SUMMER 2018

# ECAC NEWS #66

European Civil Aviation Conference Magazine

## SAFETY

*Aviation's biggest achievement*

ECAC • CEAC

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ECACNEWS
#66 – Summer 2018

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# Furthering Safety – The hallmark of aviation?

**Salvatore Sciacchitano**
*Executive Secretary of ECAC*

**Safety statistics for the year 2017 show the safest year on record in the history of air transport.**

Through the cooperative efforts of governments, airlines, airports, manufacturers, and across the aviation supply chain, the number of accidents and fatalities reached unseen lows of 45 accidents worldwide that year, down from an average of 75 in each of the preceding five years [(1)]. And when looking at safety figure trends beyond the recent period, it is striking how accident numbers have drastically gone down whereas daily operations continue to grow year after year.

While we can only commend the reduction in lives lost, there is still **ample room for improvement worldwide,** and our priority should remain as acute as ever on the promotion of safety. In this issue, the ECAC Focal Point for Safety invites us to reflect on the constant challenge posed by aviation safety and its requirement for continued vigilance, despite the excellent safety record achieved in recent years. Continuous improvement of safety records is, and must be, the imperative.

That is why – and particularly in view of the expected growth in air travel – well-timed, acurate reports are of utmost importance to **identify vulnerabilities and gain knowledge** from each accident and incident. *Each accident must be investigated:* the chair and co-chair of the ECAC Air Accident and Incident Investigation Group of Experts highlight in this edition why learning from past accidents continues to be the cornerstone of that effort and how the "just culture" concept contributes to furthering the finding of safety investigations.

In this respect, the **Safety Recommendation of Global Concern** (SRGC) database developed by ICAO plays a key role in making safety recommendations pertaining to "systemic deficienc(ies) having a probability of recurrence with the potential for significant consequences" accessible to all aviation stakeholders and the public.

Individual States' responsibility for safety oversight in civil aviation is one of the key principles of the Chicago Convention. Yet, there is a consensus in the international community that the issue is **a matter of global concern** and, as such, cannot be thoroughly addressed with strictly national regulations and jurisdictions. In order to advance the common objective of improved safety resulting in fewer accidents, recommendations must be shared and international safety regulation harmonised.

In this regard, improving the safety of the global air transport system is "ICAO's guiding and most fundamental strategic objective". In an effort to assist States in fulfilling this crucial responsibility, ICAO has developed **international standards and recommended practices** (SARPs) covering a wide spectrum of aviation activities with a view to achieve uniformity of safety regulations. In this issue, the president of the ICAO Air Navigation Commission (ANC) describes how ICAO's technical work programme is managed by the Council with the guidance of the ANC, one of the main outcomes being proposals for new or amended SARPs.

ICAO also aims to address and enhance global aviation safety through coordinated activities and targets as set out in its **Global Aviation Safety Plan** (GASP). The ICAO EUR/NAT Office describes, for ECAC News, the current and future GASP priorities, in which emerging risks and mitigation measures are proactively identified in accordance with the ICAO global plans.

The progress in aviation safety implies that improvements may be harder to achieve and require a **high level of adaptation to arising needs.** This is well-illustrated in the Swiss Federal Office of Civil Aviation's contribution on the development of U-Space in order to ensure the scalability of Unmanned Aircraft Systems operations that are bound to grow more and more in our skies.

Finally, leader in traffic management research EUROCONTROL gives us a look at the bigger picture with the description of its **"case-based" approach simulation programme** and how simulation can greatly contribute to furthering tomorrow's safety.

Air transport has never been so safe. Recent excellent records demonstrate how joining forces and devising solutions together as an aviation community is the path to address the global challenges facing our sector. Such is the spirit of ECAC, which remains committed to enabling the closest cooperation among its 44 Member States and with other regions of the world to further all major aviation fields.

(1) Source: IATA Safety Report 2017, April 2018.

# Safety, an investment for the future

**Pekka Henttu**
*Director General of Civil Aviation, Finnish Transport Safety Agency (Trafi) and ECAC Focal Point for Safety*

**In recent years, the international work in aviation has focused on future trends, digitalisation, and especially the environment. However, we must remember that safety and security are still a vital part of the future of aviation – even more than ever before. If the general public cannot trust the services provided, it will seriously hinder the sector's development.**

For aviation, this is a good time. Europe also has its share of the growth in air transport. It has certainly not happened all by itself, but required significant investment from various stakeholders. It is exciting to see how the aviation business is developing. The sector can now offer employment and contribute to our well-being and prosperity.

The past years have shown an excellent safety record for aviation both at the global level and in Europe. Last year was the best ever for air transport safety. In my capacity as ECAC's Focal Point for Safety, I wish to express my strong appreciation to everyone involved for the successful safety work achieved.

- You have managed to achieve a balance between safety, economy, environmental issues, reliability, punctuality and other performance factors. In real life, those performance factors tend to contradict each other every day. True professionals are masters in setting priorities.
- Success in safety is not something that can be taken for granted. It requires constant improvement and ever more effective safety work from all of us in our own positions.

I wish to particularly underline the role of the State Safety Programme and Safety Plan in the improvement of safety. The programme describes the procedures, and the plan details the actions necessary at national level. I would like to encourage my fellow civil aviation directors to make sure that those central elements of safety work are not only documents on the office shelf, but genuine descriptions of how safety work is conducted in the organisation and what actions are taken to mitigate risks at national level. Oversight must focus on the implementation and follow-up of actions needed to reduce risks.

To highlight the importance of the Safety Programme and Safety Plan, we, in Finland, have nomi-

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nated a responsible person concentrating on our own State Safety Programme and Safety Plan, and especially supporting their implementation in the CAA and among stakeholders. The post was transferred to my support staff so that the postholder reports directly to the Director General of Civil Aviation. This has raised the status of the work. With this arrangement, I think we have taken a huge step forward in our safety work during the past two years. I believe that our safety efforts are more ambitious, systematic and clearly defined than before. I hope they will also have a greater influence.

In the spirit of our times, the importance of knowledge for decision-making is emphasized. In order to understand the overall situation and to serve decision-making in safety management, it is essential to identify safety threats, assess safety risks and form a risk picture both at the aviation stakeholder level and at national or global level, tailored specifically for each level. The European Plan for Aviation Safety, which also takes into account ICAO's safety plan, provides a firm basis for national aviation safety plans. It is worth making full use of it at State level. The effectiveness of safety plan actions is monitored using predetermined safety performance indicators.

However, I also see misinterpreted or poorly determined safety performance indicators as safety threats, if they are used as a sole basis for decision-making. Therefore, the effort made to determine safety performance indicators together with our stakeholders is vitally important, as they are one of the tools to monitor safety performance. They help us to make good decisions and to form an accurate overall picture of safety, as far as possible. We must remember that there is always a residual risk as long as there are flight operations. Let's work together to keep that residual risk low.

We are now living in a time of extensive digitalisation. The other side of that coin are cyber threats. As we have learned from safety work, exchange of information is one of the cornerstones for safety. The same holds true in the efforts for improving cyber safety, which are now progressing at a good pace in Europe. The management of risks associated with cyber threats will apply the same procedures as for safety management. The basis for EASA's cyber safety work is solid. All stakeholders, including ECAC and EUROCONTROL, are together making valuable contributions under the lead of EASA.

The world of aviation is still not ready. Everyone involved has a lot of work to do. We often highlight the operators' responsibility for their own operations. However, we must also challenge ourselves continuously. We must make sure that the safety work of regulatory authorities really adds value, and that we take responsibility for those issues that belong to us, taking right actions in a wise manner. We need to have courage and a modern attitude to our work as an authority, helping the aviation sector to develop safely. Let's carry on our safety and security work ambitiously, in a spirit of continuous improvement. It is essential to maintain trust in the air transport system among the general public, whether the aircraft are manned or unmanned.

Investment in safety is an investment in the future. ■

Before his employment at Trafi, **Pekka Henttu** worked for Finnair for 33 years as a pilot (13 500 flight hours) and in various management positions, such as head of regulatory issues and technical chief pilot. In addition to Commander qualification, he also has an M.Sc.Eng degree from Helsinki University of Technology. He has a total 41 years of experience as an aviation professional. Mr Henttu has been Director General of Civil Aviation at Trafi since 1 May 2011. He also carries out other duties in the European aviation community, including as chairman of the EASA Management Board, member of the ECAC Coordinating Committee (as Focal Point for Safety), and vice chairman of ICAO's European Regional Aviation Safety Group.

# The value of simulations to improve safety

**Philippe Merlo**
*Director DECMA,*
*Directorate European Civil-Military Aviation*

**The recent years have been among the safest in the history of aviation, but this has not come about by sheer luck. Changing complex systems in any business is risky and expensive. Knowing whether changes will actually improve safety before they are implemented is therefore essential.**

We at EUROCONTROL, the European Organisation for the Safety of Air Navigation, have always kept safety as our prime objective, at every stage of our work, from identification of the problem and definition of a potential solution (e.g. new procedures, tools, airspace structure), through the initial feasibility assessment and advanced integration exercises, up to initial operations.

With its Experimental Centre in Brétigny near Paris, EUROCONTROL has been the leader in air traffic management research, and in particular in the field of simulations, for over 50 years now. The aviation industry is continuously devising new solutions to improve the overall performance of aviation. These may come from navigation service providers or from the European research project, SESAR, and may, say, reduce delays, shorten routes, optimise algorithms or simply bring in new technology. But whatever their origin or nature, for each and every single change we must be sure they will improve safety, or at least not affect it.

If they are not improving safety we must detect, stop or correct them as early as possible.

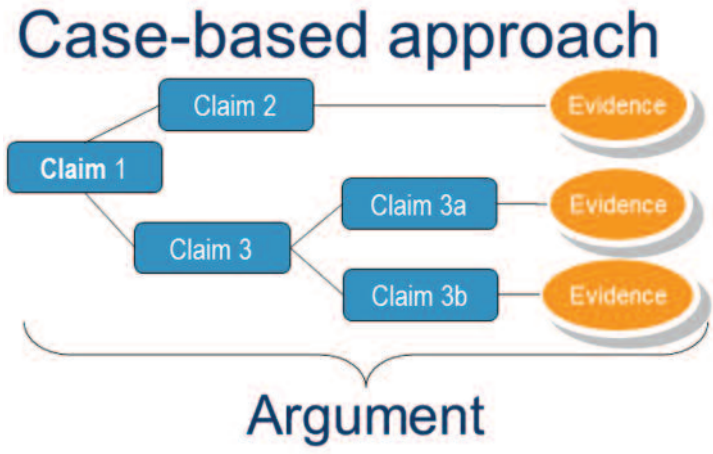
That is no easy job.

**Safety has many facets and even the tiniest change can affect safety.** To convince the safety authorities our solutions are safe we need a robust and proven method and strong evidence.

Fortunately we at EUROCONTROL can demonstrate not only that the changes will, or will not, bring about the desired benefits, but also to what extent they will affect safety. This is what is called validation.

**The cornerstone of our validation method is the "case-based" approach.** It is based on the European Operational Concept Validation Methodology, developed by EUROCONTROL and the European Commission, and provides solid guidelines on how to build a case, demanding evidence at every step.

**To build a case, we must first understand the operational environment, clarify the expected benefits for all stakeholders and examine the proposed solutions.** We break them down into smaller components of change and define benefit mechanisms, working out how each change could deliver im-




*A case with claims and evidence*


provements. We then know what to demonstrate, what to measure, and under what conditions. This is spelled out in unequivocal claims supported by robust evidence. For example, the high-level claim that a particular concept will improve safety and flight efficiency is broken down into lower-level, testable, claims that the concept will lead to fewer aircraft crossing and safety alerts, a lower workload for air traffic controllers while indeed reducing the flown track miles in the airspace concerned, and not creating new hot spots. This has to be tested not only under normal conditions but also under non-nominal conditions, e.g. when a technical failure occurs or during bad weather.

It is after this stage that we select the best simulation approach in order to collect all the supporting evidence. This could be a mathematical, fast-time simulation, or a gaming exercise and may be a real-time simulation or a live trial. Or even a combination of these, as each has its strengths and limitations.

Once the validation scenarios and objectives have been defined, the actual preparation of the simulations can start. This can be a very lengthy task, spanning many months, requiring several operational, technical and validation meetings to accurately build the simulation exercises. These need to be prepared in minute detail in order to achieve the highest possible degree of realism. This is a prerequisite for building credible and valid data as evidence to test the claims.

> “Assessing safety in aviation can be very challenging, but simulations lend a helping hand.”

Most projects begin with mathematical simulations as these are relatively easy and inexpensive to run and involve fewer actors, but they can simulate very large airspace over long periods, thus generating a high repetition of data. They help to quickly discard weak solutions, pinpoint trouble areas and generate lots of useful data to be fed into the next step.

**The logical next step, in particular when the focus is on safety assessment, is to proceed with real-time simulations.** These are more demanding and expensive to conduct but are an extremely powerful means of assessing safety aspects as this is one of the first times in the life cycle of a new solution that all elements are integrated: the new tools, procedures or technology are inserted into a realistic operational environment, involving real active air traffic controllers working with realistic traffic.

But before conducting such real-time simulations we must build the simulated environment. For air navigation service providers (ANSPs), that must be as close as possible to their own operational environment – right down to the seating, the screen layout and colour of the aircraft labels and even the mouse position!

Once this is done, we verify the simulation environment with the air traffic controllers. They help us tweak it so it feels just like home. The simulation is run in a known environment first, so as to establish a baseline and to make sure the simulator works correctly. This represents the baseline, a reference point to be able to subsequently measure the effects of the changes or new solution. It is indeed often easier to make relative comparisons rather than absolute measurements.

Then we run the new or future scenarios four times, as a rule, so that we generate enough statisti-

cally valid data. A typical exercise lasts for about an hour but it can take twice as long if the airspace is large or the new concept complex.

We collect a vast amount of subjective and objective data. Every event is recorded and measured: the time it takes for air traffic controllers (ATCOs) to respond; how long they talk on the radio or telephone; the traffic density and number of aircraft movements in the sectors; how often and when exactly the ATCOs use the new tools, procedures or safety nets; the number of instructions and safety alerts. To collect subjective data we often have observers supervising the conduct of the exercises and, after each session, the ATCOs are given a questionnaire which helps us clarify the human factor elements, e.g. situational awareness and stress level. We also measure their workload perception every two minutes. Each ATCO is invited at regular intervals to rate their own feelings about the work by choosing from a series of buttons. These data are all essential to build a coherent picture of the safety impact of the new solution or concept.

A debriefing is held at the end of each day. As everything is recorded, we can enrich the discussions with a synthesised view of the relevant data for each exercise. Controllers can see for themselves how they handled the new system or tools and comment on all events and data. For example, controllers can comment on the usefulness of a new safety net, whether the safely alerts or advisory messages were relevant and correct; operational and human factors experts can investigate and ask if and why some tools were properly used or not. Recommendations can also be expressed on how to improve the fine-tuning, configuration or implementation of a specific safety decision aid.

Once the exercises have all been run – this typically takes two weeks – another key phase in our work begins: analysing the mountains of data that the simulations have generated. This is a joint task both for our EUROCONTROL human factors, validation and operational experts, and for the experts from the research project or ANSP who designed the new solutions.

Analysing the data collected and writing up the report usually takes three months. The reports provide a clear overview of the validation approach: objectives, hypotheses, scenarios, claims, metrics used, profile of participating ATCOs or operational experts, and most importantly, a neutral, impartial, solid and credible assessment of the benefits and potential drawbacks of the tested solutions, accompanied by a series of recommendations to further improve the benefits of the solutions.

**At Brétigny, we have different types of simulator platforms and various tools for validation.** The major one used for air traffic control simulations is ESCAPE, used in three air traffic control simulation rooms with in each one up to 40 controller positions and 16 pseudo-piloting positions.

We also have other simulators to complement these air traffic control simulators, allowing our experts to address all the phases of flight:

- For network projects we have the EUROCONTROL Network Management Validation Platform (NMVP) and the ISA Software's INNOVE.

- For airports: the ASTRIUM airport operations centre (APOC) and the combined EUROCONTROL eDEP-based tower simulator with third-party 3D visualisation.
- For the cockpit: a third-party Airbus A320 cockpit simulator.
- For environmental studies: our IMPACT suite of simulators for emissions and noise assessment studies.
- And a variety of other mathematical simulators.

**For future issues such as cyber security and artificial intelligence (AI), simulations will also be a very valuable tool** in ensuring that the right solutions are designed, tested and implemented.

In the field of cyber security, real-time simulations could test what happens and how to react, not only when the overall air traffic management system is down, but also in the event of smaller-scale but nevertheless vicious data corruption. A total failure of radar tracking information may be easy to detect, but what if tracks are maliciously biased by a few miles horizontally or a few hundred feet vertically? We must be able to spot this, and be ready to react.

New AI systems or algorithms require a massive amount of data to be trained how to react and decide. But this data need not only reflect normal operations. AI systems must also be confronted with non-nominal situations that never, or only very rarely, happen in real life but that can lead to disastrous consequences if the AI machine does not know how to react. Simulations could provide such rare and non-nominal scenarios to test and train the AI systems.

EUROCONTROL, with its vast experience in air traffic management simulations and simulators, is ready to contribute to the safety of aviation and make sure the coming decades remain amongst the safest in history. ■

*Further reading on the EUROCONTROL Experimental Centre, its research activities and simulation infrastructure: https://eec50.eurocontrol.int/a & https://simulations.eurocontrol.int*

**Philippe Merlo** has led the new Directorate European Civil-Military Aviation (DECMA) since its creation in April 2018. DECMA, a merger of two former directorates (Directorate Air Traffic Management (ATM), which Mr Merlo had been in charge of since joining EUROCONTROL in February 2014, and Directorate Pan-European Single Sky), represents a significantly expanded mandate and portfolio.

DECMA brings under one roof a strong technology, State support and innovation function:

- Its State support units work to ensure the development and implementation of the Single European Sky (SES) at the pan-European level, supporting the EU and States as needed.
- Its civil-military ATM coordination division ensures appropriate civil-military and military-military ATM coordination via EUROCONTROL's unique civil-military competences.
- Its R&D and SESAR Contribution Management division plays a core role in SESAR 2020, where EUROCONTROL leads eight projects and contributes to many more with the aim of achieving the objectives of the SES and the performance scheme, as well as ensuring full alignment of SESAR initiatives in accordance with the ATM Master Plan.
- Its ATM strategies division ensures the strategic development of ATM, with particular focus on ensuring coordination at a global level with the key actors.

Mr Merlo has spent his entire career in ATM, beginning as a flight test engineer in 1986 in the French Directorate General of Civil Aviation after graduating from the *École Nationale de l'Aviation Civile* in Toulouse. He would then steadily rise within the organisation to occupy a number of managerial functions of increasing responsibility, including four years as head of the En-Route ATC Centre in Bordeaux and four years as director of all technical systems and innovation. In 2010 he became deputy CEO of DSNA, the French air navigation service provider, in which capacity he was increasingly involved in ATM at a European level, before joining EUROCONTROL four years later.

# Role and priorities of the ICAO Air Navigation Commission

**Claude Hurley**
*President, ICAO Air Navigation Commission (ANC)*

**As we, States, industry stakeholders and ICAO look forward, together, to this autumn's ICAO Air Navigation Conference, I appreciate this opportunity to reflect on how ECAC States and aviation stakeholders can best continue the strong participation they have always brought to ICAO's standard-making process.**

## The role of the Air Navigation Commission within the ICAO framework

To begin this reflection, it is perhaps best to start by looking briefly at the Air Navigation Commission's (ANC) role within the ICAO framework. Our primary task, on behalf of all ICAO States, is to consider and recommend Standards and Recommended Practices (SARPs), as well as Procedures for Air Navigation Services (PANS) for adoption or approval by the ICAO Council.

In the ANC itself, we are 19 commissioners, who are nominated by States and appointed by the ICAO Council, which has judged us to have "suitable qualifications and experience in the science and practice of aeronautics", as outlined in the Convention on International Civil Aviation (Chicago Convention).

While I feel blessed every day to be able to work with such distinguished aviation professionals as my colleagues in the Commission, as well as in the Secretariat, I believe the key to our long-term success in providing technical advice to the ICAO Council lies not necessarily in our expertise, but in the fact that while each commissioner is nominated by specific ICAO Member States, they do not represent the interest of any particular State – or even region. Instead, as envisaged in the Chicago Convention, each commissioner acts independently, leveraging their expertise in the interest of the whole international civil aviation community.

We are not alone, of course, in this work, and rely on many others to help us achieve our objectives on behalf of all States.

Of note is that a number of experts, directly representing States and industry organisations, participate in the ANC deliberations as accredited observers, and their insights are necessary to the Commission gaining a broader understanding of the possible impact of the proposals being discussed.

As well, the many dedicated individuals who collectively make up the Secretariat ensure that we are well supported and advised in our discussions, and are also the bridge that allows all stakeholders in the process to communicate effectively.

*ICAO Air Navigation Commission Session*

© Commissioner Mervyn Fernando

*The ICAO Air Navigation Commission*

## The ANC's mission

In the big picture, we aim to proactively identify emerging risks and devise mitigation measures in accordance with the ICAO global plans, such as the Global Aviation Safety Plan (GASP) and the Global Air Navigation Plan (GANP).

To do this, the ANC is tasked by the Council to manage ICAO's technical work programme, with one of the main outcomes being amendments to the Annexes to the Chicago Convention, or more specifically, proposals for new or amended SARPs. While ICAO recognises, as do States, that new regulations are not always either the only, or necessarily the best, solution to emerging risks, more often than not amendments to the SARPs are needed to maintain and improve aviation safety and air navigation efficiency, while integrating increased traffic into the current aviation infrastructure.

To ensure that we are making progress along the path, we do very much need States to give us their feedback, either in the form of comments to specific proposals for SARP amendments, but as well, as to whether or not we are even on the right path. On the latter question – are we choosing the right path – your participation in the Air Navigation Conference will allow you to give direct feedback on the proposed priorities for ICAO's technical work, and that, ahead of the 2019 ICAO Assembly.

## ICAO's Air Navigation Conference and the path of "implementable" SARPs

The theme of ICAO's 13th Air Navigation Conference (www.icao.int/Meetings/anconf13), to be held in October this year, is *From Development to Implementation,* which ties in directly with the ANC's two main focus areas for 2018: 'implementation' and 'communications', which you will have understood, falls within the greater framework of ICAO's well publicised *No Country Left Behind* initiative.

Of note is that this Air Navigation Conference is the best chance for States to influence the direction of ICAO's technical work, ahead of the next Assembly, so that your choices for priorities are fully reflected in how ICAO prepares itself for the decisions to be made in the 40th Assembly, in 2019.

For us in the ANC, implementation essentially means that we need to ensure that the SARPs we help develop are *implementable.* As we aim to get that feedback early on in the SARP development process, we look to you, as States and aviation stakeholders, to continue to provide us with valuable advice.

As one example, the strong participation of experts nominated by ECAC States, both in the ANC's technical panels, as well as with study groups of the ICAO Secretariat, has helped bring maturity to the proposals brought forward to the ANC for our preliminary review.

After the conclusion of the ANC's preliminary review process, State letters on these proposals for amendments to the SARPs are then sent out by the Secretariat to all ICAO States, which is the first formal opportunity that States have to comment on the specific proposals being brought forward.

It is widely recognised that the high response rate to State letters amongst ECAC States has ensured that ICAO receives not only a number of valuable comments on these proposals, but provides us with an indication of which particular areas caused the greatest concern. We can only encourage all States to make the investment of time and effort in this State letter consultation process, as your feedback is fully considered by the Secretariat and the ANC, as it very much helps us in our final review process. Our aim is to recommend mature, implementable SARPs to the ICAO Council for their adoption, and it is best that we know ahead of time if States have any concerns.

As a specific example, I want to assure you that the ANC has noted the ECAC States' commitment to implementing safety management systems (SMS) and State Safety Programme (SSP) – this has been obvious from your contributions to the development of Amendment 1 provisions to Annex 19 – Safety


Management, and in particular the strong response to the State letter for the proposal. If you will allow me to be repetitive, responding to State letters is one of the key mechanisms for the ANC to receive feedback from States and the industry, and we want to assure you that we consider all of your comments, and we do believe strongly that all feedback helps to improve international provisions for all States.

The feedback loop does continue though, as the ANC is made aware when we later review the reports of ICAO's Planning and Implementation Regional Groups (PIRGs) and Regional Aviation Safety Groups (RASGs) on either best practices or even implementation challenges that States face. In these reports, and in conversations we have with the ICAO regional offices, we note the many excellent examples from States, such as those from the European Air Navigation Planning Group (EANPG), which we have encouraged the Secretariat to share with other regions so that we can all benefit from lessons along the path. It is only through the sharing of best practices, resources, and expertise that we, globally, can improve safety performance.

As air traffic continues to grow it is obvious that we need to move from purely rule- and compliance-based methods of ensuring safety to being predictive, using all of the information available to us collectively. Sharing information amongst regulators, service providers and across borders will enable us to have a clearer picture of the potential risks and allow us to work together to address them. This might require cultural changes in the ways we work but has the potential to make significant positive changes in safety. It is through continuous communication and feedback that we will acquire greater situational awareness of safety in our organisation, in our industry, and even perhaps, how our industry touches and is touched by other industries, both in our States and around the globe.

This is one of the reasons why the proposed revisions to the Global Aviation Safety Plan (GASP) encourages implementation of the GASP goals, targets and indicators at the regional and national levels, in a coordinated and collaborative fashion. The safety roadmap, presented in the GASP, serves as an action plan to assist the entire aviation community in achieving the GASP goals through a structured common frame of reference for all relevant stakeholders. We encourage all ECAC States to review the draft GASP and Global Air Navigation Plan (GANP) ahead of this autumn's ICAO Air Navigation Conference, and provide, as always, your constructive feedback during the conference itself, or through the submission of your own working papers.

Looking forward to seeing as many of you as possible during the Air Navigation Conference, but whether or not you can join us in Montreal in October, please realise that your and your State's contributions and commitment to working together to improve what is already the safest global transportation system – aviation – is greatly appreciated by all.

Wishing you, on behalf of the Air Navigation Commission, happy landings! ■

Captain **Claude Hurley**, FRAeS, was nominated by Canada, and appointed by the ICAO Council to the Air Navigation Commission (ANC) in 2014. He was elected as its president for the 2018 calendar year. Mr Hurley previously served two years as vice-president of the ANC, and has also chaired the ANC group on implementation as well as the ANC group on Safety Management Systems. His substantive position is as an executive with Transport Canada, where he managed and led teams with responsibilities in aviation safety regulatory oversight. Prior to joining Transport Canada, Mr Hurley flew for many years, first with the Canadian Armed Forces, then more recently in industry, in roles as diverse as training pilot, type rating examiner, technical pilot, as well as supporting flight operations in management roles.

# ICAO Global Aviation Safety Plan – Current and upcoming editions

**Arnaud Desjardin**
*Regional Officer, Safety, ICAO EUR/NAT Office*

**The ICAO Global Aviation Safety Plan (GASP - ICAO Doc 10004) sets forth a strategy which supports the prioritisation and continuous improvement of aviation safety. It is a strategic document that enables States, regions and industry to adopt a flexible, step-by-step approach for safety planning and implementation.**

In accordance with ICAO Standards and Recommended Practices (SARPs), States must develop their safety oversight capabilities and implement a State Safety Programme (SSP). The GASP is a means for States to achieve compliance with ICAO safety-related SARPs and to go beyond the minimum level of compliance by proactively enhancing safety through the management of operational safety risks. The GASP assists States to identify deficiencies and prioritise actions so they can meet their safety responsibilities by providing an implementation strategy presented in the global aviation safety roadmap. The GASP further assists States in strengthening their capabilities in the management of safety through a structured process founded on the critical elements (CEs) of a State safety oversight system. A State's safety responsibilities comprise both safety oversight and safety management, collectively implemented through an SSP.

States, regions and industry facilitate the implementation of the GASP through coordinated Safety Enhancement Initiatives (SEI). The GASP seeks to assist States, regions and industry in their respective safety planning and implementation by:

a) establishing GASP goals, targets and indicators;
b) providing a framework for planning and implementation of SEIs;
c) presenting the global aviation safety roadmap, which can be used to achieve the GASP goals and to set specific targets at both national and regional levels as well as for industry partners; and
d) providing a methodology to guide States in the identification of current and emerging hazards, and the management of safety risks.

The GASP has significantly changed since its introduction in 1997, and has evolved through continuous consultation and review. The 2014-2016 edition was published in 2013 and included GASP objectives for States to achieve through the implementation of an effective safety oversight system, an SSP and safety capabilities necessary to support future aviation systems. The current edition (2017-2019) was published in 2016 and includes a global aviation safety roadmap developed to support an integrated approach to the implementation of the GASP objectives. The three near-term objectives, which had to be achieved by 2017, are:

a) States lacking fundamental safety oversight capabilities are to achieve an Effective Implementation (EI) of at least 60% overall of the eight Critical Elements (CE) of a State safety oversight system.
b) States which have an EI of 60% or greater should implement a State Safety Programme (SSP), which will facilitate addressing risks specific to their aviation systems; and
c) all States and stakeholders are encouraged to put in place mechanisms for the sharing of safety information through their Regional Aviation Safety Groups (RASGs) and other regional or sub-regional fora.

The mid-term objective calls for all States to achieve SSP implementation by 2022. Additionally, RASGs should continue to advance to mature regional monitoring and safety management programmes. The long-term objective calls for States to build upon safety management practices within the SSP to develop advanced safety oversight systems, including predictive risk management.

The 2020-2022 edition of the GASP will maintain some key elements from its previous edition, such as goals for States to improve their effective safety oversight capabilities and to progress in the implementation of SSPs. Main changes in the plan will include new goals and targets for States, regions and industry as well as tools to measure States' safety oversight capabilities. The goals include:

- a continuous reduction of operational safety risks;
- the implementation by all States of the eight critical elements of a safety oversight system;
- the full implementation of effective SSPs;
- an increased collaboration at the regional level to enhance safety;
- an expanded use of industry programmes;
- an appropriate infrastructure available to support safe operations.

Furthermore, in order to mitigate the risk of fatalities, States, regions and industry need to address the high risk categories of occurrences (HRCs). The selection of types of occurrences which are deemed global HRCs (previously referred to as "global safety priorities" in the 2017-2019 edition of the GASP) is based on actual fatalities from past accidents, high fatality risk per accident or the

number of accidents and incidents. The following HRCs, in no particular order, have been identified for the 2020-2022 edition of the GASP: controlled flight into terrain (CFIT); loss of control in-flight (LOC-I); mid-air collision (MAC); runway excursion (RE); and runway incursion (RI).

This next edition of the GASP will also recognise the importance of safety risk analysis at national and regional levels. It will incorporate guidelines and a structure by which States, groups of States or entities within a region identify hazards and mitigate operational safety risks therein, through the assistance of Regional Aviation Safety Groups (RASG) as well as regional coordination. For the area of accreditation of the European and North Atlantic (EUR/NAT) Office of ICAO, the RASG-EUR is the leading group for the regional implementation of the GASP. It ensures the effective coordination and cooperation between all stakeholders and monitors the progress in the implementation of the GASP. It also supports the establishment and operation of performance-based safety systems within the Region.

Contracting States entitled to participate as members in the RASG-EUR meetings are those whose territories or dependencies are located partially or wholly within the area of accreditation of the EUR/NAT Office of ICAO (56 Contracting States). Regional organisations, within the area of accreditation of the EUR/NAT Office of ICAO, which have mechanisms in place for the management of aviation safety, are entitled to participate as members in the RASG-EUR (1). International organisations, air operators, aircraft design organisations and manufacturers, air navigation service providers, aerodrome operators, aircraft maintenance organisations, aviation training organisations and other aviation industry representatives are invited to participate in and contribute to the work of the RASG-EUR and its contributory bodies.

ICAO plays a role in coordinating and monitoring the implementation of the GASP at the global and regional levels. The role of ICAO within the GASP includes the following:

a) promoting collaboration at the global level to enhance safety;
b) coordinating activities of the RASGs to ensure their alignment with the GASP;
c) ensuring close coordination between the RASGs and the Planning and Implementation Regional Groups (PIRGs);
d) encouraging the active participation of States and industry in the RASGs;
e) encouraging the active involvement of regional mechanisms, such as Regional Safety Oversight Organisations (RSOO) and regional Accident Investigation Organisations (RAIO) in RASG activities;
f) implementing a global aviation safety oversight system (GASOS) with the goal to improve national and regional safety oversight capabilities;
g) encouraging States with effective safety oversight systems to provide assistance to other States, where practicable;
h) providing data and tools to support the monitoring of GASP implementation;
i) facilitating the sharing and exchange of safety information and best practices across regions;
j) facilitating access to resources and technical assistance by States; and
k) facilitating training and workshops.

The next edition of the GASP will include detailed roadmaps, which serve as action plans to assist the aviation community in achieving its goals through a structured, common frame of reference for all relevant stakeholders. Each region and each State should use the GASP to develop a regional aviation safety plan and national aviation safety plan, respectively, which includes industry participation. The regional or national aviation safety plan presents the strategic direction for the management of aviation safety at the regional or national level, for a set time period and should be developed in line with the GASP's goals, targets and HRCs. The global aviation safety roadmap in the next edition of the GASP will be composed of two pieces:

a) organisational challenges – this part of the roadmap (referred to as the ORG roadmap) will provide SEIs to meet GASP goals related to States' safety oversight capabilities and the implementation of SSPs, as well as industry's implementation of SMS. It contains two distinct components, in line with the GASP goals, to address safety management responsibilities: State safety oversight (SSO) system; and SSP, including service providers' SMS.
b) operational safety risks – this part of the roadmap (referred to as the OPS roadmap) will provide SEIs to meet the GASP goals related to a continuous reduction of operational safety risks and regional and industry safety risk management activities to address the HRCs.

The 2020-2022 GASP edition will be presented at the ICAO 13th Air Navigation Conference (AN-Conf/13) at ICAO headquarters, Montreal, Canada on 9 to 19 October 2018. The Conference will be invited to put forward recommendations on the 2020-2022 edition of the GASP, and the final version will be published in December 2019. ■

(1) European Aviation Safety Agency (EASA) • European Civil Aviation Conference (ECAC) • European Commission (EC) • EUROCONTROL • Interstate Aviation Committee (IAC)

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# Safety recommendations – How are we doing?

**Robert Carter**
*Principal Inspector, United Kingdom Air Accidents Investigation Branch (AAIB), Chair of ECAC Air Accident and Incident Investigation Group of Experts (ACC)*

**To any air safety investigator from a State accident investigation authority (AIA), such as the National Transportation Safety Board (NTSB) in the United States, the Federal Bureau of Aircraft Accident Investigation (BFU) in Germany or the *Bureau d'Enquêtes et d'Analyses pour la sécurité* (BEA) in France, developing safety recommendations is an inherent part of the investigation task.**

To us, the 'Recommendations' section of the final report is often the most significant part of an accident or incident investigation; it is certainly the section we seem to pore over for the longest time. That is right and as it should be; in making a safety recommendation, we investigators are putting other busy people to a great deal of trouble even in properly considering their response, let alone implementing the recommendation. So we need to get it right. But what makes a good safety recommendation? And are we doing it right?

Safety investigation is a highly collaborative process and it is simply the case that aviation took an early lead, thanks largely to the 'Founding Fathers' of the 1944 Chicago Convention. This early lead was in aviation consistently generating coherent and focused safety recommendations, based on structured technical investigations and reports. But in recent years, other transport modes (maritime, rail, etc.) have been catching up, and even the medical world, in the United Kingdom for instance, has been adopting this approach. In aviation, many have worked to refine and develop our founding document, the 'Standards and Recommended Practices' of ICAO's Annex 13 (Aircraft Accident and Incident Investigation). So the Annex 13 definition is a good place to start.

That definition reads:

***"Safety recommendation.** A proposal of an accident investigation authority based on information derived from an investigation, made with the intention of preventing accidents or incidents and which in no case has the purpose of creating presumption of blame or liability for an accident or incident. In addition to safety recommendations arising from accident or incident investigation, safety recommendations may result from diverse sources, including safety studies."*

That really does say it all, in the usual elegant and concise ICAO language. It says that this is not trivial, that safety recommendations should be evidence-based and taken seriously, both in their development by a State accident investigation authority and in their consideration by the recommendation's addressee. Most importantly, it says that *'blame and liability'* should have no part in this process.

## History

Within the ICAO structure of Annex 13 – Standards and Recommended Practices (which wag decided on the '13' numbering? – it surely cannot have been coincidence…), passages of text on safety recommendations have been there from the earliest editions. It is always interesting to look back at where we have come from, and certainly the Air Accidents Investigation Branch reports (AAIB – or AIB as it was then, before marine and rail stepped in) have always carried plenty of safety recommendations. A good example was a prominent accident that occurred in the United Kingdom shortly after this author joined the AIB in 1985.

## Accident at Manchester Airport on 22 August 1985

In 1985, the AIB investigated a tragic and major accident at Manchester Airport, where a B737-236 caught fire during its take-off run and 55 passengers died in the subsequent fire. It was a landmark investigation for the United Kingdom AIB (as it was then), looking at the aircraft operation, emergency services response, propulsion system integrity, the development of the fire, survival factors and the evacuation of the aircraft. A landmark investigation with a total of 31 safety recommendations, and in 2018 the investigation report still reads well [1].

Ironically, though, what do *not* read so well to our 2018 eyes are some of the safety recommendations. The accident had been initiated by the rupture of the com-

(1) Report available on the gov.uk website: https://www.gov.uk/aaib-reports/8-1988-boeing-737-236-g-bgjl-22-august-1985

bustion chamber casing in one of the engines, so the subject of jet engine maintenance was treated seriously and in depth in the investigation and its report. But to our 2018 eyes, this example of the safety recommendations does not really do justice to that work:
*"4.7 If manufacturers are to continue to supply maintenance guidelines which require the operator and his (sic) regulatory authority to determine maintenance intervals, particularly for critical components, a re-evaluation should be undertaken of the methods employed to judge residual components, particularly following repair."*

It is useful in analysing recommendations to ask "Who is being asked to do what in this recommendation? What does success look like?". It is difficult to say from the wording of this example whether this is being addressed to a regulator (to the Civil Aviation Authority, to the Federal Aviation Administration. Or both? Or even to the manufacturer?). And just *what* is being recommended and is it just for jet engine maintenance or for the airframe and other systems too? Is the language suitable? A native English speaker can untangle the complex sentence but it would certainly be challenging for many non-native English speakers.

## The Joint Aviation Authorities (JAA), European Aviation Safety Agency (EASA) and ENCASIA

The process of managing safety recommendations in those years was not helped by the United Kingdom AAIB, as other AIA organisations at that time, not keeping a formal tracking of the progress of recommendations. Within Europe, the gradual move towards a more formalised and consistent approach seems to have developed with the new century. EASA was formed in 2002 and replaced the JAA as the place where AIAs would address safety recommendations, particularly on design and certification issues on large aircraft. The development of the JAA, starting in the 1980s and running up to the creation of EASA, had done a great deal to bring about the consolidation and harmonisation of certification requirements between the JAA partners. As well as developing modern certification codes, the JAA partners worked hard to define the similarities, and the differences, between the JAA's Joint Aviation Requirements (JARs) and other codes, such as the Federal Aviation Regulations (FARs) in the United States.

But the JAA was never a good destination for safety recommendations, with its loose partner structure and its lack of real regulatory authority. In the early days after its forming in 2002, EASA, finding its feet and establishing its role, struggled with safety recommendations, just as the JAA had before. The lines of responsibility were not yet clear, much of the EASA work was still being done by the national aviation authorities and it was often unclear just where regulatory responsibility lay.

Since 2002, the situation has certainly improved, with the investigation community and the regulator working to enable safety recommendations to be considered and processed in a timely, clear and consistent manner. In 2006, the ECAC expert group on aircraft accident and incident investigation (ACC), under the leadership of Paul-Louis Arslanian, then director of the BEA and chair of the ACC, initiated and conducted a workshop on the safety recommendation process. This highlighted the areas of best practice and prepared the active ACC members for the ICAO Accident Investigation Panel (AIG) divisional meeting in Montreal in 2008.

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The ACC under Paul-Louis Arslanian also brought a shared approach amongst its members, which informed the extensive 2008-2009 discussions in the European Commission's development of the Regulation (EU) No 996/2010 with the EU States. Those discussions, often robust, enabled the regulation, when it emerged as Regulation (EU) No 996/2010 to become a regulatory document that has been effective and surprisingly robust.

The language of EU996 is, helpfully, very close to that of Annex 13 and Article 17 (Safety Recommendations) and causes no problems to any State investigator familiar with ICAO Annex 13 practice. But EU996 then goes further, in two important ways. One is that a Network was defined (Article 7 – European Network of Civil Safety Investigation Authorities) in order that there should not be a need for a single EU safety investigation AIA. This grouping is now known more simply (thank goodness!) to all as 'ENCASIA' (European Network of Civil Aviation Safety Investigation Authorities). The other is about follow-up (Article 18 – Follow-up to safety recommendations and safety recommendations database) – and this goes quite a bit further than Annex 13, with its need for global acceptance, is able to.

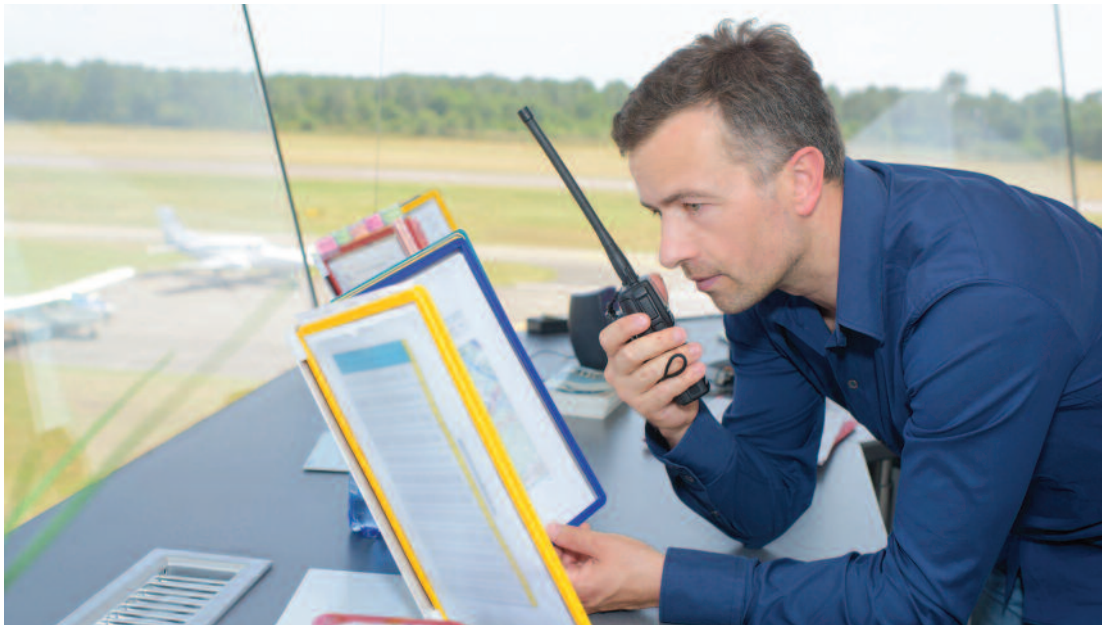
## How do we try to do it now?

Coming back to those early questions (*"What makes a good safety recommendation? And what does it look like?"*) there are many answers out there and reams of papers on the topic. This author has had the privilege of leading sessions on safety recommendations at Cranfield University's safety investigation courses. On these courses, almost a full day is now dedicated to the topic, where student groups develop their own draft safety recommendations from a full-on field simulation exercise.

Distilled, the answers often use the SMART model used for many objective-setting processes. SMART is 'Specific, Measurable, Achievable, Realistic and Timely' and is at least a consistent way to approach the topic.

• ***Specific*** – this is the important one. A good safety recommendation needs to be made specifically to a single named body and state the specific recommended action. For example, *"It is recommended that Scruggs Aerospace redesign the engine support system in the Scruggs Aerostar SA21 to ensure that it fully meets the strength requirements of EASA Certification Specification (CS) 23."* Note that the target and the action are specific, without defining exactly how the good people at Scruggs Aerospace are to do it. Incidentally, the advice from Cranfield and the AAIB is that there should *always* be a dedicated recommendations review meeting before any recommendation is propagated, even as a draft recommendation in a draft report.

One thing that will certainly have been discussed at this dedicated recommendation review meeting will be the addressee; should it be Scruggs Aerospace? Or should it be, say, the regulator? AAIB practice is to take our clue from our discussions before that meeting with the likely recipient – if Scruggs Aerospace seems receptive, then that is probably the most direct and effective route, not requiring action by the regulator. If, on the other hand, this has happened before, or Scruggs is not receptive, the recommendation easily becomes *"It is recommended that the European Aviation Safety Agency (EASA) require that Scruggs Aerospace redesign the engine support system in the Scruggs Aerostar SA21 to ensure that it meets the strength requirements of EASA Certification Specification (CS) 23."* What should be clear in the recommendation wording is who is responsible for carrying out the actions to address the identified safety issue.



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• ***Measurable*** – some recommendations, such as that Manchester example quoted, are just too vague. Simply asking the question "What does acceptance of this recommendation look like?" helps to tweak the text to something where the response is 'measurable'.

• ***Achievable and Realistic*** – these rather hang together. Simply – can the objective of the recommendation be managed? If not, is there an intermediate target than can be achieved?

• ***Timely*** – this is the one people argue about and there is no right answer. AAIB experience is that putting arbitrary timescales on safety recommendations is not productive; if a body accepts a recommendation, it is in their interests to move it at the best pace they can. By the same token, if the addressee is *not* minded to accept the recommendation, putting a time on it is not helpful and may even harm its chances of being accepted. One notable exception is where an action already has a timescale embedded – such as in recommending that, say, a specific Service Bulletin (SB) be made mandatory. However, Annex 13 does require that States (note – meaning an entity within the State) provide a response on their proposed actions within 90 days.

## Follow-up and databases

There are many different models around the world on how safety recommendations are followed and the responses logged and categorised. For most ECAC members, including all EU Member States, the process developed under the ENCASIA has been the Safety Recommendation Information System (SRIS). SRIS has been developed largely under the auspices of one of the working groups that were initiated by ENCASIA shortly after its formation. Essentially, ENCASIA Working Group 6 (WG6) is a voluntary partnership between State investigators, the European Commission, EASA and others, to address the subject of safety recommendations, developing SRIS and working towards consistency and common procedures amongst the ENCASIA States. The SRIS is a part of ECCAIRS (European Co-ordination Centre for Accident and Incident Reporting Systems) and provides the means to implement Article 18 of EU996 – to record safety recommendations and their responses. It also allows for an analysis of the database with the results being presented in the ENCASIA annual safety report.

Article 18 also requires the addressee of a safety recommendation to respond within 90 days about actions they propose to take. Within 60 days of receiving the response, the State investigation authority that made the recommendation assesses the adequacy of the response, which should include the proposed actions and the timescales for addressing the safety issue. The safety recommendations on SRIS are publicly viewable on the public SRIS database (http://eccairsportal.jrc.ec.europa.eu/index.php?id=114 ). As of 2018, the various responses are not yet made public – but the intention, as the system develops, is that the responses *will* become accessible to the public at some point in the future. Some SIAs, like the AAIB, publish the responses to their recommendations. In addition, EASA also annually publishes a report containing their responses to any safety recommendation they have received.

Although there is a need for addressees to respond within 90 days of receiving a recommendation, there is no need for them to continue to provide updates on progress. Indeed, EU996 puts the onus on monitoring of the actions to a safety recommendation with the addressee and the authority responsible for civil aviation.

## Safety Recommendations of Global Concern

One area of particular recent interest in ICAO has been the idea of identifying the most far-reaching safety recommendations as being SRGCs – Safety Recommendations of Global Concern. This was first mooted at the AIG divisional meeting in 2008 and received broad support. Developing that SRGC concept has been (as with all things ICAO… ) gradual, and in the AIG Panel (AIGP/4) in 2018 there was discussion on two topics:

1) *The obligation for States to provide SRGCs and their responses and to assess them.*
2) *The obligation for ICAO to record the SRGCs and their responses in a central database, to efficiently process and monitor its content and to ensure its completeness.*

This again is an area in which the ENCASIA, with its tighter grouping of States and more frequent face-to-face meetings, has been able to push ahead, developing and implementing the ENCASIA equivalent – the SRUR (Safety Recommendation of Union-wide Relevance). These SRURs are identified and communicated to all EU AIAs and also reviewed annually by ENCASIA WG6, with publication in the ENCASIA annual report.

## Safety actions

One curious thing that a number of State investigation authorities, such as the AAIB in the United Kingdom, have noticed in recent years has been a decrease in the number of safety recommendations that are being made. One factor in this decrease appears to be that the bodies (regulators, manufacturers, air traffic systems, operators) who might have received safety recommendations in the past are now much more safety-conscious and proactive in the investigation. In other words, they would rather have taken safety action already than await a safety recommendation in a published report. This is very understandable and certainly commendable. To support this, some investigation authorities, including the AAIB, will now give the same highlighted prominence to a safety action in the published report as to a safety recommendation. This seems a very positive trend.

## The future?

The business of writing and publishing safety recommendations does appear to be moving in the right direction. The process is now approached more carefully and professionally in the SIAs and the results are more closely followed, particularly by the major regulators such as EASA. Some addressees are not as conscientious as EASA and the FAA in monitoring the progress of the actions described in the 90-day initial response. This remains a challenge but is balanced by the greater willingness to take proactive safety actions.

Two other challenges are how to measure the effectiveness of the acceptance of a safety recommendation and how to ensure that acceptance of a safety recommendation does not bring about unintended consequences. Neither is easy to address – if they were, the aviation safety community would have done so years ago! But they are a constant reminder that aviation safety is always a collaborative venture, that none of us have all the answers and that, coming back to ICAO Annex 13, a safety recommendation is, simply, *'a proposal'.* ■



**Robert Carter** is a Principal Inspector with the Air Accidents Investigation Branch. He joined the AAIB in 1985 and has participated in a wide range of civil and military investigations. These have included the PanAm B747 at Lockerbie (1988), the British Midland B737 at Kegworth (1989), a Garuda A300B4 in Sumatra (1997), the Air France Concorde at Paris (2000) and the British Airways B777 at Heathrow (2007). Prior to the AAIB he worked in the USA as a flight test engineer at Sikorsky Aircraft for nine years, following an engineering undergraduate apprenticeship at the British Aircraft Corporation at Weybridge and graduate study at Cornell University. In 2017 he was elected Chair of the ECAC Air Accident and Incident Investigation Group of Experts (ACC), where he follows in the footsteps of Paul-Louis Arslanian and Jurgen Whyte.

# Implementation of the just culture concept in safety investigations

**Rémi Jouty**
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**The concept named "just culture" was formalised and promoted by EUROCONTROL in the 2000s to encourage more reporting of safety problems by those on the front line (notably pilots and air traffic controllers) so that their feedback would be available and could be used to improve safety. The main objective of the just culture is to improve the analysis of incidents, including those which are minor, by protecting those who may have caused the incident so that they are encouraged to report it without the fear of actions being taken against them. In this context, they would feel freer to share important information for flight safety which would otherwise be unknown.**

The safety investigation is first and foremost interested in the accidents themselves; its mission is to understand what happened, with the sole objective of improving safety, without apportioning blame or liability. There is a shared logic between the just culture concept and the safety investigation: to have a reporting system in operation to improve safety and to avoid the apportioning of blame or liability holding back or contaminating this process.

The working paper 33, initially prepared by EUROCONTROL and then finalised during ECAC's expert group on aircraft accident and incident investigation (ACC) meetings, was presented by France, on behalf of the European Community and its Member States, by the other ECAC Members States, and by EUROCONTROL, to the ICAO Accident Investigation and Prevention (AIG) Divisional Meeting in 2008. This paper encouraged the application of this just culture concept, as far as possible, in the accident investigation field. A definition was also proposed: "A culture in which front line operators or others are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but where gross negligence, wilful violations and destructive acts are not tolerated". The divisional meeting came up with the Recommendation 1.7/1 to further study the protection of safety data, i.e. that ICAO undertakes a study with the aim of reviewing and facilitating the implementation of paragraph 5.12 and Attachment E to Annex 13 of the Chicago Convention. That study was undertaken by an ad hoc task force and a group of experts who proposed amendments to Annex 13 and Annex 19.

Since the presentation of this working paper, Regulation (EU) No 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, and amendments 14 and 15 of ICAO Annex 13 on Aircraft Accident and Incident Investigation, introduced modifications inspired by this concept of a just culture. This is identified in recital 24 of Regulation (EU) No 996/2010: "the civil aviation system should equally promote a non-punitive environment facilitating the spontaneous reporting of occurrences and thereby advancing the principle of "just culture"".

A just culture seminar [1] took place on 19 April 2012 to debate on how to better protect reporters and information. The conclusions of that seminar paved the way for the new legislation on occurrence reporting.

### Can the concept of a just culture be fully applied in the safety investigation of an accident? How and up to what point is it implemented today?

The concept of a just culture in the systematic analysis of incidents, safety information and human failures and errors without immediate serious consequences, is now well established with the generalisation of safety management systems (SMS). The latter encourage and organise this type of reporting among civil aviation actors. A regulatory framework was defined at the regional level – with Regulation (EU) No 376/2014 on the reporting, analysis and follow-up of occurrences in civil aviation, which henceforth defines just culture [2] – and at the international level with

(1) https://ec.europa.eu/transport/modes/air/event/seminar-just-culture-context-occurence-reporting-schemes_en

(2) 'Just culture' means a culture in which front-line operators or other persons are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which gross negligence, wilful violations and destructive acts are not tolerated.
*Note:* this definition was first introduced in the European legislation in conjunction with the introduction of the Single European Sky package. Just culture was defined in Article 2.k of Commission Regulation (EU) No 691/2010 of 29 July 2010 laying down a performance scheme for air navigation services and network functions. Follow-up regulations endeavoured to measure the level of presence and corresponding level of absence of just culture in Member States and in their air navigation service providers.

the publication of the new ICAO Annex 19 on the safety management activities carried out by States and organisations.

However, it cannot be ignored that there are differences between the analysis of incidents, small daily errors and safety information in an organisation, according to the just culture concept, and the collection and analysis of information as part of a safety investigation.

The safety investigation applies to a serious incident or accident and is carried out by an official investigation authority, independent of the organisation in which the event occurred. The increased seriousness of the event, notably when there are serious or fatal injuries, naturally creates a situation where high societal pressure also leads to consider possible liabilities, even when there is no indication of gross negligence, wilful violations or destructive acts. The media turmoil and the expectations voiced by air accident victims and/or their families push in this direction. The considerable decrease in fatal accidents in commercial transport has led to the paradoxical situation of considering that the accident, which has become rarer and rarer, is unacceptable and that guilty parties must thus be found. Society demands punishment for such events, whereas conversely, the just culture concept considers safety events as valuable and makes them the driving force for safety improvements. This rejection of the accident at the very least, leads to the initiation of proceedings for compensation.

Criminal investigations for involuntary manslaughter or unintentional injuries are also opened more and more frequently, even when there is no evidence to think that gross negligence could have contributed to the event. It has sometimes happened that criminal proceedings have been started for endangering the lives of others and for psychological injuries, for dramatic serious incidents or accidents, but in which no passenger was physically injured. These situations have occurred in numerous Latin-culture countries. This trend has also appeared more and more frequently in countries where the initiation of criminal proceedings was reserved for proven cases of gross negligence, wilful violations and destructive acts. We are thus a long way from the concept of just culture. Moreover, the initial idea of the just culture protecting the author of an error which led to an incident so that he or she reports this incident as otherwise it would remain unknown or little known is not really applicable to an accident with visible consequences.

Despite these expectations and changes seen in society, the safety investigation process must nevertheless endeavour to limit itself to its sole aim of preventing future accidents and to not enter into the apportioning of negligence or liability. This is necessary in order to continue to have access to useful information and to produce credible and convincing investigation reports in order to drive, by means of the report's recommendations, the changes designed to improve safety. All the same, the safety investigation process cannot ignore the expectations regarding the apportioning of negligence and liability, and the possible existence of legal proceedings to this end. Neither can it pretend to stand in the way of such proceedings being carried out. This potential coexistence of a non-punitive reporting process within the aviation world, and the process of apportioning liability outside aviation, constitutes a fundamental difference with the initial concept of a just culture, which considered that an event where the causes clearly appeared to not arise from gross negligence, should not lead to actions being taken, or the search for actions to be taken, but be solely analysed for safety purposes. Conversely, when there is unquestionable gross negligence, the events should trigger legal actions and are thus no longer part of the reporting to improve safety process.

**The application of the just culture concept to a safety investigation thus had to be adapted and was the subject of special provisions,** which appear notably in Regulation (EU) No 996/2010 and in the latest amendment of Annex 13.

In the first instance, by acknowledging the possibility of a judicial investigation and by considering that the judicial investigation and safety investigation are interested in one and the same event, these new rules and guidance also allow certain elements of factual evidence to be shared between the safety investigation and the judicial investigation. The European regulations acknowledge this reality in a particularly explicit way by requesting (art 12.1) that the judicial authorities are consulted before any examination which could modify, alter or destroy physical evidence. However, as the judicial systems and practices in the various States are very different, the European legislator, like ICAO, has renounced precisely stipulating the conditions of this cooperation and refers to the establishment of advance arrangements at national level (art 12.3 of Regulation (EU) No 996/2010 and the note associated with the Recommendation 5.4.4 of Annex 13).

The European legislator and ICAO have also specified that certain sensitive information should only be used in the context of the safety investigation. This concerns notably witness statements, their identity, information on the health of the individuals involved and cockpit voice recordings.

When taking the witness statements, we find the initial logic of the just culture concept, which is to encourage individuals able to supply useful safety information to do so, without fearing the consequences in terms of legal proceedings, both for themselves and for others where witnesses could be required to report on acts. However, this logic finds limits in the context of an investigation into an accident.

Firstly, the same witnesses may also be called on to give witness statements by the judicial investigation. This is notably the situation commonly encountered in France. The concept of protecting the witness statements obtained by the safety investigation then loses some of its meaning insofar as the same information can be independently obtained by the judicial authority. In certain countries, the principle of non-self-incrimination can limit the extent of witness statements obtained in the context of a judicial proceeding. The stake regarding the protection of witness statements provided in the context of the safety investigation will then be greater.

Secondly, the safety investigation will generally have to include witness statements in its report, thus making them publicly accessible, with the possibility of them being used in legal proceedings even if the foreword of the report always states that the investigations are conducted with the sole objective of improving aviation safety and are not intended to apportion blame or liability. To comply as closely as possible with the principles of just culture, the safety investigation authority strives to include only excerpts or summaries from the witness statements which are strictly necessary for the understanding of the event and to avoid any wording which could be interpreted as pointing to blame or liability. Moreover, names are never mentioned in reports in accordance with article 16.2 of the Regulation (EU) No 996/2010, which states that "the report shall protect the anonymity of any individual involved in the accident or serious incident".

Other sensitive information – and particularly useful for understanding accidents – is the cockpit voice recording. The international aviation community, and notably the pilots, are particularly attached to the protection of this information, which can affect their privacy. The stake here goes beyond protecting the author of the informa-

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tion (the pilots are unfortunately often among the victims in the case of a fatal accident) but rather aims at safeguarding the availability of the information for all future accidents. The associations representing the pilots, at world level, have only accepted that the cockpit conversations are recorded on the basis that solid guarantees are given as to the protection of this information and to it not being disclosed to the public. New developments improving the availability and the quality of this information (for example the recent increase in recording time or further on in the future, the possibility of recording images) could not be or will not be introduced unless it is shown that the planned protections are actually complied with.

However, the European legislator, like the ICAO bodies, has provided for exceptions to the protection of sensitive information. Article 14.3 of the European regulations states that "...the administration of justice or the authority competent to decide on the disclosure of records according to national law may decide that the benefits of the disclosure of the records referred to in paragraphs 1 and 2 *(sensitive information)* for any other purposes permitted by law outweigh the adverse domestic and international impact that such action may have on that or any future safety investigation." Article 5.12 of Annex 13 develops a similar logic: "The State conducting the *(safety)* investigation of an accident or incident shall not make the following records available for purposes other than accident or incident investigation, unless the competent authority designated by that State determines, in accordance with national laws and subject to Appendix 2 and 5.12.5, that their disclosure or use outweighs the likely adverse domestic and international impact such action may have on that or any future investigations."

It is thus acknowledged that although highly desirable from the standpoint of the safety investigation and the improvement of aviation safety, the protection of this information cannot always be maintained in the case of an accident, notably to meet other societal expectations supported by legal proceedings, even in the absence of gross negligence. Today, in a world where transparency is a cardinal virtue, it is practically impossible to ask families of victims of a major disaster to accept the idea that a legal proceeding to identify liabilities will not have the right to obtain knowledge of the content of the cockpit voice recorder to do this. A more realistic compromise could be to ensure, as required by article 5.12.5, that the audio content of the cockpit voice recorder is not disclosed to the public when this record is used in a legal proceeding.

An important element to ensure that the safety investigation corresponds as closely as possible to the spirit of the just culture concept, is the writing of the final report. This report will be read by readers with diverse interests. The media will often want to find in it a quick and simplistic reading of the causes of the accident and will want to see, for example, the contributory factor of the aircraft design placed in opposition to that of the airline company or the behaviour of the pilots. The families of victims and the parties in any possible legal proceedings will scrutinise it for elements to build a case to apportion blame or liability.

The addressees of the safety recommendations which conclude the reports could be seen, in a very short-sighted way, as designating potential "guilty parties". This is why article 17(3) of Regulation (EU) No 996/2010 anticipated this incorrect interpretation by specifying that a safety recommendation shall in no case create a presumption of blame or liability for an accident, serious incident or incident. In the United States, the legislation goes even further as rule 407 of the Federal law specifies that it is not admissible to judge an individual in

the light of the safety measures taken after the accident.

The fact that the report is public allows it, in the judiciary system of numerous countries, to be added to the judicial file, despite the same foreword similar to that of the safety recommendations mentioning that this report is not to be used to apportion blame or liability. The judicial system of other countries integrates the concept of "admissible evidence", which in theory would exclude the use of the investigation report in legal proceedings establishing liability. However, appeals in countries having this type of approach have concluded that the factual part of the investigation report was admissible in a legal proceeding, on the grounds that notably, the data collected by the investigation authority was quality data, owing to the authority's specific expertise, and that in this way, the duplication of investigations was avoided. The investigation authority must therefore be aware of the various readers, and the various uses that may be made of its report, while keeping in mind the goal of safety improvement and thus the necessity, first and foremost, of being convincing for the readers who are able to take the safety measures suggested in the report.

This requires careful writing of the report, to avoid wording which could appear accusatory or may lend itself to unwanted interpretations. This also means that preliminary thought must be given to the choice of information to be shown in the report, in order to provide all the elements necessary to convincingly support the analysis and conclusions, to not leave the authority open to accusations of insufficient transparency while omitting unnecessary information connected, for example, to the private life of the individuals involved. Particular attention must be paid to the narration of a possible human error. A simple narration of this, without explaining the work organisation context in which the error is said to have occurred, will usually not make it possible to draw up safety lessons, and will open the way to simplistic interpretations in apportioning liability.

**The form of the just culture concept in the safety investigation field thus has to be adapted, which moves it away from the simplicity of the initial concept, in order to take into account the specific context of an aviation disaster.** The safety investigation cannot ignore the other societal expectations emerging in reaction to an aviation disaster. The initial just culture concept aims at protecting information sources (in a non-punitive environment) whereas the protections introduced in the safety investigations protect, above all, the use of the information itself. However, exceptions have to be provided for in the protection of safety information, even that acknowledged as sensitive. Regulation (EU) No 996/2010 and the latest amendments to Annex 13 and ICAO DOC 10053 now provide useful and enhanced legal tools and guidance for safeguarding the specificity and objectives of the safety investigation, despite more and more pressing expectations regarding the apportioning of liability. In addition to these legal tools, the safeguarding of the finality of the safety investigation also largely depends on the determination, attention and sense of proportion of the investigators. Experience shared between investigators, as facilitated by the ECAC Air Accident and Incident Investigation Group of Experts, greatly helps those investigators, coming from countries with different legal systems, to succeed in reaching the sole objective of the safety investigations: the prevention of accidents and incidents, and not the apportioning of blame or liability. ■

**Rémi Jouty,** *ingénieur général des ponts, des eaux et des forêts*, took over as director of the Bureau d'Enquêtes et d'Analyses (BEA) on 1 January 2014. Currently, he also chairs the European Network of Civil Aviation Safety Investigation Authorities (ENCASIA) and is the deputy chair of the ECAC Air Accident and Incident Investigation Group of Experts (ACC).

Mr Jouty began his career in aeronautical research at the French Directorate General of Armaments (DGA) where he managed the programmes on aerodynamic and flight dynamics from 1987 to 1995. From 1995 to 2006, he dedicated himself to aviation safety at the Directorate General of Civil Aviation (DGAC) in the aeronautical training and technical control service (SFACT) (which became the safety control directorate (DCS) in 2005). He oversaw all activities related to certification and continuing airworthiness of French-designed or registered public transport aircraft. In a European context, he ran the international teams responsible for the A330 and A340, then the definition of the certification conditions for the A380. He organised the gradual transfer of type certification activities for transport aeroplanes and helicopters to the European Aviation Safety Agency (EASA) and implemented the new European regulation on aircraft maintenance and the issuing and continuation of individual airworthiness.

From 2006 to 2008, he took over as head of the investigation department at the BEA, and was then asked in January 2009 to assist the director of the civil aviation security branch (DSAC), the DGAC's oversight authority with 1300 staff. While there, he oversaw the process of risk evaluation and reduction. Mr Jouty is a graduate of the *École Polytechnique* and of the *École Nationale de l'Aéronautique et de l'Espace* (ENSAE).

# U-Space as a prerequisite for scalable UAS operations [1]

**Marcel Kaegi**
*Legal and international affairs officer,*
*Federal Office of Civil Aviation (FOCA) of Switzerland*

**Applications of Unmanned Aircraft Systems (UAS) are growing rapidly. They are used for a wide range of tasks, including logistics, surveillance, geo information or agriculture, and their economic significance is assessed to grow rapidly in the future [2]. Worldwide, civil aviation authorities (CAAs) are working on regulatory frameworks for UAS.**

In many major aviation regions, convergence towards a risk-based and operation-centric approach based on recommendations from the Joint Authorities for Rulemaking on Unmanned Systems (JARUS) is becoming apparent. This approach allows CAAs and industry to address safety for a wide range of different UAS operations. However, it is becoming increasingly clear that a risk-based approval process is merely a necessary, but not a sufficient, condition for the scalable use of UAS technology. UAS Traffic Management (UTM), which in Europe is commonly referred to as U-Space, is increasingly seen as an additional prerequisite to enable sustainably scalable UAS use.

U-Space is commonly defined as a set of services intended to enable sustainable, efficient, safe and secure access of a large number of UAS to airspace. It is not limited to a particular airspace, but is relevant for all types of UAS, all airspaces and all types of missions, including interaction with manned aviation. U-Space services will be provided in a connected manner, based on open protocols that enable maximised synergies with regard to the use of data between services, and with a high degree of automation, minimising the need for human intervention. Initial applications of U-Space are being used and further developed in various major aviation regions worldwide, based on the integration of existing technologies [3].

This article first looks at the regulatory approach commonly used for UAS and establishes the main rationale as to why U-Space is needed in the context of this approach (section 2). It then describes necessary actions from the point of view of CAAs and governments more generally in order to move forward, using experience gained in Switzerland on the establishment of initial U-Space services as examples (section 3). In general, the article focuses on safety, but addresses regulatory approaches for the protection of other public interests such as security, privacy or environmental protection, when appropriate. It does not go into technical details but tries to stay at a conceptual level, while referring to existing and emerging publications for details.

## Regulatory approach for UAS

The reason for the appropriateness of a risk-based approach for UAS operations safety regulation is straightforward: with the exception of UAS carrying people on board [4], the risk emanating from a UAS is differently structured compared to that of manned aviation. In the case of the latter, regulation is focused on protecting people on board an aircraft, which indirectly protects people in other aircraft, as well as people and property on the ground. For example, this leads to a rather rigorous approach for aircraft type certification, because regardless of the intended operation, the risk of people on board needs to be mitigated to an acceptable level.

In the case of UAS, the mitigations required to ensure an acceptable level of safety depend on the

(1) The author would like to thank all colleagues within and outside the Federal Office of Civil Aviation (FOCA) involved in the subject. In particular, he would like to thank Lorenzo Murzilli, who leads the FOCA's U-Space Working Group.
(2) See for example assessment by the European Commission: http://ec.europa.eu/growth/sectors/aeronautics/rpas_en (last accessed on May 18 2018).
(3) For further details on the definition of UTM and U-Space, see "Unmanned Aircraft System Traffic Management (UTM) Concept of Operations" by Parimal Kopardekar et al. (https://utm.arc.nasa.gov/docs/Kopardekar_2016-3292_ATIO.pdf, last accessed 18 may 2018), the "Drones Helsinki Declaration" of 22 November 2017 (https://ec.europa.eu/transport/sites/transport/files/2017-drones-declaration-helsinki.pdf, last accessed on 18 March 2018), or the "Beijing Initiative" (http://uom.caac.gov.cn/Public/Uploads/2018-03-22/5ab3647b17a2e.pdf, last accessed on 18 May 2018). For an overview of main technology providers, refer to the Global UTM Association (GUTMA), https://gutma.org/, last accessed on 18 May 2018. For the use of the cellular network for UAS operations, see for example the "3GPP TR 36.777, Enhanced LTE support for aerial vehicles" report (ftp://www.3gpp.org/specs/archive/36_series/36.777., last accessed on March 17, 2018).
(4) Commonly referred to as "personal aerial transportation system" (PATS) or "air taxis".

intended operation. If an operation bears higher risk for people in other aircraft or on the ground, more rigorous mitigations are justified; if the risk is lower, less stringent mitigations are acceptable. This means, for example, that for a UAS being used over a rural area or in an airspace not frequently used by other traffic, the applicable risk mitigations will be considerably less stringent compared to when a similar UAS is used over a crowd of people or in busy airspace. For the purpose of structuring applicants' assessment of risk and identifying the level and combination of appropriate mitigation measures, risk assessment processes such as JARUS Specific Operations Risk Assessment (SORA) [5] have been developed and successfully applied by the industry and CAAs.

SORA-based UAS approvals have enabled a wide range of operations to be conducted at an acceptable level of safety. However, it has become increasingly clear that for complex operations (e.g. Beyond Visual Line of Sight in complex airspace) there is a need for dedicated tools to support the SORA risk assessment methodology. This is particularly the case for cities, where UAS operations take place in airspace used by other aircraft, usually due to the proximity to airports or air ambulance flights to hospitals, as well as areas with a dynamic ground risk, like short-term assemblies of people due to events. At the same time, cities are where the use of UAS is economically most interesting. In the absence of U-Space, such operations require inefficient risk mitigations strategies, often involving high human workload for operators, such as calling air traffic control manually, informing operators that are likely to use the same airspace, or ad hoc contact with local police. U-Space services, such as automatic flight approval, dynamic airspace management or deconfliction services, would dramatically increase efficiency of such risk mitigation measures [6].

Major aviation regions, such as the USA, Europe or China have recognised this need and are calling for a rapid development of U-Space. For example, in the Helsinki Declaration [7], the European Commission has identified the need for quick development of a regulatory framework for U-Space to allow the development of a drone services market until 2019. The next section proposes some priorities for such a regulatory framework, along with a rationale as to why certain regulatory actions should be undertaken with high priority.

## Necessary actions to facilitate prompt development of U-Space – regulation and standardisation

Most relevant technologies for a first set of U-Space services already exist today. In China, six individual UTM services providers offer basic U-Space services in various parts of the country [8]. In the United States, the Federal Aviation Administration and private UAS Service Suppliers (USS) are using LAANC (Low Altitude Authorization and Notification Capability) to automatically approve UAS operations in the vicinity of aerodromes. In Switzerland, the Swiss air navigation service provider (ANSP) (Skyguide), together with other stakeholders, has demonstrated the use of a wide range of initial U-Space services during a technology demonstration last year, which is currently being upgraded to a nationwide pilot project [9].

Figure 1 shows an example for such initial U-Space services including dynamic geo awareness and real time traffic information in use in Switzerland today.

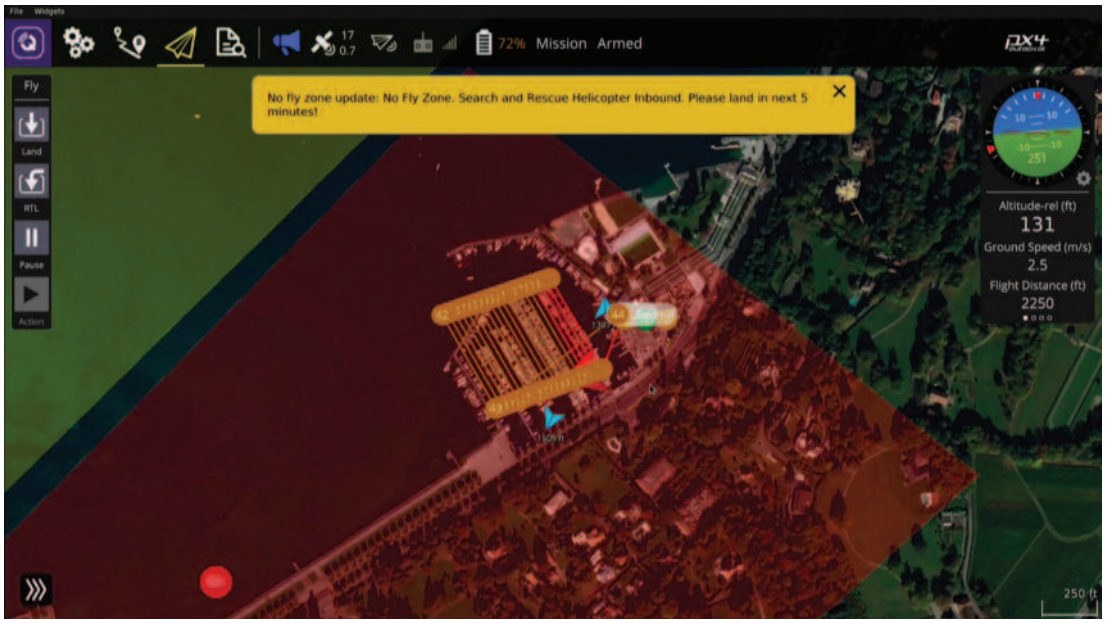



*Figure 1: UAS ground control station software with directly integrated dynamic geo awareness information as well as the location of other traffic as used at a technology demonstration in Geneva in September 2017 (source: Skyguide, PX4, https://www.skyguide.ch/de/events-medien/u-space-live-demonstration/ last accessed on 18 May 2018). In this example, a rescue helicopter is using the same airspace as the UAS. The U-Space provides the relevant information (land immediately) directly to the UAS operator, within the ground control station software, thus not requiring her or him to consult another screen or application.*

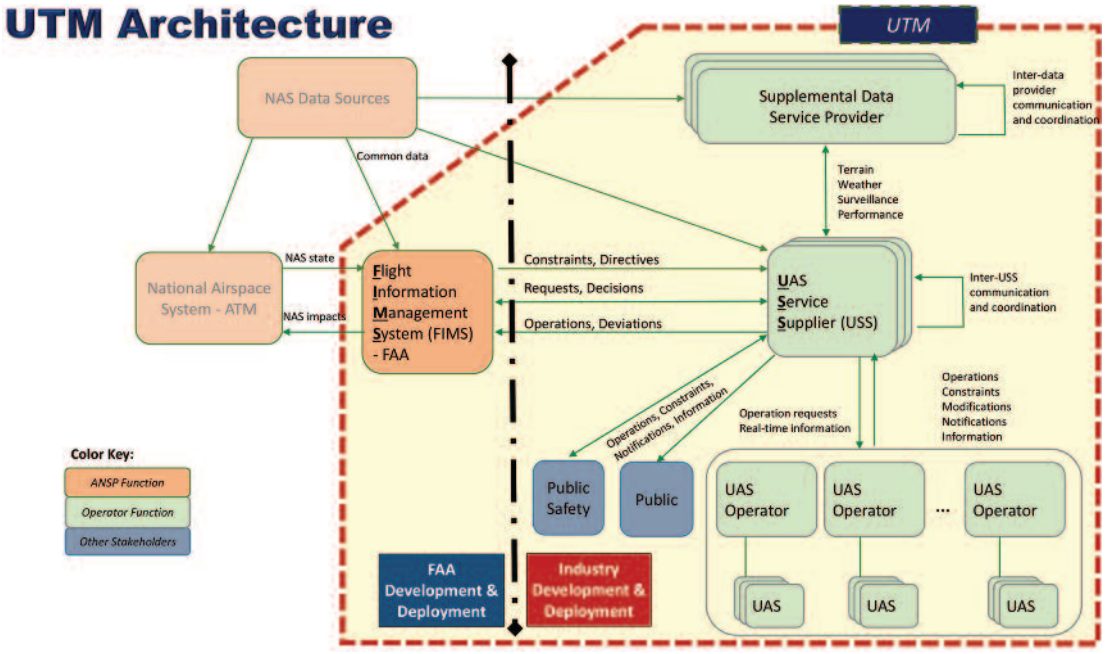



*Figure 2: NASA UTM Architecture (Source: https://www.faa.gov/uas/resources/event_archive/2018_uas_symposium, last accessed on 18 May 2018).*

The challenge for enabling U-Space at a larger scale therefore lies in the integration of existing technologies, which requires legal certainty to attract investments as well as a regulatory framework to ensure the protection of public interests and to inform the necessary standardisation activities. The focus on regulation and standardisation is particularly important because the research and development (R&D) activities linked to U-Space are being conducted in a much more decentralised manner than R&D in manned aviation. Therefore, unlike in manned aviation, trying to steer technology development centrally will most probably not be an effective strategy to enable initial U-Space services. Instead, regulation and standardisation should be prioritised.

For the purpose of regulation and standardisation, a gap analysis of all potentially applicable legal bases will need to be conducted in order to detect inconsistencies. In addition, requirements for various actors in the U-Space will need to be created. For identifying these stakeholders and structuring the regulatory needs (e.g. organisation approvals), exciting proposals for U-Space architectures can be considered [10]. In terms of impact with regard to regulatory follow up [11], the most advanced approach to UTM architecture comes from NASA, as contained in figure 2.

This architecture illustrates the various roles of entities within the U-Space. The functions on the left of the dotted black vertical line will be provided by the ANSP, mostly in a monopolistic manner; those on the right by industry, based on competition. The rules to be developed based on such an architecture will thus not only have to address safety or security related aspects, but also economic aspects, in order to enable fair competition. Particularly in smaller States, the market for U-Space services will most probably be too small to allow for competition from the start. Therefore, it might be necessary to use concepts similar to net neutrality [12] in order to ensure that service providers do not unfairly misuse their market power.

(5) The relevant documentation can be found on the JARUS website: http://jarus-rpas.org/content/jar-doc-06-sora-package (last accessed on 14 May 2018). A new version is foreseen to be published later this year.
(6) JARUS WG-6, which among other tasks is working on the further development of SORA, is currently incorporating the safety impact of U-Space services into the SORA methodology.
(7) The Helsinki Declaration of 22 November 2017 can be found here: https://ec.europa.eu/transport/sites/transport/files/2017-drones-declaration-helsinki.pdf (last accessed on 14 May 2018).
(8) See CAAC UAS Annual report of 2017, p. 39.
(9) See https://www.skyguide.ch/de/events-medien/u-space-live-demonstration/ (last accessed on 16 March 2018) for more information on the Swiss U-Space demonstrator. Other demonstrators are currently planned in the context of the European U-Space Demonstrator Network (https://www.sesarju.eu/news/sesar-launches-call-demonstrations-drone-integration, last accessed 15 March 2018).
(10) For example, see the GUTMA UTM architecture (https://www.gutma.org/docs/Global_UTM_Architecture_V1.pdf, last accessed on 18 May 2018).
(11) §45506 and §45507 require the FAA to develop rules to approve UAS service suppliers (USS) based on this architecture. See https://www.congress.gov/bill/115th-congress/house-bill/4/text, last accessed on 18 May 2018. Google and Airmap have recently demonstrated the use of a standard for USS to USS communication within the same volume of airspace (see https://www.airmap.com/tcl3-project-wing-uss-deconfliction/, last accessed on 17 May 2018).
(12) As contained for example in Regulation (EU) 2015/2120 laying down measures concerning open internet access and amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services and Regulation (EU) No 531/2012 on roaming on public mobile communications networks within the Union.

In addition, in order to allow for U-Space to develop in an incremental manner, regulation will need to take into account the risk emanating from the various services offered. Regulation should be commensurate to this risk, regulating – for example – a provider of weather data differently from a provider of deconfliction information. At the same time, the regulatory approach needs to be "future-proof". U-Space can compensate to a certain extent for the lack of intelligence on the UAS. For example, it can provide functions of detect and avoid if an unmanned aircraft does not have a sufficient level of that functionality on board. Therefore, on a conceptual level, the need for U-Space is high in the short to mid term, where such functions will be costly to integrate in a UAS. However, if UAS will become more autonomous, the need for U-Space services might decrease in the long term.

In addition to the necessary regulation to be devolved and existing regulation (such as the Standardised European Rules of the Air - SERA) to be amended, there will be a need to develop standards. Being based on the principle of a network, U-Space will primarily need data to be exchanged across the network in an appropriate manner. Figure 1 illustrated a basic example for this need for standardisation. In order for information from ANSPs (such as radar data), other drone users and other manned aircraft to be pushed directly into a ground control station of a UAS, all parties need to use an open data exchange standard. A pragmatic approach to introduce such a standard would be to make its use mandatory, by – for example – requiring all UAS sold and used across Europe to use it. Individual States' markets will most probably be too small to make sure that such a standard is used broadly; for this reason, coordinated action is needed. Last but not least, such standards would have to be developed in a technology-neutral manner. For example, already now, there are different ways to connect UAS to a network, for example through the ground control station or through the unmanned aircraft itself (carrying a SIM card or being connected by other means such as satellite).

## Conclusion

The focus of this article was to illustrate the need for U-Space to regulate and manage UAS operations by risk-based and operation-centric approvals. However, U-Space can be used for many other purposes as well. Considering that current technology allows a large majority of UAS to be connected to a network [13], remote identification of unmanned aircraft while in flight could be enabled at marginal additional cost and without the need to equip drones with additional hardware. Furthermore, U-Space can help to automate approval processes for UAS operations, which is another prerequisite for scalability, as authorities will most likely not be able to cope with the increasing demand from operators [14].

Assuming that most scalable UAS operations will require some level of U-Space services, be it to address safety, security or privacy concerns, the challenge for regulators lies in the drafting of regulation that not only ensures the protection of these public interests, but also maximises the amount of synergies that U-Space can bring as an enabler for innovation more generally. Despite these regulatory hurdles to be overcome, there will most probably also be political and economic challenges linked to the introduction of U-Space. In particular, scaling the use of UAS technology will require manned aviation to adapt, in particular regarding the need to equip manned aircraft with technology enabling them to become part of the U-Space. However, this challenge can be reduced considerably if the respective technology will be available at low cost.

In order to make sure that the benefits of U-Space will allow for the scalability of the technology, European aviation regulators should move ahead in a coordinated manner and establish a regulatory framework for U-Space as soon as possible. ■

(13) See for example the "3GPP TR 36.777, Enhanced LTE support for aerial vehicles" report for evidence (ftp://www.3gpp.org/specs/archive/36_series/36.777, last accessed on 17 March 2018).
(14) The FAA in the LAANC programme is already doing this.

**Marcel Kaegi** is currently employed as legal and international affairs officer at the Federal Office of Civil Aviation of Switzerland (FOCA). He is in charge of the coordination and representation of Swiss interests in international decision-making processes in the area of civil aviation safety and the definition of respective strategies. In addition, Mr Kaegi is responsible for national and international regulatory development in the area of emerging technologies, such as civil drones and aviation-related aspects of commercial space transportation. In his previous position as advisor at the permanent mission of Switzerland to the United Nations in New York, he represented Switzerland in the administrative and budgetary committee (Fifth Committee) of the United Nations General Assembly. Mr Kaegi holds a master's degree in political science and law from the University of Bern, Switzerland.

# ECAC Common Evaluation Process (CEP) of security equipment

Interview with **Julien Levet**

*Deputy-head of security measures department, French Directorate General of Civil Aviation*

**Julien Levet (DGCA France) chaired the ECAC Common Evaluation Process of security equipment (CEP) from December 2017 to April 2018. ECAC News asked him to present this Programme he has taken a part in for one year.**

**What is the main objective of the CEP and how is it organised?**

The objective of the CEP is to support the 44 ECAC Member States in their certification or approval of aviation security equipment at the national level.
The CEP is organised as follows:

- Seven participating test centres (HOCAST and DSTL in the United Kingdom, Fraunhofer ICT and the Federal Police Technology Center in Germany, TNO in the Netherlands, STAC in France, INTA in Spain) have been nominated by their States as test centres able to carry out the CEP tests.
- The CEP Management Group consists of five contributing authorities – France, Germany, Netherlands, Spain and the United Kingdom – which have designated CEP test centres. The group is completed by the test centres themselves and the ECAC Secretariat. The CEP Management Group manages the CEP by undertaking, among others, the allocation of equipment to test centres and the endorsement of test reports. The role of the group is to define the procedures of the CEP before their submission to Directors General for approval and to monitor the implementation of the CEP tests. It holds four meetings a year.
- The ECAC Secretariat is in charge of the administration of the CEP and supports the activities of the CEP Management Group. In addition, the ECAC Secretariat verifies the accuracy of test reports provided by participating test centres, issues the 'closing letters' (i.e. the document sent to the manufacturer specifying whether an ECAC/EU performance standard has been met) at the end of the CEP procedure and maintains a list of endorsed configurations on the ECAC website.

*Meeting of the CEP Management Group, November 2017.*

### How does the programme work?

Aviation security equipment manufacturers who wish their configuration to be tested against the performance standards of one of the CEP equipment types submit a request through the ECAC Secretariat for coordination. The CEP Management Group then assigns the request a test centre. For fairness reasons, the manufacturer cannot decide which test centre will carry out the CEP tests.

Once the slot is allocated, the centre performs the test at the time agreed with the manufacturer. The test report is reviewed and endorsed by the CEP Management Group. Further to the endorsement, a closing letter is issued by the ECAC Secretariat to the manufacturer to indicate whether the system, with the tested configuration and Concept of Operation (CONOPS), meets a performance standard.

Whilst the tests of new configurations are known as 'full tests', other processes are in place to run specific tests, such as Simulator Re-Tests (SRTs) designed for detection algorithm changes only. Such flexibility means that the manufacturer can minimise both time spent testing and incurred costs, by avoiding a new full test.

The CEP Management Group has also put in place a Configuration Change Management (CCM) tool to track the different types of changes which can be made to critical elements and which indicates whether a new full test or SRT may be required accordingly.

The performance standards specified in ECAC Doc 30, Part II (13th edition/May 2010) are identical to the standards in the EU regulations currently in force.

### What equipment types are covered by the CEP?

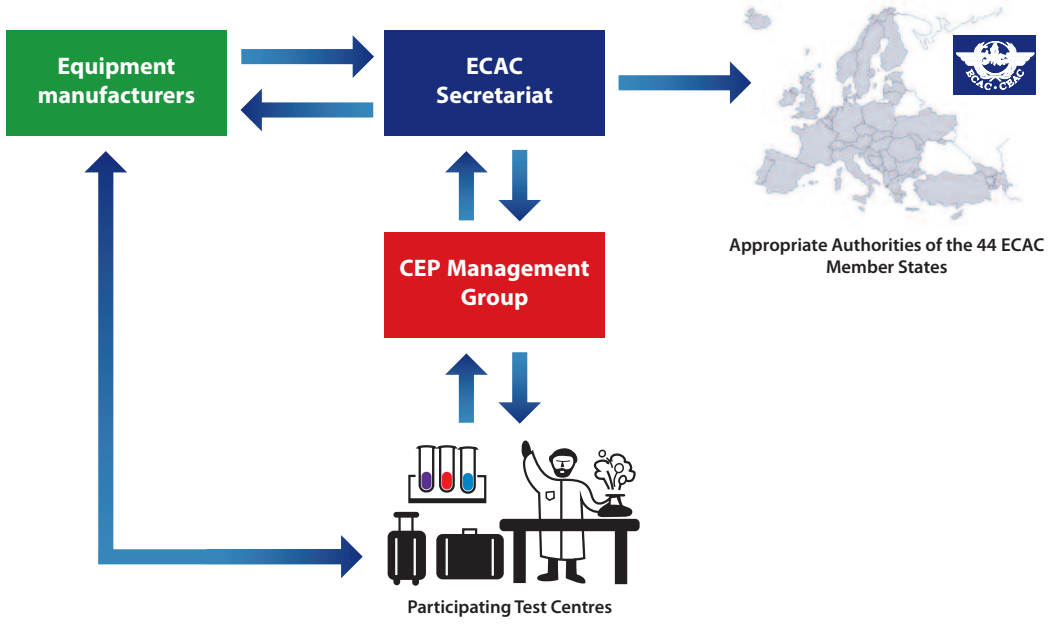
The CEP currently applies to the following different categories of security equipment:

- **Explosive detection systems (EDS)**, used for the hold baggage screening and integrated into the baggage handling system of the airport.
- **Liquid explosive detection systems (LEDS)**, used for liquids screening at checkpoint.
- **Security scanners (SSc)**, used for screening passengers at checkpoint.
- **Explosive trace detection (ETD) equipment**, used for screening passengers, baggage and cargo.
- **Metal detection equipment (MDE)**, used for screening cargo.
- **Explosive detection systems for cabin baggage (EDSCB)**, used for the screening of the cabin baggage at checkpoints.
- **Walk Through Metal Detection (WTMD),** used for screening passengers at checkpoint.

### When was the CEP developed, what is its background?

In 2006, Directors General of Civil Aviation of the ECAC region decided to elaborate a technical and legal framework for a Common Evaluation Process of security equipment (CEP) for aviation security.

They endorsed the principle that we should share our expertise by having joint testing of security equipment organised by ECAC in order to provide a common reference for national administrations, which are responsible for certifying that security equipment meets the technical specifications adopted at EU/ECAC level. It took several years to finalise this process, which entered into operation in 2010 with the first testing of explosive detection systems (EDS) for hold baggage screening.



*Information session for manufacturers involved in the ECAC CEP, Paris, November 2017.*

Through the years, this process has improved a lot and grown to apply to all aviation security equipment, with the exception of those types using x-ray technology, since it has no performance standards as the image is analysed by an x-ray operator.

The CEP is widely internationally recognised and often required as part of international tenders launched by States or airports for the purchase of new security equipment. All 44 Member States recognise the CEP as a basis of their national certification of equipment or as a prerequisite for the deployment of equipment at their airports. Most actually recognise ECAC closing letters in their national legislation.

### What are the benefits for ECAC Member States?

The CEP is based on cooperation. It encourages Member States to exchange and compare views, techniques, methodology and information. It is a mutually beneficial mechanism and it contributes to improving the level of security in ECAC Member States. It is outcome-oriented, no matter the technology used. Individual countries can apply more stringent measures (MSMs, e.g. requiring both detection and identification, more threats, lower false alarm rates, no radioactive sources, etc.). It also enables the harmonisation of the evaluation of aviation security equipment in 44 countries. The process sets a platform for national certification, benefitting both Member States and manufacturers and delivering a common roadmap for detection performances.

The CEP provides a robust and flexible system for laboratory-standardised tests of aviation security equipment and results are recognised throughout ECAC Member States. The programme is expandable to new aviation security equipment categories, open to additional contributing authorities and test centres and recognised by States beyond the ECAC region, such as Australia, Canada and China.

### And for security equipment manufacturers?

The CEP provides a clear and stable regulatory framework: this is paramount for the manufacturers, in the sense that they can make appropriate investments in the development of aviation security equipment.

Moreover, the programme allows access to the aviation security market in the 44 countries constituting the ECAC membership, a reference in the aviation security world and a roadmap of the aviation security market for the coming years.

The CEP works in close cooperation with the industry taking into account remarks or suggestions. This dialogue is essential. From a more formal point of view, the CEP organises a meeting with all stakeholders every year.

### What are the next steps?

The CEP will continue to improve its mechanism for the benefit of the ECAC Member States and the industry. After walk-through metal detection (WTMD) in 2018, new extensions to the CEP will continue, for instance with explosive vapour detection (EVD) systems.

### On a more personal aspect, what do you learn from this experience?

I am really impressed by the level of expertise and professionalism of the persons involved in the process. There is a real willingness to cooperate having in mind the common interest of all ECAC Member States. This cooperation is very unique and seen as an example by other regions in the world. An amazing job has been accomplished to improve the system to make it more effective. I am convinced this will be continued in the future under the chairmanship of my successor, Mr Uwe Richter (Germany). ■

**Julien Levet** is a legal expert within the French Directorate General of Civil Aviation. He graduated in international/European law and in political science. After six years as a legal consultant in the European and international legal department, and two as EU policy officer at the DGAC, he served for four years as a civil aviation attaché at the French Embassy in Moscow, Russian Federation. Since September 2016, he has been deputy head of the department of aviation security measures at the DGAC, where he contributes to managing the definition and implementation of the national aviation security policy. Mr Levet represents France in the European Commission's Aviation Security Committee.

## Directors General of Civil Aviation gather for their 150th meeting
### Paris, 14-15 May 2018

Following a closed session on 14 May, Directors General were joined on 15 May by observers EASA, EUROCONTROL, the European Commission and ICAO EUR/NAT to review ongoing aviation activities and policy issues.

Much of the discussion centred on the European priorities and key messages in view of the upcoming discussions on CORSIA in the ICAO Council (June) and other major ICAO events in the year, such as the 13th ICAO Air Navigation Conference (October) and the 2nd ICAO High-level Conference on Aviation Security (November). Helene Jansson-Saxe, Representative of Sweden/NORDICAO States on the ICAO Council, presented recent developments in the ICAO Council and the main outcomes of its 213th Session, while the exiting European Union Council Presidency (Bulgaria) and forthcoming Presidency (Austria) shared their main priorities for 2018, joined in doing so by the European Commission. Directors General also heard from EUROCONTROL and EASA, who shared the latest developments in safety and ATM matters, and from the US Federal Aviation Administration, who presented their progress and positions on CORSIA-related topics in anticipation of the next ICAO Council Session.

In a session dedicated to reviewing progress in the implementation of ECAC's 2016-2018 Work Programme, Directors General appointed Michael Lunter (Netherlands) and Urs Ziegler (Switzerland) as chair and vice-chair of the European Aviation and Environment Working Group (EAEG) and the ECAC Environmental Forum, roles which they will rotate on an annual basis. Directors General also appointed Halla Sigurdardottir (Deputy Director General, Iceland) as the new chair of the ECAC Facilitation Working Group, and formally adopted the amendments to ECAC Doc 30, Part I on Facilitation. This 12th edition will be available on the ECAC website.

Finally, Directors General endorsed the ECAC Work Programme for the next three years, which will be formally approved at ECAC's 36th Plenary (Triennial) Session in Strasbourg (10-11 July 2018).

## First Coordinating Committee meeting of 2018 • Paris, 28 March

The members of ECAC's Coordinating Committee met in Paris on 28 March. They were joined by Filip Cornelis representing the European Commission.

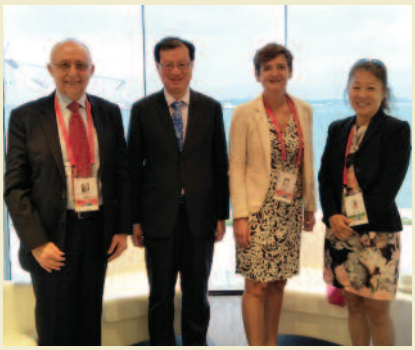
Member States' responses to the ICAO State letter on CORSIA Standards and Recommended Practices (SARPs) were a key focus of the discussions. The Committee reiterated its commitment to support the implementation of the CORSIA SARPs, and the importance of ECAC delivering capacity-building activities to ECAC Member States and to States in other regions. The proposed 2019-2021 Work Programme was endorsed with one pending issue and the Committee agreed to submit it for consideration to Directors General at their next meeting in May.

The meeting also discussed the preparations for the ICAO Air Navigation Conference in October 2018 and underlined the importance of coordinating with other ECAC groups on cross-domain issues, such as cyber security, and with other States and regional organisations in seeking support for European papers. Other issues addressed during the meeting included the status of ECAC's preparations for the 2018 Triennial Session to be held in Strasbourg in July.


*With South Africa Civil Aviation Authority Director Poppy Khoza.*

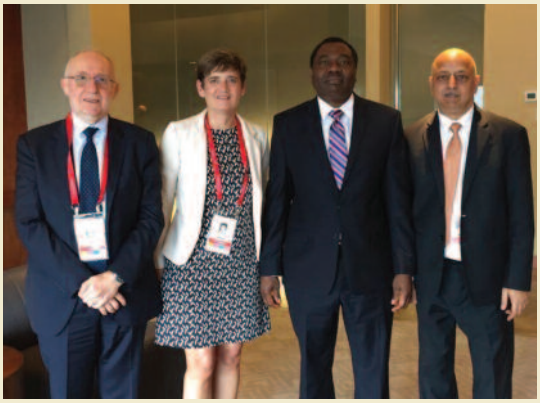
## Europe, Middle East and Africa Summit on cyber security in civil aviation • Bucharest, 7-9 May

ECAC Executive Secretary Salvatore Sciacchitano focused on the ECAC initiatives and efforts deployed to reach a better understanding and mitigation of cyber security threats in aviation, in his keynote address at the ICAO Europe, Middle East and Africa Summit on Cyber Security in Civil Aviation. In a session dedicated to harmonising and strengthening State cyber security frameworks, Mr Sciacchitano emphasised the need to work towards building an international framework which protects aviation – both from a safety and a security perspective – while ensuring the efficiency of the air transport sector.



*With Singapore Permanent Secretary of Transport Loh Ngai Seng and Director of International Relations Eileen Poh.*

*With ICAO President Olumuyiwa Benard Aliu and ICAO Asia and Pacific Office Regional Director Arun Mishra.*



## ECAC President joins global stakeholders at the Singapore Airshow Aviation Leadership Summit • Singapore, 4-5 February

ECAC President Ingrid Cherfils and Executive Secretary Salvatore Sciacchitano attended the 6th Singapore Airshow Aviation Leadership Summit on 4 and 5 February. Bringing together high-level participants from government regulators, the private sector and airline operators, this year the Summit looked at the key issues affecting commercial aviation. The Summit also presented the opportunity for a number of bilateral meetings. Ms Cherfils and Mr Sciacchitano discussed current issues with ICAO President Olumuyiwa Benard Aliu and ICAO Asia and Pacific Office Regional Director Arun Mishra. They also met with their AFCAC counterparts, as well as with Singapore Permanent Secretary of Transport Loh Ngai Seng, and Civil Aviation Authority of Singapore Director General Kevin Shum and Director of International Relations Eileen Poh, to examine ongoing and future areas of cooperation between Singapore and ECAC.

*With Civil Aviation Authority of Singapore Director General Kevin Shum.*


*With Civil Aviation Authority Israel Head of Civil UAS Department Benny Davidor.*


## Executive Secretary speaks at ICAO regional conference addressing common challenges through implementation of the GASeP

### Lisbon, 29-31 May

How ECAC's security activities actively contribute towards implementation of the ICAO Global Aviation Security Plan (GASeP) in the ECAC region was the focus of Executive Secretary Salvatore Sciacchitano's presentation at the ICAO Regional Aviation Security Conference addressing common challenges through implementation of the GASeP, held in Lisbon.

In a session looking at regional initiatives to strengthen global and regional aviation security, Mr Sciacchitano highlighted five objectives in ECAC's 2016-2018 Work Programme which are similar to the GASeP priorities: risk-based approach to security, security technology, efficient implementation of security measures, cooperation and support. He explained how these objectives are achieved through the work of ECAC's security groups and task forces, the ECAC audit, capacity-building and vulnerability assessment programmes, and the Common Evaluation Process of security equipment for 44 Member States, as well as the capacity-building activities of the EU-funded ECAC-implemented CASE (Africa and Arabian Peninsula) Project and joint ECAC/EASA Eastern Partnership and Central Asia (EaP/CA) Project.

## Events to come

**JUNE**

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| 8/ | 4th CASE Project Steering Group meeting (CASE-SG/4), Brussels |
| 8/ | 4th CASE Project Programme Management Committee meeting (CASE-PMC/4), Brussels |
| 11-12/ | 20th meeting of the Behaviour Detection Study Group (BDSG/20), Washington DC |
| 12-13/ | 70th meeting of the Technical Task Force (TTF/70), Paris |
| 19-20/ | 25th meeting of the Security Forum (SF/25), Paris |
| 20/ | 22nd meeting of the ad hoc Coordination Group on security (ADHOC-SEC/22), Paris |
| 21-22/ | 16th annual meeting of ECAC security auditors (AUD/16), Paris |
| 21/ | Workshop on ECAC.CEAC Doc 29, 4th edition – Aircraft Noise Modelling, Berlin |
| 26-27/ | 48th meeting of the group of experts on accident investigation (ACC/48), Bucharest |

**JULY**

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| 5/ | 34th meeting of the Legal Task Force (LEGTF/34), Paris |
| 10-11/ | 36th Plenary (Triennial) Session (ECAC/36), Strasbourg |
| 11/ | 182nd meeting of the Coordinating Committee (CC/182), Strasbourg |
| 19/ | 27th meeting of the Security Programme Management Group (SPMG/27), Rome |
| 25/ | 38th meeting of the Common Evaluation Process Management Group (CEP-MG/38), Paris |

**AUGUST**

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| 28/ | 1st meeting of the European ad hoc coordination group preparing for the 10th ICAO Facilitation Panel (FALP10-ADHOC/1), Paris |
| 29 Aug-1 Sept/ | 67th Special meeting of Directors General of Civil Aviation DGCA(SP)/67, Ponta Delgada, Portugal (Azores) |

## Cargo and mail security mentoring in Kazakhstan • Astana, 15-17 May

The main objective of the mentoring activity was to provide advice on the implementation of cargo and mail secure supply chain requirements based on ICAO Standards and Recommended Practices (SARPs) and ECAC Doc 30 recommendations. The mentoring activity also provided an opportunity to describe best practices for the efficient screening of cargo and mail, and to share implementation guidelines with the Appropriate Authority of Kazakhstan. During the mentoring activity, an ECAC cargo expert provided on-site coaching on the implementation of Doc 30 recommendations in the field of cargo and mail security for the benefit of the entities involved in their implementation.

## Cargo and mail security audit in Ukraine • Kiev, 16-20 April

The cargo and mail security audit organised under the auspices of the EU-funded EASA/ECAC-implemented Project for Eastern Partnership and Central Asia countries (EaP/CA) took place from 16 to 20 April 2018 in Kiev, Ukraine. The main objective of this audit was to assess whether existing aviation security legislation and operational procedures were compliant with international rules and best practice in the field. The audit was based on ECAC Doc 30, Part II recommendations.

## EASA hosts second EaP/CA Project technical board meeting • Cologne, 18 April

The second technical board meeting of the Project for Eastern Partnership and Central Asia Countries (EaP/CA Project) took place at EASA's headquarters in Cologne. The meeting, which was attended by representatives of the European Commission, EASA and ECAC and a representative of ICAO in an observer capacity, acknowledged progress made in implementing the Project and discussed the schedule of activities for the next year. Regarding the Project's security component, which is under ECAC's responsibility, an outline of the activities already implemented was presented and the meeting discussed ECAC's proposal to offer new capacity-building activities for the benefit of Partner States. The meeting also reviewed preparations for the next Steering Committee meeting scheduled to take place on 27 June in Kazakhstan.

## ECAC organises workshop on cargo and mail security • Paris, 6-7 March

ECAC organised its second workshop on cargo and mail security within the framework of the EaP/CA Project.

During the workshop, international and European requirements on cargo and mail security were reviewed as well as the principal concepts surrounding the secure supply chain. Participants also had the opportunity to discuss the practical aspects of the implementation of cargo and mail security measures. Four States delivered presentations on the cargo and mail systems in their own countries.

The workshop brought together 37 security experts from 16 States and AFCAC, as well as representatives of EEA, IATA and La Poste (France).

ASSOCIATED BODY OF ECAC

# News from the JAA Training Organisation (JAA TO)

EDITORIAL

## CAAs benefit from ICAO GSI courses and CAA Cameroon concludes partnership with JAA TO!

**Paula V. de Almeida**
*JAA TO Director*

The Training Needs Analysis (TNA) – a new Program provided by JAA TO and exclusively to ECAC Member States' CAAs – has revealed that many CAAs can benefit from ICAO's "Government Safety Inspectors" training courses. Also known as GSI, these courses contribute to the increase of essential skills and abilities of CAA Inspectors.

For the upcoming session in June, six different CAAs have already registered for the first GSI course taking place in Europe, which JAA TO has taken the initiative to schedule. Additionally, JAA TO has scheduled two more GSI courses to take place in September and October.

JAA TO takes these initiatives in line with its mission of taking aviation safety to higher standards. Also with this in mind, JAA TO has just concluded its first partnership with an African Civil Aviation Authority. JAA TO and the CAA of Cameroon have signed a Memorandum of Understanding on 24 May. Read more about this below.


## GSI courses

The GSI courses were developed as a collaborative effort between ICAO and the Federal Aviation Administration (FAA), so they are very complete and relevant to CAAs. JAA TO is honoured to be the first training organisation in Europe to host them. We do so, as the leading European aviation regulatory training organisation in Europe, Associated Body of ECAC, and the first ICAO Regional Training Center of Excellence (RTCE) of Europe. JAA TO welcomes CAAs to register for:

**ICAO Government Safety Inspector (GSI) Operations – Air Operator Certification – 18700**
*Course Date:* ***04 - 20 June 2018***

This 13-day course aims to provide operations, airworthiness, and personnel licensing aviation safety inspectors worldwide with uniform skills and knowledge to conduct their specific safety oversight functions. It covers the basic concepts and steps involved in certificating air transport operators.
**Learn more at:** https://jaato.com/courses/642/

**ICAO GSI Airworthiness – Air Operations & Approved Maintenance Organisation – 18701**
*Course Date:* ***17 September 2018 - 04 October 2018***

This 14-day course is designed for airworthiness inspectors. It covers the basic concepts and steps involved in certificating approved maintenance organisations and air transport operators.
**Learn more at:** https://jaato.com/courses/647/

**ICAO GSI - Personnel Licensing Course – 18710**
*Course Date:* ***08 - 26 October 2018***

This 15-day course is intended for Civil Aviation Authorities (CAAs) involved in developing or upgrading their own State licensing or PEL system. The course is designed for a group composed of personnel assigned to a CAA's PEL office.
**Learn more at:** https://jaato.com/courses/648/

## About the TNA

The TNA is a program offered free of charge and exceptionally to ECAC Member States. ECAC encourages CAAs to benefit from this service. The ultimate objective is to support the implementation of new or updated regulations, playing a significant part in aviation safety and efficiency worldwide. Would you like to know more? Email training@jaato.com.

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*Director General of the Cameroon Civil Aviation Authority, Ms. Avomo Assoumou Paule Koki, and Director of JAA TO, Ms. Paula V. de Almeida with the delegation from Cameroon.*

## CAA Cameroon concludes partnership with JAA TO!

The Director General of the Cameroon Civil Aviation Authority (CCAA), Ms. Avomo Assoumou Paule Koki, and the Director of the Joint Aviation Authorities Training Organisation (JAA TO), Ms. Paula V. de Almeida, signed a Memorandum of Understanding (MoU) on 24 May 2018 at the JAA TO's Headquarters, Netherlands. Both parties welcomed the agreement, which has the primary objective of setting Cameroon CAA as the JAA TO satellite for the Central African region.

In the short term, JAA TO is to organise a series of open training courses at the Cameroon CAA's Training School. At a later stage, JAA TO will initiate the training and qualification of local instructors, so as to build internal and sustainable capacity towards JAA TO's high quality standards.

It should be noted that the Cameroon CAA is – to date – the only Civil Aviation Organisation in the African region to sign such a partnership agreement with JAA TO. This partnership will undoubtedly propel the viability for increased competency levels of aviation professionals in the African region.


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