



ANA


Administration de la
navigation aérienne

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FOREWORD



"The greatest asset of ANA is the dedication and professionalism of its people". This is my firm personal conviction.

ANA's innovative culture and the values shown by our staff enabled us facing the 2021 challenges related to the consequences of the COVID-19 pandemic.

It is up to everyone to be courageous, to be open to change and to develop their own capabilities.

Last year events highlighted the ANA work culture.

As Director, I am proud in the way that we responded to the crisis and how we adapted and simply "made things work" for the benefit of our customers.

We had to continue to provide services at any time and so we had to respond adequately to ensure that staff could still work in a healthy and safe environment.

Our customers are all aware of our challenges and appreciate the efforts we are making. Despite those challenges, ANA continued to develop itself.

All this shows ANA's innovative capabilities especially in the environmental area — something which I have been focusing on for some time.

Clearly, the recent events have hit the entire aviation industry extremely hard. Despite being budget rather than revenue-driven, ANA is not immune to the need to reduce costs wherever possible. Since the onset of the pandemic, ANA management has been proactive in scrutinizing the financial situation and making savings.

In conclusion, it is clear that 2021 presented an exceptional challenge to the aviation industry and I am confident that, in the future, ANA and all its stakeholders will stay true to the goal of providing safe, expeditious and cost-effective integrated air navigation services.

KEEP HEALTHY AND SAFE!

Claudio Clori
ANA Director



ANA MISSION & TASKS

ANA counts 7 different departments.

Supported by cutting-edge technologies, our highly qualified teams with managerial, operational, technical and administrative expertise are trained in air traffic management, aerodrome operations and in developing innovative solutions to minimize risk and anticipate the occurrence of problems to ensure safe and smooth flights.

1

The meteorological department (MET) is made up of an operational service and a technical service. The operational service provides meteorological information in order to ensure the safety, regularity and efficiency of flight operations and delivers the services incumbent on national meteorology including the publication of warning messages for

the general public. The technical service (METTECH) is responsible for the installation and maintenance of meteorological measurement systems and sensors as well as for the establishment of equipment programs for technical infrastructures and future meteorological systems.

2

The aeronautical operations department (ARO) is responsible for receiving reports concerning air traffic services and flight plans submitted before departure, as well as providing the aeronautical data and information necessary for air navigation, including the dynamic and integrated management of the latter by the provision and collaborative exchange of digital data that has been subject to quality control.

The department is divided into two services:

- The Aeronautical Information Management (AIM) service
- The ATS Reporting Office (ARO)

3

The certification department's (CERT) mission is to guarantee compliance with certification obligations in terms of Air Navigation Service Provider (ANSP) and Aerodrome service (AER), safety, quality, environment, health and safety at work, by the implementation and development of management systems (e.g. project-, risk-, compliance-, performance-management) and strategic analysis. Our ANSP and aerodrome safety management teams ensure the development,

maintenance and improvement of the aviation safety management system and the security of ANA.

Furthermore, the certification department is responsible for guaranteeing aerodrome operations in accordance with lux-Airport for inspections, management of winter conditions, prevention of bird strikes, coordination of operational activities related to works in the maneuvering area and all other activities on the maneuvering area.

4

The Communication, Navigation and Surveillance service (CNS): The mission of the CNS service is to provide and ensure the optimal use and maintenance of current and future electronic air navigation systems. The CNS service counts three areas of specialization:

Communication

The technical team acquires, integrates, and certifies radio- and telecommunication systems like ATN (Aeronautical Telecommunications Network) bringing together Very High and Ultra High Frequency (VHF-UHF) communications, network communications with other control centers, as well as data channels allowing the exchange of air traffic management data, to comply with national and worldwide civil airspace requirements.

Navigation

Navigation refers to the process of planning, recording, and controlling the movement of an aircraft from one place to another by providing accurate, reliable and seamless position determination proficiency through radio navigation systems. This includes the landing assistance installations (Instrument Landing System - ILS) and the En-Route and terminal radio navigation means (DVOR, DME, DF and NDB).

Surveillance

The surveillance and visualization installations and systems group together the primary radars, the secondary radars, the processing and calculation of multi-radar trajectories, the radar visualization equipment and the processing of data relating to coordination of air traffic.

5

The **administrative department (ADM)** has a transversal dimension within ANA. Administrative activities are support activities for all of the upper management 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 of the administration and the supervision of the administration staff in general

The Electrotechnical service (ELE):

The operation of the airport requires a network of cables of several hundred kilometers, such as, medium and low voltage cables, telephone and data cables as well as fiber optic cables. In total, nearly 2,500 beacon lights are installed on the runway, taxiways, parking areas and in the approach sectors. In this context, ANA's electrotechnical experts are responsible for:

- The commissioning and maintenance of all the main and auxiliary systems the supplying and distributing electrical energy to the administration equipment, including back-up groups and transformers;
- The installation and maintenance of the control and visualization system as well as any other airport lighting equipment;
- The installation and maintenance of the administration's telephone communication platform;
- The establishment of equipment programs relating to airport lighting as well as to the supply and distribution of electrical energy, including the corresponding studies and research;
- The management of electronic conduits and networks and distribution of electrical energy.

The IT services: The IT team manages the IT stock, develops and administers the IT network and provides services that make everyday life easier for users.

ANA MISSION & TASKS

6 The **finance department's (FIN)** mission is to provide support to ANA's departments through sound management of ANA's financial resources. It supports the upper management and all the departments in all financial planning and budgetary matters and is in charge of ANA's accounting in accordance with national and international regulations. It ensures the financial integrity of ANA by promoting responsible resource allocation, providing

oversight of resource usage, and improving financial, accounting and management processes. Furthermore, 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 the chargeable unit rates for terminal and En-Route (ER) Air Navigation Service (ANS).

7 **Air Traffic Control (ATC) department:** Air traffic controllers are responsible for guiding pilots to ensure the safety of the skies. They take charge of all planes that come within their perimeter.

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

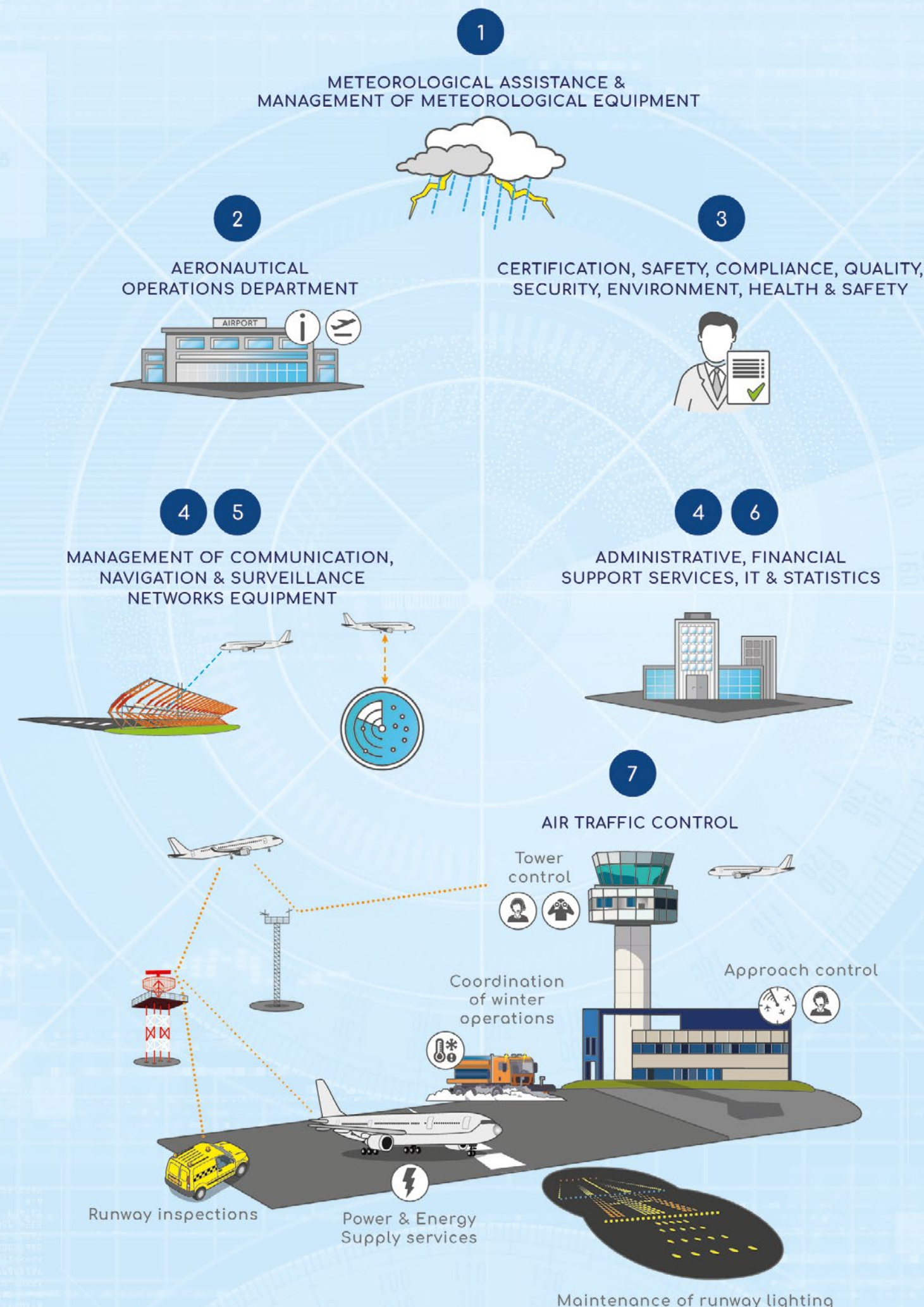
- Tower controllers
- Radar approach controllers

Together, they ensure effective air control, surveillance and safety in the Luxembourg airspace and in the adjacent airspaces for which delegations of services have been established by the competent air traffic control centers, while respecting the regulations in force.

ANA operates the Luxembourg En-Route control center, LU (ATC Luxembourg), to provide air control of ground movements up to 4,500 meters (above sea level) above Luxembourg's territory and over parts of the territory of the neighboring countries (Belgium, Germany and France).

From 4501 to 8000 meters above sea level, air traffic control is provided by the En-Route control center in Brussels, BE (CANAC2), operated by keyes.

Above an altitude of 8000 meters, responsibility falls to the En-Route control center in Maastricht, NL (Maastricht Upper Airspace Control Centre - MUAC), operated by EUROCONTROL.



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 2021. This year, let us introduce you to our colleagues from ATC APPROACH (Air traffic control approach), METTECH (Meteorological technical service), ARO (Air traffic services reporting office), HR (Human resources) and CNS (Communication, navigation and surveillance).

ATC APPROACH

05:00

During the night, due to the airport closure (23:00 – 06:00), traffic is low, just a few commercial arrivals from the surrounding airports and hospital flights (organs and patients transport) must be guided through our airspace. The latter represents an important aspect of our service provision and one of the reasons we are a 24/7 service.

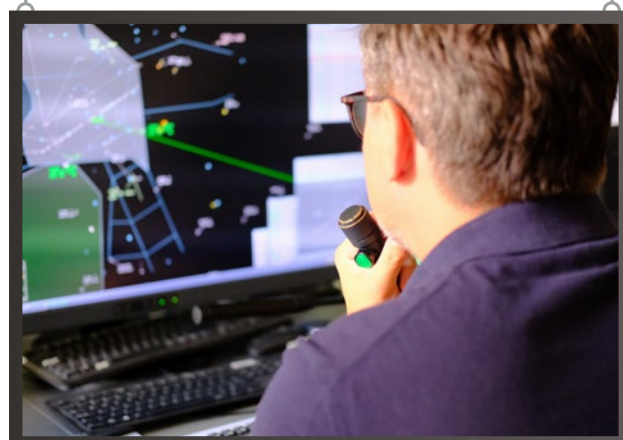


06:00

A few minutes before the opening of the runway, the first arrivals into Luxembourg airport are handed over to ATC approach by the surrounding ATC units.

Before the takeover by the colleagues from the morning shift, all relevant information needs to be exchanged: Runway in use, weather briefing and incidents occurred and more general information such as traffic during the night.

Emails and NOTAM's (Notice to Airmen) have to be checked and line checks will be performed with the other units. Some commercial aircraft on the ground are leaving Luxembourg to their destinations, arrivals have to be sequenced and a lot of supporting work is performed.



MET TECHNICAL

06:30

The first engineers arriving at the METTECH offices are checking the status of the Automated Weather Observation Service (AWOS), the Automatic Terminal Information Service (ATIS), the RVR contingency system, and the mechanical wind system. In case of eventual problems, immediate investigations and corrective actions will be performed.



ARO

07:00

A private pilot is calling in and wants to go flying today. The ARO Officer checks whether a free slot is still available today and if it does not interfere with peak hours. He records the necessary data and wishes the pilot a good flight. After that, he enters the data into the Flight Data Processor system so that the Tower has the information when the pilot calls for departure. A few minutes later, several pilots are calling in requesting for slot booking during the day. The ARO Officer accepts the demands or, in case a slot has already been booked, he proposes an alternative. The Officer also accepts cancellations and modifications.

CNS 07:00

CNS is in charge of ensuring the efficiency of all the technical services that support safe and performant ATS operations and other stakeholder's activities. The CNS service is effective 24/7 with a mandatory presence of agents during office working hours and with a less than one hour recall standby during the rest of the time.



ARO 08:00

lux-Airport Business Aviation Center (BAC) asks for an invoice for a departing flight. The ARO Officer is responsible for establishing invoices as every departing aircraft has to pay their Terminal Navigation Charges. The

ARO Officer checks his emails and finds the necessary information about the aircraft (e.g. weight, owner, expected departure time) as received from lux-Airport.

Unfortunately, the noise information about this aircraft is missing and noise emissions have an impact on the final price. As the aircraft is in Luxembourg for the first time, he decides to call back the BAC Officer who sends the missing noise certificate per email.

The ARO Officer then enters all the data into the invoicing system. The ARO Officer establishes the invoice and emails it to lux-Airport and to the ANAs finance department before recording the invoice number on a log sheet.

MET TECHNICAL

08:00



All METTECH agents have to be present at the daily METTECH briefing. This internal meeting guarantees to share all information related to their daily business. After a review of the previous working day, an outlook of the upcoming tasks is communicated to the METTECH staff. Among planning several maintenance and inspection tasks, one particular case needs to be addressed: CNS reported that inside the glide-path building at location 24, certain fiber optic cables have been damaged. As some of these cables are being used by METTECH equipment, an assessment of the damage and possible resulting effects needs to be performed on-site. This check will be performed by the agent(s) who will be doing the weekly visual obstacle light inspection today.

CNS 08:15

In CNS, every day starts with a daily briefing meeting between 8:30 to 9:00. The CNS head of service meets all the ATSEP (Air traffic Safety Electronics Personnel) and technicians together and a debriefing regarding the previous day is performed. The principle is to share the return of experience of the potential issues, actions or information treated during the day prior including the standby period. The potential planned maintenances performed the day before are also debriefed. Even if risk assessments and dedicated procedures are always prepared beforehand, the return of experience is shared between all the agents of the CNS service. This contributes to global knowledge improvement, to safety culture and also a better communication. Besides that, the Head of Service confirms the daily planned tasks for each CNS agent and takes advantage of the presence of all the team to inform about various topics that go from technical works, to more corporate informative subjects.



A team of technicians is there to cover specific activities within CNS Service. As a matter of fact they are dealing with numerous premises, power supply and mechanical maintenances. For example dealing with inspection and maintenance of air conditioning equipment, inspection and replacement of batteries located in CNS stations, oil draining of Radar gearboxes, and filters replacement of CNS technical equipment.

They are a key part of the CNS service and help to provide an essential quality of service.

HUMAN RESSOURCES 08:30

HR begins the day by checking the mailbox and emails. This is always first task as HR is responsible responsible for many urgent, legal and time sensitive matters. Therefore, they start the day by prioritizing urgent matters. In addition, they arrange their day's tasks according to pre-scheduled meetings and appointments.

ARO 08:30

The ARO trainee has to send departure messages for departing VFR flights so that the concerned units know that the aircraft is on its way and know when to start the alerting services if necessary. At the same time, he also has to send invoices for terminal navigation charges for the aircrafts to which they apply.



ARO 09:00

An alarm sound fills the office. The ARO Officer knows that an emergency beacon from a plane has been activated. The Officer stays calm because he has been trained for this situation.

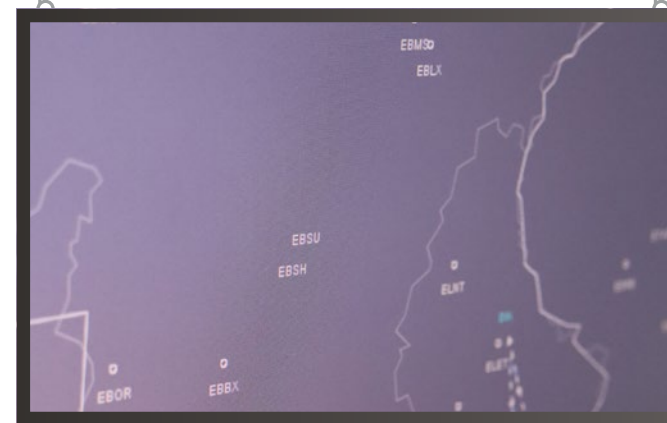
In the emergency message, he discovers that the distress beacon in the aircraft has been triggered. The Officer knows that this message does not necessarily mean that a plane has had an accident but that the beacon could also have been unintentionally triggered.

The ARO Officer records the hexadecimal code from the message received by an international satellite system for search and rescue and compares it to a list where the

respective owners and operators and the contact details of the aircraft are displayed.

Before calling the operator, the ARO Officer checks in his flight manager system whether the aircraft is supposedly in the air or on the ground. He sees that the aircraft is currently on the tarmac which is already good news.

He then calls the operator of the aircraft who informs him that they are currently doing maintenance on the aircraft. The ARO Officer records all the events as well as the messages received on a logsheet for an eventual follow-up and as audit evidence.

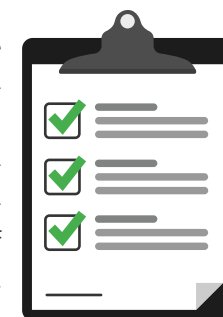


HUMAN RESSOURCES 09:00

HR attends a meeting with ANA's head of departments to discuss and identify staffing needs. HR ensure to work closely with the Ministry in order for those needs to be fulfilled.

MET TECHNICAL 09:00

The quarterly inspection of the runway visual range sensors (Flamingos) at location 06, MID and 24 is due. The mentioned inspection consists of cleaning the optical surfaces, the recalibration of the sensors and a filter test check. This preventive maintenance requires two experienced engineers, supported by an ATSEP trainee. At location 06, one Flamingo reached the limit of its transmission value, and a filter replacement has to be performed as soon as possible.



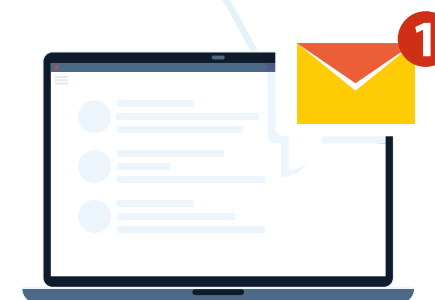
MET TECHNICAL 09:30

The weekly inspection of the equipment installed in the data center and BTO, including a check of obstacle lights mounted on the top of METTECH infrastructure (wind mast, RVR sensors, etc.), are executed. On this occasion, the reported damaged fiber optic cables inside the glide-path 24 building are inspected. Only the cables used by the ceilometer "A" seem to be affected. The cables show slight damages on the outer cable mantle, with no effect on functionality. However, in order to prevent any possible issues in the future, the decision to replace the cables during the afternoon is taken.

The METTECH training officer is updating the training organizer tool.

ARO 10:00

The ARO trainee receives an e-mail, a pilot is asking for a PIB (pre-flight information bulletin), this means he wants to get the NOTAMs (notice to airmen) that are related to his flight. With this bulletin, the pilot knows what is happening at his departure aerodrome, on his route and at the destination aerodrome. The trainee creates the bulletin and emails it to the pilot.





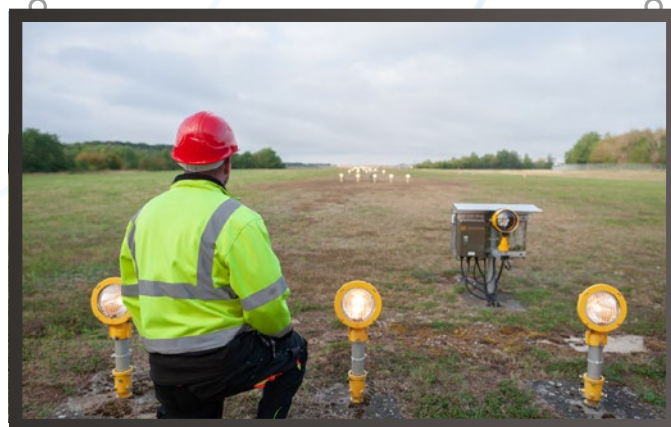
CNS 10:15

After the daily briefing, a part of the CNS team is dedicated to perform the inspections of the operational equipment and services in regards to all the domains of activity pertaining to the CNS. Inspections are very important tasks and are subdivided in daily, weekly, monthly and yearly inspections depending the criticality of the equipment or service. The inspections are performed on all the sites where CNS manages equipment, like the "Batiment Technique Opérationnel", the approach and ground radars buildings, the runway, the new technical room located near the approach radar, the DVOR in Diekirch and more. CNS ATSEPs verify the correct functioning of each equipment through specialized procedures.

ATSEPs updates the logs with the measurements and verifications that are performed to always monitor the correct performance of each equipment. If failure or a drifting trend are ever visible through the inspections, the ATSEPs perform a first visual investigation. If it is a failure or a partial failure, they are trained to restore the service as it is one of their tasks to perform the incident management. ATSEP's always gather the maximum information available as well as store all the possible environmental information available.

The information will be useful for deeper investigation, sometimes with the support of the supplier, to insure the equipment and system are operating at the requested level of quality, resilience, performance and redundancy.

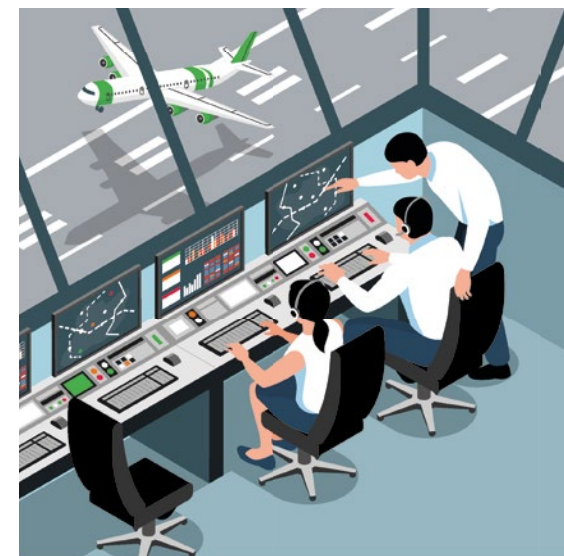
If some interventions are later needed on the equipment to restore the requested level of quality, resilience, performance and redundancy, the CNS ATSEPs are highly qualified to perform the task, in close coordination with operational users and in the frame of the good practices of ANAs safety management. CNS ATSEPs always coordinate and give feedback to their ATS customers for them to be aware of the potential impact of the issues or failures discovered. Transparent communication is a must for operational services and CNS is deeply aware of it.



ARO 10:30

The purpose of the AEP is to facilitate the timely, appropriate and coordinated response to emergencies occurring on, or in the immediate vicinity of Luxembourg International Airport. A pilot informed Luxembourg ATC that they have problems with their hydraulic system. Tower informs ARO about the activation of an emergency scenario, ES1 – Local Standby. ARO informs lux-Airport, the aerodrome operator, as well as a defined list of other entities (e.g. ANA's aerodrome service) about the activation of ES1 using the AlarmTILT system.

The information provided covers mainly the aircraft type, number of persons on board, remaining fuel quantity, eventual



presence of dangerous goods and, of course, a short description of the problem. At first the remaining fuel is not known, after an update from ATC, the ARO officer updates the AlarmTILT message.

Fortunately, the aircraft lands safely and ATC reports the end of the scenario, which is also transmitted by ARO via AlarmTILT.

ATC APPROACH 11:00

After the daily equipment checks from the colleagues of the CNS department, inbound sequence is steadily increasing on the radar, from a couple of arrivals to a constant flow of traffic. Military zones are activated more frequently, which means more guiding restrictions through our Airspace.

In order to ensure safe flights due to the permanent growth of air traffic volume before the pandemic, ANA took the decision to implement a third ATCO position (the director position). For the trainees hired just before the significant decrease of air traffic, a simulator training room was inaugurated to ensure high level of on the job training in order to be ready for the post pandemic traffic raise.

HUMAN RESOURCES 11:00

HR arranges job interviews and onboarding for new agents and also make sure that all paperwork involved with hiring is filled out and that everything from the first day to each subsequent day is navigated successfully.



CNS DURING THE DAY

During the working hours, some CNS agents are also dedicated to perform other activities than inspections. CNS ATSEPs have various tasks including Technical expertise as support to project managers, investigations, contacts with suppliers, safety and risk assessments, system alerts monitoring on Centralized Monitoring Systems, phone and physical support to CNS services customers like ATS or some ANA stakeholders.

MET TECHNICAL

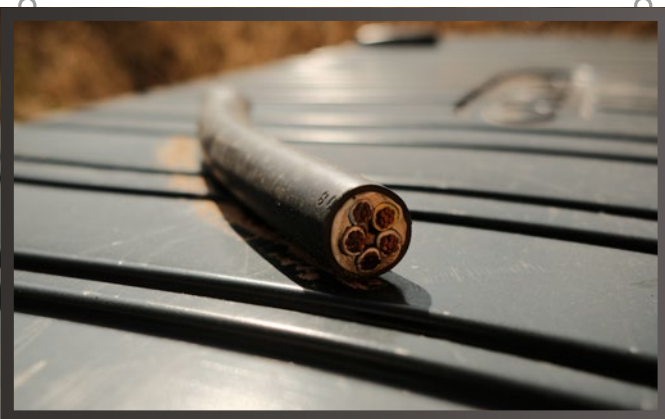
13:00

At location 06, the replacement of the Flamingo short base filter and recalibration of the equipment are carried out by two engineers. Before the beginning of the maintenance, this was coordinated together with MET, TWR and APP.



13:30

The damaged fiber optic cables inside the glide-path 24 building have been replaced. Again, before the beginning of the maintenance, everything had been coordinated together with MET, TWR and APP. A check of the AWOS system confirms the correct receiving of data from the ceilometer "A". This is also confirmed by operational staff after announcing the end of the maintenance.



HUMAN RESOURCES

14:00

HR update agent's personal information and also make official updates to policies that no longer serve the administration or the agents.

MET TECHNICAL

14:30



Finalization works, such as cabling and labelling, for the RVR contingency system are carried out in the localizer 06 building, final checks for the SAT of the RVR contingency system are performed.

HUMAN RESOURCES

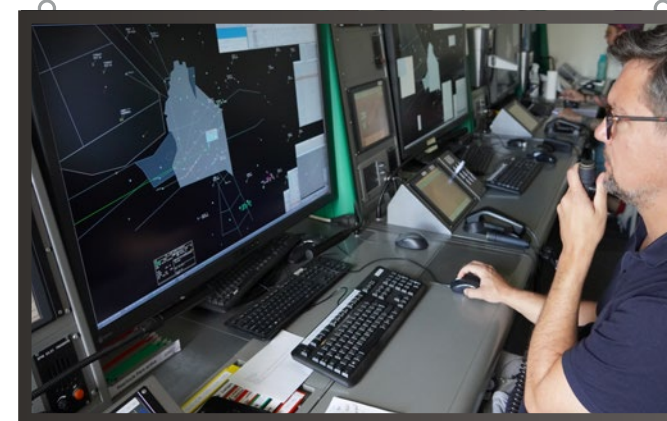
16:30

HR work with training officers to find training programs that will help grow agent's skills so that they will perform better in their job functions.

ATC APPROACH

17:00

Besides the ATCO's main duty, to guide traffic through our airspace and to coordinate with German, French and Belgian authorities, the investigation of potential route incidents on their contingency factors is essential to guarantee safety through our airspace.



MET TECHNICAL

18:15

At approximately 18:15, the last agent is leaving the METTECH office. Service continuity is guaranteed by one qualified ATSEP performing on-call duty.

ARO 18:30

UAS (Unmanned Aerial System), commonly known as drones, are not allowed to fly through active no-fly zones. An UAS operator has to check on the Geoportal of the Grand-Duchy of Luxembourg, the official national platform for governmental geodata and services (geoportail.lu) which zones are active. Some zones are permanently active such as above Luxembourg airport. Other zones are

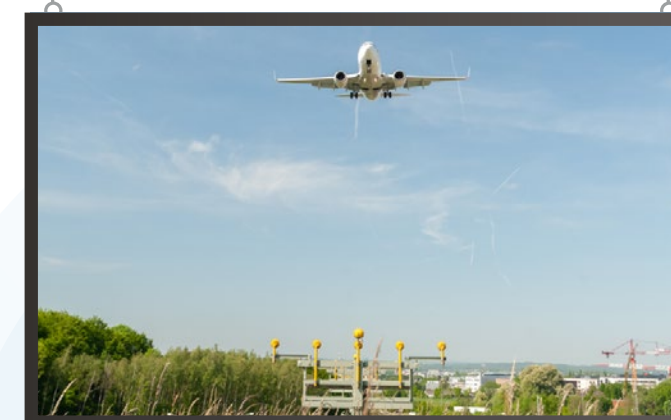
activated only when in use such as the zones above the Noertrange (parachuting activity) and Useldange (glider activity) airfields, or areas used by military drones (TSA, Temporary Segregated Areas). The ARO is informed of the opening and closure of the two airfields as well as of the activation times of the military areas, they actively inserts this data for visualisation via the Geoportal.

The implementation of this interface via the Luxembourgish Geoportal was a joint effort of the Directory of Civil Aviation (DAC), the cadastre administration (ACT) and ANA's GIS unit.

ATC APPROACH

19:00

Medical diversions, airspace infringements, VFR flights having troubles with their maps, operational disruptions like Low Visibility or bad weather conditions, guidance for Airrescue ambulance flights and line information are additionally on the ATCO's daily timetable.



ATC APPROACH 19:00

While standard traffic represents the major part of the job, other situations such as medical emergencies, wildlife issues or aircraft emergencies also happen regularly. Those situations demand a strong team work between the controllers on duty while one assists the pilot on the frequency, his colleague handles all associated coordination calls with CGDIS, ARO, 112 etc. to prepare the airport for the event. Even more severe weather situations such as winter storms can be challenging, as they need more stakeholders to work closely together to keep airplanes flying.



ARO NIGHT

The ARO Officer on the late shift briefs his colleague on the current situation so she can take over the working position. A new Runway Condition Report (RCR) is communicated by an AER (aerodrome inspector). As the runway contamination with snow is high, ATC decides to close the runway for 70 minutes in order for AER to clean the RWY and TWY.

Multiple tasks must be performed in parallel by the Officer, information needs to be logged, a NOTAM has to be issued to inform pilots of the runway closure, and a SNOWTAM has to be established to inform users of the current RWY conditions. In parallel, companies and flight dispatchers call to receive information. TWR informs ARO that the RWY will open as planned; a new RCR arrives, which triggers the publication of an updated SNOWTAM.

After a quick look at the departing flights list, they proactively decide to contact a flight dispatcher to inquire if they can depart before the airport closure time. Subsequently, a curfew extension request arrives which is treated swiftly, all concerned parties are informed and the flight does not get any additional delay and can transport the passengers to their destination.

Already past midnight, time to finish all the paper work and write a report about the night movements and unusual events.

22:00



When an aircraft plans to fly through airspace that is congested (e.g. military exercise in the area, bad weather) they may not be allowed to take-off at the time they planned but will receive a Calculated Take-Off Time (CTOT) considering all the known restrictions in the European airspace covering 41 countries. Eurocontrol, a pan-European intergovernmental organization, dedicated to optimize operational performance, manages the traffic in this airspace. A pilot who wants to know whether his flight is restricted can contact the ARO office who will provide its CTOT, the reason for the delay and contact information for Eurocontrol to negotiate a better route if necessary.

05:00

After a long and busy night, the ARO Officer is more than happy when the morning shift arrives at 06:45 and after an extensive briefing, the working position is handed over and a tired but happy ARO Officer drives home carefully.

CNS TONIGHT

A regular dedicated "Flight Check" is planned which mainly aims to measure and verify the Instrument Landing System calibration. Even though monitoring of this highly critical navigational aid for aircrafts is constantly performed on the ground, CNS ATSEPs regularly carry out measurements with a dedicated aircraft that will perform several landing approach procedures to achieve the nominal measurements, but also the ones at the limits of the ILS. For several hours, CNS ATSEPs measure and verify during the flight that all the measurements are correctly in the defined tolerances zones of the international regulations. Reporting and logging of all the measurement are preciously kept once the "flight check" is performed.



ATC APPROACH

NIGHT

23:00-06:00

During curfew hours traffic is relatively quiet except for some late arrivals, scheduled departures until midnight, organ transports or potential emergencies. However, this time is also used to perform maintenance works such as pavement resurfacing, grass mowing, airfield ground lighting works or aircraft maintenance bows from the maintenance hangars to the aprons and vice versa.



Movements, Passengers, Freight & Service Units

Table 1, page 20 shows the activities in Luxembourg terminal airspace and Luxembourg Airport during Reporting Period 2 (RP2) and the two 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 recovered in 2021 by a significant amount, especially compared to other areas in Europe. As cargo traffic was strong at time it represents a substantial amount of our traffic mix.

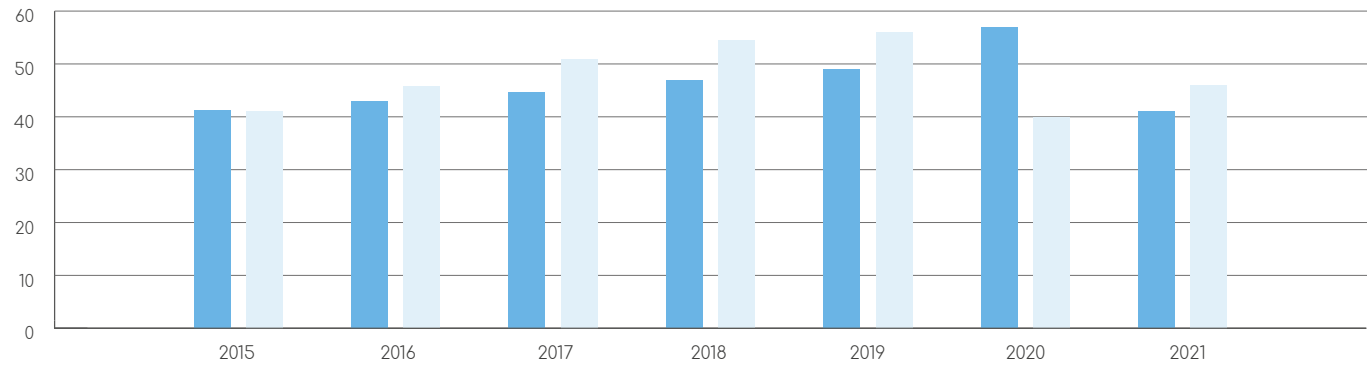
The overall outcome is still a substantial loss in revenues in terminal charges, but less severe than in En-Route charges. The situation in 2021 has improved compared to 2020.

The outlook for the coming years remains uncertain as the recovery depends on many factors. ANA continues to adapt its operation accordingly.

Table 1– Traffic movement, passengers, freight & service units over RP2 (2015-2019) and 2020-2021 /2019-2021 in comparison

	2015	2016	2017	2018	2019	2020	2021	Change 2020-21	Change 2019-21
Reporting Period	RP2					RP3			
Total movements	85.031	86.402	89.944	94.586	94.985	64.705	74.516	+15,2%	-21,5%
International Movements	65.128	69.577	74.515	79.109	80.557	43.639	51.789	+18,7%	-35,7%
Commercial Movements	58.119	62.534	67.927	72.313	73.801	38.629	45.691	+18,3%	-38,1%
Passengers (Mio)	2,687	3,022	3,599	4,037	4,416	1,446	2,039	+41,0%	-53,8%
Cargo Movements	10.170	11.137	12.547	13.364	13.367	13.307	14.931	+12,2%	+11,7%
Freight (t)	737.625	801.807	897.127	894.649	853.354	905.223	1.088.441	+20,2%	+27,5%
Actual terminal Traffic Service Units (in .000)	41,1	45,7	50,9	54,4	56,0	40,0	46,0	+15%	-17,9%
EUROCONTROL STATFOR Forecast May 2021 - Terminal TSU for 2021							33,0	-28,3% Forecast grow compared to actual TSU in 2021	+27,5%
Terminal TSU forecast	41,0	46,0	51,0	55,0	56,0	39,0	41,0 ¹	+5,1%	

Figure 1 - Terminal TSU forecast and actual values/2019-2021 in comparison



1 Latest available forecast in 2020 in the RP3 PP (Nov 2020)

ANA 2021 Calendar of Events

Table 2, page 21 gives a chronological overview of the 2021 events in projects.

Months	Progress and Events in Air Traffic Management (ATM)
Jan	• New Visual Flight Rule (VFR) Routes Traffic Circuit North & South were implemented
Feb	
Mar	• Global Positioning System (GPS) based precision approach procedures (Performance Based Navigation - PBN) for Runway (RWY) 06 and 24 were released for use by the airspace users. • New ENVINET weather data network server installed
Apr	• Updated Statistic Tool was implemented
May	
Jun	• Final version of the ANA Environmental Statement 2020 released and published
Jul	• New big screens in Meteo (MET) Forecast office
Aug	• Update of a complete and transparent citizen noise complaints process and template (online)
Sep	• Instrument Landing System (ILS) 24 replaced and commissioned
Oct	• Digital tool for managing/monitoring/tracking of budget engagements and purchase orders in Finance Department • Phase 1 Airfield Lighting Control and Monitoring System (ALCMS) update
Nov	• Aerodrome work – CAT II/III Holding Points moved closer to the RWY
Dec	• Foundation of the Luxembourg Airport Environmental Committee with partners Luxembourg airport, Luxair and Cargolux • ANA Environment Management System (EMS) ISO 14001 Re-certification audit • Signing the Integrated Management System (IMS) Luxembourg Zero single-use plastic manifesto



KEY PERFORMANCE AREAS



One immediate experience made during the crisis and its impacts is clear: “Resilience” – the ability to provide a safe, consistent or improving level of service and deliver a performance in the major Key Performance Areas (KPA) - no matter how profound the crisis, external factors or economic pressures might prevail – is key to overcome the situation in

an orderly, coordinated and effective manner. ANA demonstrated this capability during the crisis and provided un-interrupted services and continued activities on vital projects.

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

KPA	Key Performance Indicators	Targets	2021 Results
Safety	Effectiveness of Safety Management	Level D in Safety Risk Management	Partly achieved (1 Ds , 2 C)
		Level C in all other Objectives	Partly achieved (5 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	Achieved
	Effectiveness of contingency exercises to ensure safe mode of operation	No target set; for monitoring and establishment of targets.	Not used in 2021
Capacity	Air traffic Flow Management (ATFM) arrival delay	0,5 +50% min/flight	Not achieved (0,14 min / flight average)
	Slot adherence	> 80%	Achieved (93,4%)
	Additional taxi-out time	No target set (min/flight)	No data available on Performance Review Unit (PRU) dashboard for Luxembourg
	ATFM pre-departure delay	No target set (min/flight)	0.04 minutes per departureLuxembourg
Cost -Efficiency	CRSTMP delay	No target set for RP3	0 min /flight
	Cost-efficiency (terminal Air Navigation Service (ANS))	Reduce Determined Unit Cost (DUC) for terminal services (in real terms)	See Cost-efficiency (En-Route ANS)
	Cost-efficiency (En-Route ANS)	Reduce DUC for En-Route services (in real terms)	According to Implementing Regulation (EU) 2020/1627, the key performance indicator on the DUC for En-Route air navigation services at local level shall be defined, in respect of calendar years 2020 and 2021, as a combined value for those 2 years.
Environment	Vertical flight efficiency	Continuous Descent Operations (CDO) Usage	19,3% of incoming flights
	Night flights 2300-0600	Reduce flights <95	Achieved (90 flights outside curfew)
Security	ANS security	ANS Security Management	Ensured
		Access control system	Improved compared to 2020
	Cyber-security	IT security watch	Constant
Risk Management	Risk Management Framework maturity	80% of all risks assessed and monitored	Not Achieved





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.

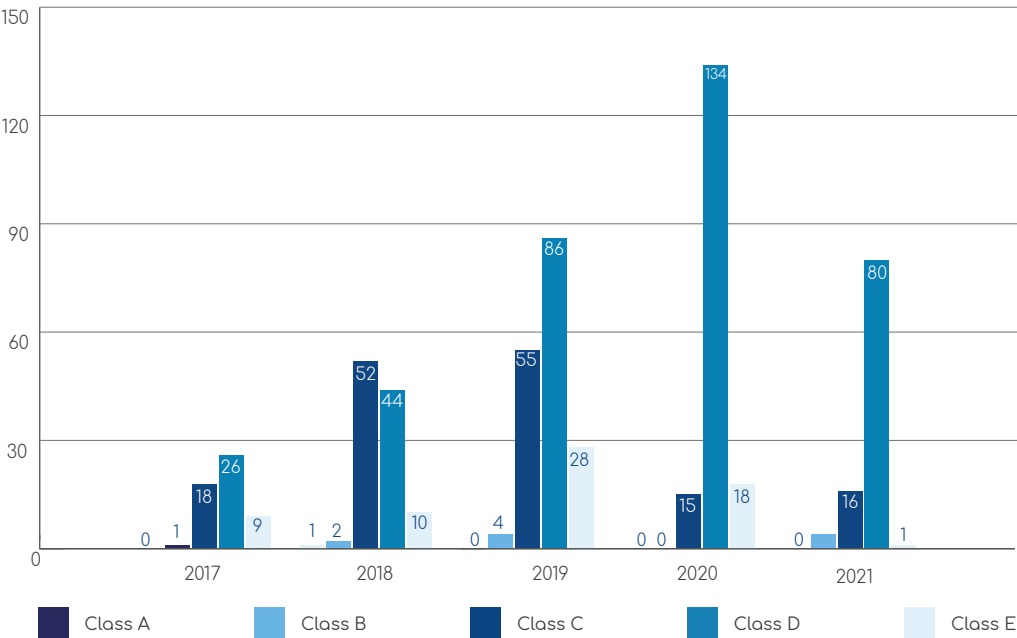
Table 4 - Effectiveness of Safety Management (EOSM) from 2021 onwards

New scale	New Management objective	Target	2021 result
Component 1	Safety Culture	C	B
Component 2	Safety Policy and Objectives	C	C
Component 3	Safety Risk Management	D	C
Component 4	Safety Assurance	C	C
Component 5	Safety Promotion	C	C

The Effectiveness of Safety Management questionnaire:

The EOSM results of 2021, where all but one target were met, represent the work done by CERT-Safety to achieve the targets but also shows that we still need to strive higher to achieve Level D and Level C respectively by the end of RP3. This represents a continuing work to maintain and improve the state of the SMS and the associated scores. Plans are in place to maintain this in 2022 and raise it for 2023.

Figure 2 - Maximum tolerable ATM SE incidents

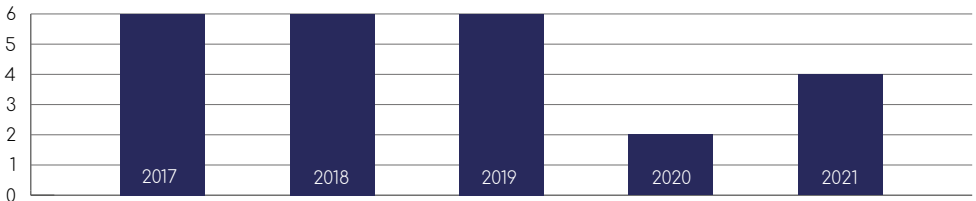


ANA has achieved no critical ATM SE incidents of level A for 2021. We had more incidents of Category B,C (no safety effect) as our reporting rate increased a lot. The type of issues to be reported remained the same, however awareness of reporting has improved. These incidents are tracked and solutions findings and implementation are on-going.



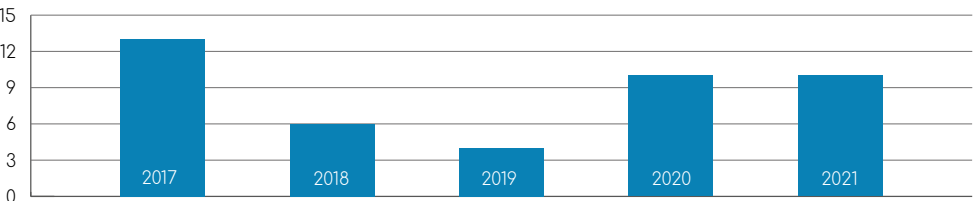
Number of ACAS RA

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. Fewer ACAS RAs occurred in the proximity of the airport which is due to the implementation of mitigation measures in the recent years. The overall number compared to 2020 has increased due to the increase in traffic.

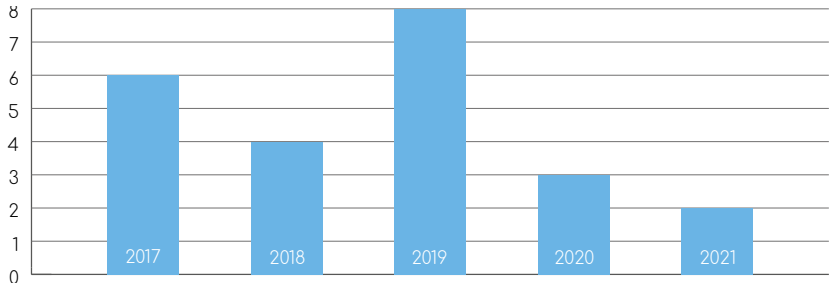


Airflight Infringements

Airspace infringements have increased over the years as recently temporary restricted airspace for drone usage was implemented in the north of the country which led to more infringements of unaware aircraft.



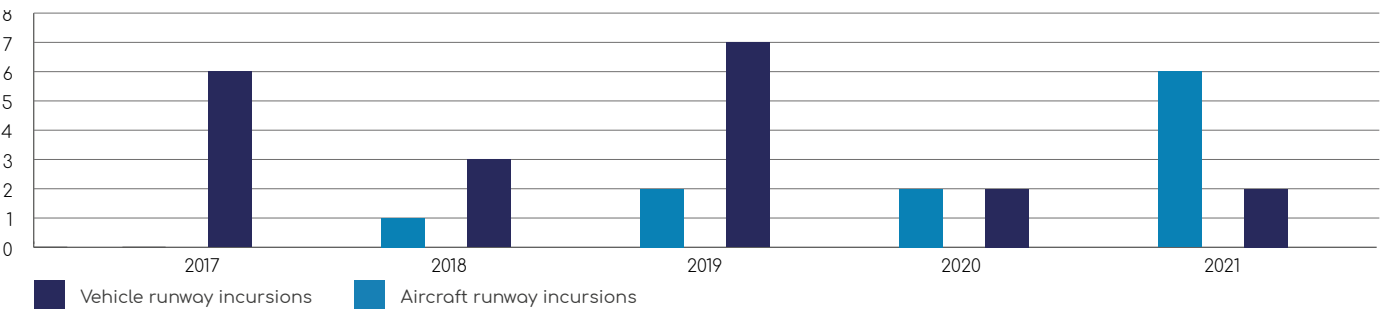
Separation Minima Infringements

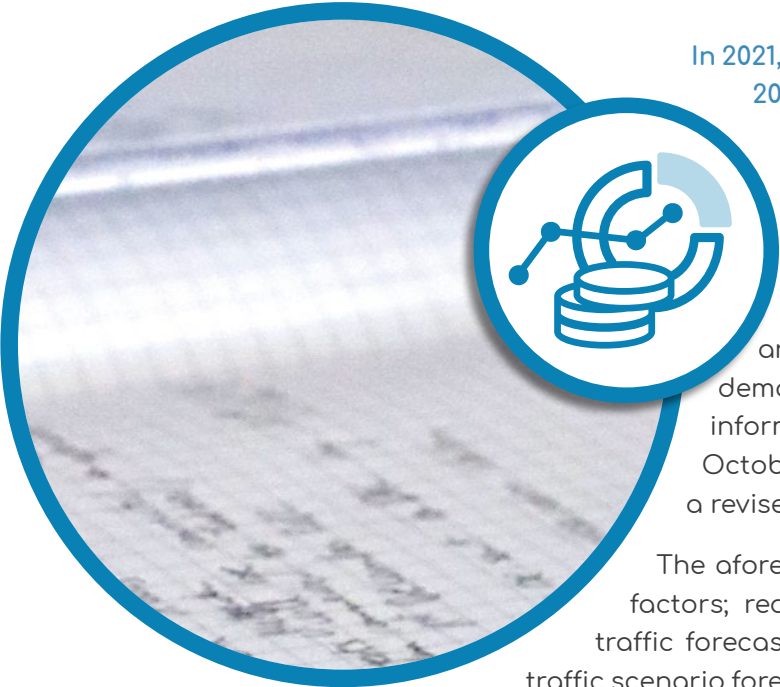


Separation Minima Infringements between IFR aircrafts have stabilized in 2021 as ANA had inducted new trainees whose training periods caused some of these infringements. The training being now finished along with a decrease in IFR traffic led to a decrease in 2021.

Aircraft/vehicle runway incursion

Runway incursions of aircraft have increased in 2021.





In 2021, ANA had to face the same sanitary crisis as in 2020, which still caused severe problems to ANA's treasury, due to the ongoing reduced traffic and the resulting low level of income from air navigation charges.

The finance department fulfilled all obligations with regard to regular reporting and furthermore answered to all specific demands by the European Commission for information related to the COVID-19 crisis. In October 2021, ANA submitted, due to new regulations, a revised performance plan for RP3.

The aforementioned revision was mainly based on two factors; reducing determined costs and adjusting the traffic forecast to the actual situation. Since the adjusted traffic scenario foresaw much lower service units, a steep increase

of the unit cost couldn't be avoided, despite a significant reduction of the determined costs.

In order to keep the unit rate on a similar level than the years before, ANA has worked to encourage the Luxembourg State to grant additional public funding. Since the discussion lasted somewhat longer, the unit rates shown during the different user consultations to En- route and terminal services users were a sort of worst-case scenario.

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

EN-ROUTE COSTS & REVENUES

Our partner skeyes 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 however focus on ANA's own contribution to the costs of this common

ER charging zone.

With regard to the crisis, the European Commission has fixed in June 2021² new EU-wide targets in terms of cost reduction. However, it is foreseen to consider 2020 and 2021 together. The average costs for ER services for both years should not exceed 97% of the actual costs from 2019. As a consequence, ANA submitted in October 2021, together with skeyes and the other FABEC members a revised version of the performance plan for RP3. Although ANA provided in March 2022 all available information and missing data upon request of the PRB following its assessment, the

European Commission decided that the submitted determined costs would still be inconsistent with the EU-wide performance targets. As a result, ANA did a complete overhaul of the determined costs and submitted together with skeyes another revised version of it in July 2022. A more detailed analysis by the EC is currently ongoing.

The actual total costs in nominal terms for the ANA ER cost part were 7,295 M€ in 2021 and 7,230 M€ in 2020, an increase of 0,9%. Compared to the initial draft performance plan for the third reference period (RP3), submitted in 2019 before the COVID-19 crisis, it is a decrease of costs by -6,1%.

The ANA part of the Unit Cost in real terms per service unit for the common charging zone was 6,46 € in 2020

and dropped to 5,87 € in 2021. 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 2021 a unit rate (UR) of 2,44 € per service unit (SU) relative to ANA. Since traffic slightly recovered after last year's drop due to the pandemic crisis, this lead to a slight increase of the annual amount actually recovered through the EUROCONTROL route charges system to Luxembourg from 4,0 M€ in 2020 to 4,6 M€ in 2021.

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	0
Traffic adjustment	-4	2	99	76	124	0
Adjust. Determined costs	6.618	7.465	7.846	7.388	7.794	7.407
Other revenues	-585	-880	-974	-2.969	-1.217	-1.198
Remaining (chargeable costs)	6.033	6.585	6.871	4.419	6.577	6.209
Total service units (PP forecast)	2.720	2.759	2.811,4	2.108	2.445	2.542
Unit rate (in €/SU)	2,22	2,39	2,44	2,10	2,69	2,85
Annual variation of UR (in %)	-0,73%	7,50%	2,41%	-14,20%	28,31%	5,78%

² COMMISSION IMPLEMENTING DECISION (EU) 2021/891 of 2 June 2021 setting revised Union-wide performance targets for the air traffic management network for the third reference period (2020-2024) and repealing Implementing Decision (EU) 2019/903



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

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 1,9% lower than in 2020, and 7,0% below the DC for 2021. The actual unit cost in real terms is 9,1% lower in 2021 than in 2020 and 7,5% below the Determined Unit Cost mainly due to the COVID-19 crisis.

	2021 Actuals	2020 Actuals	2021 Determined (as planned in the revised Performance Plan (PP))
Total costs (real terms; Inflation index - Base 100 in 2017) for terminal services (.000€)	6.844	6.979	7.360
Service Units (in .000€)	1.166,90	1.080,87	1.161,10
Unit costs in real terms (in €/SU)	5,87	6,46	6,34

TERMINAL COSTS & REVENUES

ANA as Luxembourg ANSP provides approach (APP) and aerodrome control (TWR) services in Luxembourg airspace and on the airport. The actual costs in 2021 in nominal terms for terminal ANS (only the ANSP part) were 14,581 M€ and an increase of 0,4% compared to 2020 (14,530 M€). When compared to the determined costs (15,515 M€), actual costs were around 6% lower. The ANSP unit cost per terminal service unit was 301,89 € in 2021 compared to 351,67 € in 2020. 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 honors 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 less 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 2021 was set at 190,85 € per service unit, slightly higher than for 2020 (185,83 €).

Since traffic recovered slightly compared to the first year of the COVID-19 crisis, the amount of actually recovered TNC charges (9,1 M€) has as well slightly risen in comparison to 2020 (7,9 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	-424,9	-	351,25	-
Traffic adjustment	-1.383	-1.820	-1.525,7	-556,64	-340,9	-37,2
Modulation adjustment		327	389,3	-	- 839,75	-
Difference in revenue from temporary application of unit rate				0	0	665
Adjust. Determined costs	10.722	13.059	13.895	15.473	14.460	16.436
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	14.663
Total service units (PP forecast)	49	56,9	58,0	54,4	57,1	58,6
Unit rate (in €/SU)	186,63	185,83	190,85	216,87	224,11	250,17
Annual variation of UR (in %)	-8,93%	-0,43%	2,70%	-4,04%	3,34%	11,63%

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

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

Actual costs were, thanks to cost containment measures 2,7 lower than in 2020 and even 8,2% lower than the DC for 2021. The actual unit cost in real terms is 14,2% lower in 2021 than in 2020 and stays 5,6% under the Determined Unit Cost.

	2021 Actuals	2020 Actuals	2021 Determined (as planned in the revised Performance Plan (PP))
Total costs (real terms; Inflation index - Base 100 in 2017) for terminal services (.000€)	13.696	14.069	14.919
Service Units (in .000€)	45,4	40,0	46,7
Unit costs in real terms (in €/SU)	301,89	351,67	319,74

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 2020 can be found in chapter 2021 Investments – ATM/ANS & Aerodrome Services, page 59.

In 2021, the total investments (Capital Expenditure - CAPEX) amount for the entire ANA (ANSP, Aerodrome and non-aeronautical services) showed a significant reduction, but was very close to the amount foreseen in the revised performance plan:

Total Investments (k€) 2021 (2020) = 3.947 (6.883)



ENVIRONMENT

The activities of the Certification Department related to the environment management system (EMS) have enabled our Administration to maintain its registration under EMAS as well as its ISO14001 certification. EMAS is a European regulation created in 1993 by the European Union. It aims to frame voluntary eco-management approaches based on an environmental management system. According to the European Union (EU), it is currently the most robust tool on the market.

The year 2021 was marked mainly by the green deal. The European Commission has adopted a series of proposals in order to adapt the EU's climate, energy, transport and taxation policies with the objective of reducing net greenhouse gas emissions by at least 55% by 2030 (compared to 1990 levels). In the same year, ANA has calculated its carbon footprint for the first time, with the goal of reducing it and putting together a plan towards carbon neutrality.

Also in 2021, special attention was paid to the complaints process from local residents about airport noise. These complaints have increased drastically following the air traffic recovery during the year and after the sharp reduction observed during the 2020 lockdown.



ANA has received about 3,000 complaints in 2021 (compared to 20 received annually in the years prior to the lockdown and 1000 in 2020). In order to cope with this severe increase in noise complaints, ANA has developed a new handling process. Noise complaints are now sorted and analyzed with the help of flight tracks recorded by the radar systems.

Many other actions of the environmental management system and detailed KPIs for 2021 have been published in ANA's environmental statement 2022, with 2021 facts and data.

NIGHT FLIGHTS

2021 being symbolized as a recovery year after the big "Shutdown" of 2020, it registered an increase of approximately 19% in terms of international movements.

However, contrasting this fact, the amount of night flights dropped from 1420 registered in 2020 to 1215 for the total of the year of 2021. This represents a decrease of nearly 15%. This is mainly due to a constant evolution of the management of night flights but also due to the Runway Refurbishment.

Cargo flights specifically, recording the highest number of night flights yearly, are stating a decrease of almost 25%.

Concerning the curfew extensions, 90 were granted in 2021 compared to 83 the year before.



SECURITY

The main objective of security is to guarantee the sustainability of the Administration's activities and the protection of agents, whether in terms of physical security or cybersecurity.

In 2021, security has become a constant challenge linked to an inability to claim that the measures in place are optimal and that they do not require continuous innovation and improvement.

Security management for the Administration includes risk analysis, the implementation of measures to limit these risks, controls including audits (internal and external), inspections and tests, technological monitoring, threats and regulations, an incident analysis, etc.

All these measures are well developed for physical security and flourishing for cybersecurity.

In 2021, security was ensured since it did not record any serious incidents having an impact on the assets (People, buildings, information (data) etc.) of the Administration.

In addition, the audits, tests, and inspections (internal and external) did not lead to unmanageable weaknesses in the system.

The development of an internal threat and radicalization program allowed the Administration to expand the Security Culture.

Nevertheless, the rising security threats in the physical and cyber domains are empowering elements of continuous security improvement in the years to come.

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 2021, the risk management was mainly focused on the implementation of a risk-based approach for the whole activities of our organization, in accordance with a methodology validated by our ISO9001 auditors.

This approach allows providing ANA's management with a holistic view (in the form of a risk mapping) of the most important risks that any entity of the organization could face. This approach enables to propose, prioritize and then validate the implementation of mitigations in order to reduce the more important risks.

This risk-based approach is the centerline of the ISO 9001:2015 standard dedicated to the quality. It allows lining up the management system policy and objectives with the strategy of the organization.

The year 2021 was also dedicated to the training, as contributors of the different entities to the risk assessment have been trained to the risk management approach (global and specific).



A Key Performance Indicator relating to the maturity of the organization's Risk Management System has been set up. It is based on the ISO 31000-2018 framework. The current KPI value is about 72%. It is constantly evolving with the deployment of the risk management system. The objective of 80% will certainly be reached in 2022.

PROGRAM MANAGEMENT

Regarding the management of the ANA's project portfolio (program management), 2021 was the year of introduction of a new methodology for prioritizing projects. This methodology, which focuses on the results of the risk-based approach, as well as on the resource, compliance and financial planning components, has proved to be very effective.

In addition, a dashboard offering a synoptic follow-up of all projects (project dashboard) has been set up during the same year. This dashboard enables to analyze the performance of each project through three main pillars underlying project management. These three pillars are the respect of the project scope, the resource management and the deadline planning.



Two Indicators monitor the program management performance. The first one relates to “the respect of target date”, which only reached a value of 32% in 2021, compared to the minimum level of 75% expected. The continuing health crisis in 2021, as well as the need to prioritize our project portfolio for the purposes of sound strategic and budgetary management partly explain this low value in 2021. This latest need has led to the postponement of some of the projects not considered as a priority.

The second Key Performance Indicator is only dedicated to delivered projects. It relates to the control of the global expense in comparison with the global budget initially planned. For the year 2021, this indicator is equal to 77%, in line with the minimum objective set at 75%.

Project ID	Project Name	Service	Revised End Date
PRJ-000009	A-SMGCS Phase 1 & Phase 2	CNS	31/12/2021
PRJ-000024	Metgarden relocation	MET	12/03/2021
PRJ-000159	AWOS/ATIS software update Phase 1	MET	25/02/2021
PRJ-000207	Replacement of RVR sensors	MET	25/02/2021
PRJ-000233	RVR contingency	MET	01/10/2021
PRJ-000245	Realtime Monitoring Tool	CNS	22/06/2021



HIGHLIGHTS OF 2021

Despite the crisis, ANA could successfully finish important projects – implementing Performance Based Navigation (PBN) in Luxembourg airspace, we continued implementing Communication Navigation Surveillance (CNS) technologies and procedures based on the enhanced capabilities of modern aircraft, and achieved big steps forward in safeguarding our environment as an Environmental Management and Audit Scheme (EMAS) certified organization.



CERTIFICATION DEPARTMENT

As part of the Air Navigation Authority's (ANA) mission, the Certification Department plays a leading role in implementing management system processes, measuring performance and compliance, and driving continuous improvement:

- In charge of implementing and integrating management systems to ensure compliance with legal and regulatory obligations.
- Safety related to aviation activities, security, quality, environment, safety and health at work.

These systems are based on requirements supervised by the Civil Aviation Authority (DAC), as are the operational and technical services of our organization.

The department fulfills this role in particular through its responsibility for the various management systems dedicated to these areas of expertise, but also through the overall management of compliance, risks and the project portfolio. To do this, he can count on the support of multidisciplinary teams of experts.

Finally, the Certification Department is in charge of the activities related to aerodrome operations;

Despite continued air traffic disruptions and constraints related to the COVID pandemic, in 2021, the Certification Department fulfilled its missions and obligations without interruption and always with a high level of quality.

As far as the activities related to the management of the safety system for aviation activities (safety) are concerned, the Certification Department has, during this year 2021, been

- Strongly involved in its supervisory and advisory role, in this matter, with the Management and the Heads of Service of ANA.
- Involvement has been reinforced thanks to the permanent representation of a Safety Manager within the Departmental Committee (CODEP) of ANA.
- Audits conducted by the DAC in the area of Air Safety culture and investigations have resulted in a number of findings. In collaboration with the operational and technical entities, the Certification Department has been working to take immediate action to address these findings with the goal of correcting them in 2022.

Over the years, the Certification Department:

- Has continued to carry out its own missions. Thus, trends in aviation safety continued to be monitored jointly with the Safety Officers of each department.
- Recommendations have been issued and their implementation and effectiveness have been verified.
- Has participated in EOSM (Efficiency of Safety Management) and SOE (Standard of Excellence) which are indicators of the level of efficiency and excellence in Aviation Safety.

As for the activities of the 2021 Certification Department related to security:

- These have contributed, through a process of continuous improvement, to the sustainability of the management system developed in previous years.
- Has developed a program to monitor internal threats, including mandatory training developed internally for each agent.

Concerning quality management, the Certification Department, which is responsible for internal audits:

- The follow-up of external certification audits, exchanges with interested parties and the monitoring of the quality of our services, continued its training in 2021 to strengthen the team of specialized internal auditors of ANA's departments.

An annual meeting was held with the Users' Committee to report on investments and projects within the framework of the performance plan under the aegis of the DAC.

For health & safety activities, the Certification department

- has continued to deploy its management system through the drafting of its terms of reference, the establishment of a dedicated quarterly committee and the application of key performance indicators.
- These targets relate to the number of workplace accidents, communication and on-site inspections.
- Work to consider future ISO45001 certification for safety, health and employee well-being has also been initiated for 2021.



AERODROME SERVICE (AER)

The field of activity of the ANA aerodrome service extends on the one hand to an operational level, on the other to a theoretical level / procedures such as the following main categories:

Aerodrome Inspectors

- Presence of inspectors from the aerodrome service 24 hours a day on shiftwork.
- Monthly AER meetings to highlight the important points of the month, as well as to ensure good internal communication.
- Daily Operations Meeting between the operational services of ANA, LAP, CGDIS and APC.
- Test phase of a FOD detector for an added safety during the inspection of the runway
- Change of the Friction test to the Global Reporting Format (GRF) required by EASA regulations to assess the contamination of the runway surface.
- Night meetings on zone Z2: alignment between ANA, LAP, NACO, SOMO for night work in connection with runway repair.
- Acquisition of a lift to carry out minor maintenance on AER vehicles.
- Proficiency checks of AER agents on AER service procedures.

Aérodrome inspections

- Inspection of the maneuvering area 4 times a day.
- Daily inspection of obstacle lights.
- Daily technical road inspection.
- Inspection of the surroundings 2-3 times a day.
- Reporting Inspection AGL during weekends and holidays (Airport Ground Lighting) resumption of ELE service in autumn 2020.
- Security assessment of external premises on a monthly basis (DVOR DIK, outer marker, transmission center...).



FOD

Collation of FOD on the maneuvering area 24 hours a day during track inspections or following reports from pilots and / or ATC

Accompaniment

- Presence of an AER agent to accompany the personnel of the various sites on the maneuvering area.
- Accompaniment of people during airport visits.
- Accompaniment of UAS pilots when requesting drone flights in and around the ELLX0 airport perimeter. The ELLX0 zone is likely to impact the safety of aircraft in the approach phase, the presence of an aerodrome inspector.
- Presence of an AER agent to accompany engineering offices and contractors during the night on the maneuvering area in order to carry out the necessary soundings and surveys in connection with the renewal of the runway.
- Presence of an AER agent for the coordination of the assembly and dismantling of cranes in the axis of the runway.
- Accompaniment of the water tractor to reduce dust during the refurbishment of the track.
- Accompaniment of the sweeper to remove stones and clean the mud on the track during the rehabilitation work of the track.



Works on the maneuvering area

- Cross check of the site after completion of the site to ensure a safe start of operations (e.g. forgetting equipment on site, etc.).
- Presence of an AER agent on standby in case of take-off with a reduced runway during work or incident on runway in order to coordinate with TWR and ensure the separation of vehicles and aircraft at take-off.-
- Presence of an AER inspector to ensure missing safety measures on the ground, in case of engine test on taxiway I in LVP conditions.
- Presence of an AER agent on the technical tracks in LVP condition due to the non-functioning of the Stop bar lights to avoid runway incursions
- In the event of an RVR (runway visual range) instrument failure, an AER agent will be called by the control tower to position himself at the runway threshold and give the appropriate visual range value of the runway.
- Delimitation with positioning of lighting of the construction sites on the maneuvering area.-
- The AER officer checks whether workers are in good standing with their PPE (personal protection equipment) on the operating area and reports to ANA's health and safety department if there are discrepancies

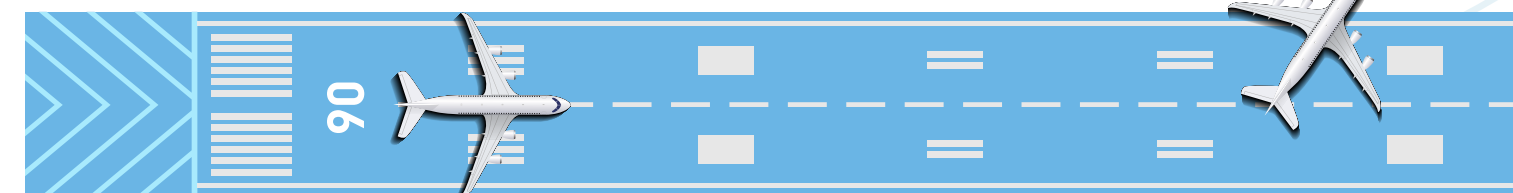
Winter Operations

- Since the change of the EASA regulation, the AER agents make runway condition assessments in relation with the Global Reporting Format (GRF).
- The AER agents integrate the runway condition assessment values in the ATIS (Automatic Terminal Information Service)
- Sending daily Winter Operations Briefing in case of winter conditions that could affect the maneuvering area.
- Training on the Global Reporting Format

Works Coordination

Coordination with lux-airport for calculations and issuance of work permits for the positioning of cranes or any material/activity piercing the OLS areas of the airport.

- Impact studies of works, objects (e.g. cranes) on OLS on and around the airport
- Regular meetings with NACO regarding the runway refurbishment planned for 2021 and 2022 (ongoing runway refurbishment project).
- Daily coordination with all stakeholders during the night work period on the maneuvering area.
- AS weekly meetings with LAP for alignment of works.
- Weekly AER-CNS works meetings coordination with CNS department for works alignment.
- AER-ELE weekly meetings coordination meeting with ELE department for work alignment and procedures.
- Regular meetings with the CERT department regarding internal communication and various projects on the agenda
- Participation in monthly AST / LRST meetings.
- Participation in AWOC meetings
- Presence of an AER delegate in the monthly meetings of the ATC/TWR department.
- Regular meetings with DAC and LAP (DAIM meeting).
- Preparation of all mentioned meetings.
- Coordination with ATC/TWR, APC, and LAP in case of runway closure due to treatment or snow removal of the maneuvering area (different scenarios).
- Coordination with ATC/TWR, APC, and LAP in case of runway closure due to runway degradation or Taxiway.
- Preparation of the annual Winter Operation Closing Report presented to LAP and the airlines at the AST/LRST.



Training center

- Complete training and theoretical and practical examination of aerodrome inspectors.
- Elaboration and publication of new internal and external trainings.
- Training of the inspectors on the Friction Tester vehicles.
- Elaboration and publication of the internal AER operations manual
- Updating of documentation, publications, procedures, AER manuals
- Elaboration and publication in-house of new training procedures.
- Preparation together with an English expert and ATC/TWR of a workshop concerning the layout of the maneuvering area.
- Preparation of various exercises for the simulator sessions.
- Regular meetings with the simulator producers to ensure high quality work and realization of the latest updates.
- Theoretical and practical courses of airport driving licenses A and B for internal staff and external companies on request.
- Refresher courses for expired licenses.
- English phraseology courses.
- Specific courses (e.g.: LVP situation).
- Redefinition of the different workstations including the redefinition of training needs.
- Review of LAP procedures. Alignment of LAP-ANA procedures.
- Addition of a pilot station for the simulator.
- Proficiency checks of the AER agents on the AER service procedures.



APP procedures and draft procedures

- Finalized the layout of the APP consoles in preparation for the 3rd APP position.
- Review of all our LoA's with the introduction of Mode S Space and introduction of points raised by DAC in their annual audits.
- Introduction of the new SA3 which has been formalized in the LoA with DFS from October 7, 2021.
- Follow-up of the Approach/Director Project Conops (3rd APP position). Finalization of the 3rd phase of the CONOPS with the training of the controllers in Finland and waiting for the validation of the concept by the DAC.
- Follow-up of the "PBN transition plan" with the elaboration of the "NDB free procedures" project which will be implemented on January 27, 2022.
- Adaptation of two conventional SID's for runway 06 and preparation for the adaptation of two SID's for runway 24 for January 27, 2022 and the abolition of 2 SID's (runway 24) for April 21, 2022. Introduction of an additional transition for January 27, 2022.
- Abundance of the "Schengen" project. Waiting for changes at DSNA (France) level to be able to pursue a reorganization of the space south of our TMA.

Procedures and draft procedures TWR

- Moving CAT 2/3 Holding Point TWY A
- Implementation of an intermediate holding point on D1
- Analysis with AER/Luxairport for the implementation of intermediate stop points on TWY A / E / B1 / B2 / B3
- Analysis and partial implementation with AER/Luxairport of a taxiway for transit between P3 and P10
- Evaluation of LVP procedures for runway 06 CAT1
- Implementation of a 360 degree simulator at our training provider FinTraffic.
- New control tower project: analysis of the possible position.

Technical projects in collaboration with CNS (APP & TWR)

- Follow-up of the "Surveillance chain upgrade" project with Leonardo.
- Continuation of the bug fixing and customization of the system.
- Implementation and use of the Leonardo simulator (APP)
- Update of the control system of the maneuvering area lighting

Miscellaneous (APP & TWR)

- Participation in the SC-OPS level (Standing committee OPS) of the FABEC.
- Participation in the HAG level (head of ACC's group)
- FinTraffic :
 - Finalization of TWR & APP trainings (May)
 - TWR & APP transition trainings (Jun)
 - Refresher training TWR & APP (Septr-Nov)
- Visits and accompaniment of new trainees to ANS Finland.
- Start of on the job training of 20 new trainees for TWR and APP
- Participation in various DAC Audits.
- 2 meetings (March and November) with our main stakeholders (Luxair and Cargolux)



COMMUNICATION, NAVIGATION & SURVEILLANCE (CNS)



The year 2021 proved to be very unsettling for the CNS service. Not only because of the disruption of the daily work caused by the COVID-19 pandemic, but also because of the change in management that took place on November of that year.

In spite of these inconveniences, the CNS has managed to carry out the necessary maintenance and changes to guarantee the services provided to the other entities of the administration and to foreign interlocutors.

Major changes and maintenance

- Update of MET categories on the ADD system.
- VCS: Installation of new receivers and transmitters at the receiving and transmitting centers respectively.
- Reconfiguration of the MFC connections (replacement of the international E1 links by E1 over IP links) for the communication lines with the neighboring air traffic control centers.
- Relocation of one of the two Meinberg NTP servers from the BTO to the Datacenter for redundancy reasons.
- TAR2 (PSR) fault following the testing of the new radar source monitoring system. Problem solved after intervention of the manufacturer.
- GP06:
 - Several floods in the GP06 building caused by heavy rains in combination with the repair works of the runway and its surroundings.
 - Control and renewal of the water tightness of the ducts entering the building.
 - Installation of an automatic water pump to limit possible damage in the event of a new flood.
- Installation of a new low voltage cable at GP06.
- Failure of one of the LOC06 transmitters. Return to normal after replacement of the faulty circuit board.

- A-SMGCS:
 - Update of the A-SMGCS software.
 - SMR, update of the clutter map.
 - SMR1, replacement of the transmission by the manufacturer.
 - SMR1 & 2, verification and compliance of the towers.

- Update of the Cadmos recording system (audio and video recording of ATCO workstations)

Relocation of a part of the A-SMGCS servers from TAR1 to the Datacenter for redundancy reasons.

New features

- VCS: Commissioning of a new frequency for the ATC APP.
- Installation and testing of a monitoring system for radar sources (real-time), TAR2 and radars St.Hubert, Chaumont, Pfälzerwald and MUAC fallback.

Personnel

- Theoretical (via video conference) and practical (on site) ILS/DME training.
- Assessments of the majority of ATSEP in the field of Navigation. (IL/DVOR/DME/NDB)
- Change in the management of the CNS service as of 01/11/2021.



ELECTRICAL ENGINEERING DEPARTMENT (ELE)

In 2021 the electrotechnical service was permanently reinforced by two new agents. The contracts of a C1 employee and a C employee were converted into permanent contracts. Employee C1 has been integrated into the AGL team, whose main tasks are the installation, maintenance and control of lighting and airport signs, as well as the maintenance and control of the related power circuits. Employee C's main mission is to assist the stock manager in managing the stock.

As in previous years, the electrical engineering department continued to provide regular preventive and corrective maintenance of the equipment and installations under its responsibility, such as

- The primary and secondary electrical power supply and distribution network (back-up power);
- The lighting and airport signs of Luxembourg Airport;
- The airfield lighting control and monitoring system;
- The telephone exchange.

From the point of view of works, the year 2021 was dominated by the repair of the runway. This project, carried out under the management of lux-Airport, included an electrotechnical component in addition to the civil engineering component. The second part required a strong investment of the electrotechnical service in this project, especially for the realization of the risk analysis, the technical assistance and the collaboration on the ground essentially for the works in the stations of the electrotechnical service.



In addition, the electronics department completed the following projects:

Updating the ALCMS (Airfield Lighting Control and Monitoring System) to incorporate the new systems installed in 2021 as part of the runway rehabilitation project:

- Replacement of outdated constant current controllers and acquisition of new controllers required as part of the runway rehabilitation - Bidding and awarding of contract, clarification of technical details;
- Finalization of the project "Relocation RWY Holding position CAT II/III on Twy A" ;
- Laying of a new LV cable between station GP06 of the CNS service and our new station 06 with temporary extension to the old station 06;
- Installation of a phone cable from station 06 to TAR2 and from the new station 06 to the old station 06.

The ELE department has planned the following projects:

- New North Main Station;
- Cladding along Bravo taxiways 1 through 4;
- Sheathing along Runway 06 approach masts;
- ALCMS upgrade planned for 2022 to incorporate new constant current controllers as well as new systems installed in 2022 as part of the runway rehabilitation project;
- Elaboration of the tender documents for the project "Extension of the medium voltage network and completion of the new stations at Luxembourg Airport";
- Acquisition and installation of new information panels for the P7 and P10 parking areas.

Besides its own projects, the electrotechnical department contributed to the realization of projects in collaboration with the Administration des ponts et chaussées such as:

- The rehabilitation of a significant part of the rolling surface of taxiways Alpha, Bravo 1 and Bravo 3/4;
- Compliance of taxiways A1 and A2 (installation of the following new systems: edge lights on the island, new airport signs);
- Installation of final lead-on circuits for taxiway Alpha CAT II/III holding point;
- Installation of inset guard lights at CAT I hold points on taxiways A1 and A2 to enhance air traffic safety. This system, which is a first for Luxembourg Airport, aims to reduce the risk of runway incursions.

For all these works, the Administration des ponts et chaussées ensured the civil engineering part and the electrotechnical service realized the electrotechnical part, i.e. the installation of the electric cabling, the lighting and the airport signs.

In addition, the electrical engineering department had to invest a lot of effort in repairing the faulty circuits of the taxiway axis lights of taxiways B3 and B4 respectively the taxiway edge lights of taxiways B4, B3 and B2.

During the year 2021, the electrical engineering department participated in internal and external audits (DAC and ISO 9001/14001 re-certification).



IT DEPARTMENT

During the year 2021, the IT department was mainly marked by the second and third waves of COVID-19, for which the department continued its efforts to offer optimal working conditions to the home office agents; however, this did not hinder the implementation of numerous new or continuous improvement projects.

The service activities listed below are grouped according to the 5 pillars of the ITIL methodology.

Service strategy

From a strategic point of view, the approximation with the CTIE allows the ANA's IT department to offer a wider range of services than in the past.

Projects for the migration and centralization of Oracle databases at CTIE have thus continued (GIS tool, statistical tool, etc.) and tests of the telephony offered by CTIE have also continued with the installation of a conference phone in one of the ANA's meeting rooms, as well as the use of Avaya soft phones by the service.

The financial management of the service is impacted by the management of two joint budgets: one intended for the CTIE's support, the other one for ANA's support.

Service design

There have been many coordination and implementation projects, but the main ones include:

- BDC Project - Improvement and development of the ANA's commitment management tool;
- HIVE project, in partnership with CTIE - Development of a new tool for managing commitment requests and standardized invoices;
- MétéoLux mobile application project, in partnership with CTIE - Monitoring of the project from a technical point of view, participation in the elaboration of the specifications and review of potential providers;
- FlightManager NG Project - Complete overhaul of the ARO billing system, transition to a web model and drastic simplification of the interface,

while maintaining full compatibility with the current system; as well as beginning discussions on a dashboard for FIN, with integration into the new FlightManager to ensure centralization, uniqueness and consistency of the data available in the various ANA systems/services

- PowerBI Report Server project - Architecture of a central data lake solution for ANA, as well as the business intelligence tools allowing to exploit it.
- FIPLAN / FLIRT Project - Upgrade - Upgrade of the servers and tools necessary to produce the ANA statistics
- Bentley Project - Upgrade to OpenComms - Installation and migration of the platform allowing to edit airport maps.
- HCI Project - IaaS - Automation of server deployments for the needs of certain operational customers (MET);
- Project HCI - VDI - Upgrade - Installation of the new virtual desktop platform (VDI)
- PMO Timekeeping Project - Search for a tool to track the hours worked by ANA agents on PMO projects
- Environmental Performance Analyzer & Optimizer Project - Discussed the technical possibilities for creating and deploying ML models, with PowerBI dashboards, that would ultimately reduce the airport's environmental impact
- Webex for conference rooms project - Deployment of Webex technology in the Executive Boardroom, Director's Office, and ATC Postholder's Room
- AER Rugged Tablets Project - LuxTrust analysis, installation and security of the tablets that will be used in the field.

- Moodle for ANA Project - Implementation of an LMS for the needs of the various ANA departments
- ATCO Qualification Management Tool project -
- P2P sync project (PoC) - Efficient inter-server synchronization project
- 3G Plan Project - Implementation and installation of an emergency EUDCC pass validation system, coupled with an integration of the security system for the management of access to the different buildings of the administration

As part of the information security management, internal and external audits were carried out. In addition, there were numerous interactions related to GovCERT alerts, including:

- Phishing attempts by our users
- Management of critical vulnerabilities, including
 - HAFNIUM (CVE-2021-26855)
- Printer Nightmare (CVE-2021-34527)
- Log4j (CVE-2021-44228)

Transition service

As part of the interconnection of the ANA business network with the CTIE network, ANA is now connected to the CTIE by two new additional lines, which provides redundancy for access to internal services and increases the availability of our installation through a total of 4 links. Numerous coordination meetings have also taken place with the CTIE network and firewall teams to prepare this migration.

At the release management level, several tools facilitate the IT team's management of the park: implementation of Desired State Configuration (DSC) features to push applications to users, development of Powershell scripts for more advanced administrative management (inventory, etc.), debugging, etc.

At the level of change management, the use of the 8MAN tool allows traceability and granular management of rights, while eventually facilitating the review of the rights of each person on the various IT systems (GDPR, etc.).

Service operation

IT incident management was marked by the creation of 2383 new tickets during the year 2021 (+21% compared to 2020), of which 2108 could be successfully closed (+12% compared to 2020, ~ 90% of the requests). These tickets concerned all day-to-day issues from agent support to hardware, software and network issues.



The ANA's IT department also implemented a feedback. The satisfaction rate of the users is 4.9/5 (for those who answered the satisfaction surveys).

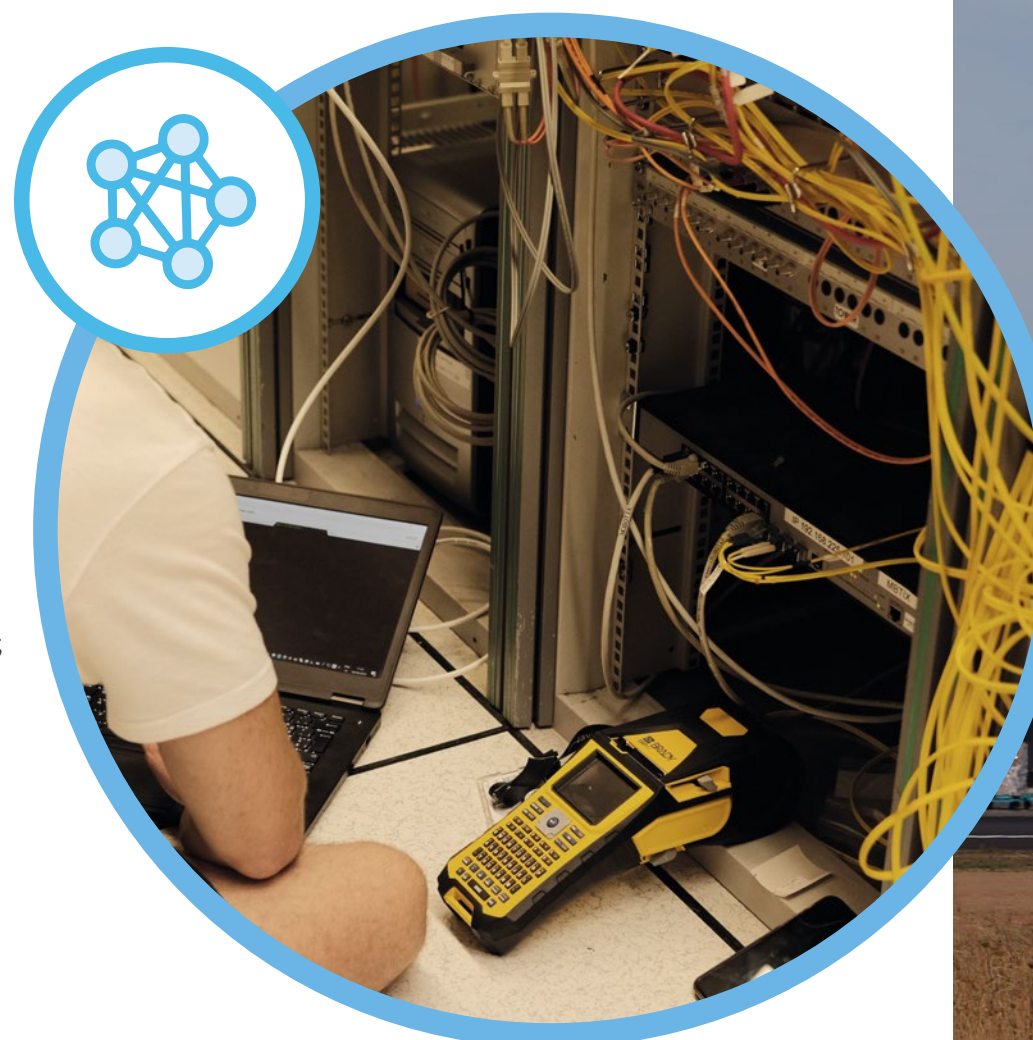
Since the migration to the new hyper converged platform, the department has noticed a gain in productivity with respect to the maintenance and administration tasks of the latter. Continual service improvement

Finally, here is a brief list of continuous improvement projects that the department worked on in 2021:

- MeteoLux web server takeover project - Hosting & management
- 2FA deployment project for the new FlightManager
- Firewall cluster upgrade project - Deployment, cabling reorganization and configuration; including vdoms/vlans restructuring, systematization of rules methods and standardization, preparation of some VLAN migration to CTIE
- Project of disengagement of the old internal and external switches, as well as migration of the old links to the new switches.
- Sharepoint PMO project - Stabilization of the new tool, and beginning of the training of the users
- Migration from the old server-storage infrastructure to the new hyper-converged platform;
- Migration to a new backup solution;
- Replacement of unsupported machines (Windows 7, etc.);
- Optimization of the VPN solution used for the telecommuting of agents;
- Centralization of logs to the Active Directory (identity management);

- Centralization of resources (databases, servers);
- Securing the network and application infrastructure;
- Development of PHP/C#/Python modules to maintain existing applications while waiting for a migration or an upgrade of legacy systems.
- Implementation of quality recommendations following ISO 9001 audits
- License management, annual reporting to CTIE

In summary, the year 2021 was marked by the second and third waves of the pandemic, which confirmed the usefulness of the numerous collaboration tools deployed in 2020 (webex, skype 4 business, etc.), an increase in the efforts to be made by our department, as well as an intelligent optimization of human and technical resources to meet the various needs of the administration in times of crisis. Cost optimization efforts have also not been forgotten, where possible.



AERONAUTICAL OPERATIONS

The aeronautical operations department carried out the following activities in 2021:

- Processing of 865 draft NOTAMs, resulting in 978 NOTAMs published by Skeyes under Luxembourg authority.
 - Realization of 622 AIP changes through 15 amendments, 37 supplements and 3 circulars.
 - Receipt and processing of more than 200,000 messages from the aeronautical fixed service concerning Air Traffic Flow and Capacity Management (ATFCM), flight plans and messages associated with flight plans, such as arrival messages, cancellation messages, etc.
 - Issuance of 2271 international flight plans.
 - Manual insertion of 4553 local flights in the FDP system (Flight Data Processor).
 - Follow-up of 34 alarms due to the activation of Luxembourg distress beacons, respectively foreign beacons located on Luxembourg territory. 15 alarms came from ships, for which the ARO service transmits the data to the Commissariat aux affaires maritimes.
 - Listing of 833 runway condition reports by the AER service, followed by 12 runway closures for clearing and publication of 127 SNOWTAM.
 - Processing of 173 specific night flight requests, including 109 for Cargolux.
 - Processing of 8 requests for engine tests outside the time slot.
 - Issuing of 3275 invoices (daily, monthly and half-yearly).
 - Processing of 799 authorizations from the Civil Aviation Authority (DAC), including 141 authorizations for specific activities, 75 requests for technical advice and 583 authorizations for traffic rights.
 - Activation of the geographical UAS zones (drones) for the geoportal amounting to 28 activations for the aerodrome of Noertrange, 100 for the aerodrome of Useldange and 127 for the military zones.
 - Follow-up of 42 continuous training courses resulting in 2708 hours of training.
- The OPS department consists of the ARO service (ATS service provider) and the AIM service (AIS service provider). Both services are certified according to the European Commission's implementing regulation 2017/373. The department is actively involved in maintaining and improving the quality, safety, environment and security management systems.
- For the publication of aeronautical information, the cooperation of the AIM department with the data providers, including the ANA services, lux-Airport as aerodrome operator and the DAC as civil aviation authority, contributes to the satisfaction of all stakeholders.
- In the field of aeronautical publication, the close cooperation with Skeyes ensures the efficient maintenance of flight procedures and the analysis of obstacles for their protection.
- Within the framework of the ANA's international obligations, the OPS department participates in several FABEC and Eurocontrol expert groups. In addition, regular consultations are arranged with our internal and external aeronautical data providers (ANA, DAC & lux-Airport) and especially with Skeyes, for the co-publication of the AIP.
- The health crisis, in its second year, continues to impact the organization of services, but meetings have been maintained, thus ensuring the smooth running of the administrative management of the department.



The aeronautical operations have maintained the continuity of the service H24 without significant disruption and the mandate has been assured.

The exemplary commitment of the OPS agents and the management within the OPS department also enabled initial and ongoing training to be provided. The department was able to quickly adapt to the online training tools proposed by the training authorities (INAP, IANS, etc.) and thus the skills required for the employees were maintained despite the health constraints.

In terms of projects, the OPS department is still waiting for the FDPS flight plan data processing system to be updated to comply.

In close cooperation with the IT department and the Finance department, a modern tool that meets the regulatory requirements for calculating TNC terminal charges is in the operational test phase and should replace the old billing system in the short term.

Another project successfully completed in 2021 is the abolition of the NDB (non-directional beacon) approach procedures in cooperation with the APP and PANS-OPS departments of Skeyes.

Due to the health crisis and budgetary restrictions, two critical projects of the AIM service have been slowed down in 2021. The first is the establishment of an aeronautical database and workflow management system to digitize the current paper-based mode of operation that requires extensive manual management of activities. This database will allow the AIM department to meet the legal requirements and to strengthen the collaboration with Skeyes.

The other project concerns the management of electronic terrain and obstacle data (eTOD). The reorganization of the GIS (Geographic Information System) unit within the AIM department, as well as the collaboration and feedback initiated with the Administration du Cadastre et de la Topographie (ACT), are promising for the successful completion of this long-term project.

In terms of human resources, the OPS department has a total staff of 19 people, corresponding to 18.25 full-time equivalents (FTE). 3.75 FTE are allocated to the AIM department, 11.5 to the ARO department, 1 to the position of department head, as well as 2 in initial training abroad. It should be noted that of the 11.5 FTEs allocated to the ARO, 9.5 are on H24 duty.

An external consultant (0.5 FTE) supports the department in the areas of certification, compliance and procedure development. While the department still notes a shortage of 2 FTEs, it can be seen that the situation is starting to improve.

Finally, it should be noted that the department has moved from airside to landside, allowing for easier access to our customers and users. Unfortunately, the leasing of two new offices, which should have allowed the AIM department and the GIS unit to consolidate and better develop, could not be completed. A rearrangement of the use of the existing offices has nevertheless allowed the GIS unit to be finally regrouped in the same office.

METEOROLOGICAL SERVICES

Severe Weather Events

MeteoLux issued 150 weather warnings during 2021. 11 of them reached the orange severity level, none the red level. The orange warnings concerned the following phenomena: strong winds (1), heavy rain (4), extreme cold (2), strong thunderstorms (4). An orange alert for heavy rainfall accompanied by a red alert for flooding issued by the EGA, had been triggered for the day of 14/07/2021 and the night of 15/07/2021. These torrential rains resulted in two absolute records for the intensity of precipitation for a month of July at the meteorological station of Luxembourg-Findel.

The MeteoLux Mobile Application project, launched at the end of 2019 and concretely started in 2020, has continued throughout 2021 and is entering its finalization phase. A Beta version is currently being tested with the goal of a release in the first half of 2022.

As the MeteoLux website dates back to 2015, a redesign project has been initiated in collaboration with the CTIE at the end of 2021. The project will actually start in 2022.

The "Data Rescue" project aiming at digitizing the historical climatological data recorded in the "Cahier d'Observations" since the end of 1946, was finalized in the fall of 2021. The CLIMATE Division will thus be able to implement a quality control protocol for long-term hourly data.

As the current AWOS system (Automatic Weather Observer Station) dates from 2009, a project for the acquisition of a new AWOS, initiated in 2020, has started in 2021 with the drafting of the specifications.

The "AWOS Software Upgrade" project has been finalized (hardware and software upgrade), allowing, in addition, to replace the data of the old LD40 ceilometers, dating from 2002, by the data of a new generation of CL31 ceilometers.

Installation of an AWOS test bench to test the system before going into production.

The "RVR Contingency" project has been finalized with an operation date of 01/10/2021. This system replaces the former METPRO to guarantee the calculation and visualization of vertical (cloud base & vertical visibility) and horizontal (MOR & RVR) visibilities in case of total failure of the main AWOS system.

The first part of the project "Relocation of the Meteorological Park" has been finalized. The necessary foundations and the installation of the ducts were carried out in close cooperation with P&CH. At the end of 2021, the system has been ordered and will be delivered in spring 2022. The 2 new weather stations will be connected to the current AWOS and can be connected to the future AWOS.

The project to renew the Synergie Web, our weather visualization and analysis system, had to be postponed to the year 2022 due to budget restrictions, however exchanges with Meteo France International have already taken place.

National and international relations

MeteoLux has participated in various exclusively virtual gatherings at national and international level in order to contribute or to strengthen the various collaborations

MeteoLux had a stand at the Agricultural Fair in Ettelbruck

Several Service Level Agreements (SLAs) at national level have been reviewed and signed.

Safety and Quality Management System

During the year, several internal and external audits were conducted to assess officer competency, occurrence reporting, change management, as well as service quality.

Due to lack of staff, MeteoLux could not implement all the necessary actions at the "MET Authority of Luxembourg" (appointment in 2019). A team of volunteers internal to the Department currently provides the essential services.

Trainings

During the year 2021, MeteoLux sent operational staff to 6 trainings that took place either online, at the Deutscher Wetterdienst or at Météo-France. The whole METTECH team has followed the trainings planned during the year. One of them was a training on maintenance and emergency repair of VAISALA sensors, which was postponed several times due to the health situation. These trainings are part of our training plan defined every year and mainly focused on upgrading the skills of our agents.

A new agent has successfully completed his initial training in Toulouse at the Météo-France school. The trainee started to integrate our operational service in July 2021 following the last step of the training as a weather forecaster.

The "competency scheme" for the technical service being in force since January 1st 2020, METTECH agents have scrupulously followed the work, training and quality procedures. In this context, the competency assessment of the agents was carried out on time. On the operational side, 3 agents were submitted to the "Competence assessment" in 2021, all 3 having passed their assessments.



HUMAN RESOURCES



Human Resources

The policy of the ANA's Human Resources Department is mainly focused on the recruitment of candidates, giving priority to the criteria of skills, potential and motivation. The development of our agents' skills is also fundamental in order to guarantee a very high level of quality and safety of our services by equipping ourselves with all the human resources necessary to fulfill our ANSP and airfield missions.

During the year 2021, the HR department has carried out the following activities:

International Relations

- Participation in the virtual meetings of the FABEC Standing Committee on HR, FABEC Training Task Force and FABEC Social Dialogue Committee

Personnel Administration

- Definition of an HR management system and review of the HR policy introduced in the ANA Integrated Management System
- Review of the organizational chart and positions with specific responsibilities
- Recruitment:
 - Hiring of 1 Civil Servant (MET Service)
 - Hiring of 1 State Employee (ADM-HR Department)
 - Hiring of 1 State employee on a fixed-term contract (STAT Unit)
 - Hiring of 1 State Employee (CNS Service)

Career management

Follow-up of agents' careers

6 requests for conversion of state employee positions to civil servant status following the successful completion of the state competitive examination

Management by objectives and development of the work program for the reference period 2022-2024

Training and Skills

- Development and maintenance of international links
- Participation in FABEC and Eurocontrol meetings and working groups
- Cooperation with several European training centers and other ANSPs, in the framework of initial and continuous training for all ANA departments
- Integration and follow-up of trainees in training abroad (ATC, MET, OPS)
- Coordination of the activities of the "ATC Training Organization
- Refresher trainings for all TWR and APP agents
- Conversion trainings for all APP agents
- Transition trainings for trainees in initial training
- Organization of several "OJTI and Assessor initial/refresher" trainings
- Focal point between the ANA and the competent authority (DAC) regarding the activities of the Training Organization and the management of ATCOs' licenses
- Resumption of the project related to the implementation of a tool for the management of competences and follow-up of licenses
- Contribution and support to operational departments during external audits
- Follow-up of corrective actions related to the training component
- Organization of several cross-functional training sessions for the Administration
- Maintaining and developing the qualifications of agents, despite the health crisis

HR Quality

- Review of internal HR procedures
- Measurement of internal stakeholder satisfaction and HR service quality
- Organization of the first ANA internal satisfaction survey



LEGAL UNIT

The Legal Unit manages and monitors all legal matters within the ANA. It protects the interests of the ANA, while respecting the relationship with the MMTP and the DAC, by ensuring the legal security of all operations and preventing the legal dangers to which the ANA may be exposed. During the year 2021, the Legal Unit carried out the following activities:

International Relations

- Participation in FABEC Standing Committee meetings IRL

Stakeholder Relations

- Review of SLA ANA CGDIS and SLA ANA Lux-Airport

In the field of public procurement

- Preparation of 23 contracts (open and negotiated procedures) including
 - 11 service contracts
 - 9 supply of products
 - 3 execution of works
- Elaboration of models of the main documentation (decrees, analysis file, correspondence, information sheet etc.)
- In the field of projects
 - Strategic projects: monitoring of legal aspects, contribution and support to the following projects:
 - A-SMGCS
 - Surveillance Chain Upgrade
 - Approach Controller Final Director
 - TWR Ground Position
 - Meteolux Mobile Application
 - Mode S Airspace in FABEC area
 - AIM Digitization

JUR projects

- GDPR: review of the description of the processing activities and elaboration of notices in collaboration with the Government Commissioner for Data Protection at the State.

- Archives: Elaboration of the Archives table and presentation of the Archives project internally.
- Derogation from working hours: monitoring of the draft law on the subject, interviews with the departments concerned and drawing up a map of requirements for derogations from existing and future rules.

Advice to management

- Ad hoc legal advice and support to management on strategic issues
- In terms of other recurring legal activities
- Review, drafting and follow-up of contracts with external service providers
 - Follow-up of legal cases (2) in progress before the courts lux.
 - Legal advice and support to other departments (HR, technical department, finance, CERT)

Internal committees

- Participation in and contribution to internal strategic committees (Change Management Board, Strategic Management Team, Safety Committee, Security Committee, Health & Safety Committee, Environmental Committee)

In terms of quality

- Review and development of the contract/ commitment management tool

REVIEW OF PROCEDURES

In terms of personnel

- Reduction of staff (from 2 FTE to 1.5 FTE) following the appointment of the lawyer to the position of Head of Department. The new Head of Department combines the function of Head of Department and lawyer.

COMMUNICATION UNIT

The missions of the communication unit are mainly focused on the elaboration, implementation and supervision of the internal and external communication strategy in order to ensure the dissemination of all useful information to the agents of the administration and to other concerned stakeholders.

Projects

• Re-design of ANA vehicles:

The communication unit finalized the lettering project of the ANA's fleet of vehicles, which had become essential for any professional activity taking place on the airside, following the need to adapt to the luxAirport Standard Operating Procedure SOP.SC-012 "Vehicle Requirements at ELLX". The communication unit has developed and deployed a graphic charter on all vehicles, including cars, vans and pick-up trucks, which also enhances the Authority's brand image on the airport platform.

• Formalization of the graphic charter - Elaboration of a user guide for the graphic charter "ANA Brand Manual":

The brand manual is a document that contains all the rules for using the graphic signs that make up the ANA's visual identity. The main objective of this document is to ensure that the brand is correctly and consistently represented. The graphic charter is an integral part of a project. It establishes the basic principles of the entire visual identity and will guide all collaborators who will be involved in the administration's graphic design.

• EMAS campaign:

The communication unit deployed an institutional communication campaign consisting in highlighting the facts, the actions and the commitments of ANA within the framework of the EMAS registration (EU environmental management and audit system). This campaign presented ANA's values, positioning and ambitions in terms of its environmental actions.

• Zero Single Use Plastic campaign:

In cooperation with IMS Luxembourg, ANA has continued to develop its actions and communication tools through the dissemination of information on the continuation of the efforts already undertaken and the implementation of new initiatives with the aim of encouraging a commitment from internal agents to reduce the consumption of single-use plastic (ideas competition, transition kit, distribution of glass bottles with the ANA branding, newsletters)

Day-to-day business

In addition to the implementation of the above-mentioned projects, the Communication unit also carries out the following day-to-day business to manage and improve all aspects of internal and external communication

- Implementation of an internal and external communication plan
- Development and implementation of communication strategies
- Event organization: Participation in several events in order to promote the ANA and its professions (Matinée d'orientation professionnelle Athénée de Luxembourg, Infobourse "Deng Zukunft d'äi Wee" - Differdange, Foire de l'étudiant - digitale version)
- Ensure the interface between the administration and the media (press relations, press releases, press kits, press conferences, specific handling of journalists, press reviews)
- Management and updating of web presences: management of website content and social networks
- Designing and publishing the annual report
- Design and editing of the Environmental statement
- Management of grievances related to airport noise pollution
- Writing and publishing articles (newspapers and professional magazines)
- Distribution of internal newsletters and thematic bulletins (Safety Bulletin, Environmental Bulletin, Security Bulletin, HR Journal, Covid-Newsletter, Display on screens)

- Support function: the Communication unit also acts as a support for the internal actors for the realization of brochures, leaflets and newsletters, proofreading and writing of documents, graphic realizations for all supports, conceptualization, graphic realization and layout of presentations for all types of events
- Representation of the ANA at FABEC ComCell and FABEC CRM

Realization of photo and video missions

- Elaboration of performance indicators and follow-up of the latter via dashboards and reports

Work progress

With a view to constant improvement, the Communication unit continues to professionalize all aspects of internal and external communication and, above all, to carry out ongoing projects with the aim of establishing more consistent and clearer communication for the various stakeholders.



MAINTENANCE UNIT



The Maintenance Unit is mainly responsible the following tasks:

- maintenance of buildings and green areas and execution of small works
- follow-up of building sites and accompaniment of ANA suppliers on the airport site
- moving furniture
- mail distribution
- management of the car fleet
- executive driver service
- beverage orders
- management of fuel oil and cleaning products orders
- waste management
- management of the administrative stock

SECRETARY'S OFFICE UNIT

The main missions of the secretariat are to provide administrative support to the various ANA departments, to receive visitors and supplies, to manage office equipment, and to manage airport badges and driving licenses for all ANA employees and certain external service providers.

For example, in 2021, the secretarial unit assisted ANA staff in drawing up 81 trip sheets and related declarations, 45 of which were related to ATC training. In addition, they drafted the minutes of 38 service meetings.



STAKEHOLDERS CONSULTATION

In 2021, 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 the Luxembourg 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 2021 was explained and 2022 Terminal Navigation Charges (TNC) determined cost and the final unit calculated and explained.

ANA held hybrid meetings for noise complaint related issues.



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.
FABEC	SPM	Safety	Analyzing yearly safety data, analyzing and compiling a safety performance monitoring report.
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.
CANSO	EC3	CERT	Representing the interests of ANA in CANSO context.
		(MET)	
		(CNS)	
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.
FABEC	SC-OPS	ATC-OPS	Representing our OPERATIONAL interests on FABEC level and receiving support for our activities.
FABEC	CRM	COM	
FABEC	COM CELL	COM	
FABEC	SC IRL	LEGAL	Representing legal interests on FABEC level and receiving support for our activities.
Eurocontrol	Eurocontrol AI Operations	OPS	
Eurocontrol	Eurocontrol Information Regulations Implementation Sub-Group (AIRI SG)		
Eurocontrol	Eurocontrol AIM/SWIM Team		
FABEC	FABEC AIM Steering Group Groupe de travail - Infrastructure Luxembourgeoise de Géodonnées (GT-ILDG)		
LAP	Lux-Airport Airport Works Coordination (AWoC)		



Luxembourg State continued carrying the costs for ATM investments and capital cost. The depreciation costs for investments are not charged to airspace users saving them an amount of close to 3M€ in 2021 in terminal costs and about 1 M€ for En-Route ANS provision.

The impacts of the COVID-19 crisis on ANA strategy, planning of resources and investments, and the dramatic reduction of revenues from route and terminal charges are severe. ANA Finance department identified the financial and cost risks and areas for improvement on cost efficiency and reduce expenses to good effect.

Nevertheless, the need for additional State funds to cover the gap in cost-to-revenues/ in the budget to ensure sufficient liquidity and the roll-out of essential investments and projects.

2021 INVESTMENTS – 2021 RESULTS
ATM/ANS &
AERODROME
SERVICES

Table 11, page 59 gives the details on investment in 2021 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.

The 2021 accounts give a consolidated view of ANA’s financial situation. After a historic loss of more than 17 M€ in 2020, 2021’s figures present a first step of a financial consolidation, limiting the yearly loss to 0, 9 M€. The financial improvement can be explained by lower running costs, the partial recovery of traffic and additional public funding.

Table 11 – ATM/ANS and Aerodrome Investments in 2021

Department/Service - Project Title	Expense 2021 (€)
ELE - ALCMS Update Phase 2	225.535
MET - RVR-contingency	154.345
MET - AWOS/ATIS software update Phase 1	60.782
NAV - ILS 24	45.234
MET - MeteoLux Mobile application	57.096
CNS - A-SMGCS Phase 1	1.053.000
ELE - Relocation holding point 24 Cat 2/3 CANSO	48.829
Sub-total project related expenses	1.644.820
Sub-total non-project related expenses	2.302.103
Grand Total	3.946.923

GLOSSARY



Abbreviation	Meaning
A-SMGCS	Advanced Surface Movement Guidance and Control System (ground radar)
ACAS RA	Airborne Collision Avoidance System - Resolution advisory
ACT	Administration du Cadastre et de la Topographie
AEP	Aeronautical Event Publication
AER	ANA Aerodrome Department
AGL	Airport Ground Lighting
AIM	Aeronautical Information Management
AIP	Aeronautical Information Publication
AIRI SG	Aeronautical Information Regulations Implementation - Sub-group
ALCMS	Airport Lighting, Controlling, and Monitoring System
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
APP	Approach Service
ARO	ANA division aerodrome reporting office
ASB	ANSP Strategic Board
AST	Airport Ground Lighting
ATC	Air Traffic Control
ATCC	Air Traffic Control Center
ATCO	Air Traffic Controller
ATS	Air Traffic Service
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information Service
ATM	Air Traffic Management
ATM MP	ATM Master Plan
ATM SE	ATM System/Equipment
ATN	Aeronautical Telecommunication Network
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
BAC	Business Aviation Center
BDC	Bi-Directional Converter
BTO	Building Tower
CANAC2	Computer Assisted National Air Traffic Control Center 2 - Belgian ATCC
CANSO	Civil Air Navigation Services Organisation
CAPEX	Capital Expenditure
CAT II/III	Category of Operation (I, II, III etc.); ILS approach
CDO	Continuous Descent Operation
CERT	ANA department 'Certification'

Abbreviation	Meaning
CESAF	CANSO European Safety Directors Group
CGDIS	Airport firefighting department
CNS	Communication Navigation Surveillance service
CODEP	Departmental Committee
COM CELL	FABEC Communication Cell
CONOPS	Concept of operations
CRM	Customer Resource Management
CRSTMP	ATFM delay causes (Capacity, Routing, Staffing, Equipment, Airspace Mgmt, and Special events)
CTOT	Calculated Take-off Time
DAC	Direction de l'Aviation Civile
DAIM	Digital Aeronautical Aviation Management
DC	Determined Costs
DF	Direction Finder
DFS	Deutsch Flugsicherung
DIR	ANA Directorate
DME	Distance Measuring Equipment
DUC	Determined unit costs
DSC	Desired State Configuration
DSNA	Direction des services de la navigation aérienne
DVOR	Doppler VHF Omni Directional Range
EASA	European Agency for the Safety of Aviation
EC	European Commission
EC3	European CANSO CEO Committee
ELE	ANA Electrotechnical Department
EMAS	Eco-Management and Audit Scheme, an environmental certification ANA holds
EMS	Environment Management System
EOSM	Effectiveness of Safety Management
ER	En-Route
ES	Emergency Scenario
eTOD	electronic Terrain & Obstacle Data repository
EU	European Union
FABEC	Functional Airspace Block Europe Center (a cooperation of ANSPs from Germany, the Netherlands, France, Belgium, Luxembourg, Switzerland and including MUAC)
FDP	Flight Data Processor
FIR	Flight Information Region
FL	Flight Level
FOD	Foreign Object Debris
FTE	Full Time Equivalent

Abbreviation	Meaning
GDPR	General Data Protection Regulation (EU Reg 2016/679)
GIS	Geographic Information System
GPS	Global Positionning System
GRF	Global Reporting Format
GT-ILDG	Groupe de travail - Infrastructure Luxembourgeoise de Géodonnées
HAGL	Height Above Ground Level
HCI	Human-Computer Interaction
HR	Human Resources
HRT SC	Human Resources and Training Standing Committee
IANIS	Institute of Air Navigation Services
IFR	Instrument flight rules
ILS	Instrument Landing System
IMS	Integrated Management System
INAP	Institut national d'administration publique
ISO	The International Organization for Standardization is an international standard-setting
IT	Information Technology
KPA	Key Performance Area
KPI	Key Performance Indicator
LAP	LuxAirport
LRST	Local Runway Safety Teams
LVP	Low Visibility Procedures
MET	MeteoLux (Luxembourg aeronautical and general meteorological service provider)
METTECH	MeteoLux technical engineers
MFC	Multiple Flight Controller
MMTP	Ministère de la Mobilité et des Travaux Public
MOR	Meteorological optical range
MTOW	Maximum Take-Off Weight
MUAC	Maastricht Upper Area Control (EUROCONTROL)
NACO	Netherlands Airport Consultants
NOTAM	Notice to Airmen
NDB	Non Directional Beacon
OJTI	On the Job Training - Initial
OLS	Obstacle Limitation Surfaces
OPS	ANA Operations Departement (AIM-ARO)
PBN	Performance based navigation (a satellite based navigation system for aircraft)
PIB	pre-flight information bulletin
PMG	FABEC Performance Management Group
PP	Performance Plan

Abbreviation	Meaning
PPE	Personal protection equipmen
PRB	Performance Review Body
PRU	Performance Review Unit
RCR	Runway Condition Report
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)
SC	Standing Committee
SC IRL	FABEC Standing Committee Institutional - Regulatory - Legal
SC SAF	FABEC Standing Committee Safety
SDC	FABEC Social Dialogue Committee
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)
SID	Standard Instrument Departure
SLA	Service Level Agreement
SOE	Standard of Excellence
SPM	FABEC Safety Performance Monitoring Group
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)
TMA	Terminal Area
TNC	Terminal Navigation Charges
TSU	Traffic Service Unit
TTF	FABEC Training Task force
TWR	Tower service
TWY	Taxiway
UAS	Unmanned Aircraft Systems
UHF	Ultra High Frequency
UR	Unit Rate
VCS	Voice Communication System
VDI	Virtual Desktop Infrastructure
VFR	Visual Flight Rules
VHF	Very High Frequency
VPN	Virtual Private Network

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