



ACTIVITY REPORT CIVILE AVIATION TECHNICAL CENTRE



SUMMARY



EDITORIAL

2020, STAC STAYS THE COURSE IN THE TURBULENCE

The year 2020 was marked for STAC, as for the whole world, by the Covid-19 pandemic. STAC first had to adapt to a brutal change in work organisation, with massive recourse to teleworking. During this period, all STAC staff proved their sense of public service and their ability to adapt. The staff in charge of support functions have greatly contributed to making this continuity possible, showing that any success, at STAC as elsewhere, can only be the result of a shared effort. In this line, you will find after this editorial the testimony of Jacques MALET, head of the ASID department and his deputy Stéphanie CHAYLA.

More than ever, this crisis shows us that nothing can be taken for granted. The air transport sector has already experienced crises, and it will experience others, each one different and therefore unpredictable. In the face of these crises, resilience can only be achieved by constantly questioning our knowledge, by always being attentive to changes in the context, open to innovations and attentive to the expectations of users. This is the attitude that STAC has maintained in 2020, as much or even more than before, despite the health crisis. The risks that threaten our activity are numerous: terrorist actions, global warming, depletion of biodiversity, pollution and nuisances of all kinds. Studying these risks, their impact on airport activity, but also, without hiding from the fact, the responsibility that we all have, as air transport players, to control them, is the condition for the future development of air transport, and this is also the role and responsibility of STAC.

This requirement, within our service, has been translated this year once again into successes of which we can all be collectively proud. In this activity report, you will find evidence of a year that was both unlike any other and yet in keeping with the work of the STAC. In each area, we have not only maintained our activities, but also drawn lessons that will help us to progress further in the years to come.

In order to be always ready to produce reliable results in all circumstances, our quality requirements have been reflected in the renewal of our certification and in our growing involvement in the field of standardisation. Our international involvement has been further strengthened: we remain as active and influential as ever at ICAO, notably within the airport panel and associated working groups. We have strengthened our presence in Eurocae and our involvement in EASA's work, for example on the certification of critical air navigation equipment and airports. Our work on safety has focused on areas as diverse as aeronautical pavements, in particular the reasoned global diagnosis and the GRF (global reporting format), and the consideration of the transport of dangerous materials, such as lithium batteries, which led to contributions to the DSAC symposium on the subject. The STAC is present on emerging subjects, such as drones and vertiports. You will also find in this activity report articles on various aspects of security, such as dog handling, cyber security, and of course the environment, with the presentation of alternatives to the use of phytosanitary products, work on air quality, the optimisation of the use of de-icing products, or the study of the use of hydrogen at airports

So, as you will see from this activity report, we have continued to make progress in keeping STAC at the forefront of expertise and influence in all our areas of activity and we will continue to do so. The crisis in air transport will not stop us from doing so. On the contrary, it is forcing us to do so.

Frédéric **MÉDIONI** Director of STAC

THANK YOU !



SUPPORT FUNCTIONS ESSENTIAL LINK IN THE FUNCTIONING OF THE STAC

The health and economic context that we have been experiencing for more than a year now has also resulted in the implementation of a new working method for most of us. If the deprivation of conviviality remains one of the most painful aspects to manage, the continuity of service has nevertheless been guaranteed thanks to the efficiency of our support functions. The support functions, which normally accompany the "core business" activities of the STAC, have spared no effort throughout the past year to ensure that everyone can carry out their activities without any malfunction.

Thus, whether at the Bonneuil, Toulouse or Biscarosse sites, the agents were able to count on the mobilisation and efficiency of all the divisions of the Administration, Information Systems and Dissemination Department (ASID).

The IT division was very much in demand from the start of the crisis and then to maintain the remote connection facilities. It was the first department to be mobilised to develop methods and tools and to optimise the resources of the teleworking agents. Keeping in touch with the organisation is essential, and the Knowledge Dissemination Division was able to maintain this mission thanks, in particular, to its regular management of the intranet site, which acts as a breadcrumb trail with the agents.

Moreover, working at a distance does not mean putting your skills on hold. Here again, everyone was able to rely on the personnel division to manage their careers or to access all the e-learning training possibilities.

Ensuring the payment of service providers and suppliers, and continuing the awarding of contracts, are also essential to the continuity of the service. Despite the difficulties experienced at times in reaching their external contacts, the Purchasing and Finance Divisions have remained committed to ensuring this continuity of activities.

Finally, when the deconfinement period was initiated, the Service Life division and the support division were the first on the bridge to organise the reception of the agents on site and to maintain the quality of life in terms of logistics and maintenance.

Thank you all for your unfailing commitment!

Jacques MALET, Head of ASID Department Stéphanie CHAYLA, Deputy Head of ASID Department





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QUALITY

QUALITY

STAC LABORATORY ACTIVITY GOING THROUGH THE HEALTH CRISIS

The SARS-Cov2 coronavirus pandemic in the spring of 2020 necessitated the immediate shutdown of some of STAC's activities, including its laboratories.

In this health context, the French Accreditation Committee has encouraged conformity assessment bodies, and consequently STAC accredited laboratories, to assess the impact of personnel lockdown on the maintenance of their accreditations.

Each of the four laboratories conducted an activity-specific impact analysis on the new external risks related to the health crisis and containment on our PR2 (Approve/Certify materials and systems) and PR5 (Perform operational services) processes, by determining whether the objectives per process could still be met for all activities. Coactivity situations that could present risks to the health or safety of staff were identified, as well as additional resources for each laboratory to reduce these risks. The co-activity situations that could be authorized were decided in compliance with the barrier gestures, in view of the knowledge on the virus at that time.

The impact study considered the way in which the shutdown was carried out and the conditions for staff to access the sites. It also considered the impact of the lockdown on our instruments: based on their inventory, it was decided how to treat instruments undergoing calibration at our service providers premises or equipment that was about to reach its calibration anniversary.

Finally, the laboratories conducted a contract review with their clients to redefine needs, priorities and deadlines. This enabled new work programs to be established in order to best reconcile the new deadlines with the clients' needs.

The impact analysis also made it possible to draw up the laboratories' business recovery plans. Thus, a few days after the reopen on 11 May 2020, some laboratories resumed their activities, to the great satisfaction of their sponsors, by putting in place prevention procedures for face-to-face activities.

In June, a wrap-up meeting was organized with all the laboratories to provide feedback on impact analyses and reopen situations and to share the best practices identified.

These works of the STAC laboratories have thus made it possible, in the context of a pandemic, to maintain our accreditations and to resume later normal activities under the best possible conditions.

STAC COORDINATION OF STANDARDISATION

Since October 2020, STAC has been part of the network of standardisation coordinators of the Ministry of Ecological Transition. The role of the network is to promote existing standards that are not always known, to foster their use in support of projects and to better integrate standards into the regulations, by clarifying the mandatory standards. The challenges of standardisation are at national, European and international level in relation to the penetration of each country's industry in these different market sectors. The role of the coordinators is to raise awareness of standardisation among the senior management of the Ministry and to promote the network's services and tools such as Sagaweb/Cobaz.



THE STAC MAINTAINS ITS ISO 9001 CERTIFICATION

On 29 July 2020, APAVE notified STAC of its decision to maintain its quality system certificate according to the 2015 version of the ISO 9001 standard, following the S1 surveillance audit.

The purpose of the audit, which took place from 27 February to 3 March 2020 in Bonneuil-sur-Marne and Toulouse, was to assess the robustness of the processes developed to provide expertise and studies, to disseminate the state of the art in our scope of practice for air transport, in safety, security and in its environmental impact, as well as to assess or approve infrastructure, equipment and systems in these fields.

This audit highlighted among STAC's strengths, the listening to internal and external stakeholders through the "STAC 2035" approach and its high-level experts.

TWO OUTSOURCED COFRAC INTERNAL AUDITS

As part of their COFRAC accreditation, STAC's laboratories and its intercomparison body must plan an internal audit in accordance with NF EN ISO/IEC 17025 version 2017 and NF EN ISO/IEC 17043 version 2010 respectively.

The temporary lack of STAC staff qualified for internal auditing led to the outsourcing of this service in 2020, a move permitted by the standards.

The audits were conducted remotely due to the health situation by major players in the fields: Olivier PIERSON and the company CT2M. Among the strong points identified during these audits, we note the competence of the personnel, the management of skills and a demonstrated traceability of technical operations and management of the health crisis.



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STUDIES AND RESEARCH



OMEGA

AUTOMATION OF ADHESION MEASUREMENTS

Carrying out measurements of the friction characteristics of airfield runways on behalf of the Ministry of the Army, the STAC's Tests and Expertise laboratory also organises inter-laboratory comparison campaigns (also known as "CIL" - 4 to 6 times a year) with self-wetting devices for continuous friction measurement. These campaigns enable the participating companies to obtain an approval certificate for their equipment (subject to validation of their performance), which is a regulatory obligation.

The OMEGA project (Modular Tool for the Exploitation and Management of Adhesion Measurements), which was finalised in 2020 and will be implemented in 2021, has made it possible to develop a Web application that will offer an ergonomic interface for registering and transmitting results to participants. It will allow the laboratory to automate the processes of statistical exploitation, management and saving of all the data from the multi-year inter-laboratory comparison (ILC) campaigns.

In addition to the automatic edition of test reports and other associated documents, this single application will replace numerous tools developed internally over time (Excel workbooks, Limesurvey forms), and will considerably improve the efficiency and, above all, the robustness of the processes for organising and carrying out CILs as required by the French Accreditation Committee (COFRAC).

REASONED GLOBAL DIAGNOSIS OF AERONAUTICAL PAVEMENTS

Visual inspections, characterisation of structures, evaluation of the bearing capacity of the supporting soil, auscultation of the bearing capacity of materials... there is no shortage of technical tests to diagnose the condition of an infrastructure. While the foundations of asset management are focused on establishing technical and practical recommendations for the use and sequencing of each of these tests, the objective of the "reasoned global diagnosis" is to optimise, from a technical and economic point of view, the choice of tests to be carried out in order to carry out a complete diagnosis of a large number of aeronautical areas, or even of a complete platform.

In other words, the objective of the "reasoned global diagnosis" is to use the right tests, at the right times, in the right places. It is therefore a question of building an effective compromise between maximising the collection of technical data and minimising budgetary and operational constraints. In practice, this means segmenting the platform on the basis of the technical and operational data already available, by categorising the areas of investigation over a spectrum ranging from:

- > Areas of little interest either because their condition is already known with a good level of confidence (very satisfactory or very degraded condition), or because they are little used - which do not require further testing or relatively light testing (inexpensive and not very restrictive);
- > critical areas where knowledge is clearly insufficient in view of the operational stakes which require a concentration of technical resources, and often the programming of periods of availability in conjunction with the operators.

Depending on their categorisation, the challenge is to define the precise protocols for carrying out the tests in each area by applying the recommendations described above to the case studies.

This approach was the subject of a project in 2020 which was developed within the framework of the work of the Asset Management WG bringing together the Centre Référent Installations Aéroportuaire (CR-Aéro) of the Service d'Infrastructure de la Défense (SID), the Service National d'Ingénierie Aéroportuaire (SNIA) and the STAC. The objectives for the year 2020 included the formalisation of selection criteria for experimental sites and the identification of a small number of these sites, based on previously defined criteria. Thus, two representative sites with flexible and rigid pavements were selected, one with "hunting" type traffic and the other with "transport" type traffic. In a second phase, work was undertaken to document a procedure for dividing the sites into zones and for scheduling short and medium-term tests.

A macro-test programme has been drawn up by the STAC and shared with the entire Asset Management WG and will be launched within a year on the two bases selected.

STUDIES AND RESEARCH

STAC'S PARTICIPATION IN VARIOUS INITIATIVES ON AUTONOMOUS VEHICLES

On an airport platform, many vehicles circulate on the movement area with the aim of carrying out various transport, maintenance and surveillance functions. The development of autonomous vehicles, vehicles in which all or part of the driving actions have been automated, could make it possible to improve safety (e.g. fewer accidents, better compliance with safety rules) and to meet environmental protection challenges (e.g. optimised journeys, use of clean vehicles, etc.).

The STAC is actively monitoring this subject and is working to better understand the associated impacts. The first French experiment with an autonomous vehicle was carried out airside at Toulouse Blagnac at the end of 2019. During this experiment, an autonomous luggage tractor was able to drive on the platform with the implementation of specific traffic rules (speed limit, priority management, etc.) and dedicated means (traffic lights, road markings, etc.). Questions arose in terms of acceptability and cybersecurity, and a few incidents were noted (geolocation problems, unannounced stops).

These elements reinforced the need for analysis of the specific constraints of the air domain, before being able to move on to a wider deployment.

In order to support the integration of autonomous vehicles on airport platforms, STAC, in partnership with France Aviation Civile Services, is also involved in a European project called AWARD (All Weather Autonomous Real logistics operations and Demonstration). Part of this project includes the testing of an autonomous baggage tractor at Oslo airport in Norway, in difficult weather conditions (fog, snow, etc.). It is in this context that STAC will contribute its expertise on regulatory, safety and environmental issues.

On the basis of the experience gained, STAC will continue to provide support to the CASD and will also contribute to European reflections on the subject. A working group met for the first time in March 2020 and brought together various representatives of civil aviation authorities to share their knowledge on autonomous vehicles.

ASSESSMENT OF THE IMPACT OF THE ADDITION OF QUICK RELEASE LANES AT BASEL-MULHOUSE EUROAIRPORT

At the request of DSNA, a capacity study was conducted by STAC in 2020 at EuroAirport Basel-Mulhouse. Two Quick Release Lanes (QRL) were simulated, one in QFU15 and the other in QFU33 at a distance of 1850 m and 1500 m respectively from the runway thresholds. Their location was determined on the basis of feedback from other hubs, the traffic typology and the spatial constraints of the EuroAirport.

The simulations showed that the reduction in runway occupancy time, combined with a lower separation between aircraft on final approach, could increase the runway throughput by one movement per hour on the simulated traffic peaks, and reduce the regulation time on arrival and the waiting time on departure. In addition, the addition of quick release lanes revealed the need to modify certain taxiways in order to maintain aircraft safety and avoid generating head-on situations.

Further studies, based on other traffic assumptions, could be considered to assess the extent of potential gains from the addition of FGDs.



STUDIES AND RESEARCH

DEVELOPMENT OF A TOOL FOR DETERMINING CHARACTERISTIC TRAFFIC

Among the data required to assess the level of saturation of an existing airport infrastructure or to design a new one, the characteristic traffic level to be retained is crucial, if not the most important.

Noting the shortcomings of existing methodologies, STAC's Airport Safety and Capacity Division set out to develop a new, more robust calculation method. In order to facilitate implementation, a dedicated tool has been designed internally by the STAC teams. Currently in the evaluation phase, it will soon be made available to all via the STAC website.

MACROTEXTURE OF THE TRACKS

The macrotexture of an airport pavement is essential to ensure the drainability of water on the runway, to maintain good skid resistance, and therefore to avoid runway excursions. This is a major safety and regulatory issue. In 2020, new studies on the analysis of the macrotexture of runways were launched. An experiment was carried out to test the capacity of different devices to measure the macrotexture of a grooved runway. In addition, an experimental protocol, in partnership with CEREMA, was set up to measure the evolution of macrotexture as a function of time and traffic on an airport in service. Safer runways, more reliable monitoring and more predictive maintenance are the challenges for tomorrow.





CONTAINMENT OF LITHIUM BATTERIES

During the second half of 2020, STAC and the Directorate General of Armament Aviation Techniques (DGA TA) jointly launched a study on the behaviour of containment devices for portable electronic devices (PEDs) powered by a lithium battery. This equipment for use by air operators is intended to provide assistance to flight crews in the event of thermal runaway of the batteries contained in the PEDs, in the cabin or in the cockpit.

The STAC and the DGA TA have begun a test campaign on this equipment in order to observe its behaviour in the event of a complete thermal runaway of a PED (projections, flames, smoke, etc.). The results of this study should make it possible to reflect on the relevance of certification of this equipment, to establish a suitable test protocol, to develop the intervention procedures of companies and the training of their personnel.

The initial findings were presented at the annual CASD Safety Symposium "Lithium Batteries: Anticipating the Risk of Fire on Board" on 3 December 2020, and have re-launched the debate on the lack of certification for this equipment.



STANDARDISATION AND REGULATION

RMT0161 OR THE CERTIFICATION OF ATM/ANS AND AIRPORT EQUIPMENT BY 2024

EASA is preparing a significant evolution in the ATM/ANS and airport fields. Indeed, through the RMT-0161 working group, the principles of certification of critical equipment will appear by 2024 at the same time as the approval of the organisations responsible for the design, production or maintenance of such equipment. A STAC expert is actively involved in this work, which began in 2020 and will continue at a steady pace over several years.

Largely supported by the European Commission, this development aims to harmonise technical specifications on issues as varied as safety, cyber security, performance and system interoperability and at the same time to guarantee a high level of compliance through the exclusive oversight of EASA as the competent authority. This development also aims to reduce the fragmentation of the European market for such equipment in a more efficient way than the current Single European Sky framework.

STANDARDISATION OF SYSTEMS FOR IDENTIFYING METEOROLOGICAL CONTAMINANTS ON RUNWAYS

STAC continued to lead the European WG-109 working group on standardisation of runway weather contamination information systems, aiming to ensure that aerodrome operators have robust arrangements to facilitate the implementation of the Global Reporting Format.

The work of the working group, which started in 2018 and includes operators, industrialists and authorities from different countries, has resulted in a consensus that has been transcribed into a normative text proposal. The work should be completed in the first quarter of 2021.

EASA RECOMMENDATIONS FOR THE DESIGN OF VERTIPORTS

In order to support the emergence of new aircraft concepts capable of vertical take-off and landing, STAC assists EASA in defining the specifications for the aeronautical infrastructures that will be used to accommodate these aircraft.

These aircraft, known as VTOL (vertical take-off and landing) aircraft, can have very different architectures in terms of propulsion, lift and piloting. Their great diversity, their unprecedented performance and their intended use in dense urban environments raise fundamental questions in defining the characteristics of the vertiports planned for their operations.

ACTIVITY REPORT 2020

STAC A PLAYER IN THE FIELD OF DRONES

The field of drones, an emerging activity with a high technological content, constitutes a field of action for the future for the STAC. Within the DGAC framework, it will be necessary to qualify drone systems, conduct safety studies for specific operations, anticipate safety and security risks, and also open up the field of drone use without loss of capacity for traditional aviation.

The STAC, with its complex systemic and methodological expertise, can partially meet these challenges in the field of airports, security and surveillance. It should also help to support airport operators in their own efforts.

STAC is also a drone operator and will have to develop this expertise in order to advise its various stakeholders. Indeed, for many airport activities, drones offer a potential gain in efficiency: pavement inspection, calibration of visual aids, use in ARFF operations, scarecrowing, biodiversity mapping, noise and environmental studies.

Thus, the STAC's UAV domain will require different types of skills, some directly related to the various jobs carried out within the service, others of a more horizontal, methodological nature.

In order to avoid duplication of effort, it seems useful to coordinate all of this activity. The appointment of a drone project manager in September 2019 is a partial response to this need.

Its role is to share within the department the experience acquired through the various uses of drones, to promote projects aimed at increasing STAC's know-how in this field and to disseminate the evolution of the regulatory framework, which should remain dynamic for a few more years.



STANDARDISATION AND REGULATION



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TRACK WORK AT OACI

STAC is a member of the VAWG (Visual Aids Working Group), an ICAO working group, attached to the ADOP (Aerodrome Design and Operation Panel) and responsible for the improvement and creation of standards and recommended practices for aeronautical visual aids necessary for the safety, regularity and efficiency of international air navigation

Within the framework of the ADOP/021 roadmap defined by ADOP and at the initiative of its leader (an engineer from STAC), the VAWG met several times in September and November 2020 to develop new provisions for signalling a construction site on an aerodrome. This regulatory work follows the occurrence of several serious accidents due in particular to the absence of appropriate visual aids.

The specifications created are intended to define the conditions of use, the location and the characteristics of a closed runway lighting system, markings and signs for temporary works at an aerodrome. The amended documents are Annex 14 - Volume I, Doc. 9157; Aerodrome Design Manual, and Doc. 9981; Procedures for Air Navigation Services. The deadline for this regulatory work has been set at the beginning of 2022, with an expected date of applicability set at the beginning of 2024.

FOCUS ON AERODROME DESIGN AND OPERATIONS PANEL GT

OLSTF, ARCTF AND GHTF. 2020 WORK AND PROSPECTS

In terms of the safety of airport operations, the STAC has intervened on ground handling operations, which have a direct impact on in-flight safety but are only very loosely regulated. In order to provide useful information to ground handling stakeholders to improve the safety of operations, the ICAO Ground Handling Task Force (GHTF) has produced the Ground Handling Manual (Doc 10120) thanks to the cooperation of regulators, industry and international organisations. For 2021, the final task of the GHTF is to develop standards and recommended practices to be included in different Annexes and complemented by specifications in the PANS-Aerodromes.

Concerning aerodrome development, STAC is involved in two ADOP working groups.

In 2020, the Obstacle Limitation Surfaces Task Force (OLSTF) continued to review the clearance surfaces in Chapter 4 of Annex 14 to make them more consistent with operations at aerodromes. Due to the health crisis, the OLSTF met little and its work was slowed down. However, the STAC worked closely with a reduced number of members of the group to justify the new concept of clearance surfaces, to refine and explain the principles of their dimensioning and to further draft the new Chapter 4. As co-chair of OLSTF, STAC has been active in sharing its work with relevant ICAO groups, including ARCTF. In 2021, OLSTF will focus on finalising the new Chapter 4 of Annex 14 and the Chapter on PANS-Aerodromes which should facilitate its application.

The Aerodrome Reference Code Task Force (ARCTF) continued the work initiated in 2015 and implemented in various amendments to Annex 14 with for example the reduction of runway and taxiway widths. In 2020, STAC played an important role in the work that ARCTF carried out on the compilation and analysis of a database of 5,700 runway overruns and on the strategy for revising runway strip widths. The work of the STAC has enabled a first synthesis of the runway overrun data in comparison with the existing strip widths. In 2021, the ARCTF will continue its reflections on the revision of the strip.



STANDARDISATION AND REGULATION

EUROCAE WG 122

FIRST DRAFT OF A STANDARD FOR VIRTUAL CENTRES

Following positive experiments carried out within the framework of SESAR 2020, the EUROCAE consortium has been mandated to define a standard allowing the virtualisation of all or part of the services required for the operation of a control centre.

These "Virtual Centres" are control centres whose positions are fed by data flows generated and distributed by external "ADSP" data providers, geographically distinct from the control centres.

There are many possible uses: for example, an ADSP could supply several centres, so that the latter could alternately manage the same sectors. Conversely, if several ADSPs were to supply a centre, it would be possible to switch from one provider to another in the event of an incident. The potential of this concept, which allows for the mutualisation of backup systems, seems significant.

The task of EUROCAE's WG-122, in which STAC is participating, consists, initially, of specifying the scenarios envisaged, selecting the usable architectures, identifying the challenges involved, as well as the efforts to be made in order to achieve industrialisation of the concept. The result of this preliminary work is expected in the first half of 2021.

Depending on the results of this feasibility study, the actual standardisation work will then be launched.

STANDARDISATION WORK AT IEC

Like all other activities, the work programme of IEC TC97 (electrical installations for lighting and beaconing of aerodromes) was heavily impacted by the COVID 19 health crisis. However, after a few months of slowdown, most of the work was able to be resumed thanks to the digital tools.

The IEC 63067 standard on connecting devices (general requirements and tests) was published in June 2020.

A new version of IEC 61820 part 2 (requirements for serial circuits) was released for consultation to IEC TC97 members in November 2020.

The working groups to update the IEC 61822 standard on constant current regulators and the IEC 62870 standard on safetyrelated secondary circuits in series circuits are progressing normally.

The plenary meeting initially scheduled for May 2021 in Vienna will finally be held as a web conference. On this occasion, a new chair of the committee will be appointed, following the departure of Sébastien MIROUZE.



IMPLEMENTATION

DEVELOPMENT OF A TOOL TO HELP ANALYSE THE VISUAL DISTURBANCE ASSOCIATED WITH A PHOTOVOLTAIC PANEL (PPV) PROJECT

A visualisation tool was developed by the STAC in 2020 in order to quickly visualise in three dimensions some of the constraints defined in a DGAC Technical Information Note (TIN) concerning the reflection of the sun on PPV installation projects near aerodromes.

The tool allows the analysis of the risk of visual disturbance due to the presence of PPVs in the vicinity of an airport for all runway types. It now takes into account the zone(s) defined by the TIN, the position of the PPVs individually and the reflections of sunlight towards the aircraft (for mirror-like reflections). This tool is intended to be an analysis aid for the DGAC services solicited within the framework of PPV installation projects.

As the tool is still under development, a stabilised version is planned for 2021 with the aim of being distributed and tested within the DGAC services. Other developments have already been identified and will make it possible, for example, to take into account the pilots' angles of vision in the risk of visual disturbance and the case of helicopters.

GLOBAL REPORTING FORMAT

MONITORING OF EARLY IMPLEMENTATION

The Global Reporting Format (GRF) is a new global system for assessing and reporting runway surface conditions to pilots under all weather conditions, driven by ICAO. It was due to come into force on 5 November 2020, but has been postponed by several months in Europe to 12 August 2021 due to Covid-19. The DGAC decided in 2019 to deploy the GRF early on the Colmar and Strasbourg aerodromes to allow initial feedback that would benefit everyone.

The early deployment was suspended from March to October 2020. However, it provided a complete overview of the preparatory phase, shared in particular during the webinar organised by the STAC on 29 September and 1 October 2020, as well as a partial overview of the practical phase. The lessons learned are also integrated into a DGAC guide that will be published in the first quarter of 2021.

The experiment will continue until the GRF comes into force, allowing a review of the system for all seasons in which STAC will participate.



MEASUREMENT OF THE MARKER LIGHTS

The French decree of 23 April 2018 on the marking of obstacles to air navigation (NOR: TRAA1809923A) came into force on 1 January 2019. It specifies the standards applicable to the beaconing of wind turbines and "traditional" obstacles (pylons, towers, antennas). This regulation has led several European manufacturers to call on STAC for certification of their new obstacle lighting models.

In 2020, to meet this demand, the STAC Visual Aids Laboratory carried out 43 tests on 23 models and issued 30 certificates. The laboratory also tested aerodrome lighting (34 tests, 24 certificates). The list of certified lights is available on the STAC website. https://www.stac.aviation-civile.gouv.fr/fr/securite- aerodromes/visual-aids/certification-equipment

STAC PARTICIPATES IN THE DSAC-LED EMERGENCY PLANNING GROUP

In 2020, the STAC participated in the Emergency Plan WG led by the DSAC, in collaboration with the UAF & FA, the Ministry of the Interior, prefectures and several SSLIA (aircraft rescue and firefighting service) managers and DSAC/IR. The aim of this WG is to develop by 2021 a guide to assist in the preparation of exercises to test the emergency plans of certified aerodromes. It will present a list of items that can be dealt with and the possible coordination with the various State services in order to facilitate the periodic organisation of these exercises, in conjunction with the ORSEC (Organisation de la Réponse de Sécurité Civile) provisions and their planning by the prefectures.



MONITORING

PAVEMENT SURVEYS ON BEHALF OF THE MINISTRY OF THE ARMY

For many years, STAC has been working on behalf of the French Ministry of Defence and more specifically for the Defence Infrastructure Service. The STAC intervenes in the framework of technical expertises related mainly to the bearing capacity of infrastructures. The year 2020 was punctuated by numerous expert assessments, all of which were as exciting as they were varied in terms of the problems they involved.

For example, some of the appraisals that took place in 2020 are listed below:

- > the expertise of the BA705 of Tours St Symphorien in the context of the end of operation of the runway and the transfer of assignment. This project related to the surface and structural condition of the platform and required many months of studies and the involvement of several experts in the field,
- > the expertise on the BA 118 of Orléans Bricy in the context of the appearance of premature deterioration following the acceptance of works,
- > the expertise carried out on the Lann Bihoué Naval Air Station as part of the master plan for the maintenance of defence aeronautical structures,
- > the expertise on BA120 at Cazaux following a request from the SNIA whose objective was to target the type of work to be carried out on each section of the runway.

Finally, we should mention the occasional consultations that the department receives for technical advice. It is important to emphasise that each of these studies is part of a global approach to asset management, as they aim to optimise the inspections required to consolidate the technical data and also to optimise the maintenance operations recommended after the study.

AERODROME SURVEILLANCE

The STAC is a privileged partner of the DSAC for the surveillance of airport lighting and energy installations. The energy and lighting subdivision of the Equipment Division also provides technical expertise to the supervisory authority and aerodrome operators in these same areas. This includes providing technical advice on major changes to the renovation of runway lighting, the installation of PAPIs or the renovation of power plants. The STAC also carries out on-site audits in the areas of lighting, energy supply and control and surveillance equipment used by airfield controllers.

In 2020, the STAC was involved in 21 changes, including the renovation of the energy plants at Paris-CDG, Paris-Orly, Toulouse-Blagnac and Pau-Pyrénées, as well as the installation of PAPIs at 6 airfields and the renovation of the lighting at Figari (Corse-du-Sud) and Marseille-Provence airfields. At the request of the DSAC/IR, the energy and lighting subdivision also took part in the annual programmes based on RBO (Risk-Based Oversight), in 6 audits in the fields of lighting and energy, including 5 aerodromes with CAT III precision approaches where the STAC's expertise is recognised.

MONITORING ADAPTS TO ATM ACCIDENT PATTERNS IN BARRIERS

DSNA has chosen to develop its safety assessment methodology based on the barrier modelling of ATM accidents carried out at the Eurocontrol experimental centre in Brétigny. While this modelling provides a more global view of the sequence of events leading to an accident involving air traffic control, it required a significant effort of appropriation for the STAC EDS auditors in order to guarantee a surveillance at the level expected by the DSAC for the first files based on this new methodology.



STUDIES AND RESEARCH

CHARACTERISATION OF CHEMICAL PRECURSORS

Faced with the emergence of new threats to air transport, the STAC is conducting characterisation studies of chemical precursors in collaboration with industry and the European Civil Aviation Conference (ECAC) test centres.

The different detection technologies deployed at passenger and cabin baggage screening stations, such as X-ray imaging (density and effective atomic number), RAMAN, infrared, dielectric and Ion Mobility Spectroscopy (IMS) are evaluated.

These characterisation studies will be used to develop new algorithms that will allow the detection of chemical precursors by safety equipment to be taken into account while guaranteeing an optimal operational false alarm rate.

ARTIFICIAL INTELLIGENCE FOR THE DETECTION OF PROHIBITED ARTICLES

Faced with an evolving and polymorphic threat, technological and digital innovations are becoming widespread in order to increase the performance of security equipment. This evolution translates into more sophisticated algorithms and more intelligent software. In this context, artificial intelligence plays an essential role. It enables machines to learn from experience, to adapt to new threats and to perform human tasks by processing vast amounts of data.

In the field of safety, artificial intelligence is studied as a decision-making tool to facilitate the work of operators, particularly in difficult cases. This technology is also considered as a tool allowing the operation to gain in efficiency by optimising the operators' tasks in the analysis of radioscopic images.

The work carried out by STAC has demonstrated the effectiveness of these solutions in detecting prohibited items in cabin baggage, particularly in complex configurations. This will be followed by an in situ evaluation phase at the airport to consolidate and validate the results obtained in the laboratory. These stages are necessary before considering the deployment of these solutions, which could well revolutionise the work of security agents and provide answers to the problems facing airports.

CYBERSECURITY POLICY AT THE ICAO

STAC is participating in the new Secretariat study group on cybersecurity (SSGC) on behalf of DGCA. This working group is responsible for defining the organisation of work on cybersecurity-related topics in ICAO. The creation of a new definitive body is underway and its experts will provide elements in support of the sub-groups dealing with security or safety under the Air Transport Bureau (ATB) or the Air Navigation Bureau (ANB). These elements are framed by a cybersecurity strategy and an action plan.



STUDIES AND RESEARCH

QUALITY CRITERIA FOR 3D IMAGES

The widespread use of 3D X-ray imaging for screening hold baggage, cabin baggage and cargo has led STAC to consider a methodology for assessing the quality of these images. As part of the work for the European Civil Aviation Conference (ECAC), STAC has developed, in partnership with the company Synergy4tech, a tool to assess the quality of 3D X-ray images produced by explosives detection equipment (cabin EDS and hold EDS). The image quality tool allows a more objective analysis of the quality of 3D X-ray images.

The image quality criteria make it possible to take into account both the alarm resolution protocol on the screen and to measure, over time, the intrinsic quality of the 3D imagery and the maintenance of the performance of the detection equipment (detection and false alarms).

This innovative and major approach in the field of airport security should lead to 3D imaging criteria at regulatory level.

MONA EXPERIMENT AT LYON-SAINT EXUPÉRY AIRPORT

2020 will have witnessed a significant slowdown in air transport activity, severely impacted by the consequences of Covid-19. Each crisis is an opportunity to innovate and a solution initially developed to meet an identified need can have unsuspected benefits.

This is the case of the Vision Sûreté experimentation project hosted at Lyon-Saint Exupéry Airport, which is based on the implementation of an automated facial recognition system for the processing of departing passengers (for check-in, access control and boarding operations).

This national first saw the operational phase of the system officially launched in mid-October, when passengers of Transavia and TAP Air Portugal were able to benefit from this biometric route (within the "MONA" route for Monitoring Aids).

The STAC was able to implement a complex expertise, in particular through the creation of the technical reference system and the associated tests prior to the commissioning of the system. The success of the project is the result of close cooperation between all the public and private players, driven by the common ambition to innovate in the service of security and the passenger experience and to build the new passenger journey in the post-Covid world.

STANDARDISATION AND REGULATION

XNA

PARTICIPATION IN INTERNATIONAL AND NATIONAL GT

The STAC Security Division participates in many national and international working groups (WG).

At the DGCA, it is a member of several WGs launched by the DSAC at the end of 2019, such as "WG3/Training and recruitment of security agents" or "WG4/Optimisation of the ADS/Equipment pair". The Security Division also regularly takes part in RCS (Security Coordination Meetings) or in the EDS COPIL.

Internationally, she is involved in WGIAS, an ICAO working group on security innovation. She also participated in the International Human Factors in Security Working Group (HF-IWG), created in 2018 by the TSA, the US National Transportation Security Agency. Within the framework of the Airports Council International (ACI), she takes part in the Advanced Cabin Baggage Systems Working Group (ACBS WG), alongside representatives of airports, equipment manufacturers and authorities.

Finally, the Security Division is involved in no less than 13 European Civil Aviation Conference (ECAC) working groups, two of which were led by STAC in 2020. STAC's Security Division thus contributes its expertise on the various security equipment (EDS, EVD, ETD, etc.), or in terms of cybersecurity and cynotechnics.

IMPLEMENTATION
IMPLEMENTATION OF EXTERNAL QUALITY CONTROL IN ODOROLOGY

Canine odorology, also known as Remote Explosive Scents Tracing (REST), is one of the screening methods used to secure air cargo. It consists of capturing "scent signatures" on filters by sampling and presenting them to dog teams for analysis.

It consists mainly of three stages:

- > 1. Sampling a volume of air from a container
- > 2. Analysis of filters by STAC certified dogs
- > 3. Decision making (presence of explosives or not)

As part of a continuous quality improvement process, an external quality control procedure has been established by the STAC. This procedure was consolidated following the implementation of pilot tests at the end of 2020, with the assistance of the DSAC (the supervisory authority), in various odorology companies.

These external quality controls thus allow an objective evaluation of the quality of the analyses carried out by odorology companies, with the feedback of impartial performance indicators. They also contribute to continuous improvement by identifying any preventive or corrective measures to be applied.

CREATION OF A CYNO EVALUATION PLATFORM IN BISCARROSSE

The opening up of the field of explosives detection to the private sector, outside airports, by private dog-handling units, has been validated by the Interministerial Commission for Land Transport Security. To date, the STAC is responsible for assessing the RATP and SNCF dog teams in the area of abandoned packages, on a transitional basis in accordance with the order of 21 January 2020 on transitional measures for the application of Article L. 1631-5 of the Transport Code.

In 2020, 77 tests were carried out for this activity.

The SGDSN and the DGPN are launching, in the continuity of the CYNODEX perimeter, the creation of a national centre for canine certification in the search for explosives in charge of validating the skills of private canine teams in the search for explosives for abandoned parcels, but also for events (securing premises, vehicles, etc.).

Based on the experience of the last few years, STAC is now providing its expertise and support in the creation of this centre, particularly on the administrative and organisational side.

This CYNODEX centre, located on the DGA site in Biscarrosse, will be deployed in two stages: first, a temporary structure to allow the DGPN to certify the first teams from mid-2021, then in January 2022, a definitive and autonomous CYNODEX centre, to allow the certification of approximately 300 teams per year.

CYBERSECURITY APPLIED TO AIRPORT ACCESS CONTROL

After the definition of the technical concepts for securing airport access controls resulting from the design phase of the STITCH system (System for Computerised Processing of Traffic Documents and Authorisations), access controls are now evolving to take advantage of all the computer security inherent in these new concepts.

In this context, the STAC intervened in two ways. Firstly, for the air navigation services, the STAC was able to provide project management assistance by providing the DSNA with technical expertise to establish their architectures. Then, for the airport operators, by providing advice and checking the compliance of the architectures presented with the specifications established by the STAC.

During the year 2020, these actions were carried out on the DSNA side, with the CRNA/Est, SNA/Sud de Toulouse, SNA/Sud-Est and on the operator side, the airports of Lille, Montpellier, Marseille, Rennes but also those located in New Caledonia.

SECURITY

MONITORING

CERTIFICATION AND MONITORING ACTIVITIES

QUANTITATIVE ASSESSMENT + EXPLORATORY TESTS

The teams at the Bonneuil-sur-Marne safety laboratory are continually carrying out national certification and European assessment of new safety equipment developed by manufacturers around the world.

The year 2020 saw the certification of 18 new pieces of equipment potentially destined for our French airports and the evaluation of 9 others for Europe. This new equipment will modernise airport security systems and help to ensure safer flights, while improving the comfort of both the passenger during inspection and the security officer in the performance of his duties, all with an increased flow for the operator. All of these actions are made possible by the improvement of the technologies deployed and the increasingly efficient integration of new solutions such as multiplexing or high-speed conveyor machines.

The Security laboratory also contributes to the continuous monitoring of airport facilities on French soil. During 2020, 12 airports and 27 cargo companies welcomed the laboratory teams to check the performance of their security equipment. During these interventions, 1,101 pieces of equipment were inspected in order to ensure that the security system remains effective over time.

EDS3 DEPLOYMENT ACTIVITY

INCLUDING FEDEX AND THE POST OFFICE

While 2020 was initially the end of the European regulatory deadline for the expiry of Standard 2 EDS (Explosive Detection System), covid-19 and its impact on all air transport stakeholders has caused EU Member States to revise the timetable for the deployment of Standard 3 EDS.

In a new regulation published in June 2020, the European Commission has postponed the expiry of Standard 2 by one year. The drastic drop in activity and the air traffic evolution scenarios for the coming years have led to delays in IFBS (Hold Baggage Screening) compliance projects, with some operators having to redesign and re-size their systems.

The STAC provided technical support to the DSAC and DTA services as well as to the aerodrome operators in order to assist them in managing the effects of the health crisis for IFBS projects.

For freight, STAC conducted certification and justification activities for parcel sorting facilities for FedEx and the La Poste group. Both companies, based at Roissy-Charles-de-Gaulle airport, are integrating standard 3 EDSs in the first level of control. The first operation is planned for the last quarter of 2020 and the first quarter of 2021. FedEx, which has a facility with an annual processing capacity of 20 million parcels, aims to become Europe's leading freight transport hub.





BIODIVERSITY & SUSTAINABLE DEVELOPMENT

STUDIES AND RESEARCH

ALTERNATIVE TECHNIQUES TO THE USE OF PLANT PROTECTION PRODUCTS

Awareness of the harmful use of plant protection products and regulatory changes in this area led STAC to take stock of airport practices.

In 2019, 65% of the airfields surveyed use glyphosate for plant treatment and 35% have committed to more ecological practices. Several operators involved in this approach were able to give their feedback on these alternative practices. The transition to zero pesticides is certainly a challenge, but above all it is a real opportunity to propose a new concept for the management of green areas at airports. This reasoned approach can be translated into the implementation of actions ranging from the ecological design of airport spaces (green areas), to the differentiated management plan for airport meadows, through the development of alternative solutions.

The reduction in the use of phytosanitary products has led to the emergence of alternative weed control techniques, particularly through the use of thermal or mechanical processes, some of which have yet to be tested. "The studies carried out by the Compamed programme show that alternative techniques are just as effective as chemical weed control, provided they are applied frequently and over time.

Thus, moving towards alternative practices depends both on the commitment of airfield operators to more virtuous approaches and on their capacity to adapt and reorganise, which may result in additional investment in human and/or technical resources. This positioning can quickly reach financial limits that can be reduced by redefining weed control objectives. To do this, a range of tools is available on the Compamed programme website (https://www.compamed.fr). The conditions of use and implementation of weed control equipment and methods, the economic costs and the cost-benefit ratio for the environment and health are presented on the Compamed ZNA programme website. This website is a valuable tool for airfield operators wishing to adopt a virtuous approach to reducing the use of plant protection products and to have access to self-assessment tools and rich, detailed technical documents on the subject.

STAC will continue this work by contributing its expertise in this field in order to best support the airport platforms in this transition.

EUROPEAN DIRECTIVE 2002/49 AND STRATEGIC NOISE MAPS

European Directive 2002/49 of 25 June 2002 requires States to draw up strategic noise maps (CSB) and environmental noise prevention plans (PPBE), particularly around major airports (more than 50,000 movements per year recorded). The maps describe the current and long-term situation (movements recorded during the day and night). The PPBEs define the commitments of the various stakeholders to mitigate noise annoyance. The directive provides for a five-year implementation period: new noise maps must therefore be drawn up every five years, which will then be published and put online on the dedicated European platform, EIONET: https://www.eionet.europa.eu

The STAC contributes to the application of the directive by providing the data necessary to feed EIONET to CEREMA on the one hand and by producing the CSBs for 7 of the 10 aerodromes concerned on the other. The CSBs for Bordeaux-Mérignac, Marseille-Provence, Nice-Côte d'Azur and Nantes Atlantique were produced using the new IMPACT modelling software. The CSBs then feed into the PPBEs.





EMISSIONS FROM AUXILIARY POWER UNITS UNDER STUDY

The Auxiliary Power Unit (APU) is a small on-board turbojet engine, usually located at the rear of the aircraft fuselage, which mainly allows the aircraft to be self-sufficient on the ground during the stopover. It provides electricity and air conditioning in the cabin, as well as compressed air for starting the main engines. It can also be used on the ground for taxiing with reduced engines, and more rarely, in flight, following a failure of the main engines to produce electricity, pressurise the aircraft or to restart the engines.

The APU runs on paraffin from the aircraft's fuel tanks, and like the aircraft's engines, it emits pollutants. These emissions depend, among other things, on how long the APU is used, which is regulated at some airports.

In 2020, STAC developed a bibliographic synthesis of the usage times and emissions of APUs at stopovers. In order to monitor the use of APU's with a regulatory objective and more broadly to reduce emissions, the STAC, in collaboration with ENAC, conducted research in 2020 to find automatic means of measuring the time of use of APU's at the stopover. A promising avenue is emerging with the use of thermal cameras.



STUDIES AND RESEARCH

IMPLEMENTATION OF VISCOELASTIC MODELS FOR THE MONITORING OF FLEXIBLE AERONAUTICAL PAVEMENTS

Structural pavement testing provides (accurate) information on the bearing capacity and estimates the residual life of the subgrade. It is therefore an indispensable tool to help managers adopt a rational maintenance strategy. Pavement testing is therefore of particular importance in the aeronautical sector's response to current ecological and economic challenges.

The Heavy Weight Deflectometer (HWD) is a non-destructive pavement testing device. The HWD test is based on the measurement of the deflection generated by an impulse load. Despite its widespread use on airport pavements, it appears that the data from this test are often interpreted within a framework of questionable assumptions because the commonly used elastostatic method does not take into account dynamic effects and limits the behaviour of bituminous materials to linear elasticity.

The thesis work of Jean-Marie ROUSSEL (https://www.stac.aviation-civile.gouv.fr/fr/publications/apport-viscoelasticite- danslanalyse-dynamique-essais-au-heavy-weight-deflectometer), entitled "Apport de la viscoélasticité dans l'analyse dynamique des essais au Heavy Weight Deflectometer" (Contribution of viscoelasticity in the dynamic analysis of Heavy Weight Deflectometer tests), carried out at the Laboratoire de Tribologie et de Dynamique des Systèmes (LTDS/ENTPE), in close collaboration with the STAC's Structure Adhesion Department, were motivated by the need to have methods for analysing the HWD test that included dynamic effects and the consideration of the linear viscoelastic properties of bituminous materials.

The proposed approach was based on the development of advanced numerical methods, the performance of in situ test campaigns on the STAC experimental board and the characterisation of bituminous materials in the ENTPE laboratory. The results obtained underline the importance of taking into account inertia effects for the analysis of HWD tests, as already demonstrated in Michaël BROUTIN's thesis (2010). An innovative method for analysing HWD data has also been developed. This method allows dynamic effects to be taken into account and the viscoelastic behaviour of asphalt mixes to be characterised. Finally, the results of the HWD data analysis were compared with the properties determined in the laboratory.

The work undertaken during this thesis suggests interesting prospects for further improving the analysis of the HWD test data and contributing to the evolution of airport pavement design and testing methods.

OPTIMISING DE-ICING UNDER STUDY

In partnership with CEREMA, the University of Lorraine and Sayens, STAC is working on the development of new tools useful during winter operations on airport platforms. A prototype has been developed to measure the remaining de-icing product concentration after an intervention. The results obtained made it possible, on the one hand, to validate the proposed operating concept in the laboratory and, on the other hand, to test the device on an on-board vehicle on the road.

In order to arrive at a patented, optimised, ergonomic and marketable product, tests under real conditions on an airport platform are necessary. To this end, the consortium has approached Aéroports de Paris to carry out this experimentation. Given the very specific conditions of the year 2020, this phase will be conducted in 2021.

The challenge of this system is, while meeting the safety issues inherent in the operation of an airport, to control the quantity of de-icing product in order to reduce the economic costs and environmental impacts of this type of activity.

STANDARDISATION AND REGULATION

CONTRIBUTION TO INTERNATIONAL WORK

The contribution of the Environment Division's experts continued within the CAEP and the ECAC. In a difficult health context, the majority of meetings were maintained by videoconference and allowed the work of cycle 12 to continue, with certain adaptations.

For WG3 (Emissions Technical Issues), progress has been made in the development of methodologies for correlating NOx and nvPM emissions in cruise with those of the LTO cycle and in the characterisation of emissions from engines intended for supersonic propulsion.

Work on climate change risk assessment continued in WG2

In addition to the "Airports and Operations working group" with proposals for adaptation measures and a set of recommendations for airports.

In the field of noise and the MDG group (modeling data base), the acoustic performance and emission data of supersonic aircraft projects are now available for use with existing models. The first modelling of supersonic aircraft projects will take place in 2021. Within the CEAC AIRMOD working group, work has focused on defining a methodology for modelling helicopter noise.

THE RECEPTION OF THE HYDROGEN AIRCRAFT AT THE AIRPORTS

In order to support Airbus in its work on the hydrogen aircraft, STAC participated in 2020 in the setting up of the working group on the regulations necessary for the operation of liquid hydrogen (LH2) in an airport environment.

It brings together Airbus, representatives of the administrations concerned (Civil Aviation and Risk Prevention), airports and fuel storage and distribution companies. Its objective is to identify and anticipate the requirements or regulatory changes associated with the introduction of "zero emission" aircraft.





SUCCESSFUL DEPLOYMENT OF THE MODELLING TOOL

PICA (Programme d'Information sur les Collisions Animalières) is the national database of animal collisions. AQUILA is a tool to help monitor animal risk at airports, consisting of a tablet and a web interface. PICA enables the level of animal risk to be established by aerodrome and by animal species. The animal observations collected by AQUILA are integrated into the PICA programme in order to calculate the statistics. It is possible to enter the observations directly into the PICA programme.

These two tools underwent numerous changes in 2020. After an ergonomic overhaul of PICA in 2019, the modernisation work continued in 2020, with particular attention dedicated to user management, reinforcing access rules. The consolidation of the interface with AQUILA was a major focus of the developments.

Like PICA, the user management of AQUILA has been improved. New functionalities have been integrated, such as statistical reports and calculations, allowing airfield operators to obtain a precise view of the actions taken. The AQUILA tablet can thus launch acoustic scares via the EFFTEL system. It can now also integrate its own sound database and work with different acoustic systems.

These developments are part of a process of continuous improvement of the IT tools, thus enabling the effectiveness of animal control to be enhanced.

IMPLEMENTATION

ACT III OF THE NOISE CLASSIFICATION FOR LIGHT AIRCRAFT

The year 2020 was a turning point for CALIPSO. As a reminder, CALIPSO is used to classify light aviation aircraft according to their noise performance index. To date, there is no other regulatory noise level comparator for these aircraft. This classification allows the aeroclub and platform manager to limit this noise nuisance as much as possible by preferring less noisy aircraft.

In 2013, only piston aircraft with CDN (Certificate of Airworthiness) and fixed-pitch propeller were concerned. Then in 2016 aircraft with CDN and variable pitch propeller were added. Since the publication of the Order of 12 May 2020 (amending the Order of 11 June 2013 on the classification of light aircraft according to their noise performance index), the CALIPSO perimeter has been extended: it now includes aircraft with a special or restricted CDN:

- > CNSKs (Special Kit Aircraft Certificate of Airworthiness, for aircraft built from a complete kit)
- > CNRAs (Restricted Certificate of Airworthiness of Aircraft, for aircraft built by an amateur from original plans)

This extension allows the STAC acoustic laboratory to measure all light aviation piston aircraft and to calculate this index in order to establish a noise classification of these aircraft for the DGAC. The classification of light aircraft according to their noise performance index (CALIPSO) is making progress and evolving. It aims to promote dialogue between residents of aerodromes and light aviation users.

THE MONITORING

The major French airports under the jurisdiction of the Airport Nuisance Control Authority (ACNUSA), as defined by Article 1609 quatervicies A of the General Tax Code, are required to have a noise measurement and aircraft trajectory monitoring system. This device, also called "monitoring system", measures continuously 24 hours a day. STAC has been involved in the field of monitoring for more than 10 years. Its investment is illustrated in particular through expert reports, comparative measurements, advice and assistance to operators. The expertise of STAC's acoustic laboratory in the verification of monitoring systems has long been recognised by ACNUSA and has been confirmed by the delivery of an accreditation since 15 November 2017. In view of the approval of their monitoring systems, several airports have called on STAC in 2020. The assessments will continue in 2021 despite a complicated health context.

To find out more, STAC published a technical information note in 2020 which is available on the STAC website (under Publications/Environment/Noise Monitoring and Aircraft Trajectories).

IMPACT, ONE YEAR ON

SUCCESSFUL DEPLOYMENT OF THE MODELLING TOOL

As the network leader for the modelling of regulatory noise curves around aerodromes, STAC has deployed IMPACT (Integrated Aircraft Noise and Emission Modeling Platform), the new software developed by Eurocontrol. IMPACT allows the production of noise curves generated by aircraft during take-off and landing around aerodromes. All the modellers from SNIA, DSNA and ADP have been trained in the new tool at ENAC. At the same time, the STAC deployed the OASIS tool (Outil d'Aide à la Saisie sous Impact Stapes), as well as a module of ELVIRA in collaboration with the DSNA. OASIS, developed by the STAC, prepares IMPACT data and the ELVIRA module allows to obtain average trajectories compatible with IMPACT from radar data. As for its use, a dedicated function box assists modellers and the initial feedback has been positive. Indeed, IMPACT is presented in the form of an internet portal, accessible via a standard computer or a tablet. The period of teleworking experienced in 2020 has therefore not been an obstacle to its use.

Thus, several projects to revise Noise Exposure Plans (PEB) or Sound Gene Plans (PGS) have been initiated with IMPACT, such as the PGS of Lille Lesquin or the PEB of Montpelier Méditerranée.

Finally, the action continues with the updating of the technical guide on the elaboration of noise maps around aerodromes, to be published in 2021.

IMPLEMENTATION

MODELLING FOR A BETTER ESTIMATION OF PAVEMENT LIFE

STAC is continuing its research work to improve knowledge of the mechanical behaviour of aeronautical pavements and their damage. The year 2020 was marked in particular by scientific advances in the modelling of the mechanical behaviour of flexible pavements (defence of a doctoral thesis on the consideration of the viscoelasticity of bituminous materials), the modelling of interfaces between pavement layers (development of an experimental in-situ measurement system and development of associated modelling), or the study of the fatigue of flexible pavements (continuation of the STAC/CER research programme initiated in 2017 involving fatigue tests on a 1:1 scale. vs. laboratory fatigue tests).

📕 ALIZÉ 2

UPCOMING AVAILABILITY OF THE AVIATION MODULES

In 2019, the Structures - Adhesion department, in collaboration with the Université Gustave Eiffel (an institution created on 1 January 2020 from the merger of Ifsttar and UPEM), launched a major update of Alizé-Aéronautique, the reference software for the mechanical design of flexible aeronautical pavements. This new version, available since January 2021, offers a more ergonomic version of the design module for new flexible pavements. Other modules will be available in the course of 2021. The module for calculating the PCR, a new indicator of the bearing capacity of an aeronautical pavement resulting from the new methodologies defined by the ICAO, will be available at the beginning of the second half of 2021. This module, which is free of charge, will be accompanied by written documentation (technical information note and associated guide) to enable airport managers to apply this new eligibility method, known as the ACR/PCR method. Finally, a reinforcement in accordance with the new rational method set up by the department.

UPDATE OF THE STAC MATERIAL GUIDES

PROMOTION OF GREEN PAVEMENTS

The Structures-Adhesion Department has launched a study on updating the STAC's material guides: guide to the application of standards (GAN, last published in 2009) and concrete guide (last published in 2000). This update is part of the department's desire to promote and supervise innovative methods for greener aeronautical pavements: recycling, reuse, warm mixes, alternative methods (biosourced formulations), among other processes. With this in mind, two working groups have been set up (one on hydrocarbon pavements and the other on concrete pavements), bringing together a panel of experts (construction companies, research centres, laboratories, the military, etc.), who met for the first time in October 2020. During these initial meetings, topics to be explored in greater depth have already been identified. The process will continue in the months and years to come, with the setting up of experimental projects to gather experience on different topics. The new guides are expected to be published by 2022-2023.



CONSULTING SERVICES FOR AIRPORT FACILITIES

In the course of 2020, STAC continued and expanded its collaboration with the Directorate of Air Transport (DTA) on airport development.

The consulting assignments for the redevelopment of the Nantes Atlantique and Saint-Nazaire Montoir airports were focused on the publication of the tender documents in the first quarter of 2020. The Structures - Adhesion Department's project management has been particularly involved in defining the technical and performance programme for the two airports. This partnership work carried out with the Safety - Structure and Ecodesign (SSE) / Environment / Airport Safety and Capacity / Security / Equipment divisions brings together all of STAC's airport expertise and provides a technical framework for the definition of the redevelopment project for the two airports by the DGAC.

At the same time, the call for tenders for the re-concession of Tahiti Faa'a airport also entered the phase of publication of the DCE in early 2020. Under the impetus of the project management, the divisions in charge of expertise in aeronautical pavements, asset management, airport capacity, the environment and security, were strongly mobilised for the production of this document and in the subsequent technical exchanges with the candidates.

Finally, the STAC was asked to provide advice to the DTA and to support the reflections on the needs of Lorient Bretagne Sud airport in the coming years.



MONITORING

ANIMAL RISK AND HEALTH CRISIS

EUROPE'S RESPONSE

The Covid-19 pandemic has had a major impact on the aviation world. In the spring of 2020, airports were forced to close or drastically reduce their commercial traffic activity for several months. During this period, wildlife took advantage of the reduced human presence and new shelter and nesting sites (i.e. parked aircraft) to settle on the airfields.

The European Aviation Safety Agency (EASA) has identified the increased presence of animals at aerodromes as one of the most critical issues arising from the Covid-19-related air traffic disruption. In July 2020, Task Force-SI 5010 was therefore created to develop tools to help airport operators and civil aviation authorities identify animal risks associated with the changes imposed by the Covid-19 pandemic.

STAC joined this working group. It contributed to the drafting of the Safety Information Bulletin 2020-07R1 and the technical guide "Wildlife Hazard Management Guide to Support the Restart of Operations in the Covid-19 Pandemic" aimed at supporting operators and authorities during the restart phase of airport operations. A webinar was also organised in September to present the first data on wildlife collision rates at European aerodromes when air traffic resumes.

2019 CALCULATION OF THE WEIGHTED GLOBAL MEASURED NOISE INDICATOR (GMI) FOR PARIS CDG

As it does every year, the STAC was commissioned by the DTA to calculate the IGMP. This indicator, defined by the decree of 28 January 2003, is representative of the annual noise energy emitted by air traffic at Paris-CDG airport. It is calculated from the maximum noise levels measured in the runway axis at a distance of 5 km from the thresholds. The ceiling value of the indicator is set at 100, corresponding to the average of the noise energy emitted over the three years 1999, 2000 and 2001.

The value of the 2019 IGMP is 66.7, the indicator increases by 0.4 points compared to 2018 ending a decade of continuous decline. This increase is linked to the 3.4% increase in the number of movements compared to 2018. However, it remains limited due to the continued modernisation of aircraft fleets by airlines and the decline in the share of night-time movements. On 7 September 2020, the STAC and the DTA presented the conditions for obtaining the value of the 2019 IGMP to the ACNUSA, which validated the results. On 18 December 2020, the indicator was presented for information to the members of the Paris-CDG Airport Consultative Commission for the Environment.

The report is made public on the website of the Ministry of Ecological Transition at the following address: https://www.ecologie.gouv.fr/lenvironnement-sonore-sur-plateforme-paris-cdg

TOUSSUS-LE-NOBLE UNDER SURVEILLANCE

Noise measurements at the Toussus-le-Noble airfield continued from June to September. At the request of the DTA, a downwind noise measurement point was installed. These measurements enable the DGAC to observe whether the flight restrictions (weekends and public holidays) stipulated by decree ⁽¹⁾ are applied. The STAC acoustic laboratory was able to carry out this mission with the transmission of indicators during this period.

(1) Amendments introduced by the order of 20 March 2019 to Article 1 of the order of 23 November 1973 laying down the conditions of use of the Toussus-le-Noble airfield.

DIFFUSION KNOWLEDGE

CARRYING OUT ACCELERATED TIME SIMULATIONS IN COLLABORATION WITH FRANCE AVIATION CIVILE SERVICES (FRACS) FOR BOGOTA

In support of FRACS, the Airport Safety and Capacity Division carried out time-lapse simulations of different operational concepts for the approach area of Bogota airports in Colombia.

These made it possible to assess the impacts and refine the various scenarios proposed by the FRACS consortium in response to a call for tenders from the Colombian Civil Aviation Authority for the development and optimisation of the capital's approach area.

The simulations carried out by STAC were particularly useful in drawing up the final proposal.

NOISE MONITORING

A technical briefing note on "Noise Measurement and Tracking of Aircraft" has been published.

In France, major airports are required to have a noise measurement and aircraft trajectory monitoring system, also known as a "monitoring system", which measures continuously 24 hours a day. Based on its experience in this field for more than 10 years, through expertise, comparative measurements and advice, the STAC has drafted this note in order to help airport operators in the knowledge and management of their monitoring system.

THE GUIDE TO THE INSTALLATION OF THE MARKER

The UAF & FA Lighting and External Lighting Working Group, in which the STAC Equipment Division participates, created a mini WG in February 2019 with the mandate to draft a technical guide on the state of the art of lighting installation on aerodromes.

The writing of this guide was motivated by a strong demand from aerodrome operators. The leadership of this mini WG was entrusted to the Equipment Division of the STAC. This mini WG met for the first time in June 2019, and after 18 months of joint work, the guide will soon be available on the STAC website.



GRF WEBINAR

On 29 September and 1 October, STAC organised a webinar on GRF for all aviation stakeholders. The first morning was mainly dedicated to pilots, airlines and aeronautical information services. The second morning was mainly dedicated to aerodromes and allowed the operators of Strasbourg and Colmar aerodromes to share their experience. The webinar attracted more than 250 viewers, on either morning.

All the presentations are available on the "GRF Support" page of the STAC website. https://www.stac.aviation-civile.gouv.fr/en/events/symposium-global-reporting-format-29-september-1-october-2020-report-symposium-aircraft-pavements-21-april-2020

SCIENTIFIC VALORISATION OF WORK ON AERONAUTICAL PAVEMENTS

The Structures - Adhesion (SA) department continued its efforts to promote its work in 2020. In total, six articles were published at international scientific conferences (ISBM, MAIREPAV and APT). These contributions were presented orally or in the form of posters and gave rise to rich exchanges with the international community.

The SA department also actively participated in the dissemination of knowledge through prominent interventions in working groups such as the Falling Weight Deflectometer User Group (FWDUG).

CONTRIBUTION TO TRAINING

BIODIVERSITY

The technical guide "Assessment and monitoring of biodiversity on an aerodrome" was published in conjunction with the Air Transport Directorate (DTA). This methodological guide aims to assist aerodrome operators wishing to give a new impetus to the environment by proposing several methods for assessing and monitoring biodiversity.

TRAINING PROVIDED

In 2020, on behalf of ENAC, the Environment Division provided several training courses: In the field:

of air quality:

 \rightarrow 2 air quality training sessions delivered to DGAC agents as part of their ongoing training.

In the area of noise:

> 1 training course delivered to IEEAC engineering students on the INM software.

> 2 training courses on noise modelling given to agents taking up their posts in the DGAC (airport technical course) and student engineers in the air force.

In the field of biodiversity and animal risk prevention:

> 9 training courses were given to air traffic controllers, surveillance inspectors, DGCA agents, military personnel and aerodrome operators.

PAVEMENT TRAINING

The Structures - Adhesion Department is continuing its efforts to train the profession in the various aspects of design, diagnosis and management of aeronautical pavements.

To this end, several training actions were carried out in 2020 on behalf of the Ministry of the Armed Forces, as well as in various schools: École Nationale des Travaux Publics de l'Etat (ENTPE), École Nationale de l'Aviation Civile (ENAC), École Supérieure d'Ingénieurs des Travaux de la Construction (ESITC), Institut d'Ingénieur des Techniques du Bâtiment et des Travaux Publics (IITBTP), etc.

In addition, in 2020 new continuous training courses were provided, in particular for ENAC (Dimalizé training). The positive feedback received following the first session has made it possible to renew this training for 2021.

The department plans to expand the range of training courses in future sessions to include aspects of aeronautical pavement assessment, monitoring and strengthening.



OUR FACILITIES



NEW TEST VEHICLES

The Structures - Adhesion Department continues to modernise and adapt its equipment and its testing and expertise material. The Defence Infrastructure Department of the Ministry of the Armed Forces, which shares this desire and for which the STAC contributes to the monitoring of the management of its assets by carrying out longitudinal friction coefficient surveys for many years, has contributed to this effort by acquiring two more suitable traction vehicles.

The 500 kg self-wetting automatic friction measuring devices are towed by trans-vehicles carrying large tanks of water and must reach a measuring speed of 95 km/h as quickly as possible.

In addition to this speed constraint, there is the braking action inherent in the measurement procedure of these two moving masses.

The two pick-ups, each with 395 hp, were acquired in 2020 and will be equipped and put into service in 2021.

They will thus enable the laboratory's teams to achieve the ambitious objective they have set themselves, namely to cross the 200-metre threshold instead of the current 320 metres to reach the measurement speed of 95 km/h.

ACTIVITY REPORT 2020



The STAC's instrumented test bed, a major facility that is an international reference for pavement bearing capacity studies and calibration of testing equipment, was equipped with a hangar in 2020.

This building allows tests to be carried out in all weathers, as it houses a calibration bench (a dynamic precision weighing system) and a reaction chamber to accommodate a vibrating pot for calibrating the HWD (Heavy Weight Deflectometer) geophones.

HOSTING DGAC DRONE TRAINING SESSIONS

In December 2020, the STAC also received a practical training session on remote piloting of drones from the DSAC and the BEA, organised by the DSAC at this test site.

In view of the satisfaction of the organisers and participants, the experiment should be repeated in 2021. If the DSAC expresses the need, it is possible for the STAC to make the area one of the official DGAC sites for this type of training.





HUMAN AND FINANCIAL RESOURCES

RESOURCES

WORKFORCE

WORKFORCE AS AT 31 DECEMBER 2020	
Technical staff	
IPEF	3
IEEAC	23
ITPE	26
IESSA	4
TSEEAC	28
TSDD	15
Contract agents and RIN	9
Defence Technician	1
TOTAL TECHNICAL STAFF	109
Administrative staff	
Ancillary	4
Contract agents and RIN	1
Assistants	12
Assistants	24
TOTAL ADMINISTRATIVE STAFF	41
Worker personnel	
Workers AC	24
Defence Worker	2
TOTAL BLUE-COLLAR STAFF	26
GENERAL TOTAL	176

BUDGET EXECUTION

DTA - BOP 614-1	k€
Environmental and safety studies	146
Aeronautical pavement heritage	274
Airport access control management system and various security systems	195
Laboratory for the detection of liquid and homemade explosives	306
Training	111
IT - Telecommunications	309
Documentation Dissemination of knowledge	42
Logistics	776
Staff travel costs	184
Ancillary staff costs	36
TOTAL	2379
DSAC - BOP 614-2	
Safety and environmental studies	157
Aeronautical pavements	111
Beaconing and ARFF test centres	90
Operation of security test centres	324
Quality - Metrology	27
TOTAL	709
SDP - BOP 613	
Pensions for accidents at work	38
TOTAL	38
DCSID - MILITARY BUDGET BOP 212	
Maintenance of the BANs/Auscultation/PEB stop strands	1339
Logistics	210
Staff travel costs	10
TOTAL	1559
DTA - Civil budget P203 - Nantes Atlantique	376
REVENUE	

Certification and monitoring fee	576
ADP (product allocation)	63
TOTAL	639

SCIENTIFIC AND INTERNATIONAL ADVISOR PROGRAMME AND PARTNERSHIP MANAGERS QUALITY MANAGER HEALTH AND SAFETY ADVISOR RADIATION SAFETY OFFICER

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GLOSSARY

Α

ACBS Advanced Cabin Baggage Systems Working Group

ACI Airports Council International

ACNUSA Airport Noise Control Authority ACR

Aircraft Classification Rating

ADOP Aerodrome Design and Operation Panel

ADSP Automatic Dependent Surveillance Panel ANB

Air Navigation Bureau APT

Accelerated Pavement Testing

APU Auxiliary Power Unit

ARCTF Aerodrome Reference Code Task Force

ATR Air Transport Bureau ATM/ANS

Air traffic management/Air navigation services

AWARD All Weather Autonomous Real logistics operations and Demonstration

С

CAEP Committee on Aviation Environmental Protection **CALIPSO**

Classification of light aircraft according to their noise performance index

CDN Certificate of Airworthiness CFAC

European Civil Aviation Conference

CEREMA Centre for studies and expertise on risks, the environment, mobility and development

CIL Inter-laboratory comparisons

CNRA Restricted Aircraft Certificate of Airworthiness **CNSK**

Special Kit Aircraft Certificate of Airworthiness COFRAC

French Accreditation Committee

CRNA En-route Air Navigation Centre

CSB Strategic noise maps

D

DCE Consultation file for companies DGA Directorate General of Armaments

DGAC

Directorate General of Civil Aviation **DGATA** Direction générale de l'Armement Techniques Aéronautiques **DGPN** Directorate General of the National Police DGV Quick release lanes **DSAC** Civil Aviation Safety Directorate **DSNA** Air Navigation Services Directorate DTA Air Transport Directorate Ε **EASA** European Union Aviation Safety Agency **EDS** Explosives Detection System EIONET European Environment Information and Observation Network **ENAC** National Civil Aviation School **ENTPE** National School of Public Works **ESITC** École Supérieure d'Ingénieurs des Travaux de la Construction **EUROCAE** EURopean Organisation for Civil Aviation Equipment **ETD** Explosives Trace Detector **FVD** Explosive vapor detection F FRACS France Aviation Civile Services **FWDUG** Falling Weight Deflectometer User Group G GAN Guide d'application des normes GHTF Ground Handling Task Force

GRF Global reporting format

н HF-IWG

International Working Group on Human Factors in Security **HWD** Heavy Weight Deflectometer L.

IEC

International Electrotechnical Commission

IEEAC Civil Aviation Design and Operations Engineer

IEESA

Electronic engineer for aviation safety systems

IFBS Screening of hold luggage

IFSTTAR French Institute for Transport, Planning and Network Science

and Technology IGMP Global Index Measured Weighted

IITBTP Institute of Building and Public Works Engineering

IMPACT An Integrated Aircraft Noise and Emission Modeling Platform IPEF

Water and Forestry Engineer

ISBM International Symposium on Bituminous Materials ITPE State Public Works Engineer

L LTDS/ENTP Laboratoire de Tribologie et de Dynamique des Systèmes/ École nationale des travaux publics de l'État

Μ

MAIREPAV Maintenance and Rehabilitation of Pavements

MONA Monitoring Aids

N NIT

Technical briefing note

International Civil Aviation Organization

Impact Stapes Input Tool

OLSTF Obstacle Limitation Surfaces Task Force

ORSEC Organisation of the civil protection response

Ρ

PANS

Procedures for air navigation servicese **PAPI**

Precision Approach Path Indicator **PCR**

Pavement Classification Rating **PEB**

Noise exposure plan

PED Portable electronic equipment

PICA Information programme on animal collisions

PGS Plan of Genoa Sound

PPBE

Environmental noise prevention plan **PPV**Photovoltaic panels

R

RATP Régie autonome des transports parisiens RBO Risk Based Oversight

RCS Security coordination meetings REST

Remote Explosive Scents Tracing

RIN National Rules of Procedure

S

SESAR Single European Sky ATM Research

SGDSN General Secretariat for Defence and National Security SID

Defence Infrastructure Service **SNA**

Air Navigation Services

SNCF Société nationale des chemins de fer français

SNIA National Airport Engineering Service

SSGC Secretariat study group on cybersecurity SSLIA

Aircraft rescue and firefighting service

STITCH Computerised processing system for travel documents and authorisations

TSA Transportation Security Administration TSDD

Senior Sustainable Development Technician **TSEEAC** Senior Technician for Civil Aviation Studies and Operations **U**

UAF & FA Union des aéroports français et francophones associés

UPEM University of Paris-Est Marne-la-Vallée

V

Т

VAWG Visual Aids Working Group

VTOL Vertical take-off and landingp

W WGIAS

Working Group on Innovation in Aviation Security



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