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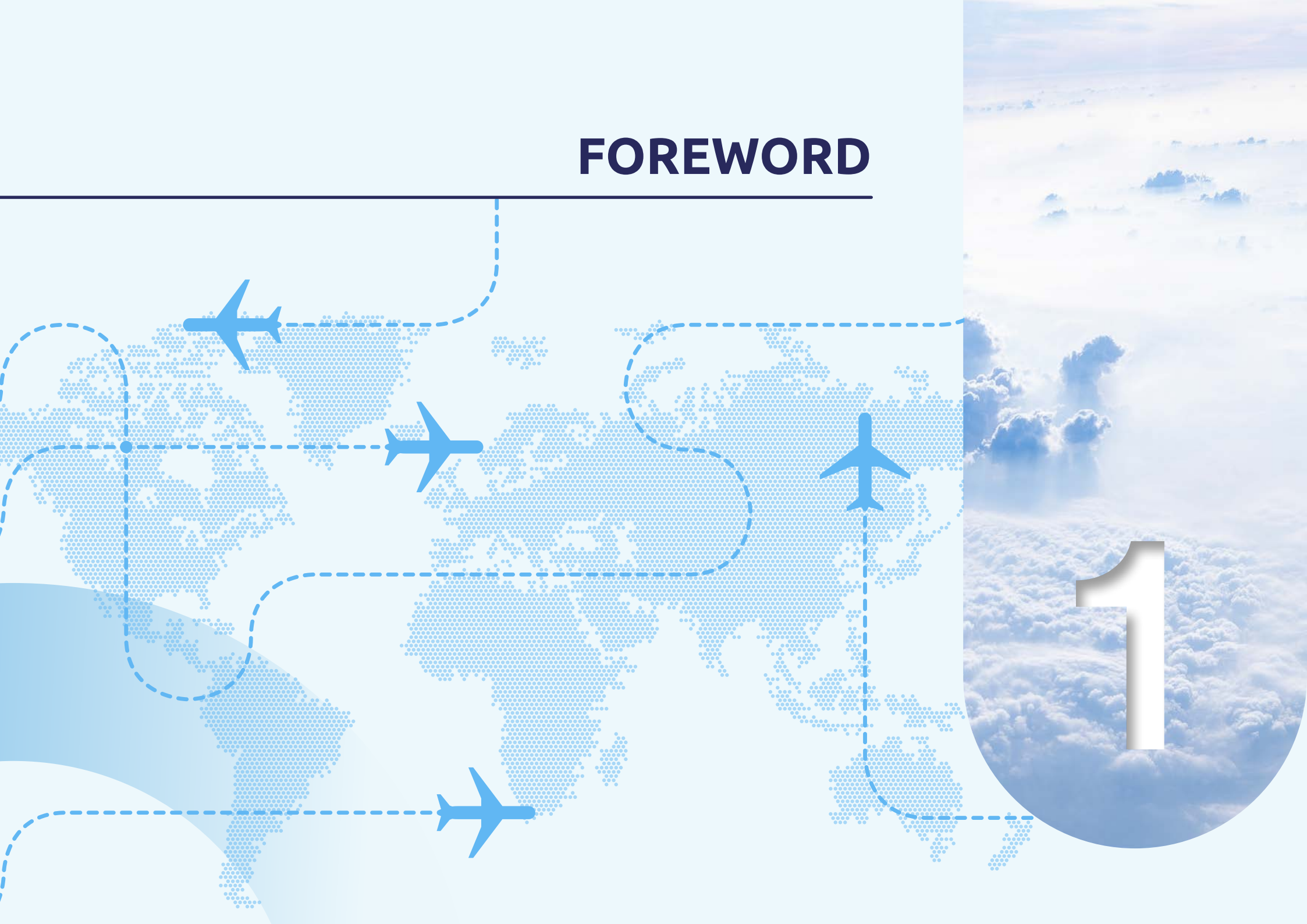
FOREWORD



FOREWORD

It is my utmost pleasure to present you the foreword for the year 2022, which marks yet another chapter in the growth and development of our administration.

First and foremost, I would like to commend our interdepartmental team for their unwavering commitment and exceptional efforts in the restructuring process of our CNS (Communication, Navigation, and Surveillance) service. Their dedication was truly remarkable, despite the challenges we faced as some ATSEP's chose to pursue different opportunities rather than embracing the new CNS structure.

In line with our commitment to innovation and progress, I am delighted to announce the decision to relocate several departments to the new Skypark building by the end of 2025. The state-of-the-art facilities and collaborative workspaces at Skypark will foster synergies among our teams, promote knowledge sharing, and enable us to deliver an even higher level of service to our valued customers and partners. This strategic move reflects our unwavering commitment to staying at the forefront of industry trends and adapting to the evolving needs of the aviation industry.

Furthermore, I am thrilled to introduce the launch of the Meteolux app, a ground-breaking addition to our weather services publications. This application harnesses the power of cutting-edge technology and real-time meteorological data to provide the public with accurate and timely weather information.

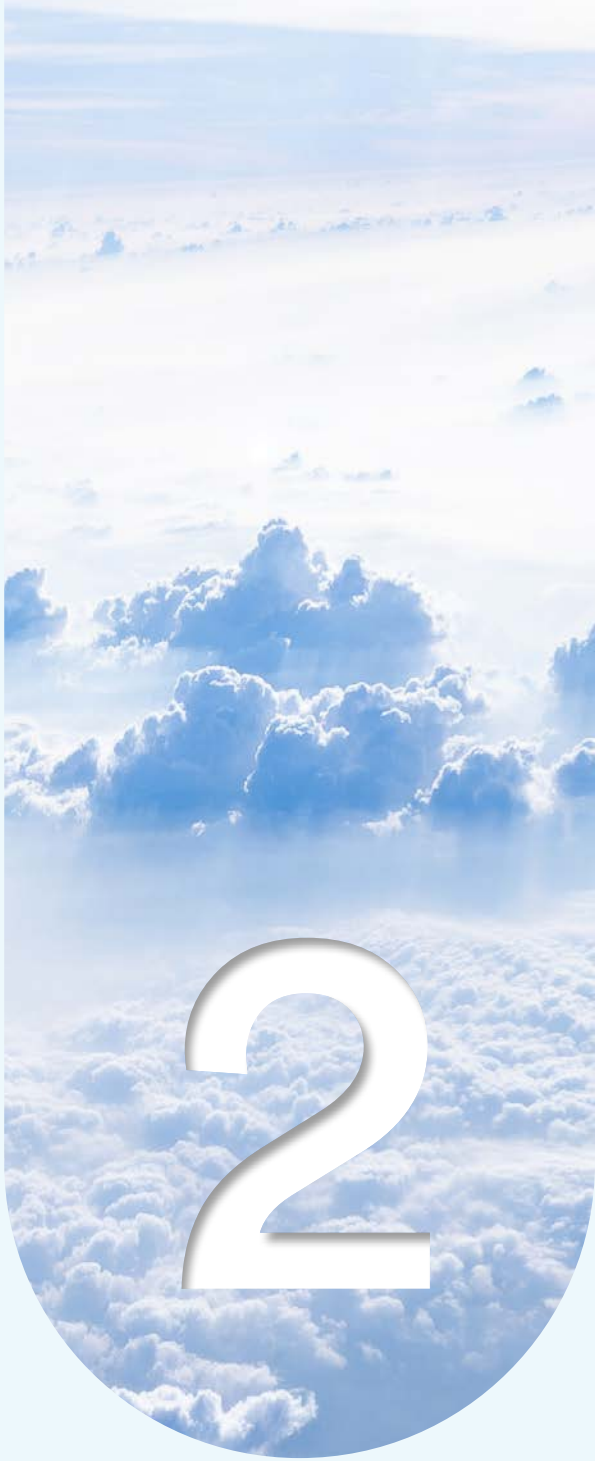
Looking ahead, the next years will hold tremendous promise for our organization. We remain committed to fostering a culture of innovation, collaboration, and continuous improvement.

I extend my heartfelt gratitude to each and every member of the ANA family for their unwavering dedication, professionalism, and passion. Thanks to the professionalism exhibited by our operational, technical, and administrative departments, ANA successfully ensured the secure and streamlined management of 93341 flights in 2022. This remarkable feat facilitated the transportation of a staggering 4.1 million passengers and a cargo weight of 970,000 tons. Our collective achievements and shared vision will undoubtedly propel us towards even greater success in the years to come.

Best regards,

Claudio Clori, Director, Administration of air navigation

ANA
MISSIONS & TASKS



2

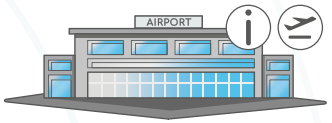
ANA MISSIONS & TASKS

Relying on modern technologies, our highly qualified teams, with managerial, operational, technical and administrative expertise, are trained in air traffic management, aerodrome operations and the development of innovative solutions to minimise risks and anticipate the occurrence of problems in order to guarantee the safety and smooth running of flights.

METEOROLOGICAL ASSISTANCE & MANAGEMENT OF METEOROLOGICAL EQUIPMENT

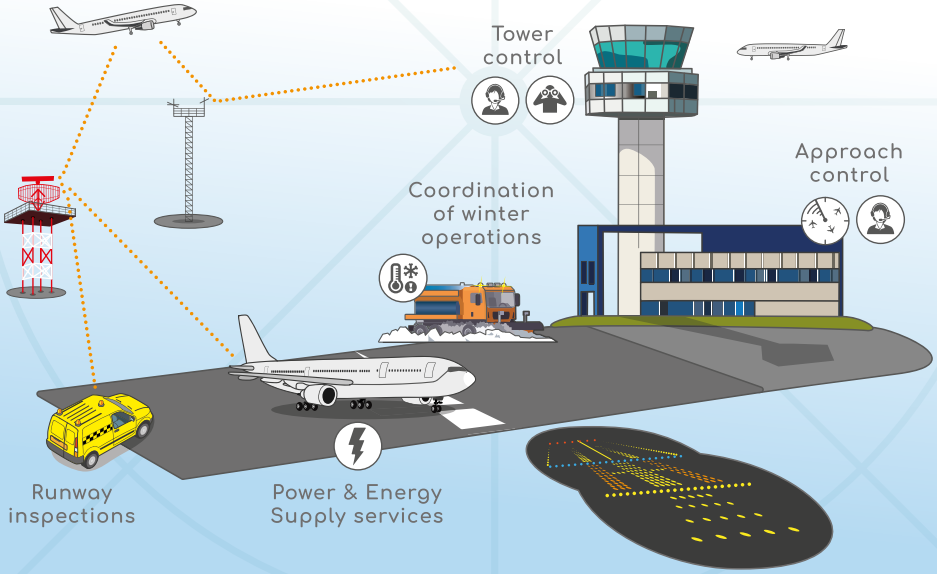
CERTIFICATION, SAFETY, COMPLIANCE, QUALITY, SECURITY, ENVIRONMENT, HEALTH & SAFETY

AERONAUTICAL OPERATIONS DEPARTMENT



ADMINISTRATIVE, FINANCIAL SUPPORT SERVICES, IT & STATISTICS

AIR TRAFFIC CONTROL



MANAGEMENT OF COMMUNICATION, NAVIGATION & SURVEILLANCE NETWORKS EQUIPMENT

ANA counts seven different departments:

1

The administrative department has a cross-functional dimension within ANA. The administrative activities are support activities for all the general and operational departments.

The administrative department is in charge of:

- Managing legal affairs in all areas of ANA activity as well as public procurement
- Guaranteeing a good management of the human resources in the administration and the supervision of the administration staff in general
- Ensuring internal and external communication and the promotion of ANA
- Managing buildings and follow-up of real estate projects and maintenance of ANA buildings

2

The mission of the **Finance Department** is to support ANA's operational and administrative departments through sound management of ANA's financial resources. It supports the General Management and all departments in all matters of financial and budgetary planning and is responsible for ANA's accounting in accordance with national and international standards. This ensures ANA's financial integrity by promoting an efficient allocation of resources, overseeing the use of resources and improving financial, accounting and management processes. In addition, the finance department is responsible for the cost-efficiency Key Performance Area (KPA) and the monitoring of the performance plan, which also includes the calculation of determined and actual costs and chargeable unit rates for terminal and En-route Air Navigation Services (ANS).

3

The mission of the **Certification Department** is to ensure compliance with ANSP and Aerodrome certification obligations in terms of safety, security, quality, environment, occupational health and safety, through the implementation and development of management systems (e.g. program, risk, compliance, audit, performance management) and strategic analysis. Our ANSP and Aerodrome Safety Management teams ensure the development, maintenance and improvement of ANA's aviation safety and safety management system.

In addition, the certification department is still responsible for inspections on the aerodrome, coordination of work on the manoeuvring area, driver's licence training on the manoeuvring area and winter operations in close collaboration with Lux-Airport, and in accordance with the relevant directives.

4

The Aeronautical Operations Department is responsible to provide:

- An ATS Reporting Office (ARO) to receive reports concerning air traffic services, flight plans and associated messages submitted for pre-flight and post-flight operations. In addition to the FPL data, the ARO publishes NOTAM (Notice to Airmen), provides briefings (Pre-Flight Information Bulletin) to pilots and manage the activation of Unmanned Aerial Vehicle (UAV) No-Fly Zones (NFZ) and Military Terminal Segregated Area (TSA) on an ArcGIS-driven public geo-portal.

- An alerting service to notify appropriate organisations regarding aircraft in need of search and rescue, and assist such organisations as required.

- A Search and Rescue (SAR) Single Point of Contact (SPOC) for the coordination of the fast and effective transfer of Cospas□Sarsat alerting data to enable the rescue of people in distress.

- An airspace management service to manage the activation of Unmanned Aerial Vehicle (UAV) No-Fly Zones (NFZ) and Military Terminal Segregated Area (TSA) on a geo-portal driven by ArcGIS.

- An Aeronautical Information Management (AIM) service to ensure the publication of the Aeronautical Information Publication (AIP), including amendments, supplements, and Aeronautical Information Circulars (AIC). In addition, as part of the AIM, the Geographic Information System (GIS) unit provides geographic and cartographic aspects for the electronic Terrain and Obstacle Data (eTOD).

- An ATS Message Handling Services (AMHS) COM Centre to supervise the node of the Aeronautical Fixed Service (AFS) Network and manage aeronautical messages through the ground-ground communications Network, e.g. for the transmission of NOTAM, Flight Plans or Meteorological Data.

- A Terminal Navigation Charges (TNC) office to collect, calculate and establish monthly, bi-annual and individual invoices for clients.

5

The technical department

a) CNS

In the context of air traffic management, CNS stands for “Communications, Navigation, and Surveillance”. The CNS service within ANA plays a crucial role in ensuring the safe, efficient, and orderly flow of air traffic within the airspace. The CNS encompasses the following components and functions:

- **Communication**

  The CNS service provides communication systems that enable seamless and reliable two-way communication between air traffic controllers, pilots, and other pertinent stakeholders. This ensures that instructions, clearances, and critical information are conveyed accurately and in a timely manner. Communication systems include voice communication through radio frequencies and data communication through data links.

- **Navigation**

  Navigation services are responsible for ensuring that aircraft can accurately determine their positions and follow the designated routes and procedures. CNS provides various navigation aids and systems, such as VOR (VHF Omnidirectional Range), DME (Distance Measuring Equipment), ILS (Instrument Landing System) and more. These systems help aircraft maintain their intended flight paths, especially during take-off, landing, and En-route phases.

- **Surveillance**

  Surveillance services involve the tracking and monitoring of aircraft within a given airspace. This includes the use of radar and other surveillance technologies to provide real-time information about aircraft positions, altitudes, speeds, and trajectories. This data is crucial for air traffic controllers to maintain safe separation between aircrafts and to manage traffic flow efficiently.

b) ELE

The Electrical Engineering Service (ELE): The airport's operations require a network of cables spanning several hundred kilometres, including medium and low voltage cables, telephone and data cables and fibre optic cables. In total, almost 3000 light beacons are installed on the runway, taxiways, parking areas and approach sectors.

ANA's electro-technical experts are responsible for:

- Commissioning and maintenance of all main and auxiliary systems for supplying and distributing electrical power to administrative equipment, including emergency power units, UPS (uninterruptible power supply) and transformers;
- Installation and maintenance of the control and display system and all other airport lighting equipment;
- Installation and maintenance of the administration's telephone communication platform;
- The establishment of equipment programmes for airport lighting and the supply and distribution of electrical energy, including the corresponding studies and research;
- The management of electronic conduits and networks and the distribution of electrical energy.

c) The IT services:

The mission of the IT team is to provide robust and reliable IT solutions that support the smooth running of ANA. It plays an important role in supporting the various departments and services by ensuring the availability, security and efficiency of the IT infrastructure and services.

The team's main responsibilities are as follows:

- User Services: The IT team provides user support and helpdesk services.
- Cybersecurity: Protecting the ANA's digital assets is a top priority.
- Software development: The team develops and maintains custom software solutions tailored to the specific needs of ANA operations.
- Network Administration: the team is responsible for the design, implementation and ongoing administration of the ANA's IT network.
- Data management: the ANA's entire data infrastructure, including data storage, backup and disaster recovery planning.
- Inventory management
- Digital transformation: supporting the ANA's digital transformation efforts, leveraging emerging technologies to streamline operations and improve the quality of services provided.
- Collaboration and integration: the team facilitates collaboration and integration between different departments by providing tools and platforms for effective communication and data sharing.
- Compliance: ensuring that ANA's IT operations are aligned with relevant regulations and industry standards, particularly those related to aviation and air navigation.

6

Air Traffic Control (ATC):

Air traffic controllers are responsible for guiding pilots to ensure the safe, efficient and expeditious flow of traffic. They take charge of all aircraft entering their area of responsibility.

Our air traffic control services are provided by two separate teams:

- Tower control
- Radar approach control

Together, they ensure efficient air traffic control, surveillance and safety in Luxembourg airspace and in adjacent airspace for which services have been delegated by the competent air traffic control centres, in compliance with the regulations in force.

ANA operates the tower and approach control centre in Luxembourg, LU (ATC Luxembourg), to provide air traffic control and flight information service of ground movements up to 4,500 metres (above sea level) over Luxembourg territory and over certain parts of the territory of neighbouring countries (Belgium, Germany and France).

From 4501 to 8000 metres altitude, air traffic control is provided by the En-route control centre in Brussels, BE (CANAC2), operated by Skeyes.

Above 8000 metres, responsibility lies with the Maastricht Upper Area Control Centre (MUAC), operated by EUROCONTROL.

7

The meteorological Department, named MeteoLux, consists of an operational unit and a technical unit (METTECH).

The missions of MeteoLux are:

- To provide aeronautical meteorological information to ensure safe and efficient flight operations.
- To serve society with the duties of a National Meteorological Service, including the publication of weather warnings and the dissemination of climatology data.
- To execute the installation and maintenance of meteorological measurement systems and sensors, and to elaborate equipment programmes for technical infrastructures and future meteorological systems.

ACHIEVEMENTS BY 2022

3

ACHIEVEMENTS BY 2022

Thanks to the commitment of its employees, ANA has been able to carry out projects to improve and innovate its services, both internally and for the general public.

Please find below a short summary of the projects completed in 2022:

AIR TRAFFIC SERVICES

The implementation of Approach / Director Procedures in Luxembourg TMA

(3rd controller position designated as "Director") in Lux/APP.

Given the constant growth of commercial traffic at Luxembourg Airport over the last few years and the traffic growth forecasts for the coming years, ELLX ATC/APP has had to adapt to this situation and start optimising its operating concept in order to continue to ensure a safe, efficient and orderly flow of traffic, covering RP3 (2020-2025) and RP4 without the need to apply restrictive traffic regulations caused by traffic overload.

An Approach/Director system means that the executive controller, APPROACH, delegates control of IFR traffic on downwind, base leg or any other coordinated position to an additional controller, DIRECTOR, who is responsible for the traffic until final approach and handover to aerodrome control (TWR).

The DIR position enhances and strengthens the capabilities of the Executive Controller (EC) and Planning Controller (PC) positions by distributing pre-planning and pre-tactical tasks on the one hand (EC and PC controller) and the service to IFR traffic for the most critical part of their approach, when they need accurate and timely clearances for base and final, by providing this service on a separate channel that is operated by a different controller (DIRECTOR) on the other hand.

After 24 months of project preparation (operating concept, safety file, ATCO training, notifications, frequency allocation, etc.), the DIR position was able to be set up on 01.04.2022.

The APP's shift system has been adapted to guarantee the presence of the third controller position during periods of heavy traffic.

The implementation was divided in 4 phases:

- **Phase 1** – implementation of an additional frequency
- **Phase 2** – technical equipment to be installed in APP/Ops Room
- **Phase 3** – training of ATCO's and notification process
- **Phase 4** – (pending) technical implementation of a dedicated surveillance sector to enhance capacity

AERONAUTICAL OPERATIONS

OPS (ARO and AIM): start of digitalisation in AIM and ATS

In today's fast-moving and interconnected world, the aviation industry and OPSs are constantly looking for ways to improve safety, effectiveness and efficiency. Digitalisation plays a crucial role in the Air Traffic Management (ATM) sector, particularly in Aeronautical Information Management (AIM) and Air Traffic Services (ATS). As Air Navigation Service Providers (ANSPs) strive to meet the demands of growing air traffic, they are turning to digitisation to improve their capabilities and streamline their operations.

One of the key aspects of the digitisation of AIM and ATS is the implementation of the System Wide Information Management (SWIM) concept. SWIM enables the seamless exchange of aeronautical information between different stakeholders, including ANSPs, airports, airlines and other aeronautical service providers. This real-time data sharing fosters collaboration and provides all parties involved with more accurate and up-to-date information. With SWIM, ANSPs can access essential information such as weather updates, flight plans and airspace restrictions in a timely manner, enabling them to make informed decisions and provide better services to pilots and airlines.

The SESAR (Single European Sky ATM Research) programme is another major initiative that promotes the digitisation of AIM and ATS. SESAR aims to modernise the European ATM system by introducing new technologies and procedures that improve safety, capacity and efficiency. One of the key elements of SESAR is Joint Project 1 (CP1), which aims to improve data sharing and harmonise information management across Europe. Under CP1, ANSPs are encouraged to adopt digital solutions that enable seamless data exchange and interoperability between different systems. This not only improves efficiency, but also enhances safety by ensuring that all stakeholders have access to accurate and consistent information.

The digitisation of AIM and ATS offers many benefits to ANSPs. By adopting digital solutions, ANSPs can streamline operations, reduce costs and enhance security. For example, automating manual processes such as data entry and information dissemination eliminates the risk of human error and ensures that information is transmitted accurately and efficiently. In addition, digitisation allows ANSPs to take advantage of advanced analytics and artificial intelligence to derive insights from the vast amount of data generated in the air traffic management sector. This enables them to identify trends, predict potential problems and take proactive decisions to optimise airspace capacity and minimise delays.

In conclusion, digitisation plays a crucial role in the future of AIM and ATS. By adopting technologies such as SWIM and implementing initiatives such as SESAR CP1, ANSPs can reap many benefits, including improved safety, efficiency and collaboration.

In 2022, the OPS (ARO and AIM) relaunched their digitisation project, adopting Eurocontrol's eEAD project as an early adopter and including the ARO in the AIM digitisation scope. Let's hope that we can finally advance digitisation in aviation, while waiting for additional resources, to successfully navigate into the future.

METEOROLOGICAL SERVICES

Launch of the MeteoLux Weather application

The national meteorological service, named MeteoLux, is responsible, among other things, for providing MET services to the general public and the national authorities. These services include the dissemination of weather, flood and air quality warnings, which can represent a risk or danger to the population. In this context, it has become essential for MeteoLux to use the best and fastest communications technology available to achieve the best possible propagation. This project is also part of the continuous improvement of MeteoLux services and meets the needs of users. As no official national mobile application dedicated to weather information was available in Luxembourg, the official MeteoLux weather application offers an alternative to private weather applications.

The MeteoLux mobile application was developed jointly by the MET Department and ANA's IT Service and provides detailed information on current weather conditions in Luxembourg and the weather forecast for the next 5 days, including active alerts

Certain functionalities have been implemented to monitor weather conditions in real time, such as radar and satellite animations. Users can also actively contribute to the observation of weather phenomena in the Greater Region.

The MeteoLux mobile application offers following advantages:

- Weather forecasts are analysed in depth and backed up by the expertise of our forecasters, who are on shift 24 hours a day, 7 days a week.
- In cooperation with the Environment Administration, air quality alerts (ozone and fine particles) can be issued;
- In cooperation with the Water Management Authority, flood warnings can be issued;
- An interface designed to make the content of the application accessible to as many people as possible, including people with disabilities, requiring the use of assistance tools (colour contrasts, alternative texts, etc.);
- The application is available in 4 languages: Luxembourgish, French, German, and English.

The MeteoLux mobile application was officially launched on 25/07/2022 and currently has over 22,500 users.

METTECH UNIT

The implementation of new redundant data collector and new sensors for Metgarden

One of METTECH's major projects in 2022 was the implementation of new redundant data collectors and sensors for Metgarden at Luxembourg Airport (ELLX). The redundant weather observation stations in the vicinity of TDZ 24 improve the representativeness and quality of measurements and thus the quality of aeronautical and other messages.

The station covers the tasks of an aeronautical, synoptic land surface and climatological reference station. Meteorological data is exchanged worldwide as part of the WMO's Integrated Global Observing System (WIGOS) and with the aviation industry (METAR, Metreports).

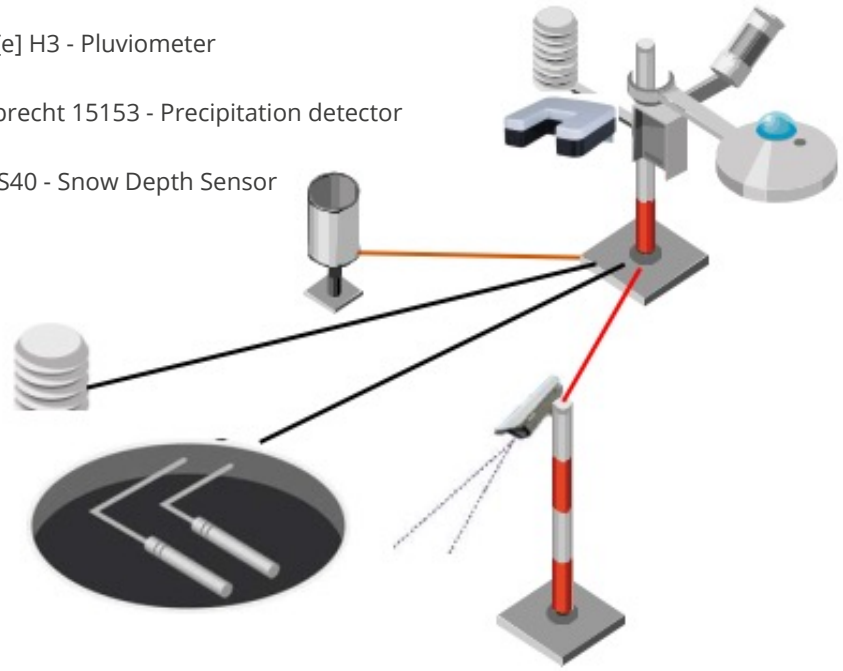
The Metgarden has been extended and the foundations laid for the new data collectors and sensors.

This project followed the full project management process:

- Study and definition of the project with the PCRT
- Development of technical requirements and call for tenders
- Procurement process
- Factory acceptance tests
- Installation with on-site acceptance tests
- Tests and comparison between old and new systems
- Training
- Updating of documentation and procedures
- Change management process

The system consists of two data loggers with following sensors each (except SDMS40):

- HMP155 – Combined Thermo-Hygrometer
- 6 QMT110 – Temp. probe (@ 2, 5, 10, 20, 50, 100cm depth)
- DTS12G – Temp. probe (@ 5cm)
- PTB330 – Barometer
- CSD3 – Sunshine Duration sensor
- SMP10 – Pyranometer
- Rain[e] H3 - Pluviometer
- Lambrecht 15153 - Precipitation detector
- SDMS40 - Snow Depth Sensor



COMMUNICATION, NAVIGATION AND SURVEILLANCE SERVICE

Restructuring process of the CNS (Communication, Navigation, and Surveillance) service

The year 2022 stands out as a chapter defined by challenges and transformations for the CNS department.

Following the change of management at the end of 2021, a comprehensive organisational review was carried out, laying the foundations for the adoption of a series of strategic recommendations.

As a result, the implementation of these recommendations has triggered a transformation of the CNS team. This transformation, although it led to staff turnover and rebuilding issues, helped to reshape the way the team operated.

The team has shown great resilience and ingenuity and, against this background of transformation, the CNS department has persevered in carrying out essential maintenance and modification work and has maintained its commitment to ensuring the quality and continuity of services while guaranteeing a high level of safety.

In addition, the CNS team embarked on an ambitious and robust recruitment and skills development campaign. The second half of 2022 saw the start of the integration of new members, marking the initial phase of this initiative.

The impact of these strategic measures should facilitate the resurgence of a high-level CNS service. This effort should help to restore and strengthen the department's reputation for outstanding performance.

The main projects for 2022 were as follows:

- Implementation of the organisational audit action plan
- The launch of an ambitious recruitment plan for CNS agents (aviation safety electronics staff).
- Re-certification of the ELLX ILS 24 as CAT III B
- The declaration of Luxembourg airspace as Mode S airspace

ELECTRICAL ENGINEERING DEPARTMENT (ELE)

Replacement of all constant current regulators (CCR)

2022 was a very busy year for the ELE department due to its involvement in two major projects, one within ANA (replacement of the old CCRs) and the other under the responsibility of Lux-Airport (refurbishment of the runway including the renewal of all AGL-related installations). The latter required an unusually high number of night shifts, particularly for AGL (Airfield Ground Lighting) staff, as well as regular participation in coordination and safety meetings with Lux-Airport. In addition, an update of the ALCMS (Airport Light and Control System) was necessary at the end of the runway renovation to implement all the new systems.

In 2022, the replacement of all CCRs with new CCRs with ILCMS (Individual Light and Control System) functionality required for the implementation of ILCMS at Luxembourg Airport to improve safety and comply with EASA rules began. Due to the renovation of the runway, the number of ACCs had to be increased in order to supply the electrical power needed for the new circuits for the guard lights, for the signs, for all the AGL systems on Taxiway (TWY) India and for the TWY Hotel centre line lights.

In fact, the new CCRs are part of a long-term project to renew all the electro-technical installations at Luxembourg airport and to implement ILCMS.

The various phases are as follows:

- Construction of new stations to accommodate the new equipment (south main station, new stations 06, 24 and 18)
- Renewal of the cabling installed in new cable ducts
- Installation of new CCRs
- Major update of the ALCMS to take account of the new CCRs (postponed to 2023)
- Implementation of ILCMS (planned for 2024)
- Construction of the new main station north (2024 - 2027)

IT SERVICES

Enhancing Weather Access for All: The MeteoLux Mobile App Initiative

In the fast-evolving landscape of air navigation and meteorology services, adaptability, innovation, and user-centric solutions stand as paramount. Over the past year, a significant achievement serves as a testament to the commitment toward excellence of the IT service at ANA. Providing the public with a user-friendly weather application is a crucial service, as it empowers individuals, communities, and businesses to make informed decisions, enhances safety, and supports efficient daily planning. This project underscores the team's dedication to delivering solutions that directly benefit the public and contribute to the broader community's well-being.

- **Delivering User-Oriented Excellence**

The project was driven by the central objective of offering the public a seamlessly accessible meteorological information platform. In today's context, where immediate access to weather data is imperative for both safety and convenience, this initiative fulfilled a vital requirement.

The app was meticulously designed to cater to a diverse range of users, from aviation professionals requiring real-time weather updates to the general public seeking accurate forecasts for daily planning. User experience was at the forefront of the approach, resulting in an intuitive and visually appealing interface that ensures accessibility for all.

- **Balancing Priorities**

Throughout the course of this project, the service navigated a multifaceted landscape. While delivering the technical expertise and code base, the agents remained steadfast in providing daily support to administration users and managing a portfolio of challenging projects across various domains. Their ability to strike this balance, ensuring that ongoing commitments were not compromised, underscores the dedication and expertise of the whole team.

- **State-of-the-Art Architecture for Massive User Engagement**

To support the massive influx of users expected for a public weather app, the service engineered a state-of-the-art architecture. Scalability and performance were central considerations, guaranteeing that the application could effortlessly handle high volumes of concurrent users, particularly during severe weather events when demand surges.

This architectural prowess not only ensures a seamless user experience but also positions ANA as a technological leader in the aviation and meteorological community.

- **A Migration Towards Efficiency**

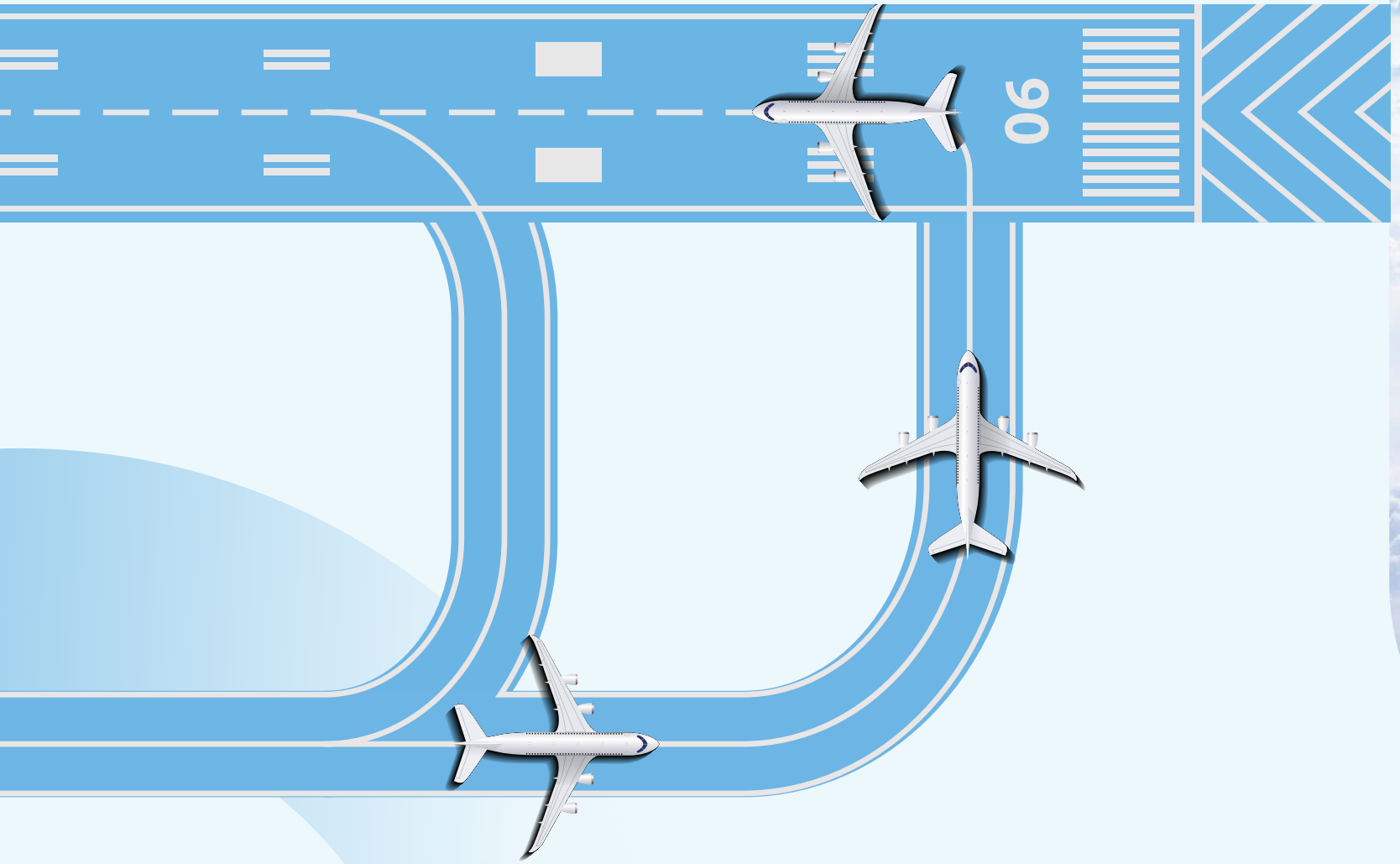
ANA recognises that modernization is key to sustained excellence. In parallel with the Mobile App project, the service has embarked on a major migration towards the CTIE (Centre des technologies de l'information de l'État) infrastructure and services. This strategic move is aimed at maximizing efficiency, optimizing time investment, and capitalizing on shared knowledge and resources. Embracing this migration reinforces the administration's image as a forward-thinking, highly efficient, and collaborative organisation.

- **Challenges and Collaboration**

One of the standout challenges of this project was the need to divide it into manageable parts, allowing external entities to contribute modern solutions. Collaboration with external partners was crucial to harness the latest technological advancements and domain expertise. This endeavour required meticulous project management and coordination, but the result was a truly cutting-edge mobile app.

In conclusion, the success of the MeteoLux Mobile App project highlights the IT Service's dedication to providing outstanding solutions that have a positive impact not just on ANA, but also on the broader community. This accomplishment underscores their capacity to manage a range of priorities, engage in fruitful collaborations, and adopt modernisation strategies. Looking ahead, they eagerly anticipate the opportunities and challenges that await them, firmly believing in their capability to maintain a high standard of excellence in the constantly evolving realm of air navigation services.

A DAY AT ANA



A DAY AT ANA

To provide you with an overview of all activities at ANA, our colleagues from various departments will share their daily routines and highlight some special events that occurred in 2022. This year, let us introduce you to our colleagues from AIR TRAFFIC CONTROL TOWER (ATC TOWER), METEROLOGICAL PREVISIONS (MET PREVISIONS), AERONAUTICAL INFORMATION MANAGEMENT (AIM) and LEGAL AFFAIRS (JUR).

ATC TOWER

05:00

The manoeuvring area, i.e. the runway and taxiways, is checked for foreign objects, lighting or other potential problems. The TWR checks the correct setting of lights, runway configuration, weather conditions and all systems required for operations. Shortly before 6.00 am, the tower and approach controllers coordinate the first planned movements and all relevant information.

06:00

Just before 6 o'clock, the pilots start requesting start-up clearance and the first aircraft starts taxiing to the RWY in use. Colleagues from the morning team begin their pre-briefing by checking emails, weather conditions, systems availability or scheduled maintenance, closed surfaces etc.

Before the colleagues take over, all the live operational information must be exchanged, such as: the runway in use, weather conditions and associated restrictions, and most importantly: doing the handover of the live traffic situation. At this point, most aircraft are leaving Luxembourg, with a few freight arrivals, usually from long-haul flights.

MET PREVISION

06:00

The warning supervisor calls the forecaster on duty to discuss the latest model forecasts available. An orange alert for heavy rain is issued. The forecaster prepares all the necessary measures for issuing the alert.

07:00

The "Bulletin Public" and the "Aeronautical Bulletin", as well as messages from the AlarmTilt (Airport Warning System) and the TAF(Terminal Aerodrome Forecast) are issued by the forecaster. He calls the CGDIS (Corps grand-ducal d'incendie et de secours) to provide a detailed update on the weather situation ahead. Two agents from the morning shift will take over and receive all the necessary information from the forecaster leaving the night shift.

JUR
07:00 - 08:30

This time slot is generally used to read and reply to emails, review documentation and take note of new procedures in ConSense (office work).

MET PREVISION
08:30

A telephone briefing with lux-Airport takes place, attended by one of the two forecasters on duty. He provides detailed weather forecasts for the airport for the current day and the following night.

AIM
09:00

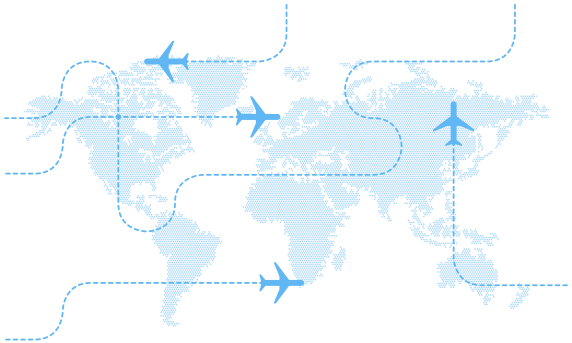
Sometimes data needs to be published at short notice. This is done by means of a NOTAM (Notice to Airmen), but if the reported change lasts for more than 3 months, it is converted into an AIP supplement (Aeronautical Information Publication), which updates ("supplements") the AIP with long-term temporary data. In this case, a crane has been erected next to the heliport of the Esch/ Alzette hospital (Centre Hospitalier Emile Mayrisch) for a period of 10 months.

ATC TOWER
09:30

After the daily runway maintenance carried out by the ELE and "Ponts et chaussées" departments, incoming traffic peak resumes. A drone pilot calls to provide information about his previously approved flight. Contact details are exchanged and the pilot is informed of any relevant information. Cargolux asks for one of its 747-8Fs to be towed from apron P7 to its maintenance hangar. ATC integrates this rather slow manoeuvre into the traffic flow in order to reduce delays for all concerned. At around 11:00, ANA's aerodrome service calls ATC to carry out a scheduled inspection of the take-off and landing runway (RWY) to detect any foreign objects or other anomalies likely to hinder air Traffic.

AIM
09:30

The AIP also contains aerodrome maps to help pilots find their way when flying to/from Luxembourg airport and when taxiing between the runway and their parking position. ANA's Geographic Information (GIS) unit, within the AIM division, updates these maps using specialised software. These maps are drawn up by the GIS unit, at the request of the AIM division, on the basis of the necessary data updates, and are then used by the AIM division when drawing up the amendment request.



As the AIP is a joint Belgian-Luxembourg AIP, ANA works closely with the AIM of Skeyes, our Belgian counterpart. Their cartographers will check the projects and approve them as a certified entity for AIP cartography.

JUR
10:00

Moving on to the business of the day, we deal with all questions and requests for legal advice. Requests can come from management or from a colleague in another department and can cover any aspect of ANA's activities: questions about existing agreements with our stakeholders or suppliers, questions about European regulatory issues related to ANA's activities as an ANSP, questions about public tendering procedures, etc.

ATC TWR
11:00

Air traffic control is a fairly demanding job, which is why it is associated with extensive training, particularly at the start of a career. ATCO students receive extensive on-the-job training to enable them to acquire the required skills and gain experience working with ATC instructors.

JUR

11:00

Participation in one of the internal strategic committees (strategic management team meeting, safety committee, health and safety committee, environmental committee, change management committee) or FABEC committees in order to monitor strategic issues in various areas of our administration and provide legal input where appropriate.

MET PREV

11:00

A telephone briefing is held with the Administration de la gestion de l'eau (AGE) to discuss the uncertainty of the precipitation forecasts and the forecaster on duty shares his expertise with them. AGE decides to raise the flood warning from yellow to orange. The forecaster begins preparing the weather bulletins to be issued at around 2pm.

15:00

ATC TWR calls the MET office to obtain information on the change in surface wind direction in order to make the decision to change runway. The forecaster on duty provides a wind forecast for the next few hours.

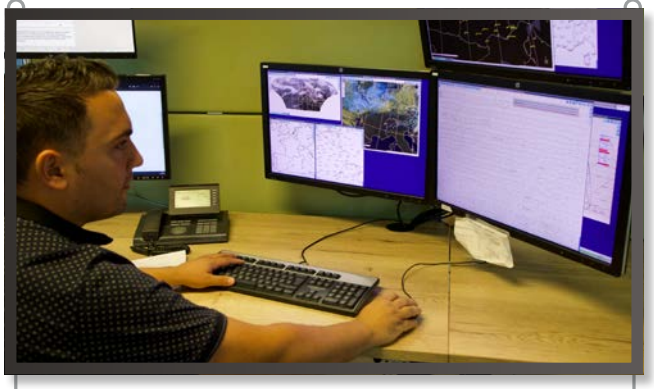
JUR

16:30

Attending a strategic project meeting (A-SMGCS, Surveillance Chain Upgrade, Approach Controller, Final Director, TWR Ground Position, GDPR, Working Hours Waiver, etc.) to advise on ongoing legal aspects, gain a good overview of the project and obtain any information required to review and negotiate the underlying contract and other legal documents with the supplier or stakeholder.

MET PREV

18:00



ATC APP calls the MET office to transmit a PILOT report. The pilot of a commercial aircraft reports that moderate icing has occurred between FL140 and FL160 over the north of Luxembourg. The forecaster on duty immediately transmits this information to Skeyes by telephone and by mail.

ATC TWR

21:00

On a clear day, immediately before sunset, the ATCO switches on the airport lighting system to guide the pilots onto the manoeuvring area and prepare the airfield for the last peak of the day. Soon, the entire Luxair fleet and a few other airlines return to Luxembourg to be ready for the next day.

MET PREV

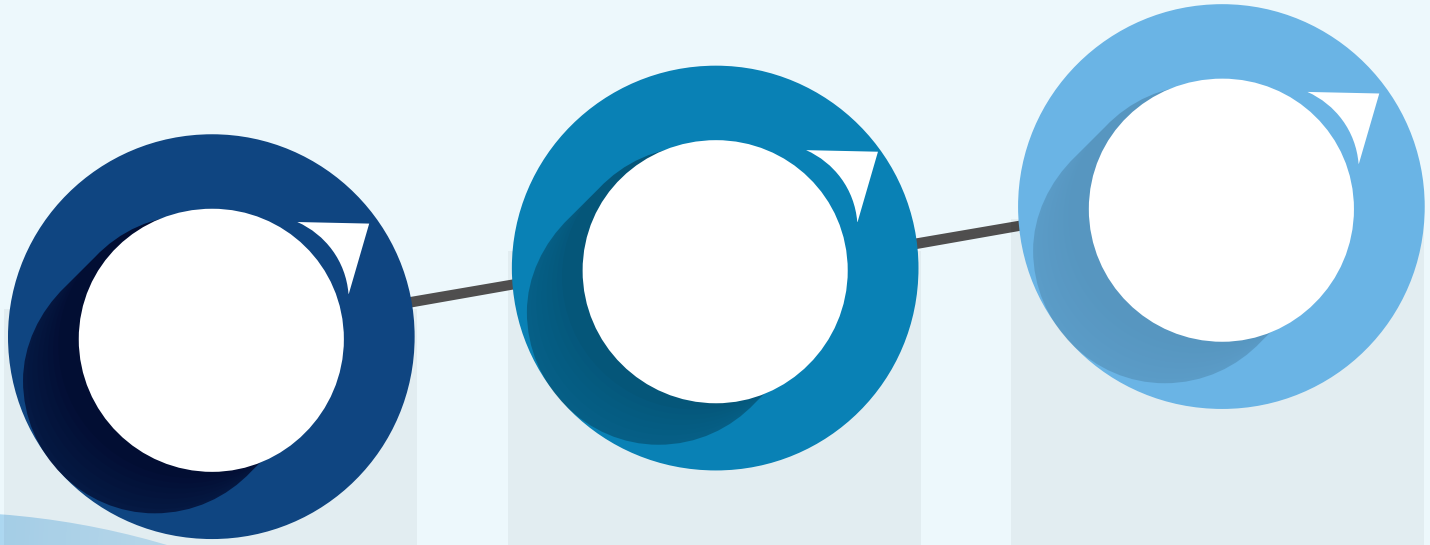
21:00

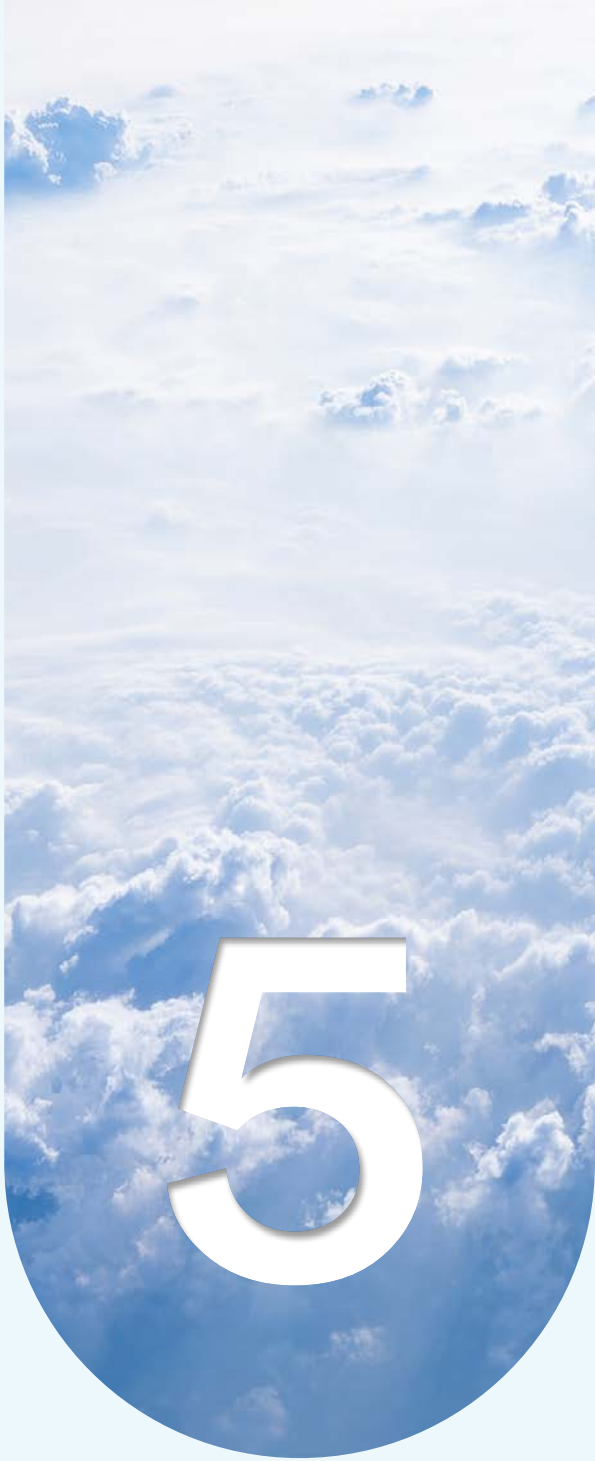
Start of the night shift. The officer who has been working in the afternoon and evening discusses the current weather situation and warnings with his colleague who is starting the night shift. A yellow alert for heavy rain is in place for the following day and it is highly likely that an orange alert will have to be issued the following morning according to the model's current forecasts. The officer working the night shift carries out an in-depth analysis of the available and updated model forecasts and prepares the weather bulletins for the general public and aviation until the early hours of the following day. At the same time, he monitors whether adverse weather conditions could affect Luxembourg territory or the airport and reacts accordingly.

23:00

The forecaster on duty discusses the current alert situation and likely updates for the following day with the alert supervisor. As the weather situation is quite complex and rainfall forecasts differ from model to model, the supervisor and forecaster agree to have a further discussion early in the morning of the following day.

FACTS & FIGURES





FACTS & FIGURES

MOVEMENTS, PASSENGERS, FREIGHT & SERVICE UNITS

Table 1, page 33 shows the activities in Luxembourg terminal airspace and Luxembourg Airport during Reporting Period 2 (RP2) and the three first years of Reporting Period 3 (RP3).

During RP2 air traffic on Luxembourg airport steadily increased – the number of flights and even more the number of terminal Traffic Service Units (TSUs) (from 2015 – 2019) – both had outgrown the projection in the Statistical Forecast of the Luxembourg Performance Plan (PP).

Traffic continued to recover significantly in 2022, particularly compared with other European regions. Freight traffic was maintained at similar levels to previous years, accounting for a substantial proportion of our traffic.

The outlook for the coming years remains uncertain as the recovery depends on many factors, and 2022 has shown the situation is improving but no immune to other crises. ANA continues to adapt its operation accordingly.

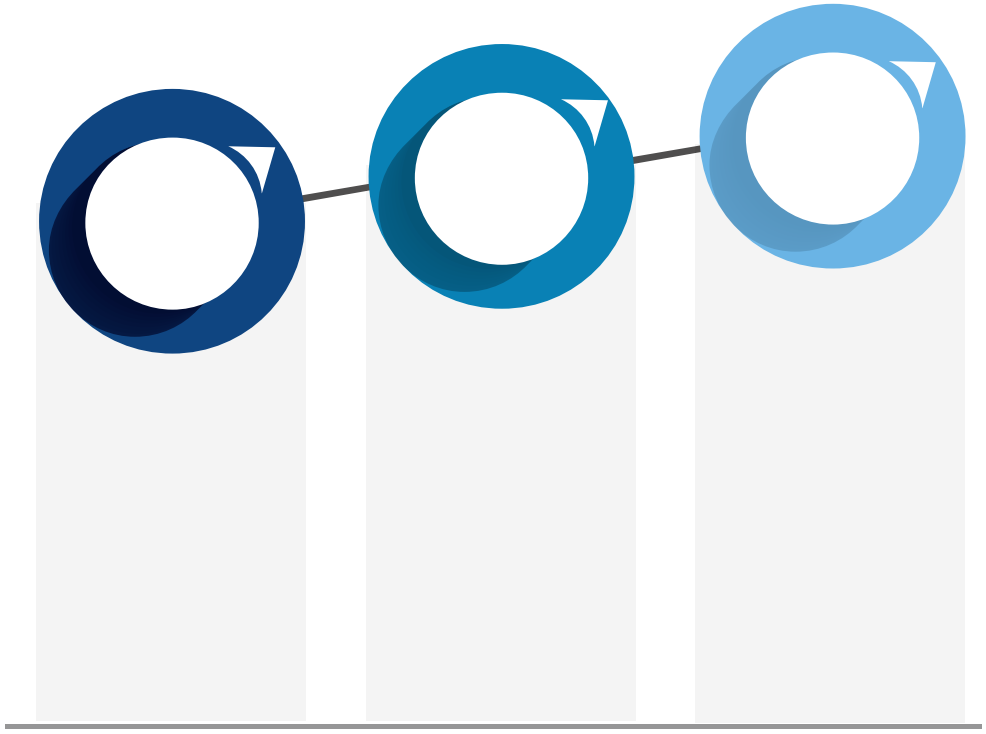
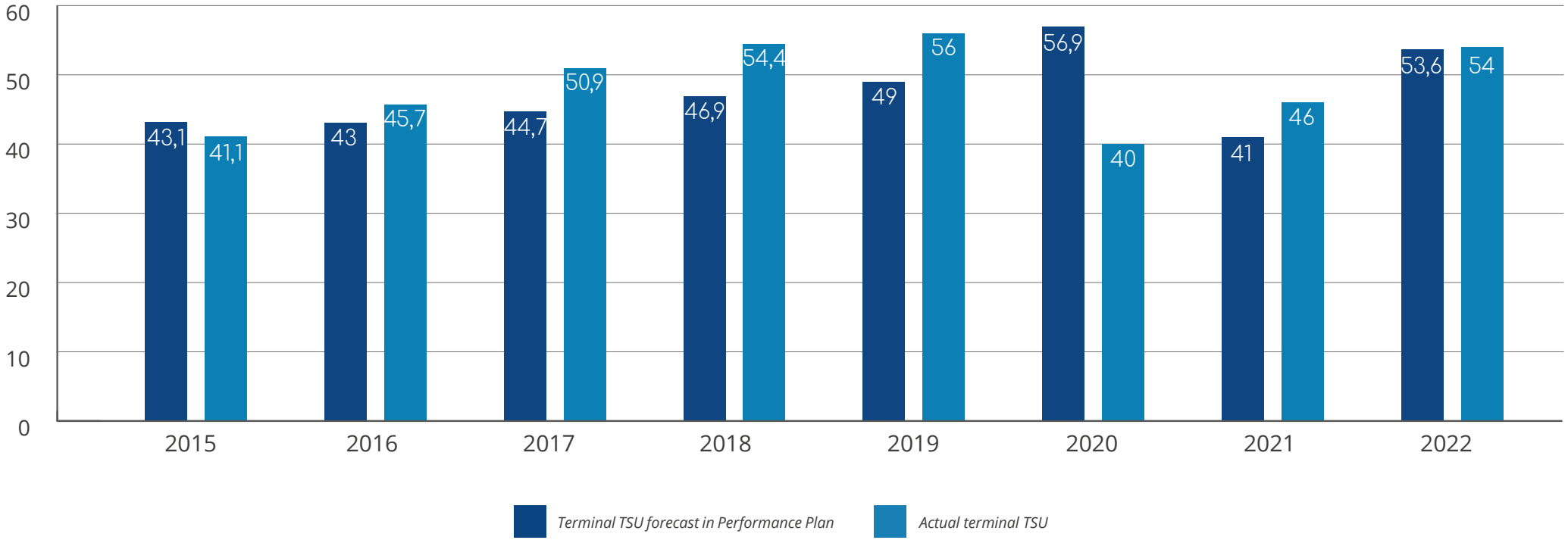


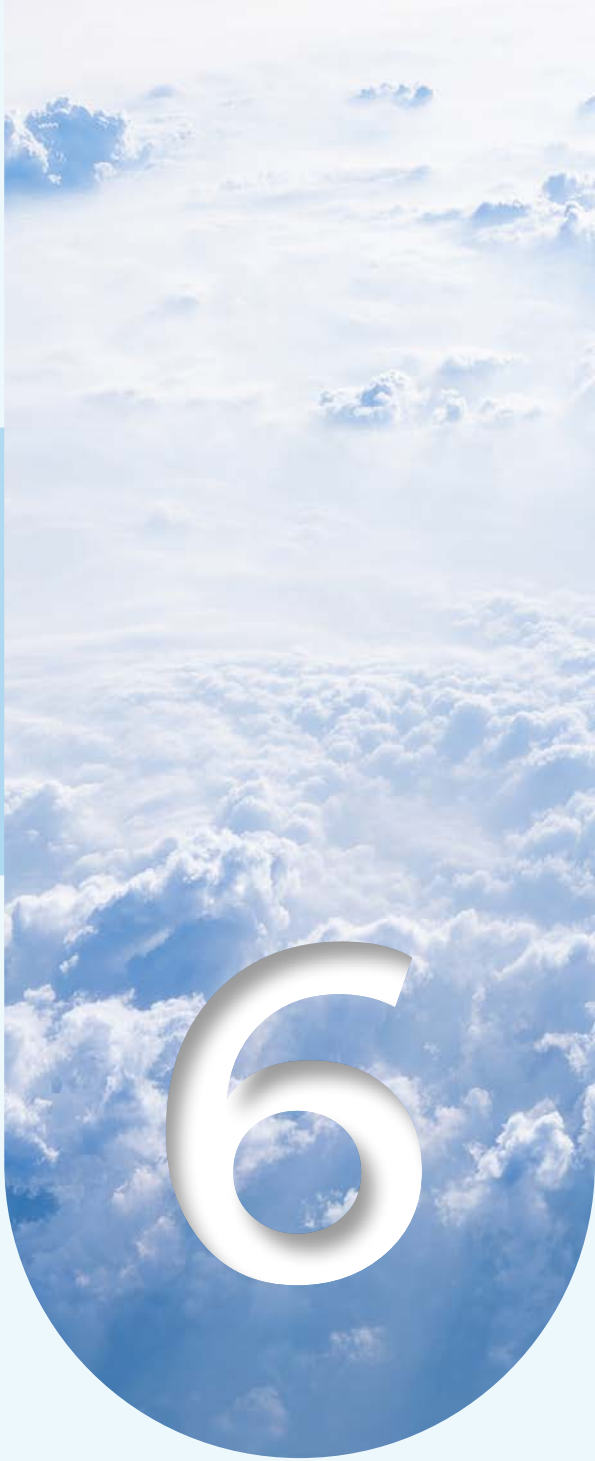
Table 1 – *Traffic movement, passengers, freight & service units over RP2 (2015-2019) and 2021-2022 /2019-2022 in comparison*

	2016	2017	2018	2019	2020	2021	2022	Change 2021-22	Change 2019-22
Reporting Period	**RP2**					**RP3**			
Total movements	86.402	89.944	94.586	94.985	64.705	74.516	93.341	+25,3%	-1,7%
International Movements	69.577	74.515	79.109	80.557	43.639	51.789	74.422	+43,7%	-7,6%
Commercial Movements	62.534	67.927	72.313	73.801	38.629	45.691	68.000	+48,8%	-7,9%
Passengers (Mio)	3,022	3,599	4,037	4,416	1,446	2,039	4,114	+101,8%	-6,8%
Cargo Movements	11.137	12.547	13.364	13.367	13.307	14.931	13.582	-9%	+1,6%
Freight (t)	801.807	897.127	894.649	853.354	905.223	1.088.441	969.962	-10,9%	+13,7%
Actual terminal Traffic Service Units (in .000)	45,7	50,9	54,4	56,0	40,0	46,0	54	+17,4%	-3,6%

Figure 1 - *Terminal TSU forecast and actual values*



KEY PERFORMANCE AREAS



KEY PERFORMANCE AREAS

ANA is in a transition phase in its process to modernise and respond to the evolving ATM environment, which is evident in the mixed KPA results. It was a tough year for ANA and the results reflect this. More work is needed in 2023 to complete this transformation to achieve better results.

Table 3 – *Overview of the achievements in the six KPAs and (local) PIs / targets that are subject to the EU regulated performance plan*

KPA	Key Performance Indicators	Targets 2022	2022 Results
Safety	Effectiveness of Safety Management	Level C in Safety Risk Management	Achieved 3 Level Cs
		Level C/B in all other Objectives	Partly achieved (2Ds, 17 Cs, 6 Bs)
	Maximum tolerable Air Traffic Management (ATM) SE incidents	No ATM SE Class A	Achieved
	Availability of safety critical Communication Navigation Surveillance service (CNS) equipment	Availability according to targets between 99,90 – 99,99% of time	Not Achieved (VCS 99.51%, Monique 99.92%, CHMI NM 99.83%, GP06 99.26%, DME DIK 99.58%, Direction Finder 99.83%, CWP 99.76%, FDPS 99.81%,, SDDS 99.81%, Real Time Monitoring 99.72%, UPS Station BTO 94.79%, UPS Station CE 99.78%, AC BTO, 99.92%
	Effectiveness of contingency exercises to ensure safe mode of operation	No target set; for monitoring and establishment of targets	Not used in 2022
Capacity	Air traffic Flow Management (ATFM) arrival delay	0,5 +50% min/flight	Not achieved (0,1 min / flight average)
	Slot adherence	> 80%	Achieved (94.12%)
	Additional taxi-out time	2.5 (min/flight)	1.95
	ATFM pre-departure delay	0.5 (min/flight)	0.04 minutes per departure Luxembourg
	CRSTMP delay	No target set for RP3	0 min /flight

KPA	Key Performance Indicators	Targets 2022	2022 Results
Cost-Efficiency	Cost-efficiency (terminal Air Navigation Service (ANS))	Reduce Determined Unit Cost (DUC) for terminal services (in real terms) Reduce DUC for En-Route services (in real terms)	See Cost-efficiency (En-route ANS)
	Cost-efficiency (En-route ANS)	TNC : 247,01 ER: 3,05 Please note that the performance plan RP3 for Belgium-Luxembourg is still pending approval by the EU Commission.	TNC: 243.87 ER: 3,08
Environment	Vertical flight efficiency	Continuous Descent Operations (CDO) Usage	65% of incoming flights
	Night flights 2300-0600	Reduce curfew authorizations <95	Achieved (83 flights)
Security	ANS security	ANS Security Management	Ensured
		Access control system	Constant improvement made
	Cyber-security	IT security monitoring	Constant
		CNS security monitoring	Constant
		Threats and vulnerability monitoring	Constant
		Cyber incident prevention and response	Procedures developed
Risk Management	Risk Management Framework maturity	monitored minimum of 80% of maturity for the Risk Management System to be achieved (continuous improvement)	81% Achieved, still in progress

SAFETY

The Safety KPAs are split up in several Key Performance Indicators (KPIs), Effectiveness of Safety Management (EOSM), Maximum tolerable ATM system/equipment (SE) incidents, Availability of safety critical CNS equipment, Effectiveness of contingency exercises to ensure safe mode of operation.

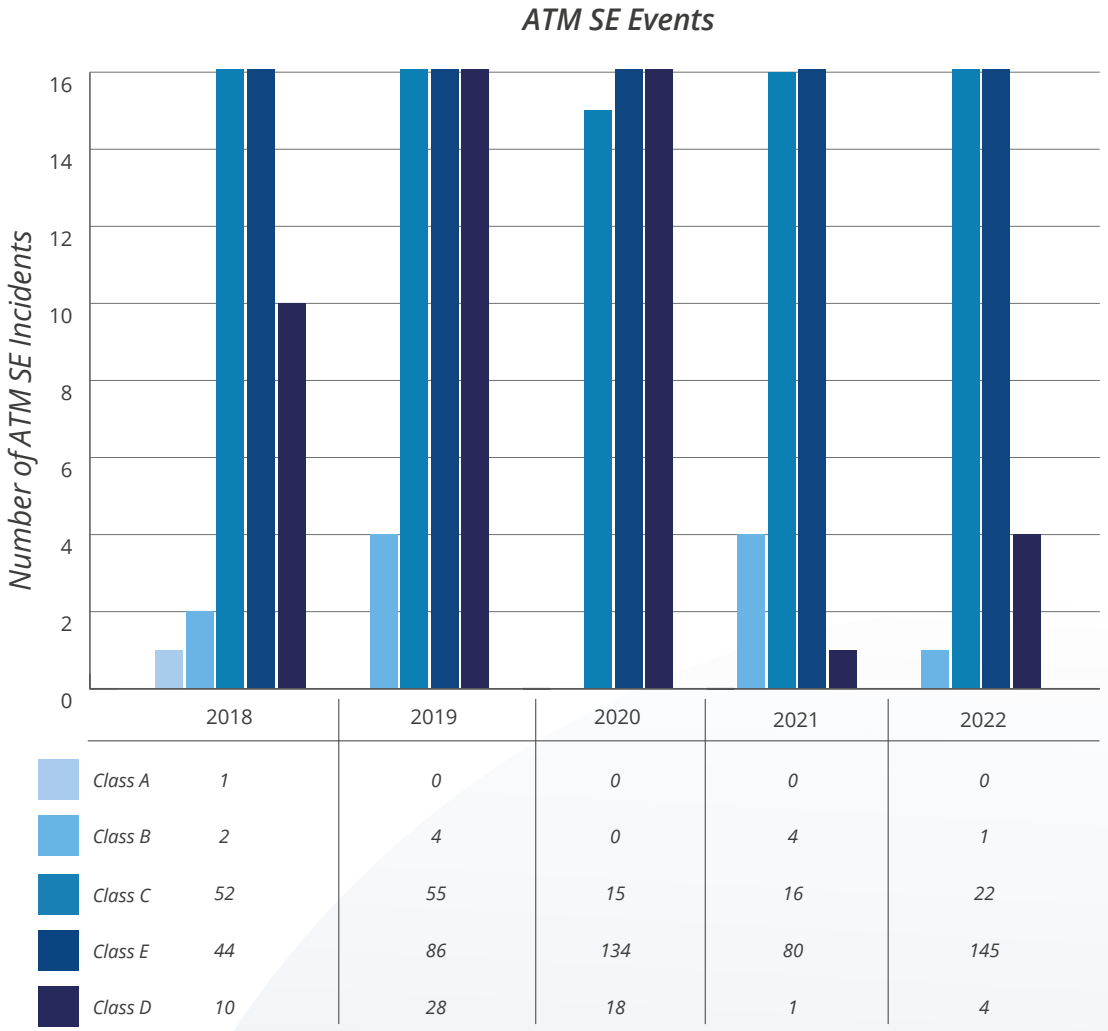
Table 4 – *Effectiveness of Safety Management (EOSM) from 2022 onwards*

New scale	New Management objective	Target 2022	2022 Result
Component 1	Safety Culture	C	1B
Component 2	Safety Policy and Objectives	C	B
Component 3	Safety Risk Management	C	C
Component 4	Safety Assurance	B	B
Component 5	Safety Promotion	C	B

The Effectiveness of Safety Management questionnaire:

The EOSM results of 2022 have stayed stagnant or slight decreased in certain areas. The Safety unit was focused on catching up from a period of high workload and few staff members. Recruitment for the safety unit at the end of 2022 and in 2023 have rectified this problem, enabling the unit to refocus on safety improvement along with their other duties. Because of these actions the scores should improve in 2023.

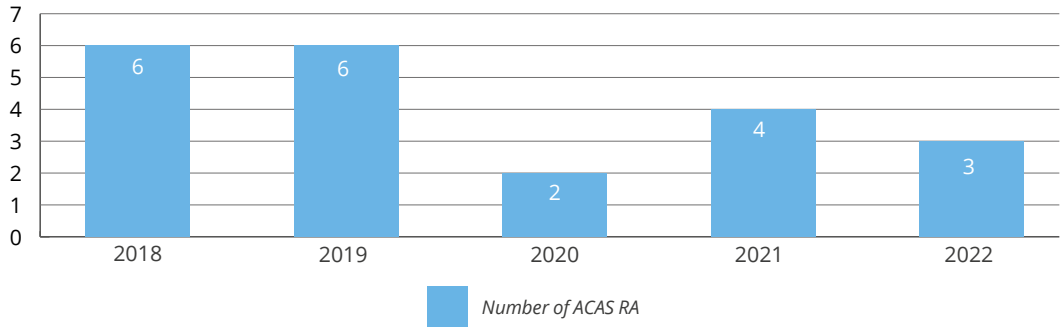
Figure 2 – *Maximum tolerable ATM SE incidents*



	2018	2019	2020	2021	2022
Class A	1	0	0	0	0
Class B	2	4	0	4	1
Class C	52	55	15	16	22
Class E	44	86	134	80	145
Class D	10	28	18	1	4

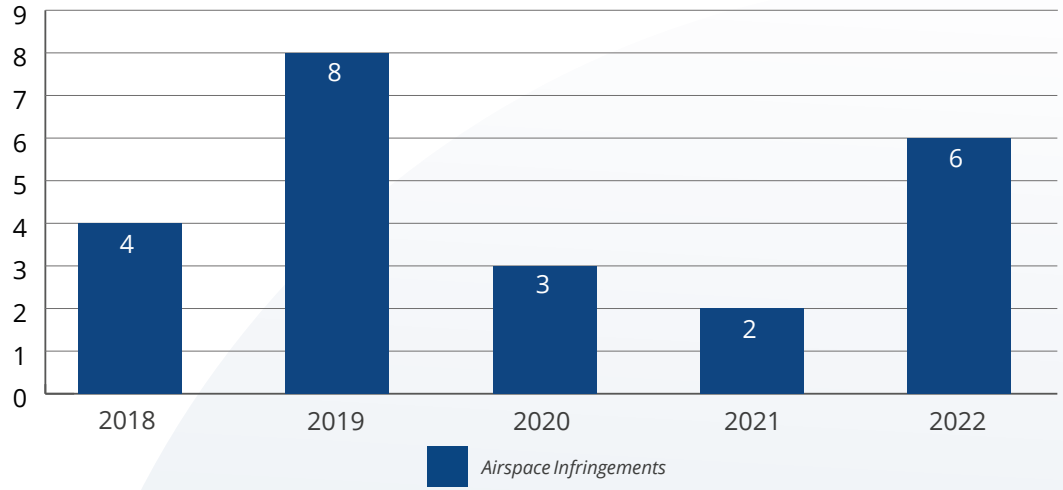
ANA has achieved no critical ATM SE incidents of level A for 2022. We had fewer category B incidents than in 2021. We had more incidents of Category C and E (no safety effect) as our reporting rate increased a lot. The type of issues reported remained the same, the treatment of on-going issues has improved.

Number of ACAS RA



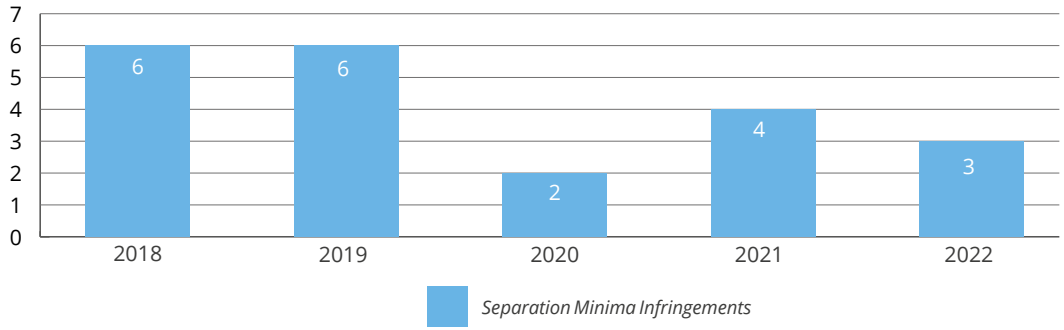
Most ACAS RAs in Luxembourg airspace (when 2 aircraft come within a defined range of each other and a proximity alarm is triggered) happened between VFR and IFR aircraft and between IFR aircraft. Only 1 ACAS RAs occurred in the proximity of the airport which is due to the implementation of mitigation measures in the recent years. No ACAS RAs between IFR aircraft were reported, only between IFR and VFR.

Airspace Infringements



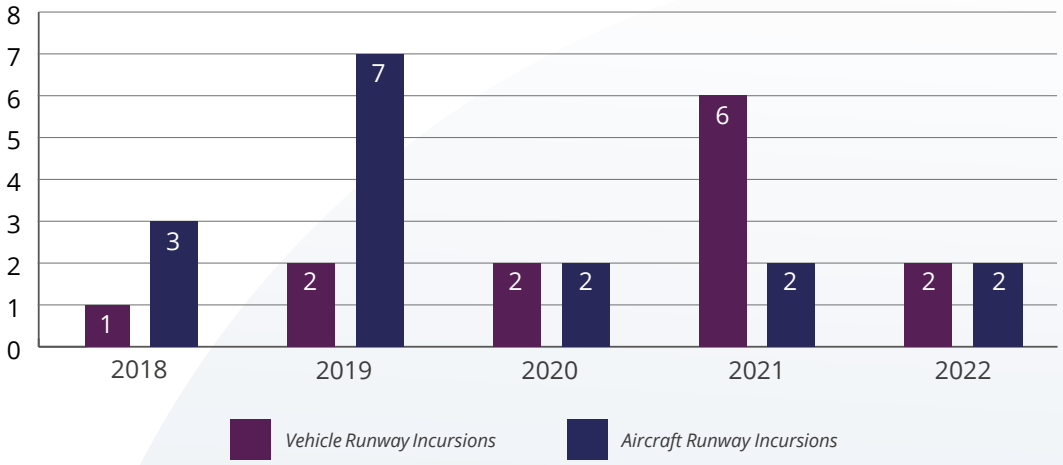
Airspace infringements have increased significantly as the flight activity of VFR and Gilder aircraft have increased after the pandemic. The previous years increase was related to the new temporary restricted zones of the country, where pilots were reminded of. This was successful as only 1 occurrence was related to these zones, the majority were TMA transitions, 2 drones and 3 CTR. A safety survey is planned in 2023 on this topic.

Separation Minima Infringements



Separation Minima Infringements between IFR aircrafts increased in 2022 as ANA had inducted new trainees in the previous years whose training periods caused some of these infringements as the increase in traffic lead to a more challenging environment for them. 2 SMIs happened during normal activities.

Aircraft / vehicle runway incursion



Runway incursions of aircraft have decreased over the last year due to lower traffic and implemented mitigations from the Runway refurbishment project.

CAPACITY

Luxembourg airport and airspace do not have a permanent capacity problem, as traffic is diversified and peak times occur at different times depending on the type of traffic. To cope with traffic peaks and maintain ATM delays at current levels, third position projects are being finalised in the APP in 2022. In addition, reduced separation projects in both ATC units have also been initiated for runways and airspace and were implemented in 2023.

COST – EFFICIENCY

In 2022, the finance department has fulfilled its financial reporting obligations to its stakeholders. Furthermore, as the revised performance plan has not yet been approved, ANA has submitted a further revision of the performance plan for the remaining year of RP3 in July 2022.

The aforementioned revision is mainly based on two factors; reducing determined costs and adjusting the traffic forecast in line with the current situation.

The following paragraphs will provide a more specific view at the En-route and terminal part.

EN-ROUTE COSTS & REVENUES

Skeyes, our partner, is the main ANSP for the provision of En-route services in the common charging zone (Brussels FIR) for Luxembourg and Belgium; Luxembourg upper airspace (above Flight Level (FL) 245) is managed by EUROCONTROL MUAC, whilst the lower airspace (below FL 145/165) is under ANA's control. Luxembourg and Belgium form a common charging zone for ER services. All three ANSPs provide their respective cost parts in full transparency in separate cost tables and MUAC costs are even split between MUAC Luxembourg and MUAC Belgium. For the remainder of this report, we will focus on ANA's contribution to the costs of this common ER charging zone.

With regard to the crisis, the European Commission has set in June 2021 new EU-wide targets in terms of cost reduction. As a consequence, ANA has submitted in October 2021, together with Skeyes and the other FABEC members a revised version of the performance plan for RP3. Although ANA had provided in March 2022 all available information and missing data upon request of the PRB, the European Commission has decided that the submitted determined costs would still be inconsistent with the EU-wide performance targets. As a result, ANA performed a complete overhaul of the determined costs and submitted together with Skeyes a further revised version in July 2022. Since Belgium-Luxembourg had to revise their performance plan once again, another revised version has been submitted in September 2022.

The actual total costs in nominal terms for the ANA ER cost part are 7,522 M€ in 2022 and 7,295 M€ in 2021, an increase of 3%.

ANA's share of the Unit Cost in real terms per service unit for the common charging zone is 5,87€ in 2021 and dropped to 3,08€ in 2022. However, the chargeable unit rate for 2021 were still not based on these actual costs, but on the determined costs from the draft performance plan for RP3. Luxembourg State charges neither the cost of capital to the users, nor the cost of depreciation of investments in the ER (and Terminal Navigation Charges (TNC)) charges. These costs are offset through the "Other Revenues" section. After deductions of over-recoveries and carry forwards from past years, ER users were charged in 2022 a unit rate (UR) of 2,10€ per service unit (SU) on behalf of ANA. Since traffic has recovered after the pandemic crisis, this leads to a notable increase of the annual amount actually recovered through the EUROCONTROL route charges system to Luxembourg from 4,6 M€ in 2021 to 8 M€ in 2022.

Table 5, gives the ANA related unit rates for en-route services for the last year of RP2 (2019) and the whole period of RP3 (2020-2024), the first year of RP3, after adjustments related to inflation and traffic.

Table 5 – *Unit rate for En-Route services 2019 (RP2) and 2020-2024 (RP3) (only ANSP ANA)*

(in k€)	2019	2020	2021	2022	2023	2024
Total determined costs	**6.560**	**7.340**	**7.634**	**7.312**	**7.568**	**7.407**
Inflation adjustment	61	123	112	0	102	151
Traffic adjustment	-4	2	99	76	124	-12
Difference in revenue from temporary application of unit rate						1.028
Adjust. Determined costs	**6.618**	**7.465**	**7.846**	**7.388**	**7.794**	**8.574**
Other revenues	-585	-880	-974	-2.969	-1.217	-1.198
Remaining (chargeable costs)	**6.033**	**6.585**	**6.871**	**4.419**	**6.577**	**7.375**
Total service units (PP forecast)	2.720	2.759	2.811,4	2.108	2.404	2.560
Unit rate (in €/SU)	2,22	2,39	2,44	2,10	2,74	2,88
Annual variation of UR (in %)	-0,73%	7,50%	2,41%	-14,20%	30,47%	5,30%

The following table gives the Total Costs, actuals and determined (DC) in real terms at 2017 price level, actual and forecasted SU´s and the actual and Determined Unit Cost (DUC) in real terms.

Actual costs were 5,7% lower than in 2021, and 0,4% above the DC for 2022. The actual unit cost in real terms is 47,5% lower in 2022 than in 2021 and 0,9% above the Determined Unit Cost mainly due to the COVID-19 crisis.

Table 6 – *Total costs and unit costs for En-Route services in real terms at 2017 price level (only ANSP ANA)*

	2022 Actuals	2021 Actuals	2022 Determined (as planned in the revised Performance Plan (PP) - September 2023)
Total costs (real terms; Inflation index - Base 100 in 2017) for terminal services (.000€)	6.456	6.844	6.432
Service Units (in .000€)	2.096,18	1.166,90	2.107,53
Unit costs in real terms (in €/SU)	3,08	5,87	3,05

Terminal costs & revenues

ANA as Luxembourg ANSP provides approach (APP) and aerodrome control (TWR) services in Luxembourg airspace and at the airport. The actual costs in 2022 in nominal terms for terminal ANS (only the ANSP part) were 15.064 M€ and an increase of 3,3% compared to 2021 (14,581 M€). When compared to the determined costs (14.758 M€), actual costs were around 2% higher. The ANSP unit cost per terminal service unit was 243,87 € in 2022 compared to 301,89 € in 2021. Traffic risk-sharing is mandatory for ANA from RP3 on and ANA operates since 2015 a charging scheme for departures from Luxembourg airport with a modulation of the charges based on the Maximum Take-off Weight (MTOW) in accordance with EU Regulation 391/2013 Art 16 (repealed by EU Regulation 2019/317 Art 32 for RP3). The scheme honours the efforts of airlines to use equipment that emits less noise (based on the aircraft noise certificate in four noise categories, factor E). Charges are lower for flights departing during day times compared to late hours or during night time (>24:00) in three categories, factor D. Charges due and bills are calculated and issued through (ANA's) charging and billing office. After closure of the billing year, traffic and modulation effects are calculated. The full amount in excess of the Determined Cost (DC) reduces user charges in the year after the following year (n+2). After deduction of the costs carried by the State of Luxembourg and taking into consideration of the different carry-forward adjustments related to traffic and modulation, the unit rate charged in 2022 was set with 218,56 € per service unit, well above the unit rate for 2021 (190,85 €).

Since traffic is still recovering after the COVID-19 crisis, the amount of actually recovered TNC charges (11,1 M€) has as well notably risen in comparison to 2021 (9,1 M€.)

Table 7, gives the unit rates for terminal services for the last year of RP2 (2019) and the whole period of RP3 (2020-2024), after adjustments related to inflation, traffic and modulation.

Table 7 – *Unit rate for terminal services 2019 (RP2) and 2020-2024 (RP3) (only ANSP ANA)*

(in k€)	2019	2020	2021	2022	2023	2024
Total determined costs	12.487	14.933	15.456	16.030	15.289	15.809
Inflation adjustment	-382	-381	-425	-	351	313
Traffic adjustment	-1.383	-1.820	-1.526	-557	-341	-17
Modulation adjustment	-	327	389	-	-840	617
Difference in revenue from temporary application of unit rate	-	-	-	-	-	663
Adjust. Determined costs	10.722	13.059	13.895	15.473	14.460	17.386
Other revenues	-1.568	-2.482	-2.818	-3.671	-1.663	-1.773
Remaining (chargeable costs)	9.154	10.577	11.077	11.802	12.797	15.612
Total service units (PP forecast)	49	56,9	58,0	54,4	56,7	60,1
Unit rate (in €/SU)	186,63	185,83	190,85	216,87	225,74	259,58
Annual variation of UR (in %)	-8,93%	-0,43%	2,70%	13,63%	4,09%	14,99%

The following table gives the Total Costs, actuals and determined (DC) in real terms at 2017 price level, actual and forecasted SU s and the actual and Determined Unit Cost (DUC) in real terms.

Actual costs were 3,7% lower than in 2021 and 0,5% below the DC for 2022. The actual unit cost in real terms is 19,2% lower in 2022 than in 2021 and stays 1,3% under the Determined Unit Cost.

Table 8 – *Total costs and unit costs for terminal services in real terms at 2017 price level (only ANSP ANA)*

	2022 Actuals	2021 Actuals	2022 Determined (as planned in the revised Performance Plan (PP) - September 2023)
Total costs (real terms; Inflation index - Base 100 in 2017) for terminal services (.000€)	13.184	13.696	13.246
Service Units (in .000€)	54,1	45,4	53,6
Unit costs in real terms (in €/TSU)	243,9	301,9	247,0

Investments (CAPEX)

After years of hold out, ANA started in 2018 to overhaul the whole ANSP infrastructure. In 2020 and 2021 the pandemic crisis has put a temporary break on this plan, which resulted in a re-prioritization, cancelling and postponement of parts of the project portfolio. However, ANA is willing to pursue the plan to renew and modernize the ANS and ATM infrastructure in line with SESAR / ATM MP. The list of investment projects for 2022 can be found in chapter 2022 Investments – ATM/ANS & Aerodrome Services, page 68.

In 2022, the total investments (Capital Expenditure - CAPEX) amount for the entire ANA (ANSP, Aerodrome and non-aeronautical services) showed a significant reduction and was far lower than the amount foreseen in the revised performance plan:

Total Investments (k€)

- 2022 3.033
- *2021 3.947*

The following table presents the CAPEX in the scope of the performance plan (ANSP part only), meaning that they can, according to the cost allocation principles in place, be allocated either to ER or to TNC.

Table 9 – *Annual and cumulative investment costs in the scope of the performance plan*

	2022 Actuals	2021 Actuals	2020 Actuals
	RP3 – Year 3 of 5	RP3 – Year 2 of 5	RP3 – Year 1 of 5
Total ANSP investments (k€) actuals vs planned (for the year)	996 / 2.528	2.291 / 2.088	2.527 / 7.484
Total ANSP investments (k€) cumulated actuals vs planned (for the total 5 years of the RP)	5.813 / 14.340	4.817 / 14.340	2.527 / 18.712
% of CAPEX target achievement for the RP	41%	34%	14%

ENVIRONMENT

The European Green Deal foresees the need to reduce transport emissions by 90% by 2050 (compared to 1990 levels). The Luxembourg government has also decided to step up its climate efforts, and is aiming for a 55% reduction in greenhouse gas emissions by 2030 compared with the 2005 baseline year. The government is committed to achieve zero net emissions in Luxembourg by 2050 at the latest. ANA is committed to achieve this ambitious but essential goal and therefore began calculating its carbon footprint in 2021, initially for scopes 1 and 2. In 2022, ANA went a step further by identifying all the other emissions categories in scope 3.

After calculating the carbon footprint with direct aspects in 2021 (according to EMAS, direct means that ANA is directly responsible and is the decision-maker), ANA's environmental unit further investigated all relevant methodologies to develop a broader or more comprehensive carbon footprint and to find the most practical tool for ANA and its EMS.

In calculating the 2022 carbon footprint, ANA takes into account, by order of magnitude, the greenhouse gas emissions generated by all the physical processes necessary for the existence of a human activity or an organisation, where it is possible to assign clear boundaries.

Emissions have been divided into three categories according to the Greenhouse Gas Protocol (GHC) in order to better understand their source.

On the European side, ANA co-chaired, with Skeyes, Pillar 3 of the ATM/ANS Environmental Transparency Working Group founded by EASA and Eurocontrol. Pillar 3 focuses on improving the carbon footprint of ANSPs. The objective of the ATM/ANS Environmental Transparency Working Group is to develop proposals on how ATM/ANS providers can increase environmental transparency and demonstrate their efforts to provide environmentally friendly air navigation services.

ANA, in cooperation with Skeyes, organised a series of sustainability webinars that focused on ways to improve the environmental footprint of ANSPs.

The webinars provided participants with the knowledge and skills to analyse the carbon footprint of their own business processes. They gave participants an overview of what an ANSP can do to control its own environmental impact, excluding airline emissions. These webinars focused on decarbonising buildings, vehicles and company infrastructure. The result of this fruitful work was the report of the Pillar 3 working group, which was published at the end of 2022.

https://ana.gouvernement.lu/dam-assets/publications/eurocontrol/eurocontrol-step-by-step-guide-measure-ansps-carbon-footprint.pdf

The carbon footprint analysis enabled ANA to identify the categories with the greatest impact on GHG emissions and to prioritise the search for solutions and actions that would significantly reduce the carbon footprint.

The carbon footprint analysis has proven to be an excellent management tool for the environmental management review, feeding the environmental action plan with results-oriented actions.

Following our last environmental review, environmental objectives were agreed and defined. It is planned to reassess our carbon footprint analysis on an annual basis. This new management tool for prioritising environmental actions will enable us to track progress in reducing our emissions and resources. A roadmap for our department will be developed to identify actions and their impact on the ANA's carbon footprint, in order to align with the ambitious national targets for carbon reduction and zero emissions. Concrete actions have already been taken. ANA wishes to define a new process for the purchase of new equipment linked to the CO2 equivalent and the home office.

Further details can be found in the ANA's 2022 Environmental Statement, which will be published in November 2023.

https://ana.gouvernement.lu/fr/publications/Environmental_statement/environmental-statement-2023.html

NIGHT FLIGHTS

The number of night flights has risen from 1215 recorded in 2021 to 1379 for the whole of 2022. This represents an increase of 13.5%.

Cargo night flights, in particular, have fallen from 856 night flights in 2021 to 640 night flights in 2022, a reduction of 25.2%.

As for curfew extensions, 83 were granted in 2022, compared with 90 the previous year.

In terms of positive approaches, the limit of 95 was once again not reached.

SECURITY

The overall aim of KPA Security is to constantly improve security, whether it be physical security or cyber security.

In the world of security, the challenge is constant because no one can claim that their security measures are optimal and do not require constant innovation and improvement.

The main objective of the security management system is to guarantee the continuity of the administration's activities and the protection of its staff, whether in terms of physical security or cyber security.

In today's world, security has become a permanent challenge, as it is impossible to pretend that the measures in place are optimal and do not require continuous innovation and improvement.

Security management for our administration includes risk analysis, the implementation of measures to limit the risks identified, the management of controls, including audits (internal and external), inspections and tests, technology watch, threats and regulations, incident analysis, etc. for both physical and cyber security.

In 2022, security was assured, since it did not give rise to any serious incidents with an impact on the administration's assets. In addition, audits, tests and inspections (both internal and external) did not reveal any glaring weaknesses in the system.

All the observations and innovative responses proposed in the area of ANA safety are and have contributed to the improvement of safety management in 2022 and constitute elements of continuous safety improvement in the years to come.

Stricter standards for access control systems implemented at all land sites were successfully tested in 2022 as part of regular checks. The level of security of access controls is therefore constantly increasing.

With regard to cyber security, ANA has regularly carried out vulnerability assessments and penetration tests (internal and external). The results showed that the level of cybersecurity needed to be reviewed and improved with actions which, for the most part, have already been implemented in 2022.

Finally, following the various regulations, in 2022 our administration strengthened synergies with the High Commission for National Protection (HCPN) and with the Luxembourg Institute for Regulation (ILR).

RISK

The Risk Key Performance Indicator monitors and assesses the maturity of Ana's Risk Management System. It measures the level of implementation and its progresses. It is based on several weighted elements like the level of maturity of the Risk Management integration, design, implementation, process, evaluation, and improvement.

Risk Management

In 2022, we continued to implement a risk-based approach for all of our organisation's activities, in accordance with a methodology validated by our ISO9001 auditors.

This approach provides ANA's management with a holistic view (in the form of risk mapping) of the most significant risks that any entity in the organisation could face. This approach makes it possible to propose, prioritise and validate the implementation of mitigation measures to reduce the most significant risks.

Our risk management system is based on the seven principal risks of our organisation: aviation safety, business continuity, security, occupational health, reputation and finance. In 2022, we introduced the ability to compare the evolution of risks from one year to the next, but we also improved the definition of our risk appetite.

In addition, we have focused on information and network security risks. To this end, we have developed a new tool that complies with the requirements of the Institut Luxembourgeois de Régulation (ILR). This new tool complements the global mapping of risks already in place

The Key Performance Indicator (KPI) for the maturity of the organisation's risk management system, itself based on the ISO 31000-2018 framework, is estimated at 81%. This KPI measures the level of implementation and its progress. It is based on several weighted elements, such as the level of maturity of the integration, design, implementation, process, evaluation and improvement of risk management. This indicator is constantly evolving as the risk management system is rolled out.

Program Management

With regard to the management of the ANA's project portfolio (programme management), the year 2022 has been the subject of significant budget rationalisation, thus limiting the number of new projects. Particular attention has been paid to projects considered essential to ensure air safety and continuity of operations, to the detriment of other projects which have had to be delayed in their launch or implementation process. The project portfolio is monitored on a recurring basis by management through various dedicated meetings, but also by the Strategic Management Team (SMT), during which the performance of each project is assessed along three main axes: compliance with project scope, resource management and compliance with deadlines.

In addition, a more global Key Performance Indicator (KPI) monitors the entire project portfolio through the timely completion of projects. This indicator reached a score of 45% in 2022, whereas the minimum expected level is 75%. The continuing consequences of the pandemic crisis, the lack of resources in certain entities, and above all the need to prioritise our project portfolio in the interests of sound strategic and budgetary management, partly explain this low value in 2022.

A second key performance indicator relates to projects delivered. It concerns the control of overall expenditure in relation to the overall budget initially planned. For 2022, this indicator is 89%, in line with the minimum target of 75%.

Project ID	Project Name	Project Owner	Completion Date
PRJ-000210	MeteoLux Mobile application	MET	31/07/2022
PRJ-000216	LVP for runway 06	TWR	31/12/2022
PRJ-000218	Mode S compliance in FABEC area	APP	30/10/2022
PRJ-000226	ATCO Qualification Management Tool	ADM	31/07/2022
PRJ-000238	NDB-Independent Flight Procedures Luxembourg	APP	27/01/2022

STAKEHOLDERS CONSULTATION

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STAKEHOLDERS CONSULTATION

In 2022, ANA continued to maintain close coordination with all stakeholders.

We coordinated and consulted the Ministry in charge on plans, changes and respective financial implications.

Of specific concern for ANA as customers and stakeholders are the airlines and Lux-Airport.

The annual Airport User Committee (AUC) meeting was held in a face to face setting again. The financial outturn and terminal ANS charges levied in 2022 was explained and 2023 Terminal Navigation Charges (TNC) determined cost and the final unit calculated and explained.

INTERNATIONAL ACTIVITIES

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INTERNATIONAL ACTIVITIES

PARTICIPATION IN FABEC, EUROCONTROL AND CANSO ACTIVITIES

ANA as an organization and staff representing certain activities take an active role in Functional Airspace Block Europe Central (FABEC), EUROCONTROL and Civil Air Navigation Services Organization (CANSO).

ANA continued to participate in the various FABEC Committees, CANSO, Maastricht Upper Area Control Center (MUAC) and EUROCONTROL groups and provided support to the State regulator on Air Navigation Service Provider (ANSP) and Single European Sky (SES) related subjects. Their virtual nature enabled ANA to send more representatives to the different meetings and workshops.

Organization	Group	ANA Service Represented	Summary
EUROCONTROL	Safety Team	Safety	Representing the interests of ANA ANSP Safety in the European context and receiving support for our activities.
FABEC	SC SAF	Safety	Representing our SAFETY interests on FABEC level and receiving support for our activities.
CANSO	CESAF	Safety	Representing the interests of ANA ANSP Safety in the European context and receiving support for our activities.
FABEC	PMG	Performance	Representing the interests of ANA Performance Management in the FABEC context.
FABEC	ASB	DIR / CERT	Representing the interests of ANA in FABEC context.
FABEC	Standing Committee Finance (SC FIN)	FIN	Representing the interests of ANA in financial and cost-efficiency matters in the FABEC context.
CANSO	EC3	CERT	Representing the interests of ANA in CANSO context.
FABEC	Human Resources and Training Standing Committee (HRT SC)	HR	Representing ANA HR interests at the FABEC HRT SC that discusses and deals with human resource and training topics within FABEC.
FABEC	Social Dialogue Committee (SDC)	HR	Representing ANA HR interests at the FABEC SDC that deals with matters of social interest within FABEC.
FABEC	Training Task force (TTF)	HR/Training	Representing ANA – HR TRAINING interests on FABEC level and receiving support for our activities.
Eurocontrol	ATM Training Team (ATT)	HR/Training	Forum for exchanges between training experts at EU level.

Organization	Group	ANA Service Represented	Summary
Eurocontrol	Enlarged Committee	FIN	Representing the interests of ANA in the Enlarged Committee
MUAC	BFWG-4	FIN	Representing the interests of ANA in the Budget Finance and Working Group of the MUAC member states
FABEC	SC-OPS	ATC-OPS	Representing our OPERATIONAL interests on FABEC level and eceiving support for our activities.
FABEC	CRM	COM	Customer Satisfaction exchanges and FABEC survey. Quality team is the focal points.
FABEC	COM CELL	COM	Communication is an essential function that needs to be centrally managed in order to help FABEC achieve its intended goals.
FABEC	SC IRL	LEGAL	Representing legal interests on FABEC level and receiving support for our activities.
Eurocontrol	Eurocontrol AI Operations	OPS	The AI Operations Subgroup (AI-OPS SG) is a stakeholder working and consultation arrangement of EUROCONTROL, governed by and subordinated to the Agency Advisory Body (AAB). AI-OPS SG reports to AIM Group and EAD Service Steering Group.
Eurocontrol	Eurocontrol Information Regulations Implementation Sub-Group (AIRI SG)	OPS	The Aeronautical Information Regulations Implementation Sub-group (AIRI SG) is established to facilitate all pan-European aspects linked with the implementation of existing or new AIS/AIM regulations, stemming from ICAO or EU, in close consultation with the relevant stakeholder groups. The AIRI is responsible for monitoring ongoing implementation, sharing experiences, supporting the development and evolution of specific guidance, assessing upcoming changes to AIS/AIM regulations concerning their potential impact on services and to advise the AIM Group on relevant matters.

Organization	Group	ANA Service Represented	Summary
Eurocontrol	AIM Group (AIMG)	OPS	The Aeronautical Information Management Group (AIMG) is a technical, operational, specialist advisory body. It provides a direct channel of consultation between all stakeholders involved in activities pertaining to performance and delivery aspects at the tactical (technical) development/deployment level for the AIM area.
Eurocontrol	Information Management Team (IMT)	OPS	The Information Management Team (IMT) is a technical, specialist advisory body. The IMT is the forum for consultation between all stakeholders on activities related to information management and exchange; in support of the design, planning, implementation and operation of a safe, secure, cost-efficient, dynamic and sustainable European ATM network. It will facilitate Pan-European buy-in, including civil-military coordination, and follow-up from concept to delivery, from research to very short term/tactical deployment aspects.
Eurocontrol	European Aeronautical Information Services Database Stakeholders Steering Group (EAD SSG)	OPS	The EAD Service Steering Group (SSG) is predominantly a service and business-oriented group with the aim of providing high-level guidance on all the elements in support of the EAD being an integrated, harmonized and interoperable solution for use of safe, secured and high quality aeronautical information.
Eurocontrol	Information management Team (IMT)	OPS	The IMT is a technical, specialist advisory body, established within the framework of the EUROCONTROL Network Cooperative Decision-Making processes. The IMT shall be the forum for consultation between all stakeholders on activities related to information management and exchange; in support of the design, planning, implementation and operation of a safe, secure, cost-efficient, dynamic and sustainable European ATM network. It will facilitate Pan-European buy-in, including civil-military coordination, and follow-up from concept to delivery, from research to very short term/tactical deployment aspects.
FABEC	FABEC AIM Steering Group (SG)	OPS	The SG is responsible for AIM Strategy & Policy (Business Case) and expert resources and provides tactical support to the FABEC airspace design projects such as harmonised working chart production and synchronisation of publications. The AIM Steering Group (SG) will defined a common planning and publication process to ensure the timely and synchronised publication of cross-border AD projects within FABEC (FABEC AIM Mandatory Information Areas (MIAs)).

Organization	Group	ANA Service Represented	Summary
ACT	Groupe Technique de l'Infrastructure de Données Géographiques	OPS	The ILDG (infrastructure luxembourgeoise de données géographies) represents the collaboration platform of geographical data at the level of the Luxembourg State. The members of the GT-ILDG are representatives of their respective public organizations and come together 2-4 times a year to discuss projects related to geodata, to discuss challenges and the progress of development of the geoportal tools created by the ILDG / Geoportal team at the Cadastre and to coordinate the experts work on INSPIRE.
LAP	Lux-Airport Airport Works Coordination (AWoC)	ANA	Meeting organised by lux-Airport regarding airside works coordination between LAP, ANA and PCH.
ICAO	Information Management Panel (IMP)	OPS	The Information Management Panel (IMP) was established to develop a global and harmonized interoperable approach and elaborate on necessary concepts in order to ensure effective management of information, including identifying the need for new information exchange formats, on a system-wide basis within the air navigation system.
ICAO	Working Group Aeronautical Information Management (WG-A)	OPS	The WG-A of the Information Management Panel is a group of dedicated international experts providing technical expertise on the subjects of aeronautical information and aeronautical charting to the Assembly, Council and the Air Navigation Commission (ANC) of ICAO.
ICAO	AFS to SWIM Transition Task Force (AST TF)	OPS	The AST TF is established by the European Region Aviation System Planning Group (EASPG) to ensure seamless transition to SWIM and pursue the tasks and issues related to Aeronautical Fixed Service (AFS) in support of the ICAO Strategic Objectives as reflected in the Global Air Navigation Plan (GANP - Doc 9750) and the relevant Air Traffic Service Units (ASBU).
FABEC	IntACT		Compliance Performing audits on FABEC level to improve understanding and compliance level

DEVELOPMENT OF FINANCE PROCESS

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DEVELOPMENT OF FINANCE PROCESS

Luxembourg State continued to cover the costs for ATM investments and cost of capital. The depreciation costs for investments are not charged to airspace users saving them an amount of close to 3.7 M€ in 2022 in terminal costs and about 3 M€ for En-Route ANS provision.

Following the COVID pandemic, the activity during the year 2022 shows a notable increase. En-route service units increased by more than 80%, while the terminal activity even reached an activity level close to what it was before the crisis. This mainly impacts the income caption, which shows a significant increase of fees received, both for En-route and TNC, from 13.7 M€ in 2021 to 19.1 M€ in 2022.

2022 INVESTMENTS – ATM/ANS & AERODROME SERVICES

Table 11, page 68 gives the details on investment in 2022 for projects related to the provision of ANS including CNS, Aeronautical Information and MET Services and for Aerodrome Infrastructure services that ANA provides to Luxembourg Airport.

Table 11 – *ATM/ANS and Aerodrome Investments in 2022*

Department/Service - Project Title	Expense 2022 (€)
ELE - Constant Current Regulator (CCR)	1.827.484
ELE - ALCMS Update 2022	158.785
ELE - Electrical Station for Gate 18 and stations 06 & 24	68.397
CNS - V/UHF analyser	46.488
MET - Data collector sensors Metgarden	134.813
ELE - ILCMS	45.724
Sub-total project related expenses	2.281.691
Sub-total non-project related expenses	751.968
Grand Total	**3.033.659**

2022 RESULTS

The 2022 accounts give a consolidated view of ANA´s global financial situation. After a loss of 0,9 M€ in 2021, still due to the Covid crisis, ANA's income site has recovered in 2022, resulting in a gain of 15,1 M€. This good performance is mainly due to a significant increase of public funding and the aforementioned increase of terminal and en route traffic. Moreover, STATFOR forecast shows that traffic should reach pre-Covid level faster than initially foreseen.

GLOSSARY

Abbreviation	Meaning
A-SMGCS	Advanced Surface Movement Guidance and Control System (ground radar)
ACAS RA	Airborne Collision Avoidance System - Resolution advisory
ACC	Alternating current
AFS	Aeronautical Fixed Service
AGE	Water Management Administration
AGL	Airfield Ground Lighting
AIC	Aeronautical Information Circulars
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIRI SG	Aeronautical Information Regulations Implementation - Sub-group
ALCMS	Airport Lighting, Controlling, and Monitoring System
AMHS	ATS Message Handling Services
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
APP	Approach Service
ARO	ANA division aerodrome reporting office
ASB	ANSP Strategic Board
AST TF	AFS to SWIM Transition Task Force
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Controller
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATM MP	ATM Master Plan
ATM SE	ATM System/Equipment
ATSEP	Air Traffic Safety Electronics Personnel
ATT	ATM Training Team
AUC	Airport Users Committee
AWoC	Lux-Airport Airport Works Coordination
AWOS	Automatic Weather Observation System
BFWG-4	Budget Finance and Working Group of the MUAC member states
CANAC2	Computer Assisted National Air Traffic Control Centre 2 - Belgian ATCC
CANSO	Civil Air Navigation Services Organisation
CAPEX	Capital Expenditure

Abbreviation	Meaning
CAT II/III	Category of Operation (I, II, III etc.); ILS approach
CCR	Constant current regulators
CDO	Continuous Descent Operation
CERT	ANA department ´Certification´
CESAF	CANSO European Safety Directors Group
CGDIS	Airport firefighting department
CNS	Communication Navigation Surveillance service
COM CELL	FABEC Communication Cell
CRM	Customer Resource Management
CRSTMP	ATFM delay causes (Capacity, Routing, Staffing, Equipment, Airspace Management, and Special events)
CTIE	State Information Technology Center
CWP	Controller Working Position
DC	Determined Costs
DIR	ANA Directorate
DME	Distance Measuring Equipment
DUC	Determined unit costs
EAD SSG	European Aeronautical Information Services Database Stakeholders Steering Group
EASA	European Agency for the Safety of Aviation
EC	Executive Controller
EC3	European CANSO CEO Committee
ELE	ANA Electro technical Department
EMAS	Eco-Management and Audit Scheme, an environmental certification ANA holds
EMS	Environmental Management System
EOSM	Effectiveness of Safety Management
ER	En-Route
eTOD	electronic Terrain & Obstacle Data repository
FABEC	Functional Airspace Block Europe Central (a cooperation of ANSPs from Germany, the Netherlands, France, Belgium, Luxembourg, Switzerland and including MUAC)
FIR	Flight Information Region
FL	Flight Level
GDPR	General Data Protection Regulation (EU Reg 2016/679)
GHC	Greenhouse gas protocol
GHG	Greenhouse gas emissions
GIS	Geographic Information System
GT-ILDG	Groupe de travail - Infrastructure Luxembourgeoise de Géodonnées

Abbreviation	Meaning
HCPN	High Commission for National Protection
HR	Human Resources
HRT SC	Human Resources and Training Standing Committee
ICAO	International civil aviation organization, a UN agency
IFR	Instrument flight rules
ILR	Luxembourg Institute for Regulation
ILS	Instrument Landing System
IMP	Information Management Panel
IMT	Information Management Team
ISO	The International Organization for Standardization is an international standard-setting
JUR	Legal affairs department
KPA	Key Performance Area
KPI	Key Performance Indicator
LAP	Lux Airport
LVP	Low Visibility Procedures
MET	MeteoLux (Luxembourg aeronautical and general meteorological service provider)
METTECH	MeteoLux technical engineers
MTOW	Maximum Take-Off Weight
MUAC	Maastricht Upper Area Control (EUROCONTROL)
NDB	Non Directional Beacon
NFZ	No-Fly Zones
OPS	ANA Operations Department (AIM-ARO)
PC	Planning Controller
PCH	Ponts & Chaussées
PMG	FABEC Performance Management Group
PP	Performance Plan
PRB	Performance Review Board
RP	SES Performance Scheme Reference Period
RP2	SES Performance Scheme Reference Period 2 (2015-2019)
RP3	SES Performance Scheme Reference Period 3 (2020-2024)
RVR	Runway Visual Range
RWY	Runway
SAF	Safety (one of the five core KPAs for European performance planning)

Abbreviation	Meaning
SAR	Search and Rescue
SC	Standing Committee
SC IRL	FABEC Standing Committee Institutional - Regulatory - Legal
SC SAF	FABEC Standing Committee Safety
SC-OPS	FABEC Standing Committee Operations
SDC	FABEC Social Dialogue Committee
SDDS	Surveillance Data Distribution System
SE	System/Equipment
SES	Single European Sky
SESAR	Single European Sky ATM Research (a technical collaborative programme for the complete overhaul of the European ATM network and infrastructure)
SG	Steering Group
SMI	Structure of Management Information
SPOC	Single Point of Contact
STATFOR	Statistics and Forecasts on air traffic in Europe (Eurocontrol)
SU	Service unit (measurement unit based on MTOW of aircraft for the calculation of user charges)
SWIM	System Wide Information Management (SESAR core project)
TAF	Terminal Aerodrome Forecast
TMA	Terminal Area
TNC	Terminal Navigation Charges
TSU	Traffic Service Unit
TTF	FABEC Training Task force
TWR	Tower service
TWY	Taxiway
UAV	Unmanned Aerial Vehicle
UR	Unit Rate
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omnidirectional Range
WG-A	Working Group Aeronautical Information Management
WIGOS	WMO's Integrated Global Observing System
WMO	World Meteorological Organization

LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Mobilité
et des Travaux publics

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