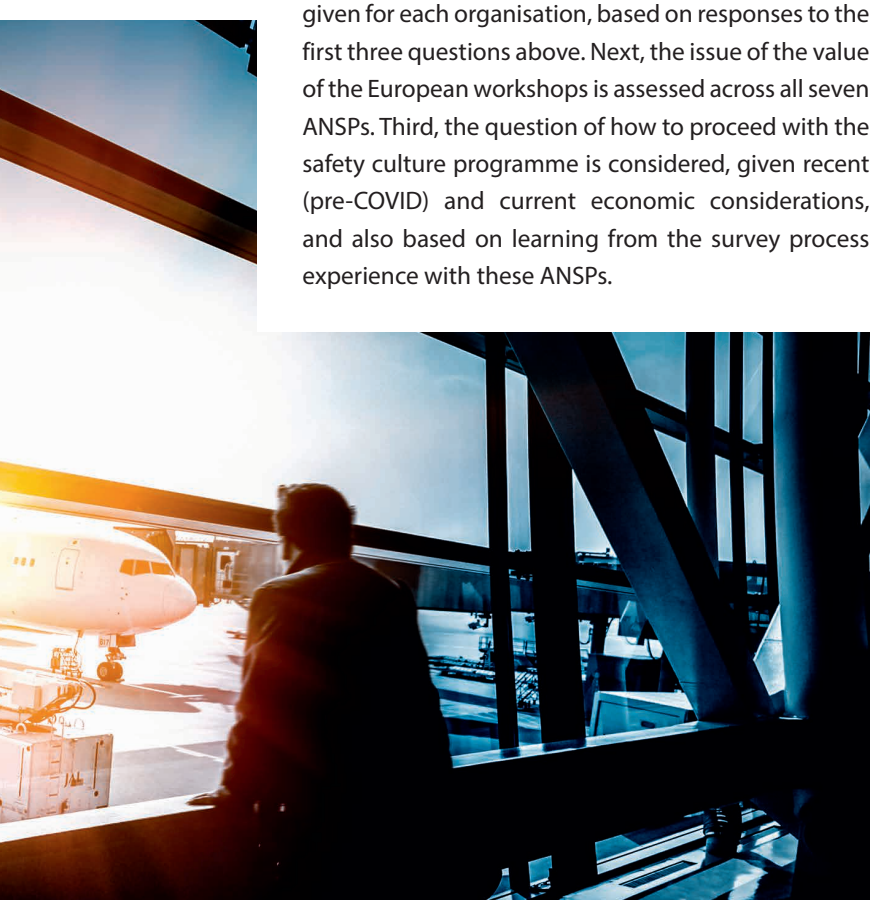
1. What did your ANSP learn through the EUROCONTROL safety culture survey process?
2. Did the safety culture survey lead to any concrete changes (e.g., to incident reporting, communication, training, etc.) in safety management in your ANSP?
3. Did the EUROCONTROL safety culture programme change how people think about safety culture in your ANSP and the wider industry? If so, at what level(s) in the organisation?
4. Were the annual European safety culture workshops useful events, and how should they continue?
5. How should the safety culture programme evolve and move forward?
6. Are there any changes you would like to see?

10 - Shorrock et al, 2011
11 - Tear et al, 2018

Results

Seven ANSPs participated in the survey: one from Northern Europe, one from Western Europe, three from Southern Europe, one from Central Europe, and one from Eastern Europe. In terms of size of operation, one is relatively small, three are of medium size, and two are considered large ANSPs. With one exception, each of these ANSPs has also had more than one safety culture survey (in one case four surveys), typically separated by 3-5 years, so these ANSPs are able to evaluate the sustained and evolving impacts of the survey process.

In terms of the responses gained, the answers are grouped below into three sections. First, a 'pen portrait' summary of the impact of the safety culture process is given for each organisation, based on responses to the first three questions above. Next, the issue of the value of the European workshops is assessed across all seven ANSPs. Third, the question of how to proceed with the safety culture programme is considered, given recent (pre-COVID) and current economic considerations, and also based on learning from the survey process experience with these ANSPs.



Seven ANSP Safety Culture Journeys

ANSP 1 – *Eastern Europe, medium ANSP*

This ANSP found the safety culture assessment process to be important and impactful in a range of different ways. They view the SMS and safety culture as "interdependent" in that *"they can only jointly affect the quality of service"*. Safety culture assessment is essential for raising awareness of safety across the organisation, for setting safety norms (and not simply relying on rules and procedures), to build trust, and to show that the involvement of staff at all levels in safety is important. Leadership matters – you need safety champions. This is especially the case with the management layer, where "safety needs to be seen as a strategic and corporate goal supported at the highest level". The process allows for the re-emphasis of organisational goals (i.e., safety in the context of competing demands), and to identify how perceptions of safety vary across the organisation, since there are different subcultures within any organisation.

> ***"Leadership matters – you need safety champions."***

The safety culture assessment process led to a range of notable activities, including enhancement of safety communication via internal safety letters and publications, safety homepage on the intranet, and

> ***"We think that the safety culture programme definitely contributed to how people think about safety."***

safety days for employees. It also contributed to the integration of Human Factors-related programmes into the SMS, a stress management programme critical incident stress management (CISM), fatigue risk management (FRM) programmes and later a fatigue risk management system (FRMS), and a just culture policy and a just culture committee, supported via modules in the SMS and recurrent training. Furthermore, the safety culture assessment process led to the implementation of a voluntary safety reporting system, and improvement of incident investigations, with regular annual training for investigators, and improvement of feedback. There was also enhancement of safety awareness for non-operational staff (e.g., project managers), and changes in internal processes, including project management rules on safety, and executive board meetings and procurement rules on safety.

"The EUROCONTROL safety culture approach paved the way for the need of measuring the change in the culture, and contributed to the development of our own method of how to monitor change."

On a practical note, this ANSP remarked that the safety culture questionnaire works best if people are addressed in their own language, though translation can be a challenge. The EUROCONTROL survey approach has now, for many years, used a bilingual questionnaire (with more than one native language in some countries). This ANSP went on to develop their own safety culture tools, allowing some targeted approaches such as developing a risk-based mindset in middle management and project managers.

ANSP 2 – *Southern Europe, large ANSP*

The safety culture assessment process *"served to make the staff at all levels more aware of the concepts of safety culture, its different components, and to think about each of them and their importance for the general improvement of safety".*

The survey "gave staff the opportunity to stop and reflect on the different areas that make up safety culture…"

This led to growing awareness, confidence in and respect for the various SMS activities, and, in combination with this, contributed to change. The assessment process identified and reinforced the need for improvement in a range of areas, including just culture, incident reporting, incident investigation, safety assessment, fatigue and stress, and safety culture surveys, once presented to the ANSP's Safety Review Board, have allowed the organisation to drive and consolidate improvements in those areas. The safety culture assessment process *"gave staff the opportunity to stop and reflect on the different areas that make up safety culture: what their actual status is in the organisation and how it can help to improve safety".* For this ANSP, the safety culture process was not an isolated element, but a wider part of an organisational movement to improve safety.

ANSP 3 – *Southern Europe, small ANSP*

This ANSP has undertaken several safety culture assessments, and found the process useful for evaluating how people feel in the organisation, showing they are ready *"to open up" and "not afraid to raise their grievances".* The workshops in particular were valuable.

"Real and concrete changes come from creating bridges between the different sections of the organisation"

The workshops gave space for people to discuss safety issues that are not normally discussed, and, through mixed workshops (e.g., with operational and technical staff), helped to raise safety issues that cross domains ("not just in silos"). The main value of the process was that "it helps steer you towards the right issues. You get the normal issues you expect, but sometimes you identify areas you thought were good but need attention, or they raise issues due to a misunderstanding that can then be corrected." Social issues may also be raised that need to be addressed. The process also helped to connect with people who may not consider themselves to be integral to safety (but are), and to build communication across disciplinary boundaries. *"Real and concrete changes come from creating bridges between the different sections of the organisation."*

ANSP 4 – *Southern Europe, medium ANSP*

This ANSP has long been a participant in the safety culture programme, and identified a range of impacts. The process helped them understand the different dimensions of safety culture, and to identify areas where improvements were required, and hence where to invest improvement effort.

"Now all staff understand that safety is also their responsibility. Until this programme, the common belief was that safety was only an operational concern."

"Although we knew that perception changes are hard and slow, we also knew where to capitalise the energy." One critical focus was communication, where work by the safety department was not being promoted, and thus not entering the awareness of employees. The survey process revealed some employee groups to be less aware of safety risks (e.g., of non-operational staff for how they influenced operational work), leading to work on communicating the different safety responsibilities within the organisation, and how everyone, regardless of role, contributes to safety. "Now all staff understand that safety is also their responsibility. Until this programme, the common belief was that safety was only an operational concern."

ANSP 5 – *Northern Europe, medium ANSP*

This ANSP had been an 'early adopter', and has used the safety culture assessment methodology several times, with a range of impacts. More generally, the process has been important for their management to signal the priority they place on safety, and the value of ensuring a continuing dialogue on safety culture within the company. It *"highlighted the importance of management signalling that they care and want to hear/learn about safety"*, as well as the need to have an action plan and follow it up to show that the organisation is serious about safety. This involved, for instance, arranging workshops between safety managers/heads of investigation and air traffic controllers (ATCOs) at each unit.

The safety culture process has been important for *"evolving the mutual risk picture between sharp end and safety management"*, and *"being a relief valve for frustrations from some parts of the operation"*. Impacts from the survey included an increased focus on safety communication from management, the continuation of safety culture workshops, and continually confirming commitment to the just culture policy.

"The safety culture assessment process has affected all levels, from CEO to middle managers to controllers, in terms of openness, awareness and trust."

"...highlighted the importance of management signalling that they care and want to hear/learn about safety"

This has contributed to safety reporting increasing approximately 80% from 2006 to 2019, and improved incident reporting has meant an increased number of occurrences have been investigated and mitigated (e.g., through training, sharing lessons learned, fixing procedures, updating methods and technology).

Encouragingly, *"the quality of the reports has improved substantially"*, with staff feeling able to address mistakes, contemplate the contributory factors and the context, and highlight the related safety risks and suggesting possible actions to take. Overall, the programme contributed to culture change in the ANSP, particularly in communication and reporting, understanding the value of just culture, lessons learned and safety competence. The workshops and face-to-face discussions enabled the development of a risk picture that brings together the risks perceived at the sharp end with those assessed by safety management. This gave *"an opportunity to mutually update on safety theories on the one side, and new ATM tools, procedures and working methods on the other"*. This enabled an organisational focus on the important risks that the organisation and the wider industry should take into consideration.

ANSP 6 – *Western Europe, medium ANSP*

The safety culture surveys provided an essential service, according to this ANSP. A key aspect was its independence. There were two surveys, and both provided independent verification of weaknesses and strengths at the time. In particular, there was an issue of trust and openness within the organisation, which have both improved. Cost containment was a key issue at the time (and still is), but the surveys led to better understanding of the issue and its impacts whether at CEO, middle manager or front-line staff level. Openness and awareness have improved across

"I believe it made a change in the culture in our ANSP, spreading the understanding of both the importance of building a sound culture, and the power and the responsibility that lies with the operation, as well as with the management, to do that."

the organisation. Tangible impacts from the safety culture programme included:

- the safety management group being better resourced
- a Just Culture system being put in place
- the safety group leading the occurrence investigation process
- the recruitment of a Human Factors specialist
- increased staff participation in safety and human factors activities, and
- a regular operational safety survey (called 'Normal Operations Safety Survey') focusing on 'work-as-done' being put in place.

"We understand and handle Just Culture better now, as before there had been an administrative approach that ultimately was about getting rid of people if there were problems."

Ultimately the safety culture assessment process has affected all levels, from CEO to middle managers to controllers and engineers, in terms of openness, awareness and trust. Key to achieving this was the independence of the approach, via an external viewpoint.

ANSP 7 – *Central European, medium ANSP*

At this ANSP, the safety culture assessment process led to some fundamental changes in the organisation. Practical interventions that emerged directly from the survey included:

- the strengthening of trust and collaboration within teams through incorporating team goals into the year-end appraisal process
- adapting and improving the internal voluntary proactive reporting tool
- publishing a clear overview on safety roles and responsibilities on our internal intranet site
- launching an independent study on performance variability in air traffic control services provided to controlled flights, and
- ensuring that system monitoring & control operational technicians in the ops room became involved in projects, changes and safety assessments by including them in the official expert validation list.

> ***"A «cultural evolution initiative» focused on improving collaboration and communication between organisational sites."***

In addition, and through ensuring representation of safety delegates in technical management meetings, there emerged better information flow and improved understanding and collaboration between the technical department and the safety department. A *«cultural evolution initiative»* was formed, focussed on improving collaboration and communication between organisational sites. Training on just culture and incident reporting has been rolled out in the technical department. The survey has also contributed to recognising the need for greater organisation-wide communication on the survey (e.g., videos from the CEO, 'town hall' meetings).

> ***"It takes real commitment, constant staying power, a bit of pickiness and hanging on things if you want to reach something."***

On a practical note, this ANSP emphasised the time and effort required, e.g., one person was 50% dedicated to the process, plus others supporting. It was also found that a working group with representatives from different departments was key to success, as was management commitment and support, and constant communication, including regular updates at Board level.

It was noted that "It takes real commitment, constant staying power, a bit of pickiness and hanging on to things if you want to reach something." Overall, awareness of safety culture has risen, along with the need to assess safety culture in a structured manner. The convincing approach, the scientific character and the favourable and human-oriented mindset of the programme were critical to success.

> ***"The convincing approach, the scientific character and the favourable and human-oriented mindset of the programme were essential."***

The European Safety Culture Workshops

Six of the seven ANSPs had attended one or more European Workshops, which typically are attended by 15-20 ANSPs. All said they were useful. The one ANSP that had not participated stated that if they were to resume (the 2020 one was cancelled due to COVID-19), they would attend. In one case it was recommended that future workshops might be better carried out as webinars, to be more inclusive and save on travel. Snapshots of the responses are summarised below.

"In our opinion, yes, they are useful events that should continue, as they serve to learn about identified improvement areas, share problems and to make regional staff feel listened to, confident, part or of common team, part of the possible solutions..."

"You understand you are not alone, maybe solutions can be exchanged. If they stop, if you cut the cables, you lose this very important cross-border information with different cultures, different set-ups, the exchange from other ANSPs. The European Workshops help you build confidence."

"I was only taking part in the first few of these workshops, and it was useful at that point to meet other ANSPs in the same situation and hear the aggregated experience and input on research and related topics from EUROCONTROL. They created an arena for ANSPs to meet and exchange experience and ask questions, as well as building competence on this topic among Safety staff."

"It is through the European Workshops that we get the state of the art of the academic developments and also where we can share problems and concerns, and also exchange learnings and strategies that allow us to have a more mature safety culture both internally and at European level."

"I always appreciated it a lot to exchange with colleagues from other ANSPs as well as to hear their struggles, ideas and best practices. The events opened the horizon on how differently safety culture topics can be dealt with in different ANSPs. They always ensured a psychologically safe, human-oriented and appreciative framework for honest exchange and authentic discussions."

"We think personal meetings should continue annually, and two-day workshops seem to be suitable for exchanging views and discussing the way forward."

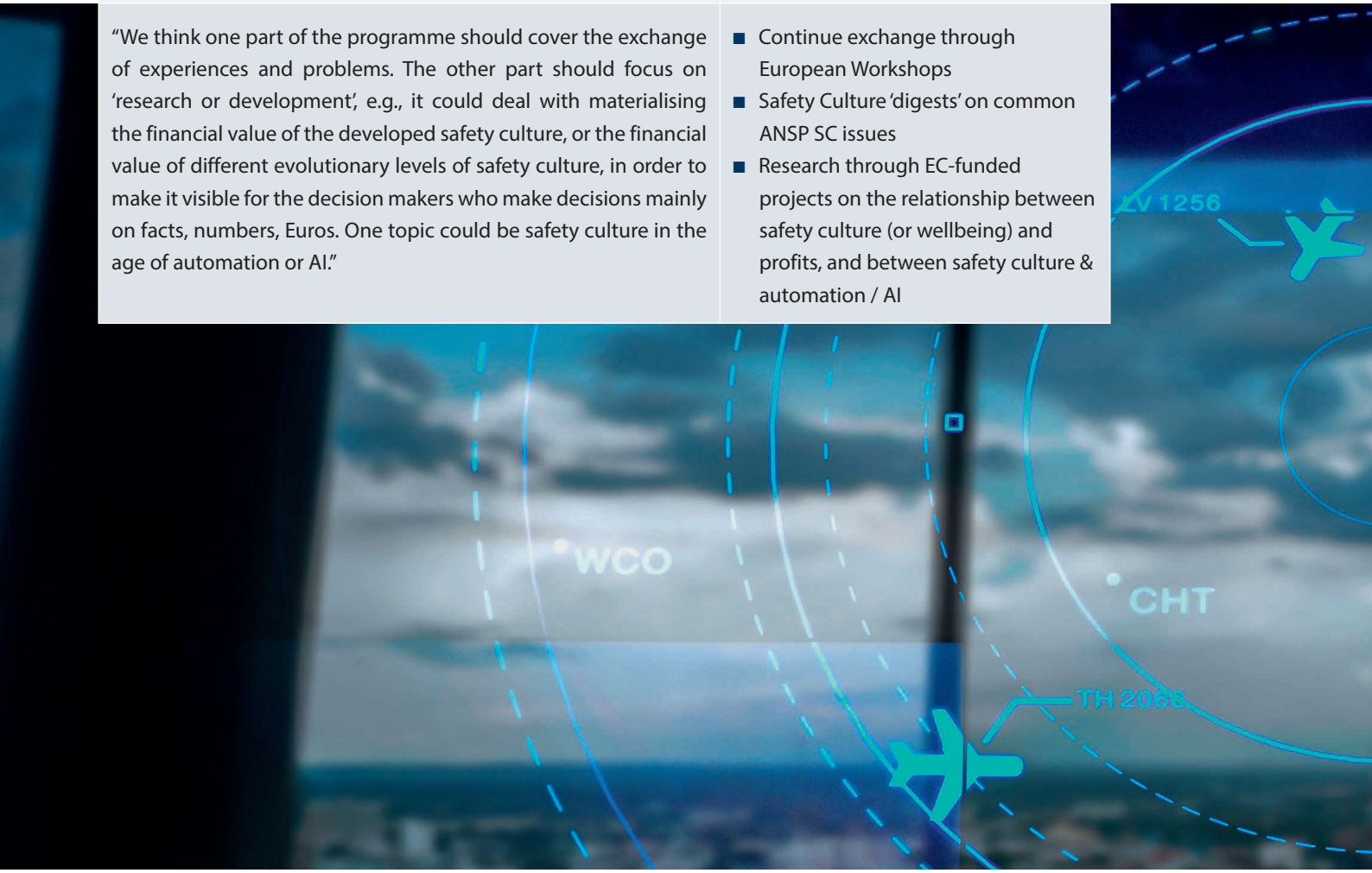
"We did not participate in the European Workshops but, if they were to resume, we would do so, probably sending one of the safety managers to attend, and/or the HF expert."

Future: where the safety culture programme goes next

The ATM industry is facing unprecedented times: due to technological advances, COVID-19, environmental concerns, and political upheaval, the nature of aviation travel is rapidly changing. As the ATM environment becomes less stable and more competitive, the safety-versus-productivity trade-offs that underpin how risk is managed will become more prominent, and ensuring the industry retains a focus on safety culture is paramount. To address these issues, and consider how the safety culture programme might evolve in ATM, our interviewees made many suggestions as described below.

ANSP Perspective	Implications for the Programme
"As we have already said, we believe that the programme is positive and should be maintained. It is desirable that good practice guides, recommendations and precise proposals achievable in the short and medium term could be derived from the programme. That will serve as a lever to continue cultural change in organisations, as well as an influence on legislators and supervisors."	■ Continue the programme ■ Good practice guides ■ A roadmap for the programme's evolution
"The safety culture survey process needs to evolve. COVID-19 gives us different problems – a new reality. Not so Ops-room focused. We need to add wellbeing and social support, and mental health support. Reduced salaries, furloughed staff, uncertain future. Staff are coming to work with problems from home, their partner working for an airline cutting staff, etc. The landscape is not good. How are you going to survive financially? These things can affect safety, because you are distracted."	■ Consider wellbeing ■ Consider impact of COVID-19 economic impact on safety culture
"I think the format should be maintained. Nevertheless, it's sad that there are no resources from EUROCONTROL to keep doing the surveys. Of course that's a cost to the ANSPs if you want to keep doing it and need to outsource it. Besides EUROCONTROL has a profound knowledge of our business and that was a huge asset to the survey but also to the support that was given after. Also if the ANSP decides to do it internally, it's very time consuming and some objectivity might be lost in the process."	■ Provide training & guidance resources to support ANSPs going it alone or outsourcing ■ EUROCONTROL provide remote support to ANSP SC 'champions'

ANSP Perspective	Implications for the Programme
"Effort must be made to continue building competence and awareness of the importance of safety culture to top management, as well as direct dialogue between middle management and operations. Management must continue to 'walk the talk'. In the situation we are in now and will continue to be in for a long time (considerably less traffic and income than normal), success depends on products being adjusted to the situation. Products that can be used when there are natural breaks (low traffic periods-merging of positions) will have a high value."	■ Mini-questionnaire for use in a unit (digitally or F2F with staff) ■ Short, intuitive mini-modules on SC topics ■ Learning Review meetings ■ Videos for discussion based on occurrences (scenario-based learning) ■ Safety manager & ATCOs open meetings
"We think one part of the programme should cover the exchange of experiences and problems. The other part should focus on 'research or development', e.g., it could deal with materialising the financial value of the developed safety culture, or the financial value of different evolutionary levels of safety culture, in order to make it visible for the decision makers who make decisions mainly on facts, numbers, Euros. One topic could be safety culture in the age of automation or AI."	■ Continue exchange through European Workshops ■ Safety Culture 'digests' on common ANSP SC issues ■ Research through EC-funded projects on the relationship between safety culture (or wellbeing) and profits, and between safety culture & automation / AI



ANSP Perspective	Implications for the Programme
"It would be good if the surveys could be more focused on the issues the organisation has. Of course, the Catch-22 is that the organisation might not be aware of certain issues. I don't think it is a good idea to expand into other areas such as security – that is more about technical and physical threats and cybersecurity, and is best dealt with through other SMS-type processes. We had been thinking of running our own internal safety culture survey, as EUROCONTROL is not doing them any more. A recent internal HF survey attracted good participation."	■ Focus on known 'problem elements' in a reduced survey ■ Stay focused on safety (no mixing with other areas) ■ Address SC issues via Human Factors surveys
"It would be great if it would 'move with the time' - meaning that it would develop new, modern, and rather quick solutions with regard to the assessment of safety culture (e.g., development of an app with which periodic safety climate assessments can be done). We need new approaches to the assessment and follow-up of safety culture topics, hands on, aiming for impact at the front (and all other management levels) – ideally done together with the people working in the areas where impact should happen. Lastly, events could be held digitally in the future."	■ Develop a SC 'app' ■ New SC and follow-up methods ■ Focus on all – from front-line to top management ■ Digital SC events

Viewpoints from two programme leaders

The foregoing highlighted views from a representative range of ANSPs who have participated in the programme since its inception. Two other views warrant consideration, namely those of the two programme leaders who have each overseen and participated in dozens of surveys across Europe, and have seen first-hand the views, concerns and safety culture ambitions of staff and management from a broad range of national cultures and geographical locations. The following short section therefore considers these programme leaders' views on the programme, its value and its potential avenues for evolution.

Programme Lead Period 1: 2003 – 2014 (Dr Barry Kirwan)

Programme Origins:
The safety culture programme began as a research project following two ATM accidents – the Milan Linate runway collision in 2001 and the Uberlingen mid-air collision in 2002. A pan-industry advisory committee (AGAS – the Action Group for Aviation Safety) was set up to improve safety given these two accidents, and since safety culture issues were implied in both accidents, an action was undertaken by EUROCONTROL to investigate what could be done in this area. The first programme leader (Dr Barry Kirwan) came originally from the nuclear power industry, where safety culture had been seen as a major issue since Chernobyl, and he set up a research project with Aberdeen University, itself a leader in safety culture in the Oil and Gas industry, and then LSE.

A good start…
Working with four ANSPs, a safety culture questionnaire was developed and piloted, building on other safety climate surveys in use at the time. But it was very long (>80 questions). During a Safety Team meeting in Madrid, European ANSP safety directors and managers worked together in small groups to prioritise the question set. What then happened was interesting, however, and led to a departure from the traditional safety climate approach.

An early course change…
Each group began discussing how they would respond to the questions, and there were clear differences in safety culture (and just culture) practices. This was a surprise to the group as a whole, showing that there was indeed room for improvement in the area. But it also signalled to the development team that you learn far more about safety culture from allowing people to discuss the issues, rather than simply having individuals answer questionnaire items. The approach, called Safety Culture Measurement Technique (SCMT), was then piloted in two ANSPs. In both cases only controllers answered the questions, but small workshops were held where controllers could discuss the issues. As surveys increased, engineers were included in the surveys, and management, and ultimately everyone in the organisation.

Gathering momentum…
For some time the surveys continued spreading across Europe as the EUROCONTROL approach was applied to more ANSPs – freely, at the time – and early regional meetings allowed ANSPs to learn from each other as well as develop their own internally-focused action plans. It helped when, around five years after Uberlingen, two ANSPs (Avinor and HungaroControl), who had both just had their second survey, could show that their safety culture appeared to have improved,

and they could point to tangible changes from the survey results. In 2010, at a CEO Safety Conference, the then CEO for Avinor stood up and told his colleagues that if you wanted to know your real risks, you should do a survey. Within a week, five more ANSPs had signed up to the survey process

Scientific credentials…

The survey questionnaire itself matured, and by 2012 was in its tenth iteration. The survey was validated twice scientifically by the London School of Economics, who had taken over from the University of Aberdeen as the academic axis of the survey, launching more and more surveys electronically and analysing the returned questionnaires, maintaining anonymity of anyone who answered them, even from the EUROCONTROL people involved in the process. The team at EUROCONTROL included psychologists and controllers, who helped to understand the operational context of the safety culture issues in workshops.

It wasn't all 'plain sailing'…

There was some resistance at the beginning of the programme, as most ANSPs were already very busy with their SMSs and investigations, and it was not until two ANSPs (AVINOR & NAV-Portugal) spoke of the impacts the surveys were having that others joined the initiative. It has to be said that in a small number of cases the survey team decided they were being fed what people thought they wanted to hear, so that any real issues remained hidden, although this usually did not last long and would be recovered if a second survey took place. In a couple of cases the survey results were so far from the safety culture norm (i.e. the negative responses outweighed the positive responses) that high-level talks occurred in order to resolve very difficult issues. It has always helped that the EUROCONTROL-facilitated Safety Team (safety directors and managers from ANSPs) is a community, where European ANSPs do naturally help each other.

The handover 'balance sheet'…

By 2014, a number of ANSPs saw the process as a key element of their safety success, while a few may have thought it something they were supposed to do in order to 'tick the box'. A small number, by this stage, seemed to be approaching 'survey fatigue', and were looking for something new to release safety energy into their workforce. Overall, however, the survey process was healthy, and the European Workshops were flourishing, having grown from three ANSPs to almost twenty.

Outreach to other aviation partners…

The added value of the programme is indicated by the ANSP insights provided earlier in this White Paper on the changes it has brought about, whether leading to concrete improvements in safety resources and approaches, or a shift in the collective mindset of the ANSP. But the programme's impact and evidence base has also spread beyond ATM, via the survey tool having been adapted, tailored and applied to a number of airlines, airports and ground handling staff, and a major airframe manufacturer.

Not just words, safety culture made real…

It is now commonplace to hear people say that you need both an SMS and a strong safety culture in order to maintain safety, which was not the norm when the programme began. Whereas other sectors such as airlines often mention safety culture in general terms, in European ATM there is a rich understanding of what it means and how it can be made real.

Programme Lead Period 2: 2014 – 2021 (Dr Steven Shorrock)

New ANSPs and further surveys…

In this period, new ANSPs joined the survey programme and completed a first survey (e.g., ISAVIA, Iceland), performed a first comprehensive survey, or performed a second or third survey. Overall, 33 ANSPs were involved in the programme.

Establishing agreed principles and protocols…

It became evident that the principles and protocols by which surveys were performed needed to be made more explicit to help ensure compatible expectations between EUROCONTROL and ANSPs. Ten principles were therefore developed concerning: 1. Survey scope; 2. Voluntariness and confidentiality; 3. Independence and impartiality; 4. Respect for opinions; 5. Validity; 6. Continuous improvement and learning; 7. Stability; 8. Findings and recommendations; 9. Senior management commitment; and, 10. Feedback. Each of these principles is supported by a number of protocols which describe the values and practices of the EUROCONTROL survey team. The principles are signed by senior managers of EUROCONTROL and the ANSP.

Acknowledging mixed results…

Throughout the programme, different reactions to safety culture surveys were observed. Some ANSPs developed action plans based on the independent findings, and implemented these using existing processes. Other ANSPs did relatively little with the findings, often due to a lack of resource. This was usually observed during the second survey, where workshop attendees would note whether they knew of any progress since the first survey. In a small number of cases, low workshop attendance at the second survey was a clue (though this could also be for other reasons).

Democratising discussion…

While organised workshops are an important part of the formal safety culture assessment process, they are constrained in several ways. First, they are only available during a survey, perhaps once every few years. Second, they require professional moderation. Third, they can imply a *for* mode of change, where information is gathered, analysed and reported for staff, but change following the workshop is not done *with* or *by* staff. While this method has advantages (such as confidentiality and independent moderation and reporting), an opportunity was seen to democratise discussion.

The EUROCONTROL Safety Culture Discussion Cards (Shorrock, 2012 a & b) were developed as a practical resource to aid real discussion about safety culture by any person or team within the ANSP, including staff and managers in air traffic operations (e.g., air traffic controllers, aeronautical information services personnel), maintenance staff, specialist staff and support staff (e.g., safety, quality, projects, human resources, legal, etc.). The cards use the same concepts as the survey methodology, though everyday language is used to make the cards completely accessible. The cards can be used without the need for external support. The A6-size cards are now in Edition 2 and are freely available in a range of languages. Ten methods are described in the cards to give ideas for different uses.

Adapting workshops…

Previously, the workshop method involved showing participants the questionnaire results and asking questions about the responses to each item. A small change was made to this approach, by asking

participants to rate anonymously (using sticky notes) agreement with an item from the questionnaire for the topic under consideration (e.g., "The procedures describe the way in which I actually do my job", under the topic 'procedures and training'), using the questionnaire's 5-point Likert scale. This helped to improve the interactivity of the workshop, open up the conversation by exposing the level of consensus in the room, and cross-check against the questionnaire results as whole (for the ANSP and staff group of interest). It also helped to avoid confirmation bias, where participants may agree with the questionnaire results without having done their own individual assessment.

Towards an asset-based approach…

As mentioned earlier, ATM is a very safe component of a very safe industry. This raises several questions. What contributes to safe operations – why are we as safe as we are? What should we continue to do for safe operations in the face of necessary cost savings? What good practices should we expand and extend? What are we proud of? What might we recommend to others? Despite these important questions, there can be a strong tendency in safety culture workshops to focus (from the beginning) on deficits – the 'glass half empty' perspective. Starting with what's wrong can result in a loss of perspective about what's strong, and weigh down discussions in problems, resulting in a feeling of doom and helplessness. Learning from other asset-based approaches, a shift was made to start with what's strong. In practice, this means that the workshop format was changed to begin with questions about why the organisation was as safe as it was, via a number of open questions, supported by positive findings from the questionnaire. This helped not only to balance discussions – acknowledging what is working well – but also set a more productive tone for discussions.

Loss of staff…

Safety culture surveys require competent scientific and operational support. With retirements and in the face of cost pressures, the loss of several psychologists and controllers meant that the EUROCONTROL programme could no longer continue in the way that it had done, as a major programme providing survey promotion, questionnaire adaptation and administration, workshop support, report writing and feedback. The programme therefore ended in this format in 2019, with the last major ANSP survey administered by EUROCONTROL. Other aspects of the programme continued and developed.

Learning from ABCD…

Another adjunct approach to workshops was developed and trialled in EUROCONTROL. This approach did not require a questionnaire as a basis for discussion, and learned from the asset-based community development (ABCD) approach. Small learning team discussions were held with mixed groups. The workshop attendees were split into groups of three (ideally, who did not routinely work together), and four questions were posed, using an informal world café style of facilitation. The questions were: 1. What is going well in your day-to-day work when it comes to safety? 2. What challenges and dilemmas do you face in maintaining safe operations? 3. What do you want (to help maintain safe operations)? 4. What can you offer (to help maintain safe operations)? Four modes of change were explained in the process (see Russell, 2018), change done to staff, change done for

staff, change done with staff, and change done by staff. The aim of these workshops was to help reveal and facilitate change in the *with* and *by* modes of change. The discussions were characterised by four basic principles: 1: Talk about everyday work. 2: Start with what's strong, not what's wrong. 3: Find ways to cross departmental boundaries. 4: Understand first what can be done BY teams. Notably, several people expressed that they had spoken to colleagues who worked on the same corridor or in the same function for the first time in the workshops, and had a better understanding of how their work connected.

Increasing ANSP capability…

In light of the difficulties in continuing a centralised programme of surveys, training has been provided to safety specialists from different ANSPs in delivering surveys, especially in facilitating workshops. This training has prompted some ANSPs to contract universities to administer the questionnaire and help conduct workshops, in collaboration with ANSP safety specialists. This in-house approach has the advantage of increasing capability, leveraging insider understanding of the organisation, and improving links between safety staff and others in the organisation. It does, however, come at a cost of reduced independence and greater difficulty in conducting workshops with senior management.

A new self-service questionnaire tool…

An electronic questionnaire was developed for use by ANSPs. This means that ANSPs, along with partner universities or other organisations, can administer the questionnaire, and conduct workshops.

While EUROCONTROL no longer offers full-service surveys, it continues to provides assistance, support and advice to European ANSPs, and continues to organise European workshops to help ANSPs learn from each other and share best practices.

New developments in safety culture

The Safety Culture Stack

The idea of the Safety Stack is to improve the safety cooperation between all the parties at an airport – the airport authority, airlines, ground handling agents, etc. – by bringing all these stakeholders together to consider common problem issues and sharing of safety good practices. The concept is operational at two airports (London Luton and Bristol in the UK), with two international airports awaiting their Stack Survey as soon as COVID allows.

The formation of the Stack follows an airport-wide safety culture survey involving all airside stakeholders and operators. Each major stakeholder gains their own confidential report on the state of their safety culture, and they are then invited to discuss with the other stakeholders key common issues to be resolved. No partner gets a perfect score, so everyone stands to learn from others.

The Stack at London Luton Airport has been running for three years, and aside from winning an award from IATA for being the first airport globally to harmonise all its ground handling procedures, the Stack partners work on a range of issues, from reducing their top five risks, to implementing a common Just Culture framework across the entire airport. The Luton Safety Stack gained wider interest when it showed a significant reduction in incidents against a simultaneous increase in reporting, productivity, and traffic volume.

Many of those involved in the Stacks have commented that for the first time they see that 'real change is possible', in terms of changing procedures and equipment for the better, rather than just retraining people or worse (firing and hiring), and in changing the culture. The approach is also inclusive, and the smaller organisations feel that the Stack gives them a voice in safety, whereas before, the safety conversation was dominated by the airlines.

There are several key principles of the Safety Culture Stack[12] that lead to improved safety:

- Each company might have smarter ways of operating or doing safety in certain areas (e.g. incident/accident reporting). The Stack helps other organisations accelerate learning by pointing out that "similar organisations do it better, why can't we?"
- Harmonising procedures across different organisations with similar operations reduces unnecessary complexity and performance variability.
- The Stack concept relates to not only the top-level risks at an airport (e.g., runway incursions/ excursions, controlled flight into terrain, etc.) but also other lower-importance risks such as collisions between vehicles on the airport apron, injuries, etc. This makes all the adjacent services such as catering, cleaning, de-icing, fuelling, etc. understand that their hazards are also important in the grand scheme of things. In this way, all staff focus on the risk encountered in day-to-day operations.

The Stack concept can help enrich safety values of employees simply by exposing them to other organisations, allowing them to learn from the experience and safety values of other companies. This may be of interest to ANSPs who have been involved in safety culture for some time, particularly for their airport units. There is always a danger that safety culture can become a little 'stale' after a number of surveys. Joining a Stack can give new energy to safety culture activities.

"At an airport, if one organisation takes a hit, we all take a hit."

"We thought we were the best at Just Culture. Now we know we aren't. But we're learning."

"In one (Stack) meeting I resolved an issue that would normally have taken months."

"People working on the ground know safety is taken seriously."

12 - Kirwan et al, 2019

The Safety Culture Discussion Cards[13]

The EUROCONTROL Safety Culture Discussion Cards (Shorrock, 2012a, 2012b) were developed as a practical resource to aid discussion about safety culture by any person or team within the ANSP, including staff and managers in air traffic operations (e.g., air traffic controllers, aeronautical information services personnel), maintenance staff, specialist staff and support staff (e.g., safety, quality, projects, human resources, legal, etc.). The cards use the same concepts as the survey methodology, though everyday language is used to make the cards completely accessible. The cards can be used without the need for external support.

AIMS

The cards have six key aims:

1. **Engage:** The cards are a tool for potentially any individual or group who wishes to use them. They should promote ownership and provoke discussion.

2. **Educate:** The cards enhance and build on users' existing understanding of safety culture from their operational or non-operational experience. They do not give answers, but rather raise questions for discussion from a comprehensive database of issues.

3. **Enable flexible use:** There are several possible 'games' or uses for the cards. Five possibilities are described, but users may use the cards however they wish. The cards are physical artefacts, but may also be used digitally, e.g., on smartphones.

4. **Reinforce memory:** The content, especially the headlines and pictures, is designed to be memorable so that users can recognise or recall aspects of the cards when they are not using them.

5. **Link to theory:** While the cards are a tool for discussion and reflection rather than a method for measurement, they are based on a model of safety culture and represent a comprehensive range of issues from theory and around 30 ANSP surveys. The cards bridge the gap between research and practice.

6. **Improve safety culture:** The cards ultimately help the users to think of ways to improve safety culture – and inspire them to take action based on the results.

13 - Shorrock, 2012a & 2012b

DEVELOPMENT OF THE CARDS

The cards build on the existing EUROCONTROL Safety Culture Survey Method. This approach helped to ensure that the cards are valid in terms of the theory of safety culture. The content of the cards was therefore driven primarily by the EUROCONTROL safety culture questionnaire for ANSPs, as well as the findings of many previous surveys of ANSPs.

FORMAT OF THE CARDS

The physical cards are printed in colour on A6 card. They are available in several European languages. The first few cards in the pack explain (very briefly) what safety culture is, show the organisation of the cards (around the EUROCONTROL safety culture elements), and explain some possibilities for using the cards. Then, the discussion cards are sorted into eight elements.

There are several discussion cards for each element, and each card shares a common formula in terms of design elements: headline, question, rationale, follow-up question, picture. There are 74 cards in total.

USING THE CARDS

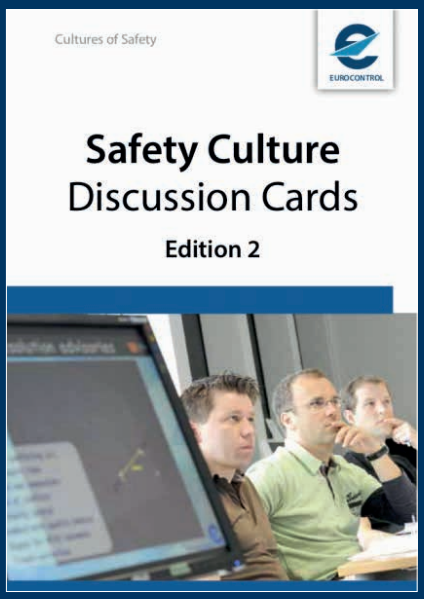
There is no set method for using the cards but ten ideas are described on the cards for how they might be used.

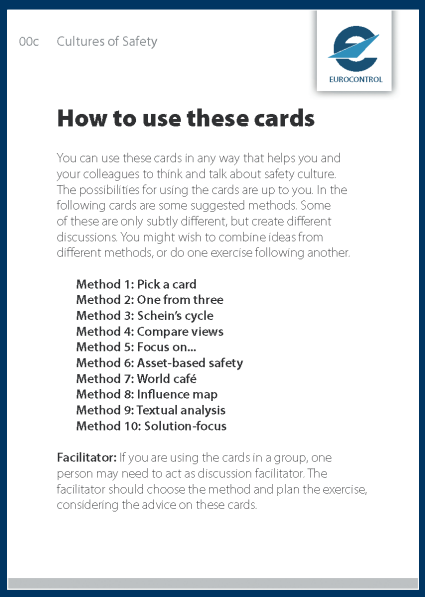
CONCLUSION

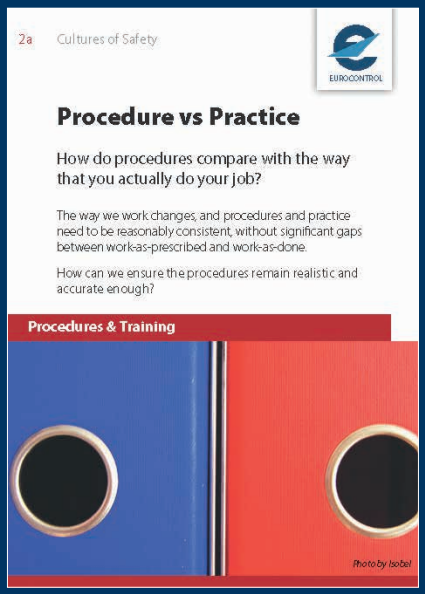
The EUROCONTROL Safety Culture Discussion Cards (Shorrock, 2012a, 2012b) are a practical resource to aid discussion about safety culture by any person or team within an organisation, in aviation and beyond. In the context of air traffic management, this includes staff and managers in air traffic operations (e.g., air traffic controllers, aeronautical information services personnel), maintenance staff, specialist staff and support staff (e.g., safety, quality, projects, human resources, legal, etc.).

The cards use the same concepts as the EUROCONTROL safety culture programme method, which has been used in over 30 air navigation service providers. The cards use everyday language to make the approach completely accessible, and can be used without the need for external support.

The Safety Culture Discussion Cards are now available in Edition 2, in several languages. They may be used in accordance with the copyright statement included in the cards (see final card).







Conclusions

Since the EUROCONTROL safety culture programme began in 2003, it developed into a world-leading programme, encompassing 30 ANSPs throughout Europe. Thousands of staff have engaged with the topic of safety culture, with conversations involving people at all levels, including operational, engineering, support and specialist staff, and senior management, up to CEO/DG level. The survey methodology and associated tools (such as the safety culture discussion cards) have been used throughout Europe and around the world, in aviation and beyond.

The safety culture programme has led to organisation-level improvements in safety management, and an industry-level focus on safety culture. Senior leaders in aviation, as well as staff in all roles, have found the programme to be valuable for understanding how groups perceive, understand and think about safety-related issues.

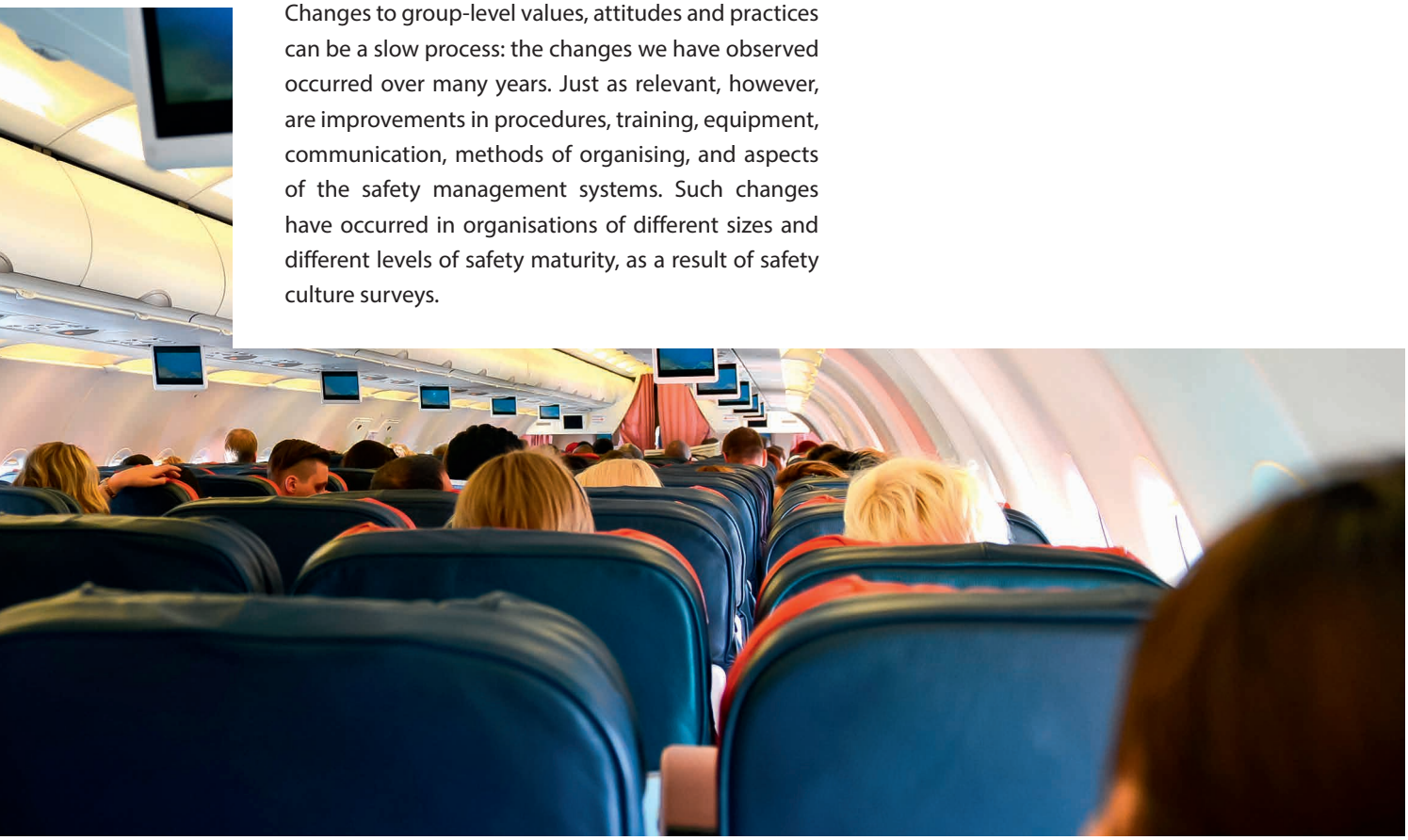
The EUROCONTROL programme has evolved over the years to adapt to needs and conditions of the aviation industry. As an independent coordinator, EUROCONTROL and associated academic partners have proven essential for establishing credibility and independence. Over time, however, ANSPs have self-organised and led their own safety culture assessments. Some ANSPs are now able to manage their own safety culture assessments, usually with some external support (e.g., from EUROCONTROL, or a university), especially where there is less internal competency in safety science, social science and human factors. The safety culture programme has evolved beyond ATM: it now incorporates all of the different stakeholders that contribute to safe air transport. This represents a significant practical and conceptual advance for safety management, whereby safety is understood to be a product of many cultures (e.g., within airlines, ATM, and airports), all of which need to coordinate and learn from one another.

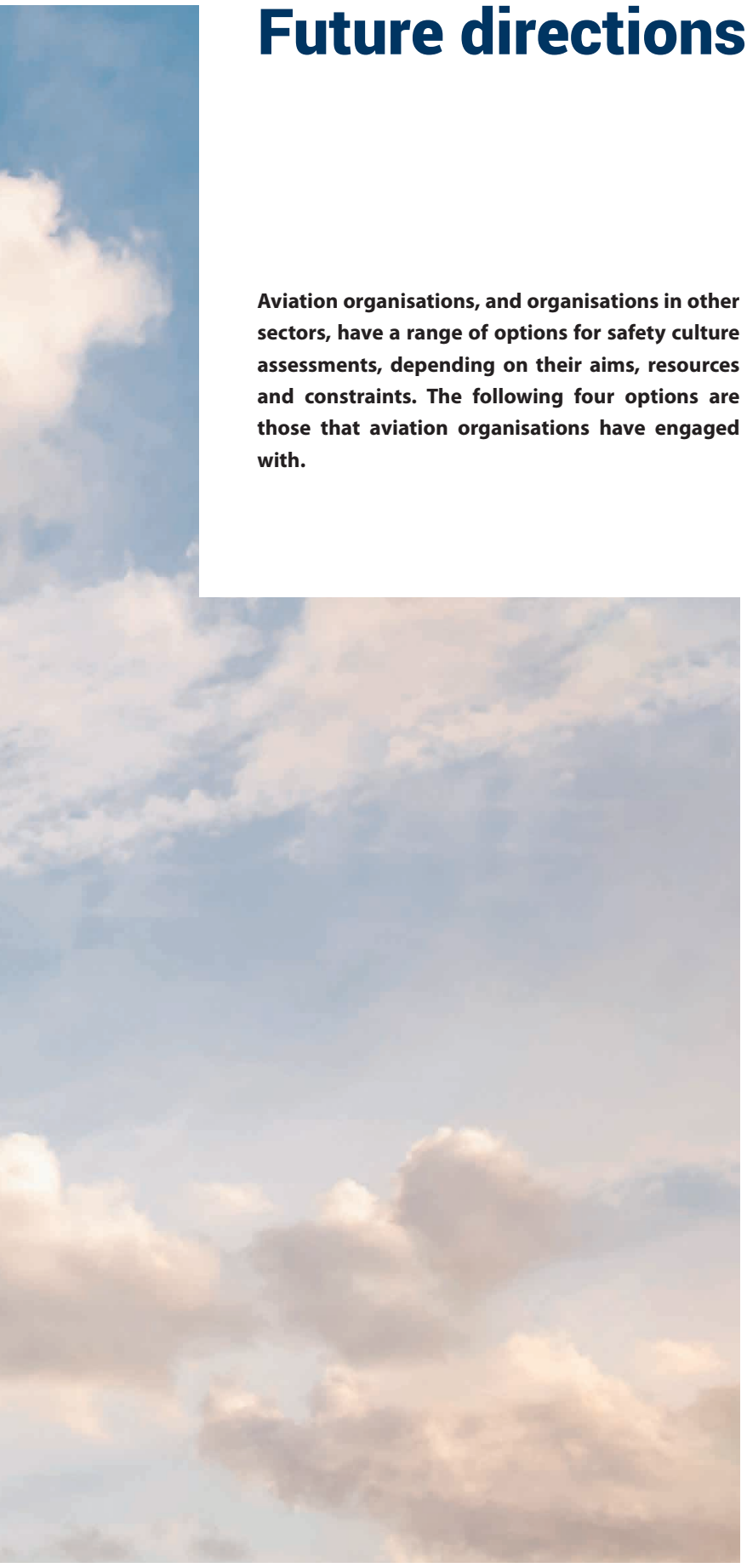
The success of safety culture surveys, in terms of the new understanding and positive interventions that arise, depend on several factors within EUROCONTROL, within aviation organisations, and within the industry as a whole. The development of a valid assessment approach has been crucial for ensuring the credibility of the programme, ensuring its longevity, and convincing senior decision makers and staff to engage in the process of understanding and intervention to improve safety. Equally important has been the independent and central role of EUROCONTROL in conducting surveys and managing the programme, including coordinating European workshops and producing practical tools and initiatives.

Survey uptake has been influenced both by management commitment to safety, and various internal and external factors such as regulatory and SMS requirements, and industry maturity levels (such as Standard of Excellence). It should be noted, however, that external motivations bring a risk that surveys are done less from commitment to the process as compliance with a requirement. Indeed, it is our experience that, in some ways, organisations with a more mature approach to safety seem to benefit more from a safety culture survey. This is not surprising, since a high level of commitment to safety is likely to be associated with more willingness to understand all aspects of safety culture, and intervene as needed.

Changes to group-level values, attitudes and practices can be a slow process: the changes we have observed occurred over many years. Just as relevant, however, are improvements in procedures, training, equipment, communication, methods of organising, and aspects of the safety management systems. Such changes have occurred in organisations of different sizes and different levels of safety maturity, as a result of safety culture surveys.

At the time of writing, aviation has been struck severely by the COVID pandemic. This too influences attitudes to safety, and associated practices. There is a risk that, with lower traffic levels and higher financial pressure, safety culture is seen as less important. This would, however, be a serious mistake. Good work done over the years could be undone, while new risks (such as skill fade among controllers) may not be fully understood. It is therefore important that momentum be maintained, in some form. The next section outlies four options for the future.





Future directions

Aviation organisations, and organisations in other sectors, have a range of options for safety culture assessments, depending on their aims, resources and constraints. The following four options are those that aviation organisations have engaged with.

Option 1: Full independent survey

A full independent survey has been the primary approach used throughout most of the EUROCONTROL safety culture programme. This involves a survey (typically via questionnaire, focus groups and interviews) administered by one or more external organisations with competencies in both social science and with domain knowledge (e.g., air traffic management, flight ops, airport operations).

KEY ADVANTAGES:

- **Independence:** Greater independence means that external providers can often ask difficult questions and also deliver results that may be difficult to develop internally.
- **Credibility:** An external partner with the required competencies and significant experience of administering surveys may bring more valid and reliable results, and insights from other organisations and industries.
- **Trust:** Independence and credibility can engender trust among both management and staff.

KEY DISADVANTAGES:

- **Cost:** May involve more cost if done on a user-pays basis.
- **Local knowledge:** External providers will have less knowledge of the local context. This can, however, also be a benefit.
- **Coordination:** External interfaces with other organisations can make coordination more difficult. This approach is also the heaviest approach for any organisation – such as EUROCONTROL – that provides a significant number of surveys, requiring significant competency and contacts.

Option 2: Self-survey

Some organisations have undertaken surveys using internal safety and human factors specialists, along with operational and technical personnel. This approach has been used by some organisations during the EUROCONTROL safety culture programme, but only those with local competency in human factors and safety science. Again, this involves a survey (typically via questionnaire, focus groups and interviews) administered, but usually from within the safety department of an organisation in collaboration with operational, technical, and other staff.

KEY ADVANTAGES:

- **External cost:** Self-surveys may involve less cost, but the process will take a significant amount of time for those responsible.
- **Local knowledge:** Internal staff will have a better understanding of local context, including staffing, projects, technologies, policies, procedures, locations and local cultures, etc. This can, however, also be a drawback if assumptions or sensitive issues arise.
- **Coordination:** Coordination is typically simpler with fewer external interfaces.
- **Language:** surveys and focus groups can be held in local languages, which may be easier for the non-ATCO participants (e.g. engineers etc.).

KEY DISADVANTAGES:

- **Lack of independence:** While safety departments have some independence, they may be seen as less independent by staff and management. Power-distance issues may also mean that it is more difficult to ask difficult questions or deliver unwanted results.
- **Competency:** Safety culture surveys require significant expertise and experience, and this will not be available in all organisations.
- **Insularity:** Lack of exposure to similar organisations and other parts of the sector can constrain thinking about problems and opportunities.
- **Trust:** In some cases, there may be trust issues between internal departments. (Unsurprisingly, this is typically much less of a problem in organisations with a more mature safety culture.)

For this option, contact with a central body can help to reduce these disadvantages.

Option 3: Day-to-day safety culture activities

Localised, day-to-day safety culture activities can help with local understanding and intervention, by staff. Such activities may be facilitated internally by safety and human factors staff, or done by other staff. They include safety culture discussion cards and learning teams, where people come together locally in small groups to discuss issues related to safety culture.

KEY ADVANTAGES:

- **Cost:** Local, day-to-day applications can be done at low cost and with or without specialist competency in social science. The main cost will be the time required for people to get together.
- **Local knowledge:** Internal staff will have a better understanding of local context, including staffing, projects, technologies, policies, procedures, locations and local cultures, etc. This can, however, also be a drawback if assumptions or sensitive issues arise.

- **Coordination:** Coordination is typically simpler with fewer external or internal interfaces.

KEY DISADVANTAGES:

- **Lack of outside perspective:** Local do-it-yourself applications can mean that there is no outside perspective, leading to some insularity. This can be overcome by involving people from other departments and mixing staff in focus groups and learning teams (e.g., operational, technical and safety staff), and also via participation in the annual multi-ANSP safety culture workshops (formerly called Regional Workshops) led by EUROCONTROL.
- **Lack of change at an organisational level:** Local approaches will tend to involve discussion of organisational issues, but changes at the levels of management or other departments may be less likely to occur without involving these in the approach.

Option 4: Location-specific, inter-organisational approaches (e.g., Stack)

Since aviation and other industries involve a number of interfacing organisations, it can be useful to approach safety culture by involving various organisations at a particular location (e.g., an airport). The safety culture stack is one such application, where safety culture surveys and interventions involve airlines, airport organisations, and the ANSP.

KEY ADVANTAGES:

Interdependency: This approach takes best account of interdependencies between organisations that work together closely.

- **Local knowledge:** Management and staff at a given site will have a better understanding of local context, including staffing, projects, technologies, policies, procedures, locations and local cultures, etc.
- **Relationships:** This approach can have long term benefits in improving communication between different organisations on a particular site.

KEY DISADVANTAGES:

- **Coordination:** Multiple external interfaces between different organisations mean that this approach has a high coordination cost. Typically, an independent coordinating organisation will be required to take this role (at least initially).
- **Scalability:** This approach is hard to scale up to a European level, since there are so many sites of interest. However, for any particular site, this is much less of a concern.
- **Lack of change at an organisational level:** Location-specific approaches will tend to involve discussion of organisational issues, but changes at the levels of senior management or other departments may be less likely to occur without involving these in the approach.

Concluding Comment

Overall, European ANSPs have achieved something quite remarkable and unique in safety culture globally, not just in aviation but also in any industry. It is hoped this White Paper will help these and other ANSPs continue to chart a safe way forward, maintaining a high degree of safety culture and safety during and beyond the current period of crisis.

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