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Runway Performance Report **2024**

LIEGE AIRPORT

skeyes / tervuursesteenweg 303 / b-1820 Steenokkerzeel
T +32 2 206 21 11 / F +32 2 206 22 88
Member of FABEC

www.skeyes.be

Runway performance report

Liege Airport

EXECUTIVE SUMMARY

This report gives an overview of Air Traffic Management (ATM) Performance at Liege Airport (International Civil Aviation Organization (ICAO) code: EBLG). ATM Performance is driven by four Key Performance Areas (KPAs): safety, capacity, environment, and cost-efficiency. This report covers the first three of these four KPAs to provide skeyes' stakeholders and anyone of interest, along with the traffic figures for 2024 and further relevant data on the performance of the operations at Liege Airport. Unlike the runway performance reports skeyes has published for its other airports, 2019 is not taken as a reference year for Liege Airport. In the ATM world, 2019 is seen as the last normal year before a decline in traffic due to COVID-19. This, however, did not occur at Liege Airport. Traffic increased in 2019 and the subsequent two years, leading to the airport's highest number of aircraft movements in 2021.

Traffic

Liege Airport, as an airport focussed mainly on freight, has seen a different trend than other airports in the last few years. In contrary to most, Liege Airport was affected positively during the pandemic in terms of traffic numbers. Due to its important role as one of Europe's major cargo hubs, Liege Airport witnessed growth and peaked in the number of movements during the COVID-19 crisis – handling pharmaceutical products and medical equipment, as well as the increased demand for express parcel deliveries & e-commerce.

Since 2022, traffic in Liege Airport has reduced. The major contributing reasons to this decrease are the overall geopolitical instability due to the Russian invasion of Ukraine, disruptions of supply chains, and a restructuring of FedEx which moved its base out of Liege in March 2022 . After this decrease continued in 2023, the downward trend ended in 2024 due to new and renewed commitments and destinations. Liege Airport keeps a major role in the needs of the European cargo market as cargo volumes increase in tonnage. Furthermore, the airport itself reported that more and more passengers are flying from and to Liege. With a total of 40,454 movements in 2024, Liege Airport is at -17% of the traffic in 2021 (highest peak) and +13% of traffic in 2023. Looking forward, Liege Airport has greenlit a development plan spanning from 2023 to 2040, entailing an investment of 500 million euros with the aim to double flight frequency.

The share of traffic that takes place during the night declined every year since 2021, making up 27% of total movements in 2024. It should also be noted that while most years saw an increase in north-easterly wind, and thus 04L and 04R usage, during the months of April, May and June, this was not the case this year.

Concerning the market shares of traffic at Liege Airport, the largest share was Cargo traffic with 62% of total IFR traffic. This share, however, has diminished every year since 2021. Despite this, the airport had its second best year when it comes to volumes of cargo handled. As reported by the airport, there were 20,579 cargo movements with 1,162,899 tons passing through Liege Airport in 2024.

Safety

Safety is an essential pillar in air traffic control. As such, safety occurrences and missed approaches are followed up by skeyes' safety unit who analyses the situations, trends and, when relevant, investigates.

The number of missed approaches, a procedure used when the approach cannot be continued for a safe landing, and particularly their cause, can indicate which measures are to be taken to improve the safety of air navigation service provision. In 2024, 46 missed approaches were logged, the same amount as the year before, in 2023. The rate of missed approaches per 1,000 arrivals decreased to the lowest in recent years. In 2024, an unstable approach was the most common reason for a missed approach.

Regarding safety occurrences, the report shows the safety events on runways and taxiways. The number of runway incursions decreased from eight incursions in 2023 to six in 2024. One runway incursion had an Air Traffic Management contribution, classified as severity E: "An incident which has no safety effect". The other five had no ATM ground contribution. Besides the runway incursions, there were also seven runway events, one taxiway/apron event, and ten taxiway incursions.

Liege Airport became a full PBN (Performance Based Navigation) environment in 2023. The use of PBN procedures greatly improves predictability, therefore situational awareness can be enhanced. On top of that, skeyes adopted phraseology improvements, especially regarding CAT II/III holding points and holding point C0, that have already begun to show positive safety results.

Furthermore, the Advanced-Surface Movements Guidance and Control System (A-SMGCS) at Liege Airport became operational in 2022 and the operational validation for its safety nets started in 2023 and successfully ended in mid-December 2024.

Capacity and Punctuality

Capacity and delay go hand in hand when it comes to runway performance. As in previous years, the declared capacity is based on the airport layout and the traffic statistics in Liege Airport, providing the number of movements that can be handled within one hour. The declared capacity of Liege Airport (34 movements/hour for runway 22; 35 movements/hour for runway 04) is based on a theoretical throughput capacity, which uses certain assumptions in its calculation. For a more complete view, this report also shows the effectively used capacity per runway configuration, i.e. how many movements took place per hour throughout the year. In 2024, the declared capacity for Liege Airport was exceeded on two days, with two extra movements during the largest exceedance .

Punctuality is affected by Air Traffic Flow Management (ATFM) delay. A fitting performance indicator for runway operations at Liege Airport is thus the arrival ATFM delay, which is defined as the average ATFM delay in minutes per flight, attributable to Liege tower under the control of skeyes. In 2024, the amount of arrival delay created by regulations put in place by Liege tower was 27 minutes. As this delay was due to weather, no delay had an Air Navigation Service Provider (ANSP) contribution.

Environment

To avoid noise around the airport and to optimize the amount of fuel needed for landings, skeyes encourages Continuous Descent Operations (CDO). During a CDO, the aircraft follows an optimum flight path to ensure environmental and economic benefits. The percentage of arrivals performing a 'CDO Fuel' (i.e. flying a CDO from FL100 to 3,000 feet) improved slightly in 2024 (57%) compared to 2023 (54%). The percentage of arrivals performing a 'CDO Noise' (i.e. flying a CDO from FL60 to 3,000 feet) improved further with a 7% increase, at 69% of arrivals. These increases occurred despite the increase in the number of CDO-eligible arrivals. skeyes is continuously aiming to increase the number of CDOs flown, for example, by continuing the promotion of the use of PBN procedures.

The 'Average level-off time below certain altitude' indicator provides a value representing the average time a descending aircraft spends flying level-off within a specific altitude/flight level range. Runway 22L demonstrated slightly better CDO performance in terms of average level-off time compared to runway 04R. The other runways were used for only a fraction of CDO-eligible arrivals.

This report also shows the yearly and monthly wind patterns at Liege Airport, as they are strongly linked to the choice of the runway. Runways 22L and 22R are preferred over runways 04R and 04L in terms of limited noise above the city of Liege. Winds are predominantly coming from the south-west at the airport. Although in recent years winds have blown more frequently from the north-east, this was not the case in 2024.

SYNOPSIS

Ce rapport donne un récapitulatif des performances de la gestion du trafic aérien (Air Traffic Management (ATM) Performance) à l'aéroport de Liège (code de l'Organisation de l'Aviation Civile Internationale (OACI) : EBLG). Les performances ATM reposent sur quatre domaines de performance clés (KPA, Key Performance Areas) : la sécurité, la capacité, l'environnement et l'efficacité économique. Ce rapport couvre les trois premiers de ces quatre KPA afin de fournir aux stakeholders de skeyes, et à toute personne intéressée, les chiffres du trafic pour 2024 et d'autres données pertinentes sur la performance des opérations à l'aéroport de Liège. Contrairement aux rapports de performance des pistes publiés par skeyes pour ses autres aéroports, l'année 2019 n'est pas prise comme référence pour l'aéroport de Liège. Dans le monde de l'ATM, 2019 est considérée comme la dernière année normale avant une baisse du trafic en raison du COVID-19. Toutefois, cela n'a pas été le cas pour l'aéroport de Liège. Le trafic a augmenté en 2019 et au cours des deux années suivantes, ce qui a permis à l'aéroport d'enregistrer le plus grand nombre de mouvements d'aéronefs en 2021.

Trafic

L'aéroport de Liège, en tant qu'aéroport principalement axé sur le fret, a connu une tendance différente de celle des autres aéroports au cours des dernières années. Contrairement à la plupart des autres aéroports, l'aéroport de Liège a été positivement impacté pendant la pandémie en ce qui concerne les chiffres de trafic. En raison de son rôle important en tant que l'une des principales plateformes de fret en Europe, l'aéroport de Liège a connu une croissance et un pic du nombre de mouvements pendant la crise du COVID-19, en traitant des produits pharmaceutiques et des équipements médicaux, ainsi que la demande accrue de livraisons de colis express et de l'e-commerce.

Depuis 2022, le trafic à l'aéroport de Liège a diminué. Les principales raisons de cette diminution sont l'instabilité géopolitique générale due à l'invasion russe de l'Ukraine, des perturbations sur les chaînes d'approvisionnement et une restructuration de FedEx qui a quitté sa base de Liège en mars 2022. Après que cette diminution se soit poursuivie en 2023, la tendance à la baisse a pris fin en 2024 en raison de nouveaux engagements et destinations ou du renouvellement de ceux-ci. L'aéroport de Liège continue à jouer un rôle majeur dans les besoins du marché européen du fret étant donné que les volumes de fret augmentent en tonnage. En outre, l'aéroport lui-même a indiqué que de plus en plus de passagers prennent l'avion au départ et à destination de Liège. Avec un total de 40.454 mouvements en 2024, l'aéroport de Liège se situe à -17% du trafic en 2021 (pic le plus élevé) et à +13% du trafic en 2023. Pour l'avenir, l'aéroport de Liège a donné son feu vert à un plan de développement s'étendant de 2023 à 2040, nécessitant un investissement de 500 millions EUR avec l'objectif de doubler la fréquence des vols.

La part du trafic de nuit a diminué chaque année depuis 2021, représentant ainsi 27% des mouvements totaux en 2024. Il faut noter également qu'alors que les vents du nord-est augmentent la plupart des années, et donc l'utilisation de la 04L et de la 04R aussi, cela n'a pas été le cas durant les mois d'avril, de mai et de juin cette année.

En ce qui concerne les parts de marché du trafic à l'aéroport de Liège, la part de marché la plus importante est le trafic de fret avec 62% de l'ensemble du trafic IFR. Cette part, toutefois, a diminué chaque année depuis 2021. Malgré cela, l'aéroport a connu sa deuxième meilleure année en ce qui concerne le volume de fret traité. L'aéroport a communiqué avoir enregistré 20.579 mouvements de fret, avec 1.162.899 tonnes transitant par l'aéroport de Liège en 2024.

Sécurité

La sécurité est un pilier essentiel du contrôle aérien. C'est pourquoi les événements de sécurité et les approches interrompues font l'objet d'un suivi par la Safety Unit de skeyes, qui analyse les situations, les tendances et, le cas échéant, mène des enquêtes.

Le nombre d'approches interrompues, une procédure utilisée lorsque l'approche ne peut être poursuivie pour effectuer un atterrissage en toute sécurité, et en particulier leur cause, peuvent indiquer les mesures à prendre pour améliorer la sécurité de la fourniture des services de navigation aérienne. En 2024, 46 approches interrompues ont été enregistrées, tout comme l'année précédente, en 2023. Le taux d'approches interrompues pour 1.000 arrivées a atteint son niveau le plus bas au cours des dernières années. Les approches instables ont été la raison la plus fréquente des approches interrompues en 2024.

En ce qui concerne les événements liés à la sécurité, le rapport indique les événements survenus sur les pistes et les voies de circulation. Le nombre d'incursions de piste ont diminué, passant de huit en 2023 à six en 2024. Une incursion de piste est imputable à l'ATM et a été classée dans la gravité E : "An incident which has no safety effect". Les cinq autres n'étaient pas imputables à l'ATM. Outre les incursions de piste, il y a également eu sept événements sur piste, un événement sur voie de circulation/aire de trafic, et dix incursions sur voie de circulation.

L'aéroport de Liège est devenu un environnement PBN (Performance Based Navigation) complet en 2023. L'utilisation de procédures PBN améliore grandement la prévisibilité et, par conséquent aussi, la conscience situationnelle. De plus, skeyes a adopté des améliorations phraséologiques, notamment en ce qui concerne les points d'attente de CAT II/III et le point attente C0, qui ont déjà commencé à montrer des résultats positifs en matière de sécurité.

En outre, l'Advanced-Surface Movements Guidance and Control System (A-SMGCS) à l'aéroport de Liège est devenu opérationnel en 2022 et la validation opérationnelle pour ses filets de sécurité a débuté en 2023 et s'est achevée avec succès mi-décembre 2024.

Capacité et ponctualité

Capacité et retard vont de pair lorsqu'il s'agit de la performance des pistes. Comme les années précédentes, la capacité déclarée est basée sur la configuration de l'aéroport et les statistiques de trafic à l'aéroport de Liège, fournissant le nombre de mouvements qui peuvent être traités en une heure de temps. La capacité déclarée de l'aéroport de Liège (34 mouvements/heure pour la piste 22 ; 35 mouvements/heure pour la piste 04) est basée sur une capacité de débit théorique, dont le calcul repose sur certaines hypothèses. Pour une vue plus complète, ce rapport montre également la capacité effectivement utilisée par configuration de piste, c'est-à-dire combien de mouvements il y a eu par heure tout au long de l'année. En 2024, l'aéroport de Liège a dépassé la capacité déclarée pendant deux jours, avec deux mouvements supplémentaires lors du dépassement le plus élevé.

La ponctualité est impactée par le retard ATFM (Air Traffic Flow Management). Un indicateur de performance adéquat pour les opérations de piste à l'aéroport de Liège est donc le retard ATFM à l'arrivée, qui est défini comme le retard ATFM moyen en minutes par vol, imputable à la tour de Liège sous le contrôle de skeyes. En 2024, le retard à l'arrivée causé par des régulations mises en place par la tour de Liège était de 27 minutes. Alors que ces retards étaient dus aux conditions météorologiques, aucun retard n'était dû à des causes impliquant le prestataire de services de navigation aérienne.

Environnement

Pour éviter le bruit autour de l'aéroport et optimiser la quantité de carburant nécessaire aux atterrissages, skeyes encourage les opérations de descente continue (CDO, Continuous Descent Operations). Au cours d'une CDO, l'avion suit une trajectoire de vol optimale afin de garantir des bienfaits environnementaux et économiques. Le pourcentage d'arrivées effectuant une CDO Fuel (c'est-à-dire effectuant une CDO du niveau de vol 100 à 3.000 pieds) a connu une légère amélioration en 2024 (57%) comparé à 2023 (54%). Le pourcentage d'arrivées effectuant une CDO Noise (c'est-à-dire une CDO du niveau de vol 60 à 3.000 pieds) s'est encore amélioré avec une hausse de 7%, pour atteindre 69% des arrivées. Ces augmentations ont été observées malgré la hausse du nombre d'arrivées appropriées pour les CDO. skeyes aspire continuellement à augmenter le nombre de CDO effectuées, par exemple en continuant à promouvoir l'utilisation de procédures PBN.

L'indicateur 'Temps moyen de mise en palier en dessous d'une certaine altitude' fournit une valeur représentant le temps moyen qu'un avion en descente passe en palier dans une plage d'altitude/de niveau de vol spécifique. La piste 22L a démontré une performance CDO légèrement meilleure que la piste 04R en termes de temps moyen de mise en palier. Les autres pistes n'ont été utilisées que pour une fraction des arrivées appropriées pour les CDO.

Ce rapport montre également les régimes de vent annuels et mensuels à l'aéroport de Liège, car ils sont fortement liés au choix de la piste. Les pistes 22L et 22R sont préférées aux pistes 04R et 04L en termes de limitation du bruit au-dessus de la ville de Liège. Les vents dominants viennent du sud-ouest de l'aéroport. Bien que les vents ont soufflé plus fréquemment du nord-est ces dernières années, cela n'a pas été le cas en 2024.

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GLOSSARY

AAE:	Above Aerodrome Elevation
AMC:	Acceptable Means of Compliance
AMS:	Airport Movement System
ANSP:	Air Navigation Service Provider
A-SMGCS:	Advanced-Surface Movement Guidance and Control System
ATC:	Air Traffic Control
ATCO:	Air Traffic Control Officer
ATFM:	Air Traffic Flow Management
ATM:	Air Traffic Management
BCAA:	Belgian Civil Aviation Authority
BURDI :	Belgium-Netherlands U-space Reference Design Implementation
CAA :	Civil Aviation Authority
CANSO :	Civil Air Navigation Service Organisation
CCO:	Continuous Climb Operations
CDO:	Continuous Descent Operations
CEM:	Collaborative Environmental Management
CISP	Common Information Service Provider
COVID-19:	Coronavirus Disease 2019
CRSTMP:	C-Capacity, R-Routeing, S-Staffing, T-Equipment, M-Airspace Management, P-Special Event
CTR:	Control Zone
DFS:	Deutsche Flugsicherung
DSA:	Drone Service Application
EASA:	European Union Aviation Safety Agency
EBAW:	Antwerp International Airport ICAO Code
EBBR	Brussels Airport ICAO Code
EBCI:	Brussels South Charleroi ICAO Code
EBKT:	Kortrijk-Wevelgem International Airport ICAO Code
EBLG:	Liege Airport ICAO Code
EBOS:	Ostend–Bruges International Airport ICAO Code
FIR :	Flight Information Region
GeoZone :	UAS geographical zone
EU:	European Union
ICAO:	International Civil Aviation Organization
IFR:	Instrument Flight Rules
ILS:	Instrument Landing Systems
IMC:	Instrument Meteorological Conditions
KPA:	Key Performance Area

LRST:	Local Runway Safety Team
LVO:	Low Visibility Operations
LVP:	Low Visibility Procedures
NM:	Nautical Mile
PBN:	Performance Based Navigation
PRU:	Performance Review Unit, EUROCONTROL
RAT:	Risk Analysis Tool
RP3:	Reference Period 3
RWY:	Runway
TWY:	Taxiway
UAS:	Unmanned Aircraft System
USSP :	U-Space Service Provider
VFR:	Visual Flight Rules
VMC	Visual Meteorological Conditions
VLL:	Very Low Level


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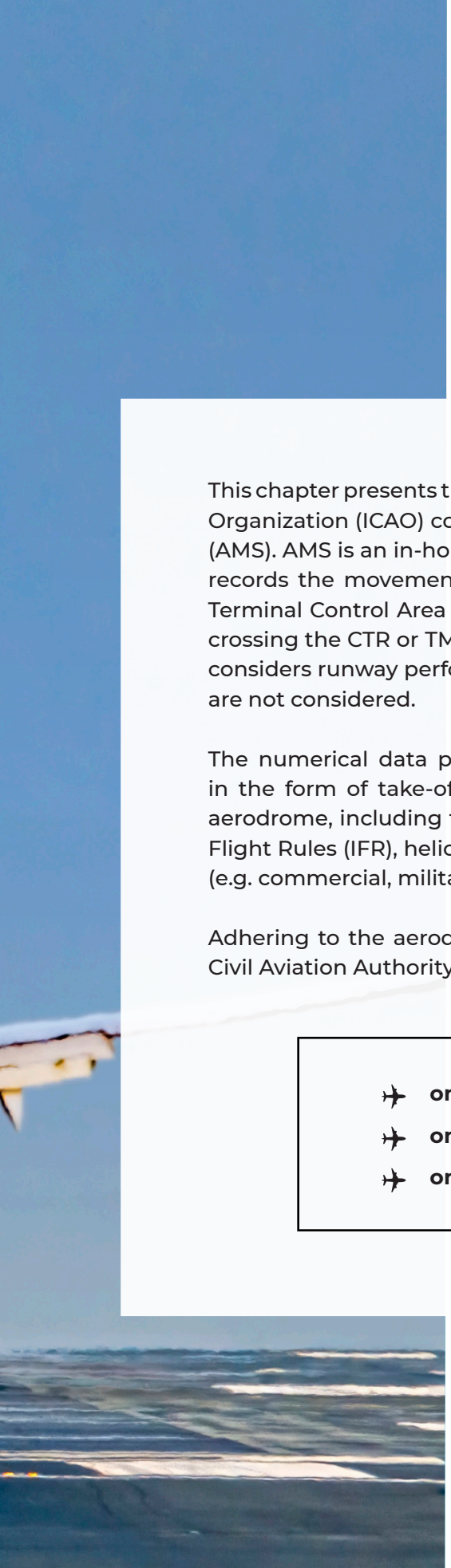
TRAFFIC



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- **Market Contributions**
- **Drone Activities**

This chapter presents the traffic data of Liege Airport (International Civil Aviation Organization (ICAO) code: EBLG) as recorded by the Airport Movement System (AMS). AMS is an in-house developed tower air traffic control (ATC) system that records the movements at an aerodrome, within its Control Zone (CTR) and Terminal Control Area (TMA). The movements are defined as an aircraft either crossing the CTR or TMA, landing or taking off at the aerodrome. As this report considers runway performance, movements such as crossings of CTRs or TMAs are not considered.

The numerical data presented in this report thus encapsulates movements in the form of take-offs or landings, encompassing all kind of traffic at the aerodrome, including flights under Visual Flight Rules (VFR) and Instrumental Flight Rules (IFR), helicopters and airplanes, and traffic of any market segment (e.g. commercial, military, or general aviation).

Adhering to the aerodrome movement definition established by the Belgian Civil Aviation Authority (BCAA), each recorded instance is quantified as follows:

- **one take-off = one movement**
- **one landing = one movement**
- **one touch-and-go = two movements**

Traffic Overview

YEARLY FIGURES

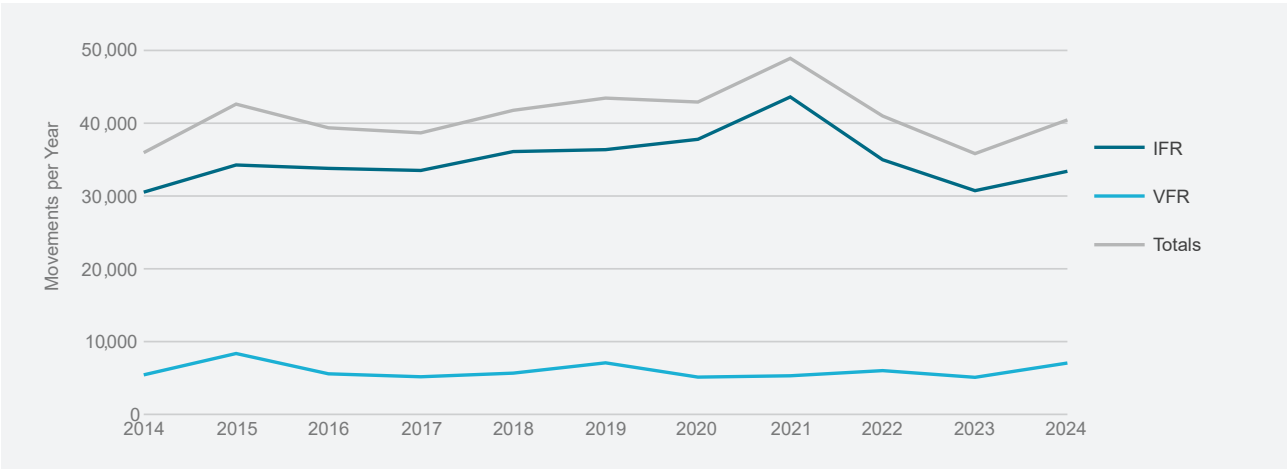
The number of aircraft movements at Liege Airport for the last four years is as follows:

2021:	**48,914 movements**	(43,611 IFR; 5,303 VFR)
2022:	**40,992 movements**	(34,980 IFR; 6,012 VFR)
2023:	**35,824 movements**	(30,734 IFR; 5,090 VFR)
2024:	**40,454 movements**	(33,400 IFR; 7,054 VFR)

In the Air Traffic Management (ATM) world 2019 is seen as the last normal year before a decline in traffic due to COVID-19. For this reason traffic in 2019 is usually taken as a reference to which current traffic numbers are compared. Liege Airport is special in this aspect as you can see in ***Figure 1.1***. Traffic increased in 2019 and the subsequent two years, leading to its highest number of aircraft movements in 2021, at 48,914. In 2022 several factors led to a decline in traffic, mainly caused by the partial departure of FedEx from the airport. As a result, 2019 is not used as a reference year in this report.

In 2024, the total number of movements increased by 13% compared to 2023, and was at -17% of its highest peak in 2021. Traffic increased after two years of decreasing in Liege Airport. From ***Figure 1.1***, which provides further information on the historical numbers of IFR and VFR flights, it can be seen that the overall increase stems from both IFR and VFR traffic being higher than in 2023. After a drop in 2022, IFR traffic decreased further to 30,734 movements in 2023. In 2024 this number recovered by 9%, reaching 33,400 movements. VFR traffic in 2023 was the lowest since 2014, with 5,090 movements. However, with an increase of 39% at 7,054 movements, VFR traffic at Liege Airport in 2024 reached its third best year since 2014 and its best since 2019. Of the total amount of movements in 2024, 17% were VFR.

Figure 1.1: *Historical traffic overview*



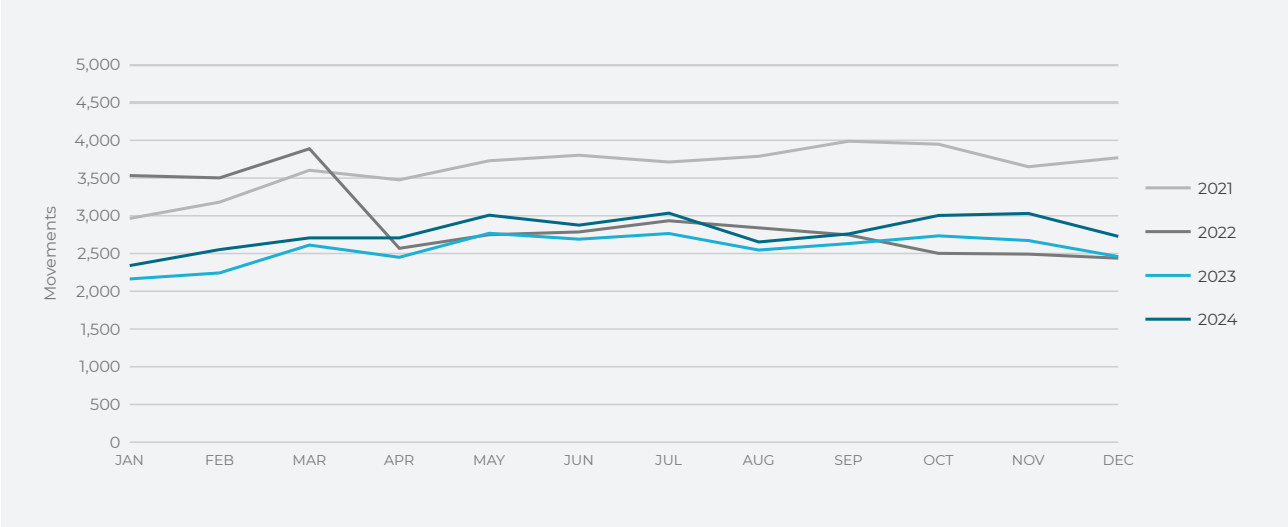

FedEx
Express
The World On Time
FedEx
Express
885

MONTHLY FIGURES

In 2022 there was a drop in traffic because FedEx partially moved its operations from Liege to Paris Charles de Gaulle, there were disruptions in air traffic activities caused by the war in Ukraine, and also a zero-Covid strategy in China that disrupted the supply chains. In 2023, with the restructuring of FedEx in full effect, the ongoing geopolitical tensions, and economic disruptions, traffic declined further . Despite these trends, the amount of traffic increased in 2024. The biggest contributors to this were FedEx, its subcontractors (mainly ASL Airlines) and Ethiopian Airlines. At the beginning of 2024, FedEx reconfirmed its commitment to Liege Airport and in May Ethiopian Cargo and Logistics Services did the same after 17 years of partnership.[1] Apart from these, other commitments and new connections contributed to the 2024 increase as well. As this increase was mainly due to cargo traffic, the airport reported an upward trend in volumes. With 1,162,899 tons passing through during 2024, it was the second best year in the airports history. Each of the last five years saw over one million tons handled.[2]

A monthly overview of the development of movements in 2024 is provided in ***Figure 1.2*** and ***Table 1.1***. It can be seen that IFR traffic in 2024 followed the same trends as 2023, but at a higher level. The amount of traffic varied between +4% and +14%. In the months of February (+14%), October (+10%), and November (+13%) the same trends causing the increase of traffic overall were present. For the last months of the year, Air Atlanta Icelandic was also a big contributor. Compared to this, in March (+4%), August (+4%), and September (+5%) the airlines responsible for the general increase in traffic were less prominent. More information about the top airlines at Liege airport is presented in the subchapter ***Market contributions*** and ***Table 1.3***.

Figure 1.2: *Monthly IFR movements per year*



The number of VFR movements have ranged from -29% (in December) to +164% (in August) of the 2023 figures. A lot of variations in VFR traffic can usually be explained by weather conditions as a sunny sky and good weather conditions promote VFR flights. Looking at the two highest increases compared to 2023, both January and August had at least 40 hours of sunshine more. On top of that, in August there were a lot of training flights, with touch and go's that count as two movements. Notably, a single aircraft with callsign DEHPW used for this purpose was responsible for 175 movements in August alone. With 1,099 movements, this was the busiest month of VFR traffic since 2015. As with the busiest months, the decline of VFR movements can also be explained by weather. For September, this was visible in both hours of sunshine, that decreased by 70 hours, and amount of rainy days, of which 2024 had ten more compared to the previous year.[3] The worst month for VFR traffic was December, with both the lowest amount of VFR traffic and largest decrease compared to December 2023. The last month of 2024 had mostly days with Instrument Meteorological Conditions (IMC), the meteorological conditions at which VFR flights are not allowed.

Table 1.1: *Monthly movements per flight rule per year*

		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
IFR	**2021**	2,965	3,181	3,603	3,476	3,729	3,802	3,712	3,788	3,988	3,948	3,650	3,769	**43,611**
	2022	3,533	3,502	3,888	2,569	2,749	2,786	2,934	2,841	2,746	2,502	2,492	2,438	**34,980**
	2023	2,163	2,243	2,612	2,450	2,768	2,690	2,765	2,546	2,632	2,734	2,672	2,459	**30,734**
	2024	2,340	2,552	2,707	2,707	3,008	2,876	3,035	2,653	2,760	3,004	3,031	2,727	**33,400**
	2024 *vs* 2023	+8%	+14%	+4%	+10%	+9%	+7%	+10%	+4%	+5%	+10%	+13%	+11%	+9%
VFR	**2021**	223	383	526	486	505	513	396	567	585	515	358	246	**5,303**
	2022	333	536	772	482	630	442	619	532	564	552	313	237	**6,012**
	2023	211	370	357	383	529	646	497	416	534	416	277	454	**5,090**
	2024	472	406	463	672	795	733	723	1,099	447	483	437	324	**7,054**
	2024 *vs* 2023	+124%	+10%	+30%	+75%	+50%	+13%	+45%	+164%	-16%	+16%	+58%	-29%	+39%
Total	**2021**	3,188	3,564	4,129	3,962	4,234	4,315	4,108	4,355	4,573	4,463	4,008	4,015	**48,914**
	2022	3,866	4,038	4,660	3,051	3,379	3,228	3,553	3,373	3,310	3,054	2,805	2,675	**40,992**
	2023	2,374	2,613	2,969	2,833	3,297	3,336	3,262	2,962	3,166	3,150	2,949	2,913	**35,824**
	2024	2,812	2,958	3,170	3,379	3,803	3,609	3,758	3,752	3,207	3,487	3,468	3,051	**40,454**
	2024 *vs* 2023	+18%	+13%	+7%	+19%	+15%	+8%	+15%	+27%	+1%	+11%	+18%	+5%	+13%

1. **Ethiopian Cargo and Liege Airport celebrate 17-year partnership,** https://www.aviation24.be/airlines/ethiopian-airlines/ethiopian-cargo-and-liege-airport-celebrate-17-year-partnership-with-renewed-commitment-to-growth/ **& Liege Airport reports strong start to 2024,** https://www.aviation24.be/airports/liege/liege-airport-reports-strong-start-to-2024-focuses-on-daytime-operations/ (URLs retrieved on 09/12/2024)
2. **Communiqué de presse: Une excellente année pour Liege Airport.**
   (Press release of 10/01/2025)
3. **IRM** https://www.meteo.be/fr/climat/climat-de-la-belgique/bilans-climatologiques/2024/decembre
   (URL retrieved on 16/01/2025)

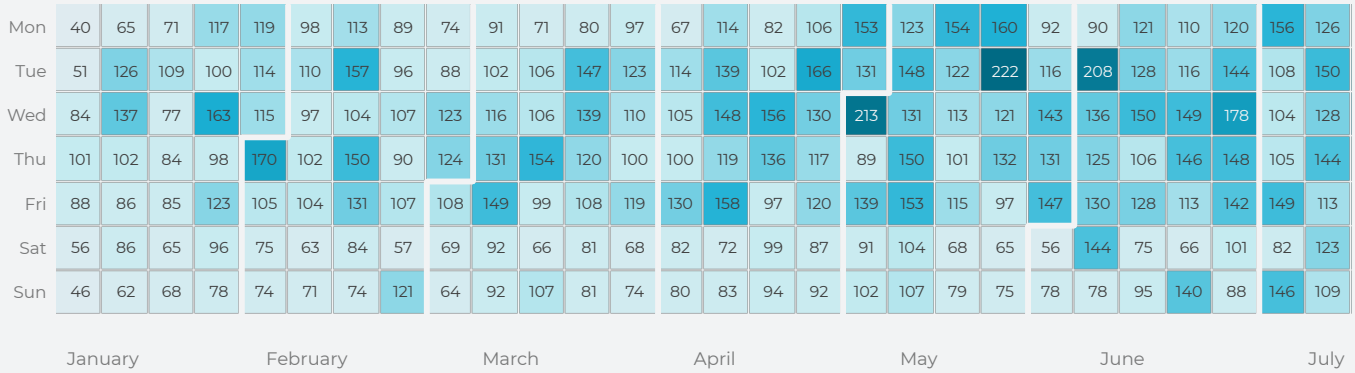


Figure 1.3: *Calendar view of movements per day in 2024*

Figure 1.3 provides more details on the traffic with a calendar view containing the daily number of movements at Liege Airport. The days have to be read from top to bottom first and then from the left to the right.

The 1st of January 2024 recorded the lowest number of movements (40). This is to be expected as New Year's Day sees lower traffic in most years. The second calmest day (46), six days later, had low visibility operations and zero VFR traffic. The days with the most traffic were the 1st and 21st of May, and the 4th of June. Of these three days, the 1st of May is interesting, because it saw 115 VFR movements, which were the main contributor of the busy day . Additionally, some patterns per weekday can be observed – for example, Tuesday to Friday is generally busier than other weekdays.

Looking forward, Liege Airport has greenlit a development plan spanning from 2023 to 2040, entailing an investment of 500 million euros with the aim to double flight frequency. This plan aims to position Liege Airport as a multimodal hub, prioritise environmental excellence, and generate employment opportunities for the region. Over the course of 15 years, the airport aims to enable the handling of more than two million tons of cargo and more than double the number of jobs created.[4]

One of the first phases of this expansion is the construction of 15 new aircraft parking spaces in the northern zone of the airport. Due to the works on the aprons, taxiways and runways, particularly regarding lighting, markings and surfaces, there is a significant impact on the flow of ground traffic. This has consequences for air traffic and requires increased vigilance from Air Traffic Control Officers (ATCOs). Most works occur during the day, so night traffic is less affected.[5]

4. **Communiqué de presse: Une excellente année pour Liege Airport.** (Press release of 10/01/2025)

5. **Invitation à la RIP de Liege Airport,** https://www.liegeairport.com/corporate/fr/actualites/invitation-a-la-rip-de-liege-airport-qui-se-tiendra-ce-20-novembre-2024/ (URL retrieved on 09/12/2024)

97	102	140	132	110	102	157	103	87	98	84	99	102	117	83	108	108	82	109	114	92	98	102	86	60
122	107	159	142	151	124	177	99	129	127	124	127	159	160	139	130	190	125	113	174	136	122	140	97	68
129	124	151	139	98	121	176	122	109	148	120	109	115	133	135	111	112	131	107	115	140	128	126	51	
108	139	77	149	135	132	152	100	103	128	112	98	115	121	160	136	128	119	133	164	114	132	107	55	
105	125	146	101	104	144	141	104	115	112	95	108	107	103	103	87	107	130	121	158	101	132	145	78	
81	86	90	85	81	94	107	75	172	85	87	109	90	80	80	78	77	85	105	117	71	67	82	72	
66	174	121	98	65	101	90	97	105	78	100	76	91	101	81	126	83	75	95	122	108	89	73	57	

August September October November December

Movements

200

150

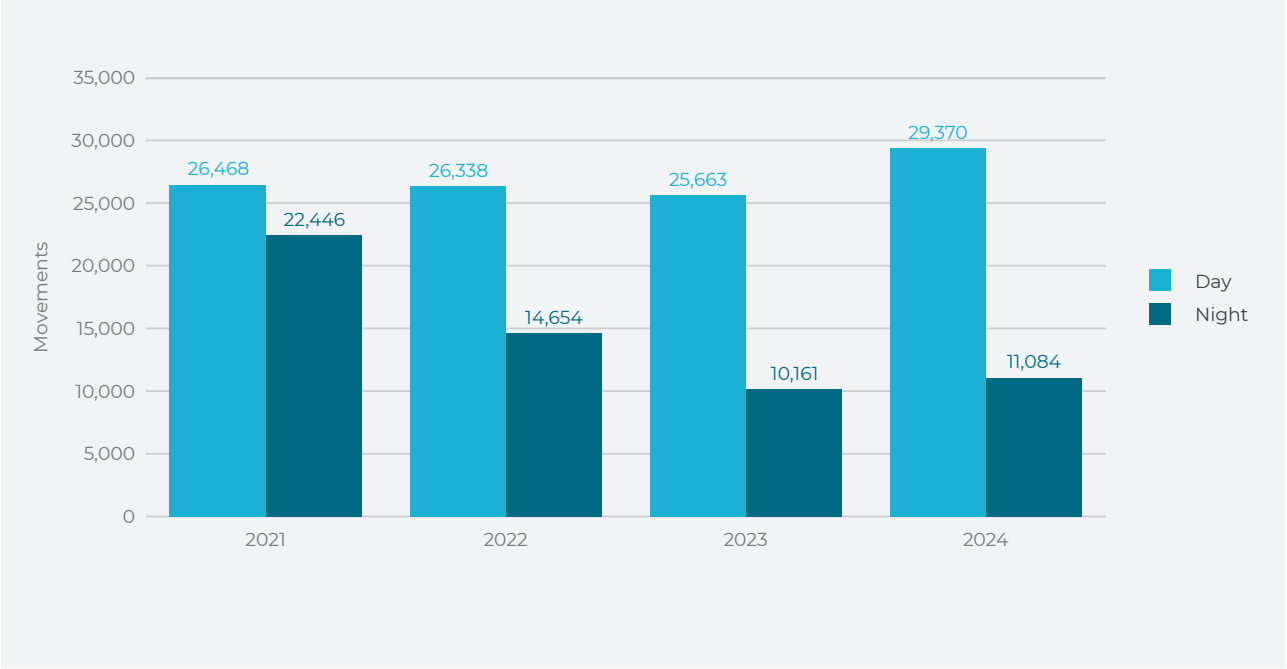
100

50

Night traffic

Since Liege Airport is active during the night, this section focusses on its nightly movements. The night is defined as follows: from 23:00 local time to 06:00 local time. ***Figure 1.4*** shows a comparison of the number of night movements (23:00-06:00 local time) and the number of day movements (06:00-23:00 local time). In 2019 and 2020, night traffic accounted for most of the airports traffic. Since 2021, however, there were fewer night movements than day movements. In 2024, out of all the traffic recorded at the airport, 27% was night traffic. Over the last four years the share of night traffic has decreased each year, the same goes for 2024, even though both the amount of day and night traffic increased compared to 2023.

Figure 1.4: *Yearly day and night movements*



The restructuring of FedEx resulted in a loss of nightly cargo traffic. This is also visible in ***Figure 1.5*** and ***Table 1.2***, where the number of movements per hour of the night are presented. The hour indicates the start of the hour. The difference between 2021 and the subsequent years can be clearly seen in ***Figure 1.5***. Traffic between 23:00 and 02:00 recovered from 2023, but were still lower than 2022 and the following years. In contrast, between 03:00 and 05:00 the amount of movements decreased slightly. The following sections further discuss daily patterns of traffic at Liege Airport.

Figure 1.5: *Yearly night movements per hour*

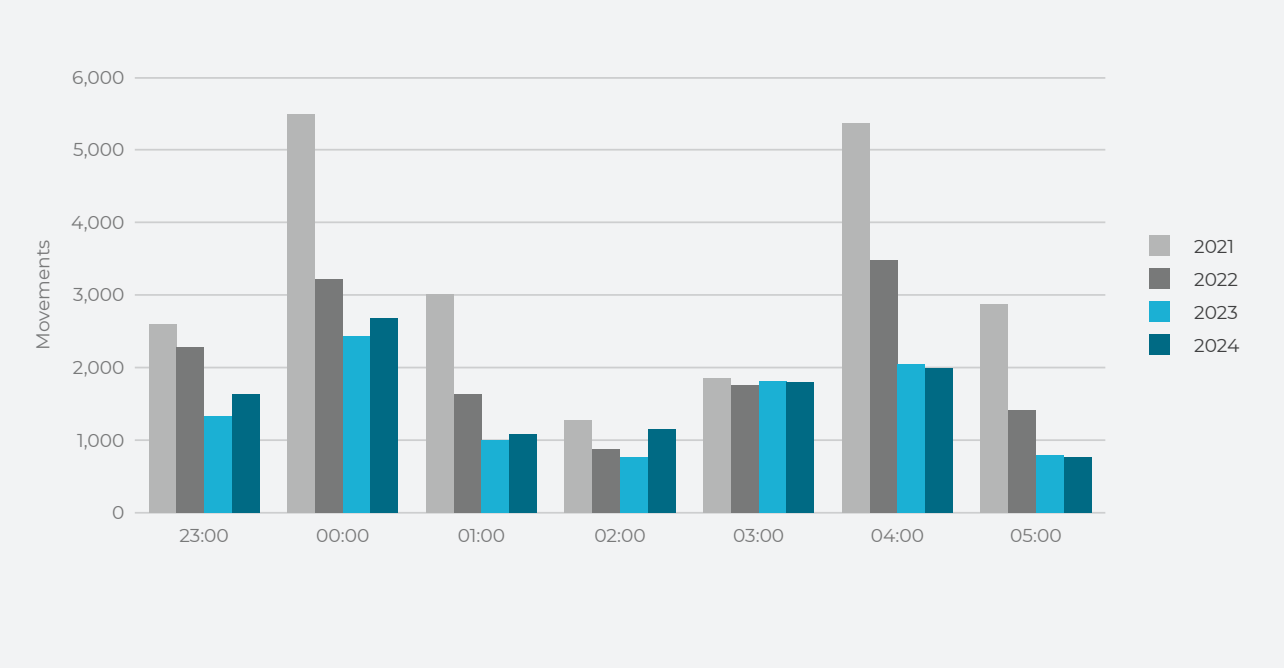


Table 1.2: *Yearly night movements per hour*

Year	23:00	00:00	01:00	02:00	03:00	04:00	05:00
2021	2,590	5,490	3,003	1,270	1,851	5,365	2,877
2022	2,277	3,214	1,630	879	1,757	3,481	1,416
2023	1,325	2,426	1,000	763	1,809	2,042	796
2024	1,628	2,677	1,076	1,154	1,792	1,988	769

Traffic Patterns

Figure 1.6 shows the average hourly movements of IFR traffic throughout the hours of the day (in local time) for the years 2021 until 2024. The variations of traffic throughout the day are totally determined by those of IFR movements, as the VFR traffic, which is lower than IFR traffic, is monotonous throughout the day and similar over the years. As such, graphs showing the total amount of movements would be nearly identical to ***Figure 1.6*** and have not been added to the document.

The IFR traffic distribution follows similar trends to 2023, yet in most cases where 2024 differs from 2023, it is due to an increase of traffic compared to the previous year. There are two pronounced peaks: one representing the wave of cargo flight arrivals at midnight and a second rush hour at 04:00 in the morning, when those flights depart from Liege. Although these peaks are still present, it is noticeable that the number of movements of these peaks are much lower than before 2023. In the years 2019 to 2021, the yearly average from midnight to 01:00 and from 04:00 to 05:00 was almost 15 movements per hour, while in 2023 and 2024 this was only six to seven movements. The main reasons for this drop were the FedEx restructuring, mentioned earlier and negative developments on cargo activity.

As mentioned before, VFR traffic has similar movement patterns over the years. This kind of traffic occurs only during the day, with a consistent amount of traffic per hour throughout the day. The mornings and evenings are the least busy.

Figure 1.6: *Average hourly IFR movements per year*

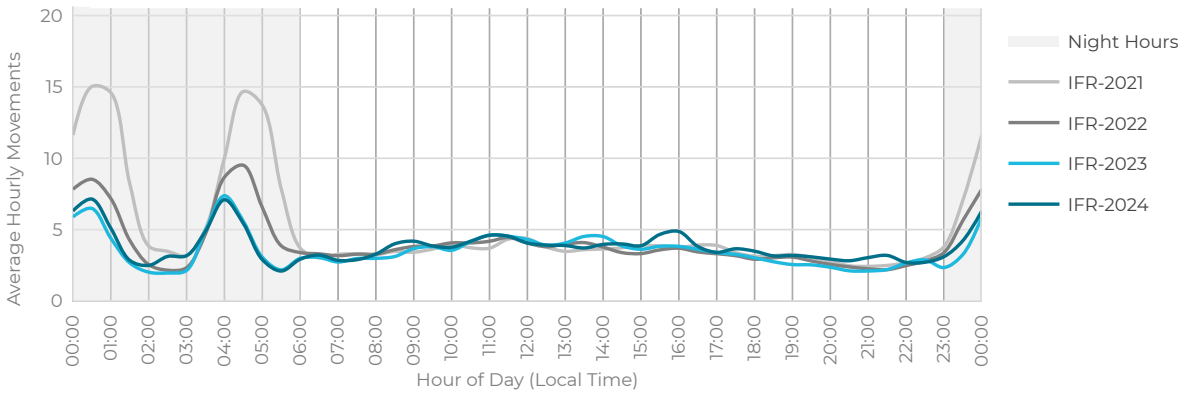
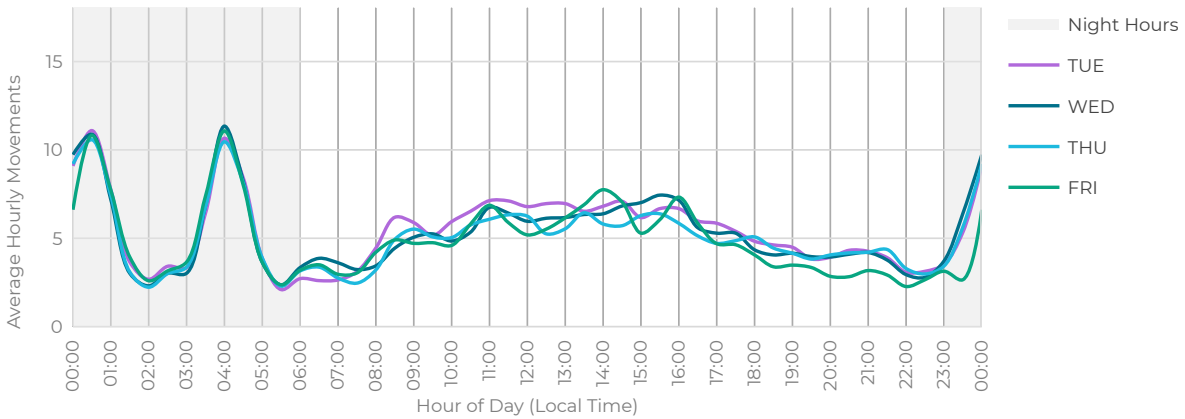


Figure 1.7: *Average hourly movements per day of the week from Tuesday to Friday*



The traffic pattern at Liege Airport can also be decomposed depending on the days of the week, as shown in ***Figures* 1.7** and **1.8**. From Tuesday to Friday the traffic is similar from day to day. It follows the same nightly trends as previously discussed in ***Figure* 1.6**. During these days, cargo companies perform most of their operations, which leads to the nightly peaks for arrivals and departures, that are respectively around 01:30 and 04:00. Day patterns remain similar throughout the years. Commercial and VFR traffic start up in the morning, slowly increase until the afternoon and diminish until nightfall.

It is clear from ***Figure* 1.8** that night movements during the weekend and Monday differ a lot from the rest of the week. During the night there are no peaks on Sunday. For Saturday and Monday smaller peaks are visible. Both these peaks are mainly arrivals. On Monday, departures are present all night and start overtaking the amount of arrivals starting at 04:00. At around 23:00, traffic numbers rise again to reach the arrival peaks of Tuesday nights. Just as during the week, day patterns remain similar throughout the years. Commercial and VFR traffic start up in the morning, slowly increase until the afternoon and diminish until nightfall.

***Figure* 1.9** shows the yearly average movements per hour separated per season. Again, there are different trends for day and night traffic. The summer sees most traffic of any season, with the winter season seeing the least. During the day, spring traffic is ahead of the fall, however, during the evening, night and morning fall reaches similar levels as summer traffic.

***Figure* 1.8:** *Average hourly movements per day of the week from Saturday to Monday*

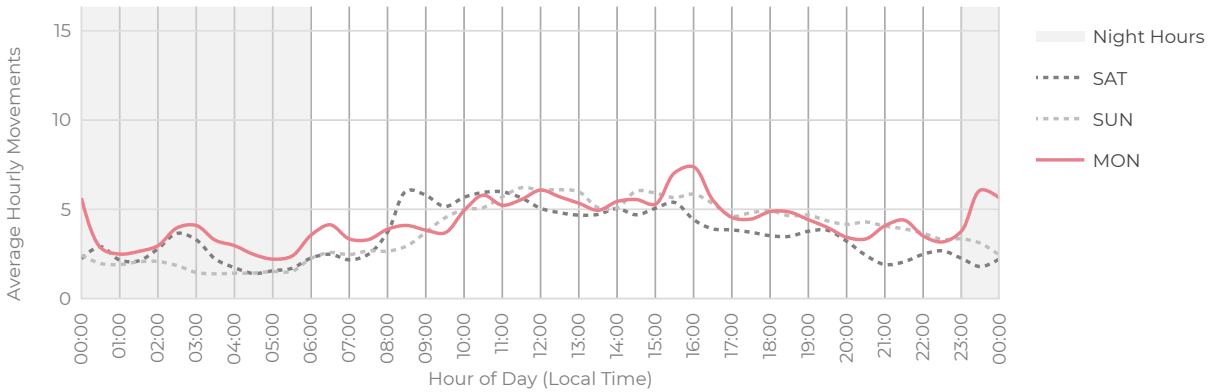
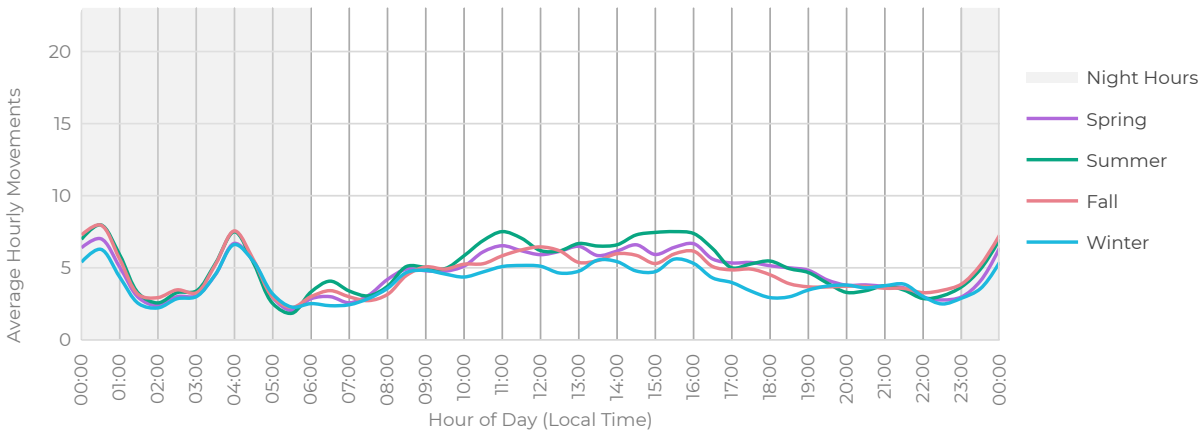


***Figure* 1.9:** *Average hourly movements by season*



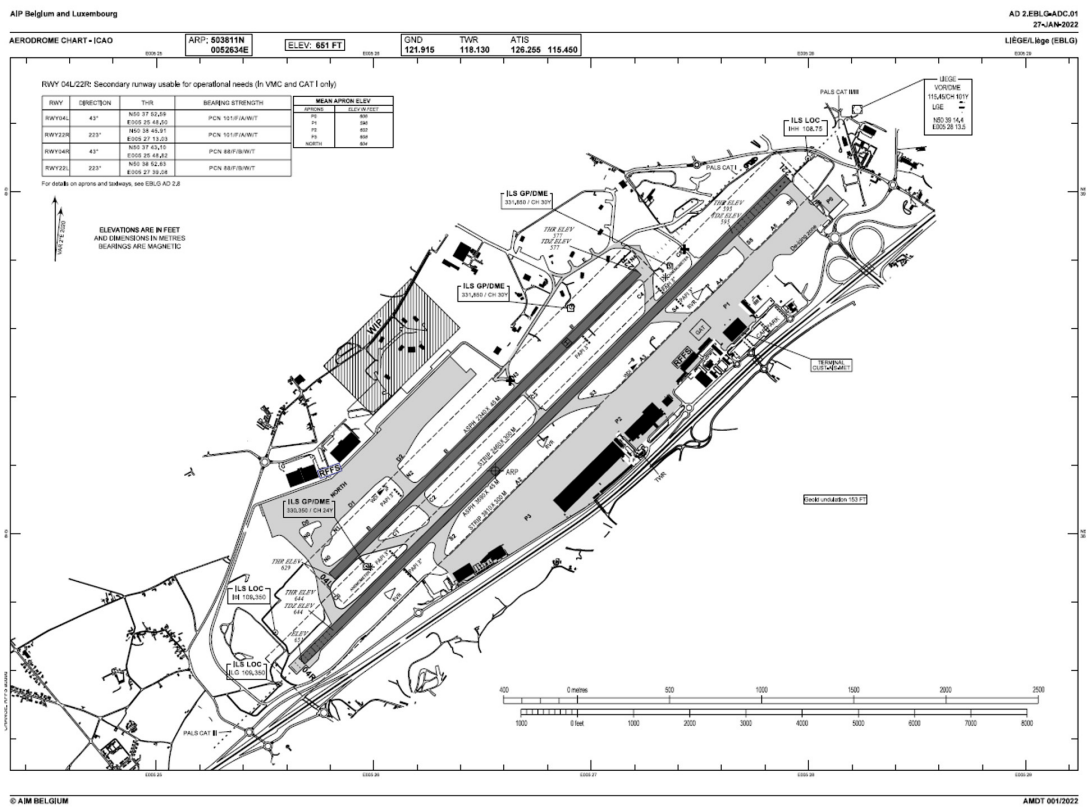
Runway Use

There are two parallel runways at Liege Airport, 04L/22R and 04R/22L (see ***Figure 1.10*** for the corresponding chart). The use of runways depends on several factors like wind direction, airport layout, approach and departure routes, works on taxiways, visibility, etc.

Due to the proximity of the parallel runways at Liege, these are so-called "dependent runways", which means that operations on one runway affect the operations on the other. Regarding Liege Airport, only one runway at a time may be used: i.e. either 04L or 04R, but not both at the same time.

Although runways 04L/22R and 04R/22L are easily interchangeable, there is a clear preference at Liege Airport for runway 04R/22L. The reason for this preference is that the runway for 04R/22L is longer, and furthermore, only 04R/22L is equipped with CAT III instrument landing systems (ILS).

Figure 1.10: *Aerodrome ground movement chart*



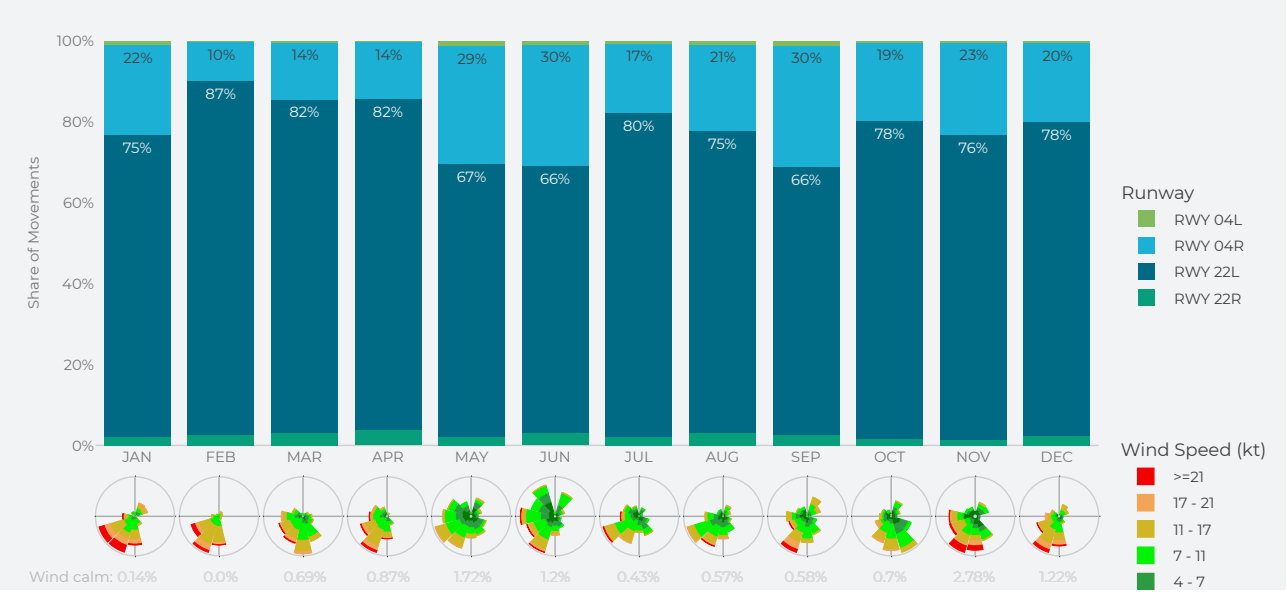

FedEx
FedEx

The number of movements per runway can be seen in ***Figure 1.11***. The most used runway was runway 22L, which registered 30,676 movements (76% of the total) in 2024. Runway 22L is the main runway because the observed winds at Liege Airport are mainly from a south-western direction and flights should depart and land with headwind for aerodynamical reasons. The wind roses underneath the bar chart (see also ***Figure 4.6*** in the Environment chapter for bigger graphs and further explanations on the wind roses) further demonstrate the influence of different wind patterns on the runways in use. Compared to the previous three years, there was less wind blowing from the north-east and accordingly, runway 22L and runway 22R were also used more in 2024. Runway 04R served 8,523 (21%) of the movements. The less preferred runways, runway 22R and runway 04L welcomed 1,023 (3%) and 232 (1%) movements respectively.

Figure 1.11: *Runway usage per year in movements*

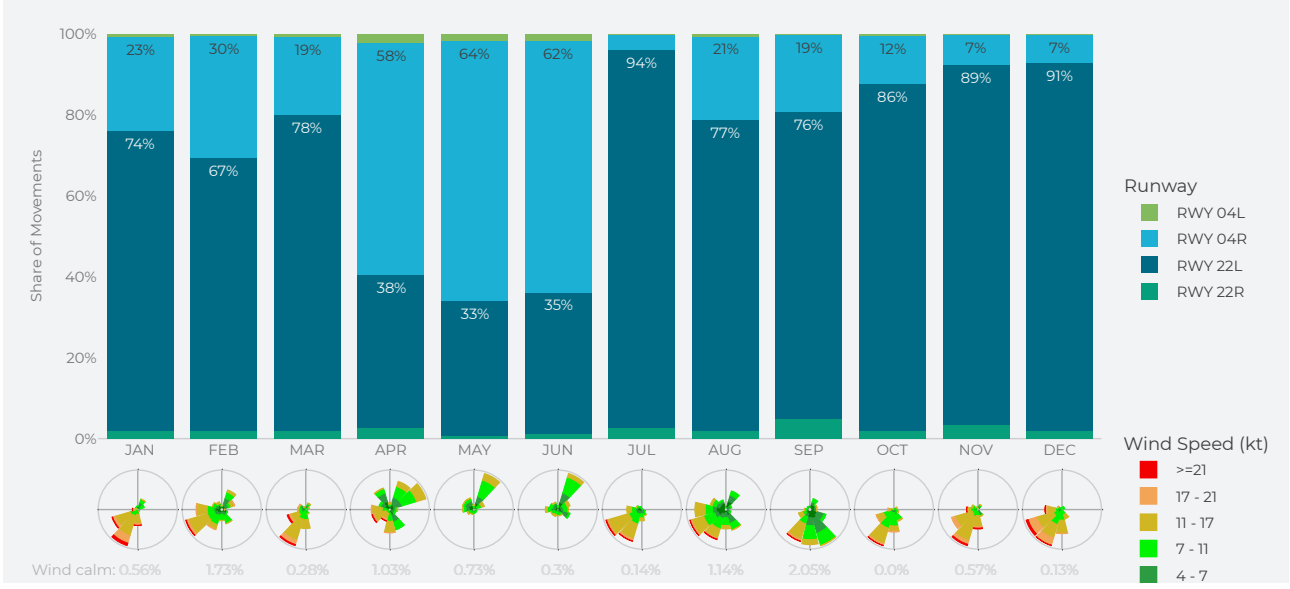
Figure 1.12 and ***Figure 1.13*** depict respectively the information on runway usage in 2024 and 2023 on a monthly basis. Again, a strong correlation of runway usage with wind can be observed. For example, during the months of May, June and September in 2024 the runways 04L and 04R were used 30% of the time. The wind roses (which can also be seen in a bigger format in ***Figure 4.7*** in the Environment chapter) reveal that in these months, strong north-east winds prevailed, which explains this high use of those runways. In June, there were also a lot of crosswinds that favoured the use of these runways. On the other end, the month of February saw almost no north-east winds, resulting in 90% usage of the runways 22L and 22R. Regarding the strength of the winds, January and November saw most wind speeds exceeding 21 knots.

Figure 1.12: *Runway usage per month in 2024 in share of movements*



Most years see a switch in wind direction from April to June as shown in ***Figure 1.13*** for 2023. In these months, north-east winds prevail over south-westerly winds, which results in runways 04L and 04R being used more, and leads in turn to other issues like noise complaints. This happens as aircraft fly over neighbourhoods where they normally do not fly. This will be discussed further in the ***Environment*** chapter. Runway use per month in 2024, as shown in ***Figure 1.12***, sees only a small decrease in the usage of runways 22L and 22R. According to the wind roses, the usual north-east winds have not been as prevalent this year.

Figure 1.13: *Runway usage per month in 2023 in share of movements*



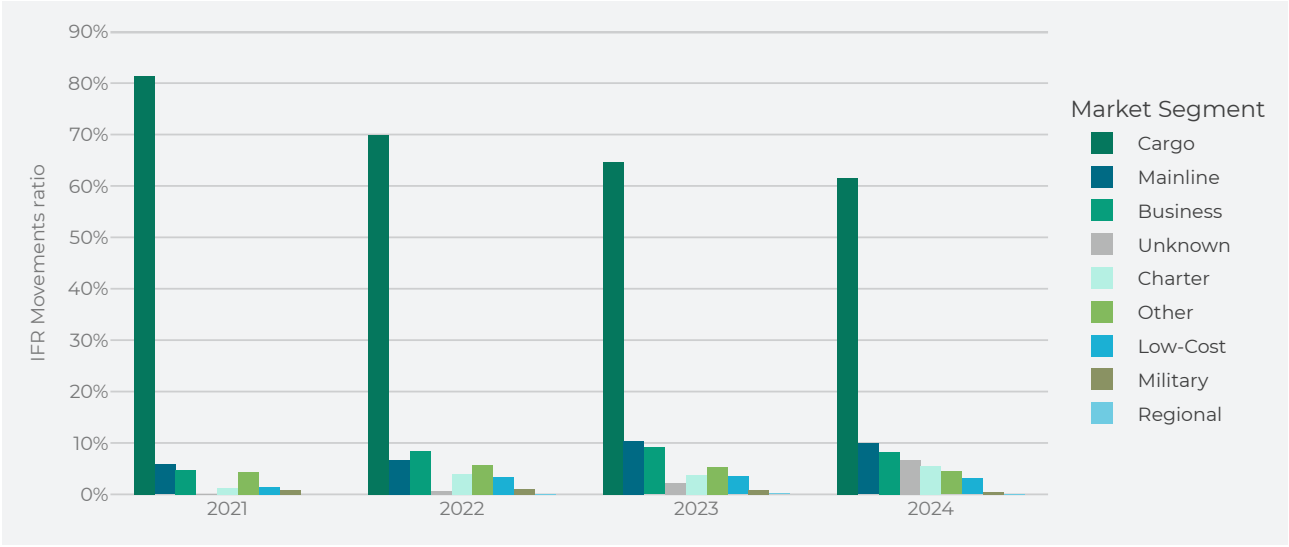
Market Contributions

MARKET SEGMENTS

This chapter delves into the type of market Liege Airport serves. First, the market segment distribution is shown in ***Figure 1.14***, based on the IFR traffic at the airport. To create this figure, the air traffic market segmentation rules from STATFOR/EUROCONTROL[6] and the flight plan information captured by skeyes' airport movement system are used. The EUROCONTROL's Market Segment Rules provide a definition for air traffic market segments based on lists of aircraft types, aircraft operators and the flight types filed on flight plans. After this general look into the market distribution at Liege Airport, a more detailed look is taken at its largest market share in the subchapter ***Cargo***.

Figure 1.14 shows the market segment distribution for Liege Airport from 2021 to 2024. An Unknown category has been included to account for movements with incomplete data, particularly those lacking information in the flight plan. This is usually a very small group, but for 2024 it is considerable consisting of 7% of all IFR traffic. As all aircraft movements in the Unknown category belong in fact in the other segments, figures and percentages presented will be affected. The largest market share for Liege Airport is Cargo by a big margin, with 20,579 movements it is responsible for 62% of the airports movements. The next biggest shares: Mainline, Business and Charter, are each between 5% and 10%. From 2021 onwards the relative share of cargo flights has diminished every year. On the opposite end of this, the share belonging to Commercial flights has grown over the same period.

Figure 1.14: *Market segments distribution ratio (only IFR)*

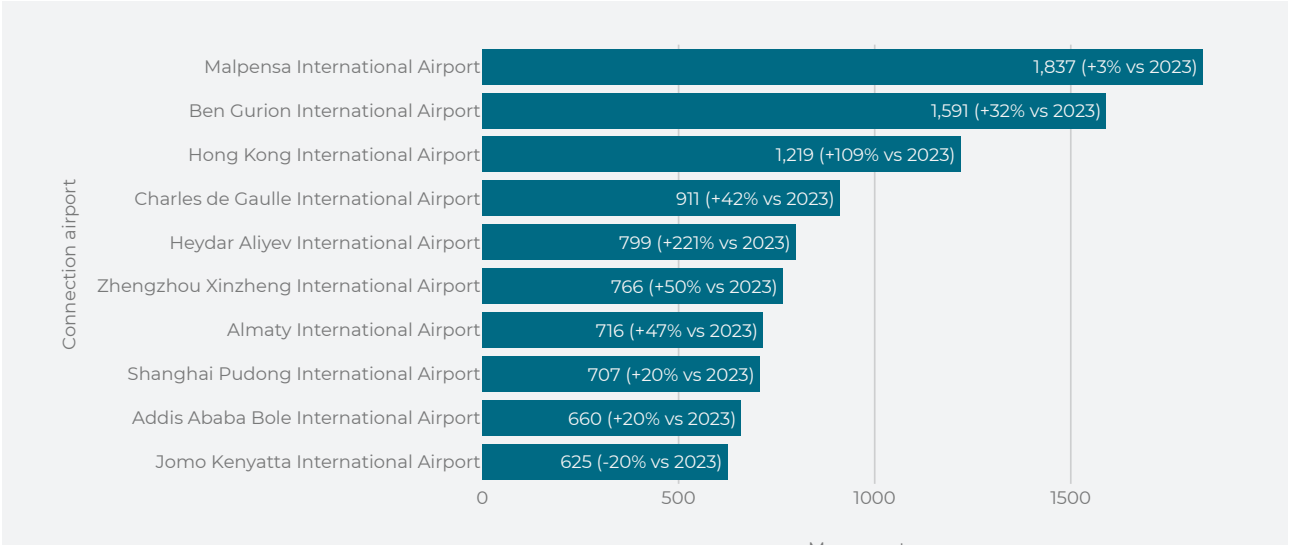


6. EUROCONTROL market segment rules, https://www.eurocontrol.int/publication/market-segment-rules (URL retrieved on 20/01/2025)

The market segment distribution is followed by two lists, respectively the top ten connections, as the airports to and from which most traffic departs and arrives, and the top airlines, as in responsible for the largest share of movements. These can be seen in ***Figure 1.15*** and ***Table 1.3***.

For the last two years, 2023 and 2024, the top connection for Liege Airport has been Milan Malpensa Airport, Italy (LIMC). Of the 1,837 flights to and from LIMC, ASL Airlines Ireland is responsible for 1,572 movements. The second most frequent connection is Ben Gurion International Airport in Israel (LLBG), it has both a lot of commercial traffic, mostly El Al Israel Airlines, as well as cargo, with FedEx and its subcontractors as the biggest contributors. This airport has been a top connection to Liege Airport for years. Third in the list is Hong Kong International Airport, China (VHHH). Flights arriving from and departing to this airport were mainly classified as Cargo traffic. It saw a large increase in traffic from 584 in 2023 to 1,219 in 2024, of which 703 were undertaken by Ethiopian Airlines. The importance of Ethiopian Airlines is again clear with the presence of Addis Ababa Bole International Airport, Ethiopia (HAAB) in the top ten. Another important country for Liege Airport is China, which has three connections in the same list: the aforementioned VHHH in Hong Kong, Zhengzhou Xinzheng International Airport (ZHCC) and Shanghai Pudong International Airport (ZSPD). Together they are responsible for 27% of movements to and from the top ten airports.

Figure 1.15: *Top 10 International connections (only IFR)*



TOP CONNECTIONS

The top ten airlines in number of movements at Liege Airport are shown in ***Table 1.3***. Besides the table, the largest differences in movements in 2024 compared to 2023 are presented in ***Figure 1.17***. It is immediately clear that most airlines present in the top ten are classified as cargo airlines. The airport increased the amount of cargo airlines operating with them from 40 at the end of 2023 to 48 at the end of 2024. This means that 21% of airlines (the top ten) are responsible for 69% of all IFR movements.

Many of the represented airlines are either FedEx directly or one of its subcontractors, such as FedEx Express (FDX), ASL Airlines Ireland (ABR), West Air Sweden (SWN) and ASL Airlines Belgium (TAY) (formerly TNT Airways). It cannot be excluded that there are further subcontractors, which are not shown in the table or figure, and it is also unknown which share of the performed flights by ASL Airlines and West Air Sweden were actually executed for FedEx operations, as the ICAO callsign the aircraft uses is the same regardless. In 2022, FedEx started restructuring its European operations and a substantial part of its business moved from Liege to Paris Charles de Gaulle. This restructuring, however, had not concluded in its entirety within 2022. Since then, the company has reaffirmed its commitment to the airport.[7] Some of the above mentioned airlines have diminished, for example ASL Airlines Belgium and West Air Sweden, while other such as ASL Airlines Ireland and FedEx Express grew in traffic. This can be seen further for flights to and from Paris Charles de Gaulle Airport, France (LFPG), and Adolfo Suárez Madrid–Barajas Airport, Spain (LEMD), where the traffic contribution was redistributed among FedEx subcontractors. Other examples of FedExes traffic having evolved since 2022 are new connections to Milan Malpensa Airport, Italy (LIMC) and Ben Gurion International Airport, Israel (LLBG), while diminishing existing ones such as to Hong Kong International Airport, China (VHHH).

Concerning this last connection, Hong Kong International Airport, China (VHHH), as mentioned before, in 2024 the majority of its connecting traffic came from Ethiopian Airlines (ETH). This airline renewed its commitment to Liege Airport this year, after a 17 year partnership they seek to strengthen their alliance and to enhance freighter operations.[8] Other notable changes are the large decline in traffic belonging to Qatar Airways (QTR) and the growth of Air Atlanta Icelandic (ABD) and Silk Way West Airlines (AZG). This last airline is curious in that it saw 476 more movements (exceeding its growth compared to 2023) to Heydar Aliyev International Airport, Azerbaijan (UBBB). In 2024, this airline was responsible for 90% of all traffic to and from that same airport. Lower in the top ten, TUI fly Belgium (JAF), a Low-Cost airline, and Challenge Airlines BE (CHG), still make up a considerable share of IFR traffic, respectively 4% and 3%.

Table 1.3: *Top 10 airlines of 2024 (only IFR)*

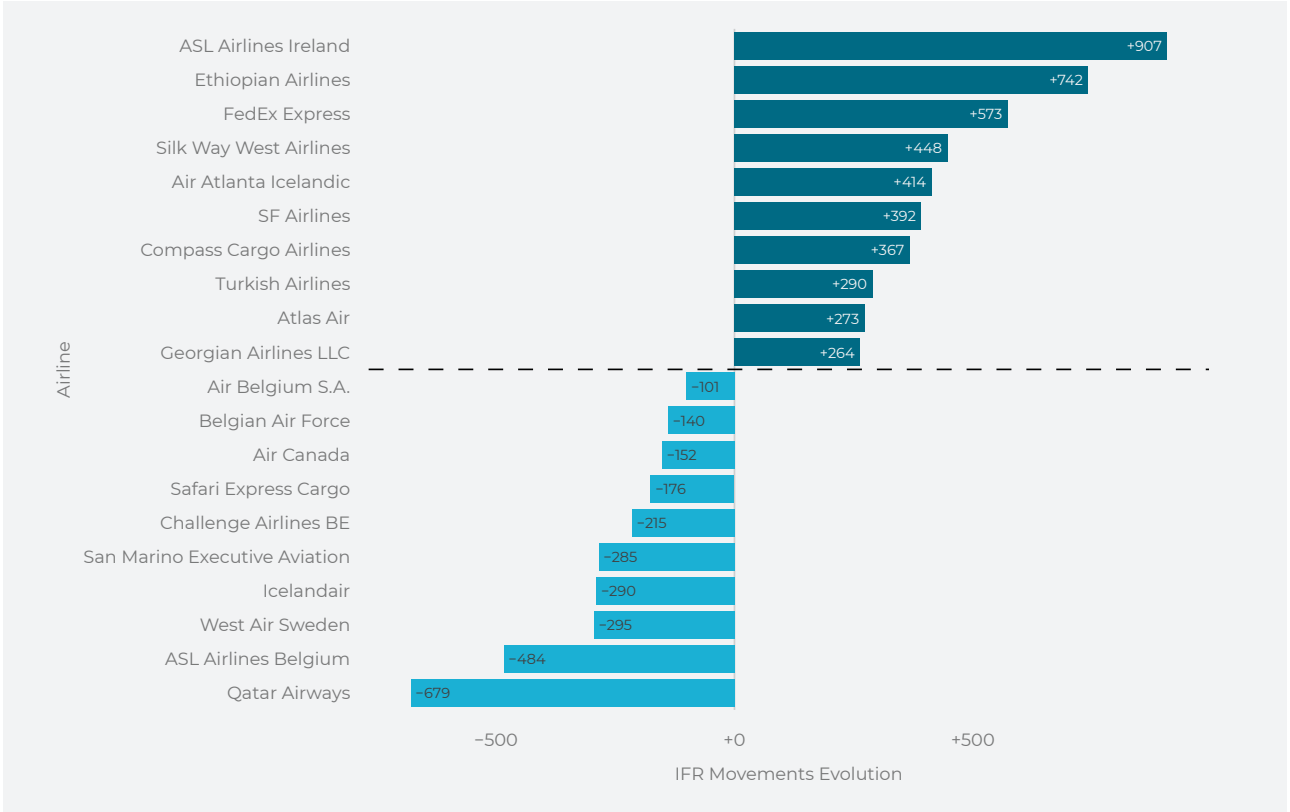
	TAY	ABR	ETH	FDX	ABD	QTR	JAF	AZG	ASL group	CHG	Total
2021	15,717	140	2,386	3,727	769	1,604	613	0	67	579	**25,602**
2022	8,626	1,662	2,494	2,309	1,197	1,772	1,016	4	308	853	**20,241**
2023	4,915	2,754	2,912	2,058	1,386	2,123	1,144	368	879	1,030	**19,569**
2024	4,431	3,661	3,654	2,631	1,800	1,444	1,139	816	815	815	**21,206**
2024 *vs* 2023	-10%	+33%	+25%	+28%	+30%	-32%	0%	+122%	-7%	-21%	+8%

7. Liege Airport reports strong start to 2024, https://www.aviation24.be/airports/liege/liege-airport-reports-strong-start-to-2024-focuses-on-daytime-operations/ (URL retrieved on 29/01/2025)

8. Ethiopian Cargo and Liege Airport celebrate 17-year partnership, https://www.aviation24.be/airlines/ethiopian-airlines/ethiopian-cargo-and-liege-airport-celebrate-17-year-partnership-with-renewed-commitment-to-growth/ (URL retrieved on 29/01/2025)

Figure 1.16: *Top 10 International connections map (only IFR)*

Figure 1.17: *Top 10 airlines'W evolution (only IFR)*



CARGO

Liege Airport is Belgium's largest cargo hub and one of the top ten cargo airports in Europe.[9] Therefore, a closer look at cargo movements is taken. For this study, Cargo refers to "all-cargo" segment, not taking into account cargo moved in the hull of passenger aircraft. ***Table 1.4*** and ***Figure 1.18*** provide an overview of the yearly evolution of Cargo traffic compared to other market segments and the share of Cargo over all IFR traffic. The year of 2022 witnessed a significant drop in Cargo figures, which continued in 2023. Traffic recovered slightly in 2024, albeit only in number of movements as the share of the total IFR traffic belonging to Cargo declined further. Keep in mind that due to the 7% of movements classified as Unknown, figures and percentages will differ from reality.

Looking back, 2021 was the year with the highest amount of Cargo traffic in Liege Airports history (with 35,483 movements): COVID-19 played a large part in this, creating a high need for transportation of medical goods and other parcels. Lockdowns and travel restrictions also caused other market segments to drop and thus gave rise to a high market share for Cargo (a maximum of 88% in 2020). Starting in 2021, other market segments started to pick up again. Cargo movements, however, dropped to 24,454 movements in 2022, such that the share of freight movements at Liege Airport was only 70%. In 2023, the same trend was seen, traffic of other market segments than Cargo increased, however, with the restructuring of FedEx, combined with a difficult international economic context, the number of Cargo movements decreased to 19,893. This downward trend for Cargo recovered in 2024, likely due to FedEx recommitting some of its business on top of other new commitments to the airport. This was discussed in more detail earlier in this chapter. Despite this, the share of Cargo traffic still declined going into 2024, this is because traffic in other market segments increased by a larger margin.

As mentioned in the beginning of this chapter, regarding volumes of cargo handled, 2024 was an "excellent" year. The airport saw 1,162,899 tons pass through in 2024, an increase of 16% compared to 2023. While the airport exceeded one million tons every year since 2020, it was the second best year in its history, behind 2021. The airport has focussed on diversifying its partnerships and will continue to do so in the future. This can be seen in tonnage handled by the top airlines. The amount the top five accounts for was 90% of all volumes in 2014, and only 58% in 2024.[10]

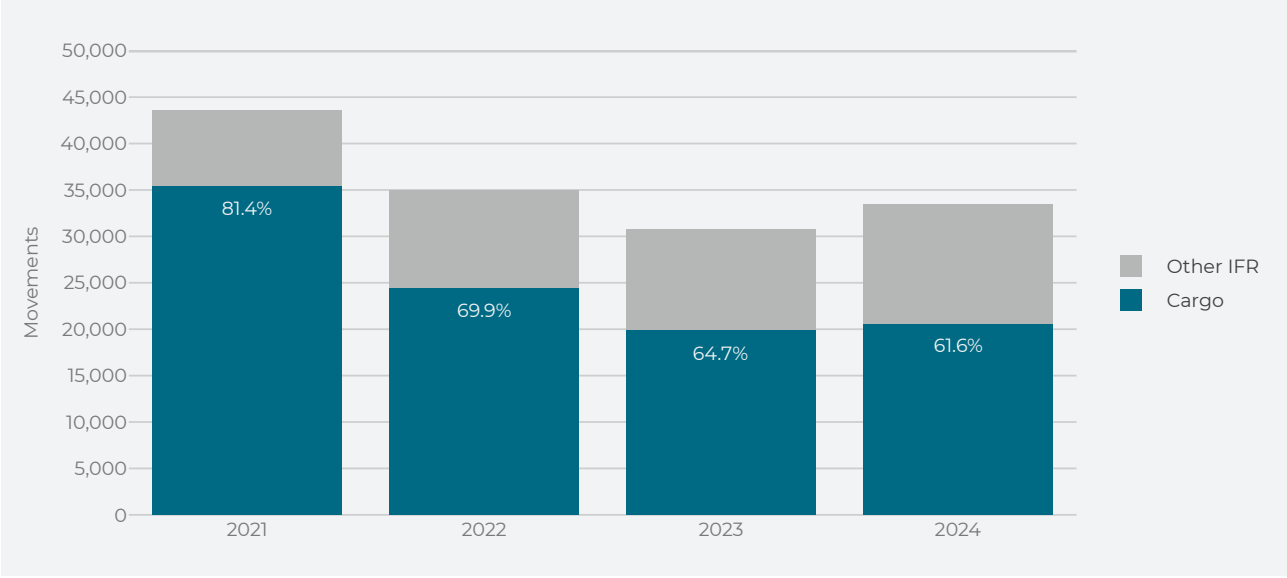
9. **Top five the largest cargo airportsin Europe,** https://www.shiphub.co/top-5-the-largest-cargo-airports-in-europe/ (URL retrieved on 04/02/2025)

10. **Communiqué de presse: Une excellente année pour Liege Airport.** (Press release of 10/01/2025)

Table 1.4: *Cargo movements per year*

	Cargo	Other IFR	% of Cargo
2021	35,483	8,128	**81.4%**
2022	24,454	10,525	**69.9%**
2023	19,890	10,859	**64.7%**
2024	20,579	12,821	**61.6%**

Figure 1.18: *Cargo movements per year*



Drone Activities

The emerging activities of unmanned aircraft systems (UAS) and the variety of their operations is one of the challenges driving the future of Air Navigation Service Providers (ANSP). To enable a reliable and efficient UAS integration, a framework is designed at European Union level: U-space. U-space is a set of specific services and procedures designed to ensure safe and efficient access to airspace for a large number of drones. Implementing U-space airspace requires states to define and designate U-space airspaces with mandatory service provision. For the provision of these mandatory services, the deployment of U-space will entail the integration of two new service providers into the system: the common information service provider (CISP) and the U-space service provider (USSP). The CISP will be in charge of making the common information required available, to enable the operation and provision of U-space services in U-space airspaces wherever it has been designated.[11]

skeyes is playing a central role in the development of the U-space as manager of UAS geographical zones in Belgium and by actively participating in the BURDI project. The BURDI project, which stands for Belgium-Netherlands U-space Reference Design Implementation, is dedicated to implementing a U-space airspace concept to ensure a reliable and efficient UAS integration. Additionally, since 2023, skeyes has been working on obtaining the certification to become the CISP in Belgium.[12]

The controlled airspace above and around an airport is a Unmanned Aircraft System geographical zone (GeoZone). GeoZone is a kind of zone that is only accessible to drones complying with technical and operational criteria called access conditions, and that can have restrictions with regard to the use of drones. skeyes is the GeoZone manager for controlled airspace above and around the airports of Antwerp, Brussels, Charleroi, Liege, Ostend and the Radio Mandatory Zone of Kortrijk.[13] [14]

A new drone detection system has been installed as a result of the collaboration between skeyes, SkeyDrone and BAC. The working methods and procedures to be followed are still being drafted.

11. What is U-space?, https://www.easa.europa.eu/en/what-u-space
(URL retrieved 16/02/2024)

12. BURDI project, https://www.sesarju.eu/projects/BURDI
(URL retrieved 16/02/2024)

13. UAS geographical zone statuses can be seen at https://map.droneguide.be
(URL retrieved on 21/04/2022)

14. skeyes, "skeyes drone service application, https://www.skeyes.be/en/services/drone-home-page/you-and-your-drone/drone-service-application/
(URL retrieved on 21/04/2022)

15. The data extraction method used by SkeyDrone has been update and discrepancies with data from previous years is to be expected.

16. Note that if an operation crosses multiple VLL zones, it will be counted multiple times in the table. ICAO Doc 4444 – PANS–ATM.

The figures in this report related to UAS are provided by the Drone Service Application (DSA) tool. This tool is a web application to facilitate planning, coordination and information flow between drone operators and Air Traffic Control, especially in controlled airspace.[15]

Table 1.5 displays the number of drone activities and the level of risk involved in the operations per airport. These categories are defined by the risk the drone activity forms for manned aviation in very low level (VLL) zones. For all airports where a control zone exists, these are defined as:

VLL0 - high risk → runway and surroundings;

VLL1 - moderate risk → departure/approach track, visual circuits and rest of the control zone 400 ft above aerodrome elevation (AAE), excluding the high risk zone;

VLL2 - low risk → on the edge of the control zone below 400 ft AAE, outside the moderate and high risk zone.

A drone activity can take place in several VLL zones, therefore, it will be counted as one activity for each risk level. This means that the addition of activities in the low, moderate and high risk levels will not provide the total number of activated drone activities in Liege CTR.

	Low	Moderate	High
2021	639	5	0
2022	1,425	55	10
2023	1,836	85	14
2024	1,827	91	9
2024 *vs* 2023	0%	+7%	-36%

In Liege Airport area, there were 1,853 drone activities recorded in 2024. Those activities can also be classified into a different scheme, taking into account the complexity of the operation. There are two such categories with activities in Belgium, which are described as follows (as per EASA definition[17]):

OPEN → Presents low risk to third parties. An authorization from the Civil Aviation Authority (CAA) is not required;

SPECIFIC → More complex operations or aspects of the operation fall outside the boundaries of the Open Category. Authorization is required from the CAA.

Table 1.6 shows the drone operations recorded in Liege Airport following the EASA risk category. In Liege Airport, almost two-thirds of the drone activities operated under the 'Open' category (1,430 activated operations). 423 (23%) were registered as 'Specific'. It can be observed that drone activities decreased slightly (-1%) in 2024 compared to 2023.

***Table 1.6**: Activated drone operations per EASA risk category*

	Open	Specific	Former Class 1	Total
2021	438	185	18	**641**
2022	1,033	419	0	**1,452**
2023	1,353	522	0	**1,875**
2024	1,430	423	0	**1,853**
2024 *vs* 2023	+6%	-19%	-	-1%

Furthermore, ***Table 1.7*** provides the number of exempted flights. These are operations performed by firefighters, police or different federal entities and are a service provided to the state.

***Table 1.7**: Activated exempted drone operations*

	Regular	Exempted	Total
2021	641	0	**641**
2022	1,377	75	**1,452**
2023	1,755	120	**1,875**
2024	1,750	103	**1,853**
2024 *vs* 2023	0%	-14%	-1%

Finally, the number of drone operations per type of are shown in ***Table 1.8***. Two type of operations are registered:

VISUAL LINE OF SIGHT (VLOS) → This means the drone is operated within the visual range of the pilot, allowing them to see the drone without any visual aids other than corrective lenses;

BEYOND VISUAL LINE OF SIGHT (BVLOS) → In BVLOS operations, the drone is flown outside the pilot's direct visual range, typically relying on technology such as cameras, GPS, or sensors to navigate and observe the environment.

In 2024, just 3,5% of all drone operations was BVLOS – there were 65 such operations, which is 67% more than in 2022 and the same as in 2023.

***Table 1.8**: Activated drone operations per type*

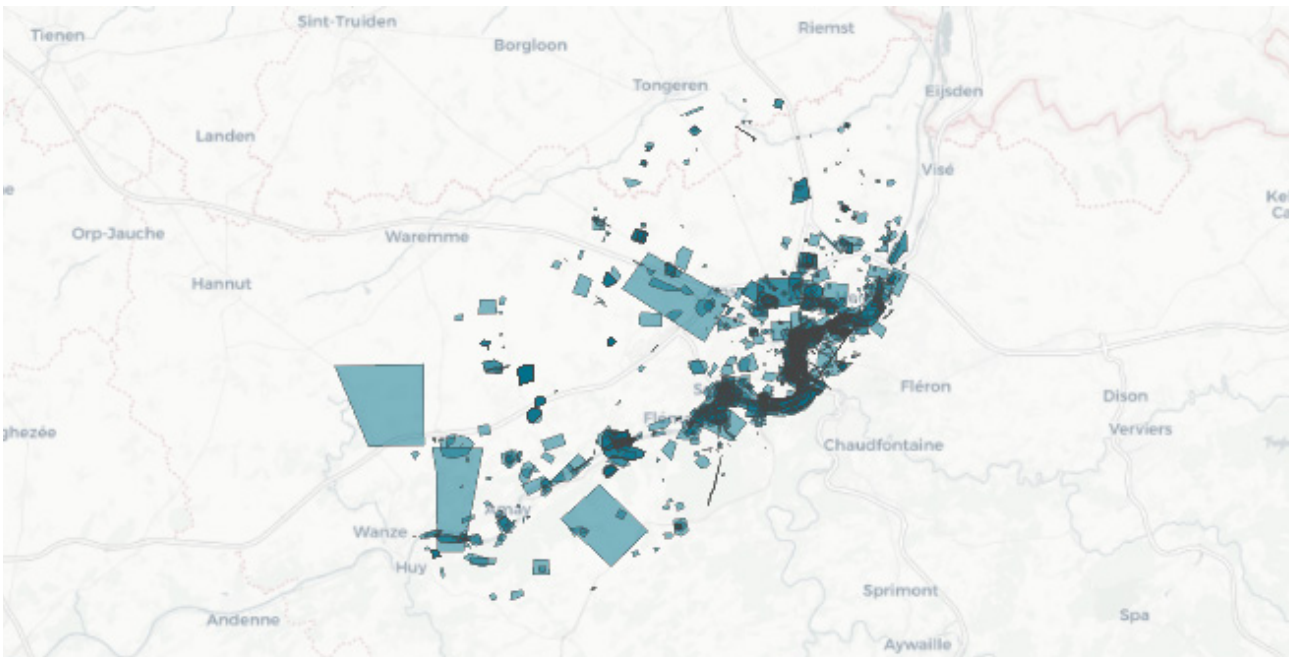
	VLOS	BVLOS	Total
2021	641	0	**641**
2022	1,413	39	**1,452**
2023	1,810	65	**1,875**
2024	1,788	65	**1,853**
2024 *vs* 2023	-1%	=	-1%

17. EASA, "Drones - regulatory framework background". https://www.easa.europa.eu/domains/civil-drones/drones-regulatory-framework-background (URL retrieved on 21/04/2022)

In ***Figure 1.19*** the reserved airspace polygons are shown, which were authorized for drone operations in Liege Airport's CTR in 2024. There is a focus of operations along the river. The top five activity types in the CTR are:

1. **Related to photo- and videography;**
2. **Aerial photography;**
3. **Photogrammetry** (art, science, and technology of obtaining reliable information about physical objects and the environment through processes of recording, measuring, and interpreting photographic images and patterns of recorded radiant electromagnetic energy and other phenomena);
4. **Security;**
5. **Recreational.**

Figure 1.19: *Reserved airspaces of activated drone operations in 2024*




2
SAFETY

- **Missed Approaches**
- **Runway Incursions**
- **Other Noteworthy Incidents**
- **Recommendations and Awareness**

This chapter is divided into four topics: missed approaches, runway incursions, other runway (RWY) / taxiway (TWY) events, and recommendations and awareness.

The missed approaches covered in the following chapter are based on internal logging. As such, the quality and accuracy of the available information is commensurate with the level of reporting. These logs of missed approaches are not considered as safety occurrences. They are an operational solution allowing to maintain safety margins when the approach cannot be continued for a safe landing. At the same time, particularly during peak hours at busy airports, they also increase the traffic complexity and the residual safety risk. It could be argued that missed approaches are a hybrid leading indicator, and that by analysing the reasons leading to this type of procedure, it is possible to examine if there are any systemic deficiencies in a technical equipment, in a procedure or in manner in which ATCOs and/or pilots apply these procedures.

The runway incursions are a lagging runway safety indicator. The runway incursions and the occurrences discussed in other RWY/TWY events are safety occurrences. These are subject to a risk classification using the Risk Analysis Tool (RAT) methodology to assess the contribution that skeyes had in the chain of events (in accordance with EU Reg 691/2010 and EU Reg 1216/2011[18]). The following chapters indicate the severity classification that was derived from the calculated RAT risk for the safety occurrences.

18. COMMISSION REGULATION (EU) No 691/2010 of 29 July 2010 laying down a performance scheme for air navigation services and network functions;

    COMMISSION IMPLEMENTING REGULATION (EU) No 1216/2011 of 24 November 2011 laying down a performance scheme for air navigation services and network functions;

The following definitions apply for the severity classification (as per EASA Acceptable Means of Compliance (AMC), Annex to ED Decision 2011/017/R)[19]. This classification scheme is applicable for the later mentioned operational occurrences.

Table 2.1: *Severity classification*[20]

Severity Classification	Description
A – Serious incident	An incident involving circumstances indicating that there was a high probability of an accident and is associated with the operation of an aircraft, which in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the primary propulsion system is shut down.
B – Major incident	An incident associated with the operation of an aircraft, in which the safety of the aircraft may have been compromised, having led to a near collision between aircraft, with ground or obstacles (i.e. safety margins were not respected; in this case, not as a result of an ATC instruction).
C – Significant incident	An incident involving circumstances indicating that an accident, or a serious or major incident could have occurred if the risk had not been managed within the safety margins, or if another aircraft had been in the vicinity.
D – Not determined	Insufficient information was available to determine the risk involved or inconclusive or conflicting evidence precluded such determination (RAT RF < 70 %).
E – No safety effect	An incident which has no safety significance.
N – No ATM ground contribution	No system, procedure or person involved in the provision of ATC services initiated or contributed to the incident.

In 2024, skeyes updated the data extraction method of logged incidents.
This can generate small differences with the numbers published in previous reports.

19. Acceptable Means of Compliance and Guidance Material for the implementation and measurement of Safety Key Performance Indicators (SKPIs) (ATM performance IR)

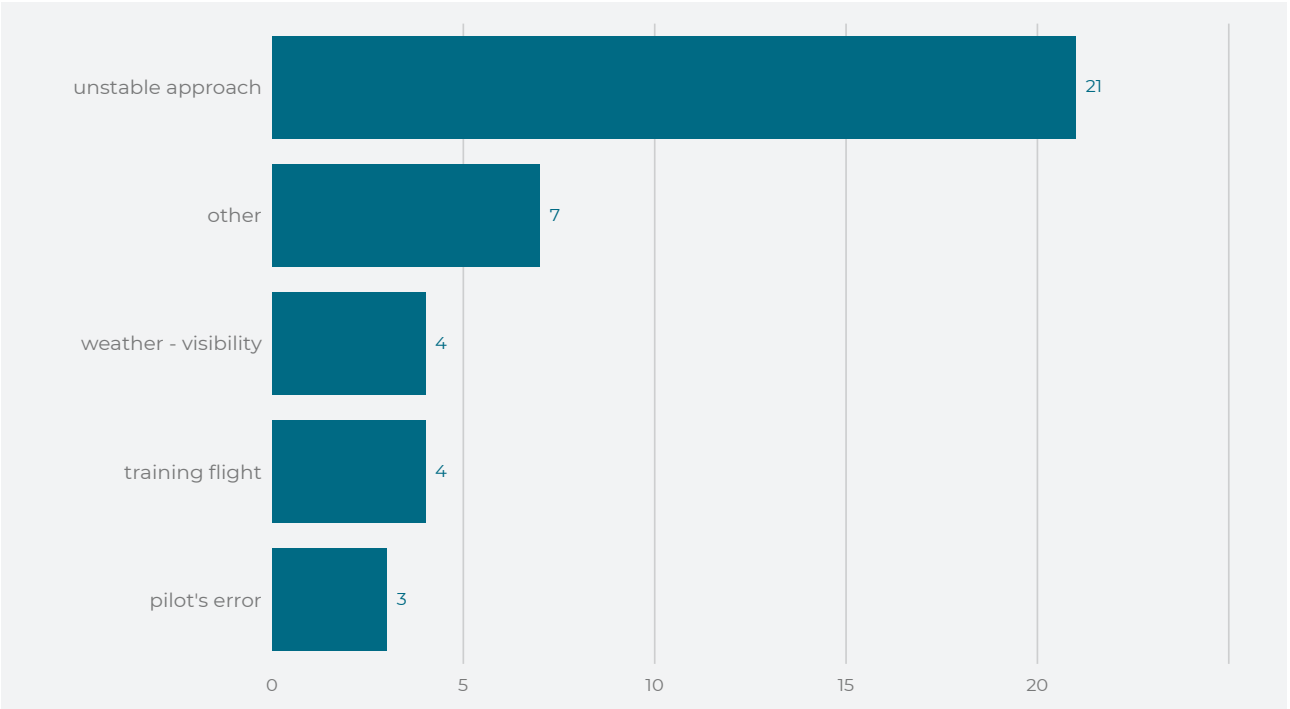
20. UI – under investigation (a non-official severity classification used during investigation before a final classification is determined)

Missed Approaches

Missed approaches are performed according to published procedures, under the instructions of the air traffic controller, or they are initiated by the pilot when the approach cannot be continued for a safe landing. Besides the discomfort for passengers and crew, missed approaches increase the air traffic management complexity. The number of missed approaches and particularly their cause can therefore indicate, which measures are to be taken to improve the safety of air navigation service provision. All missed approaches are recorded by cause of event, and the internal reporting is done by the ATCOs. The missed approaches are monitored on a weekly basis. This report gives a yearly overview and a comparison over four years for each runway at Liege Airport (runways 04L, 04R, 22L, 22R).

In 2024, there were 46 missed approaches. ***Figure 2.1*** shows the number of missed approaches per cause, for the five most common causes. The remaining causes can be found in ANNEX A: Missed approaches. Unstable approach was the main reason of missed approaches in 2024 at Liege Airport, accounting for a share of 46%. Oftentimes, unstable approaches occur due to tailwind at higher altitudes or when the aircraft takes a very direct route and is therefore unable to reduce its speed/altitude sufficiently.

Figure 2.1: *Top 5 causes for missed approaches in 2024*



The second most common reason for missed approaches is “Other”, which includes the reasons that could not be attributed to predefined reasons like passengers not ready, flight criteria not met (e.g. flap configuration) or not confirmed (runway not clear). In 2024 there were seven missed approaches with this cause. These are detailed in ***Table 2.2***.

Table 2.2: *Descriptions of the Missed Approaches with Reason O: Other*

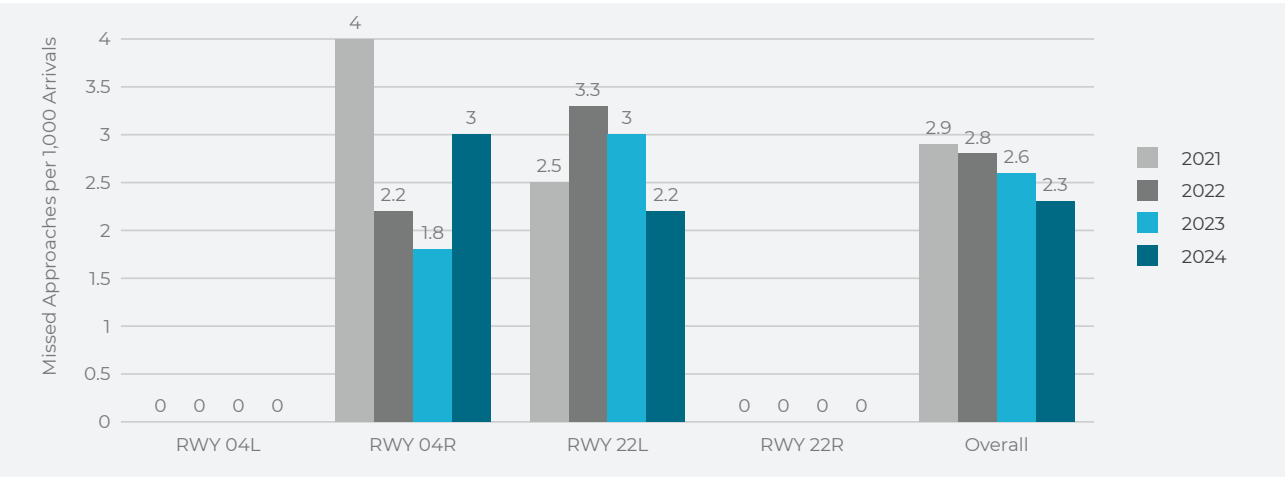
Description	Runway
Due to an excessive wind gust on final.	22L
During a category III training approach, the missed approach was decided when the "autopilot kicked off".	22L
Pilot reported that their aircraft was too heavy for landing.	22L
There were birds reported on left side of RWY 22L, the Bird Control Unit was advised and on the way. The pilot chose to go around.	22L
Reason given was too long a landing.	22L
The aircrafts navigational system was unable to calculate its position according with the Required Navigation Performance.	04R
After being established, the aircraft then lost the glide signal and chose to go around.	22L

Figure 2.2 gives the yearly rate of missed approaches per 1,000 arrivals. The number of arrivals is provided by the AMS under the BCAA's aerodrome movement definition. The overall rate has been decreasing the past four years, reaching 2.3 missed approaches per 1,000 arrivals in 2024. This makes the amount of missed approaches in 2024 the lowest since 2017. In 2024, there were no missed approaches recorded on the runways 04L and 22R.

Comparing the figures for runways 04R and 22L in 2024 with the previous year, the rate of missed approaches rose from 1.8 to 3.0 for runway 04R and dropped from 3.0 to 2.2 for runway 22L. The increase of missed approaches on runway 04R can be explained by a higher number of missed approaches due to unstable approaches. In 2023 there were two caused by an unstable approach, compared to five in 2024. For runway 22L, the missed approaches due to unstable approaches and weather conditions remained the same as in 2023. The missed approaches due to pilot's errors were still present in 2024 (2 cases), after appearing as a new cause in 2023 . Regardless of changes in individual categories, the total amount of missed approaches remained the same as in 2023, with 46 occurrences. This decline becomes more remarkable if you take into account the traffic increase for the airport and specific runway.

Further details can be found in **ANNEX A: *Missed approaches***, which shows missed approaches per cause for each runway in the years 2021 until 2024.

Figure 2.2: *Rate of missed approaches per 1,000 arrivals per runway per year*



Runway Incursions

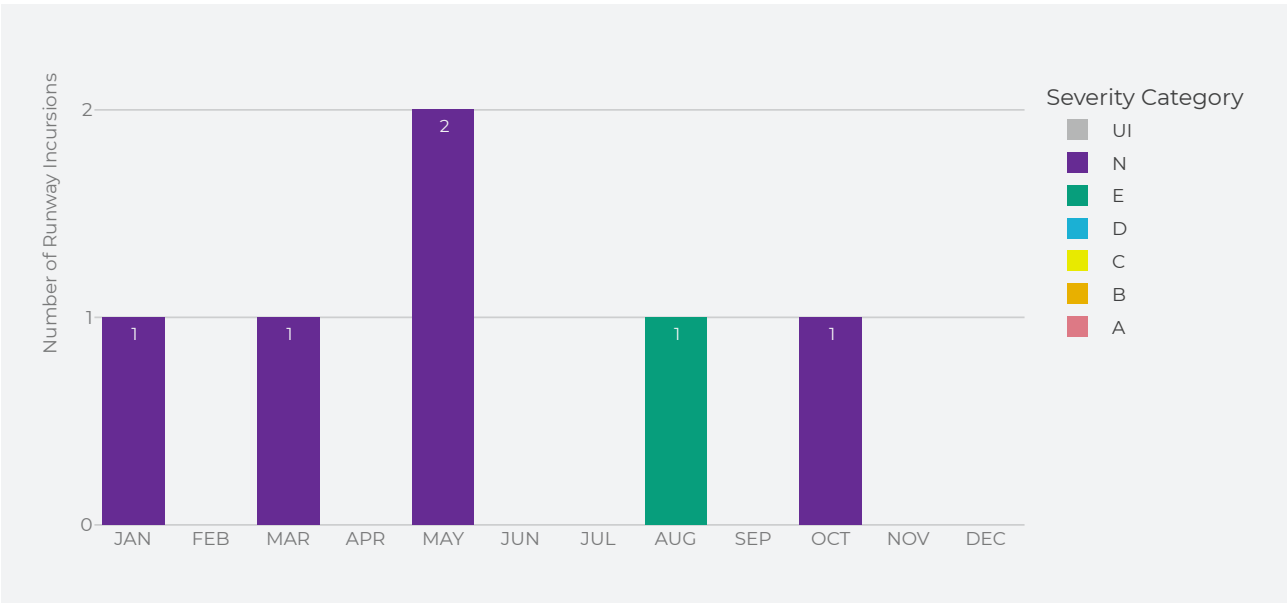
As mentioned in this chapter's introduction, this section highlights one of the safety occurrence categories: the runway incursions.

According to the International Civil Aviation Organization (ICAO Doc 4444 – PANS–ATM), a Runway Incursion is defined as "any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft".[21]

According to the Acceptable Means of Compliance (AMC), an incorrect presence is hereby defined as "the unsafe, unauthorised or undesirable presence or movement of an aircraft, vehicle, or pedestrian – irrespective of the main contributor (e.g. ATC, pilot, driver, technical system)".[22]

A monthly overview of the runway incursions in 2024 can be seen in ***Figure 2.3***. A total of six runway incursions happened in 2024. The colours of the bar chart indicate the severity as defined in ***Table 2.1***. All but one runway incursion in 2024 were without Air Traffic Management contribution. The incident in August, with severity E, was caused by a training flight that landed without clearance. Three of the remaining five were cases where an aircraft did not follow a hold instruction or crossed a holding point without clearance: they occurred in January, March and December. There was one incursion caused by a student that didn't hear a vacate instruction and took off again after thinking that the subsequent go around instruction was meant for them. This happened in May. The last incident occurred in May as well, due to a vehicle that triggered the runways safety net. After the controller told the vehicle to keep 90 meters from the centreline of the runway, it crossed this limit by a few meters, which caused the net to trigger.

Figure 2.3: *Monthly runway incursions per severity category*



21. ICAO Doc 4444 – PANS–ATM
22. AMC 3 of EU Reg 2019/317

Figure 2.4: *Yearly runway incursions per severity category*

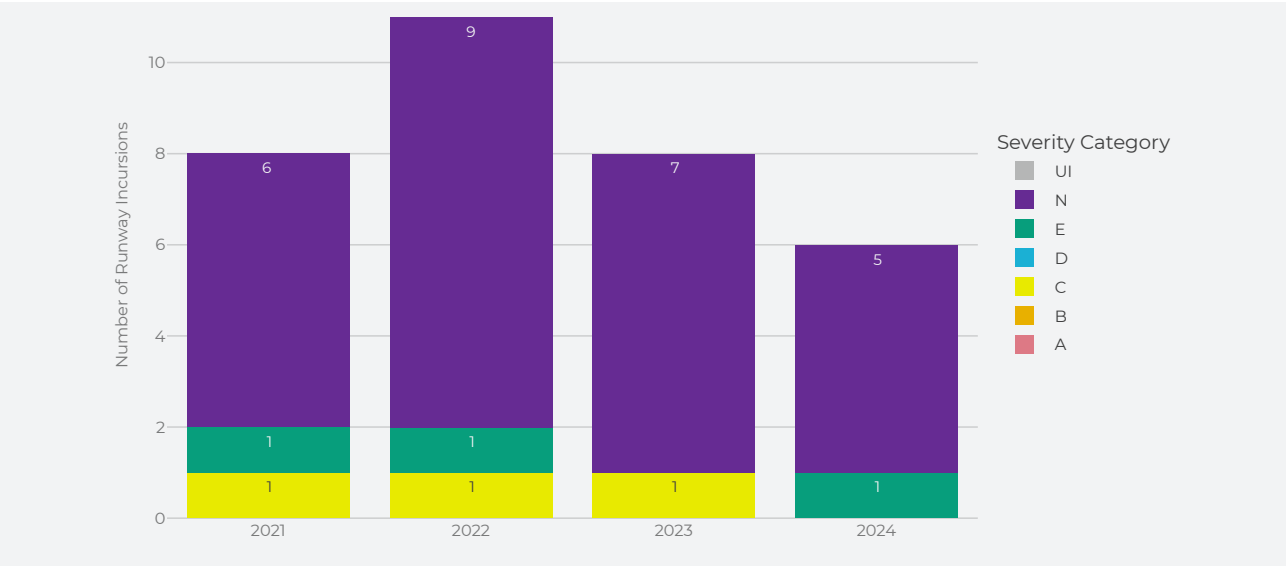
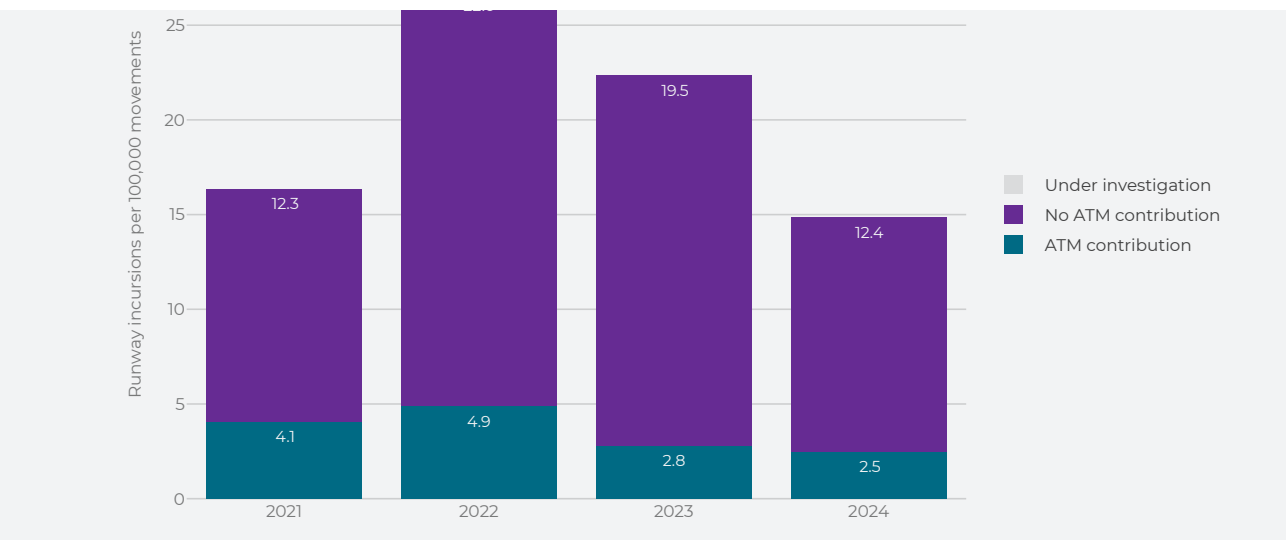


Figure 2.4 gives a yearly overview of the runway incursions from 2021 until 2024. The amount has now decreased two years in a row. After 11 runway incursions in 2022, there were eight runway incursions in 2023, and only six in 2024. There are two things to take notice of. First, each of the previous three years had a C severity incident, which is not the case in 2024. Secondly, a considerable part of runway incursions took place at holding point C0 in 2022 and 2023. Meanwhile in 2024 there was only one crossing of the holding point at C0 without clearance. This shows the positive impact of the measures undertaken by skeyes, together with stakeholders of the airport, to improve the situation at this holding point. Additionally, operational since 2022, the A-SMGCS, which detects unauthorized crossings at the holding points, together with its safety nets, further detect and help prevent runway incursions. See section ***Recommendations and Awareness*** for further information. A better way of comparing these figures, though, is the rate of runway incursions per 100,000 movements. ***Figure 2.5*** shows this rate for Liege Airport for the period from 2021 until 2024. Both the rate of incursions with and without ATM ground contribution decreased in 2024.

Figure 2.5: *Yearly rates of runway incursions per 100,000 movements by ATM contribution*



Other Noteworthy Incidents

All safety occurrences are closely monitored and registered by skeyes. In 2024, there were seven runway events at Liege Airport. Five had ATM ground contribution, of which the worst had severity class C. In February the approach was set to a different runway than an aircraft was cleared for, namely RWY 22R instead of RWY 22L. The controller cleared an arriving aircraft, which after establishing on the ILS, noticed the mistake. The pilot proceeded to land visually with Visual Meteorological Conditions (VMC). Apart from this there were four incidents classified as E severity. The first one was in March, where in a similar fashion to the previous one, the lighting was set to the wrong runway in order to perform checks. When it was noticed by an aircraft on ILS, the controller adjusted the lighting to the correct runway. The next safety event occurred in May when an aircraft was cleared for take-off, but the controller had forgotten to mention the stop bar . The alarm triggered, was subsequently turned off and the aircraft proceeded with its departure. At the time Low Visibility Operations (LVO) were installed but not in progress and visibility was good all over the field. On top of that, the aircraft was the only one on frequency and in movement. The third E severity incident was in November. An aircraft left the runway via C3, not as it was instructed, and the controller realised too late that this was happening. The correction of it caused the runway to be blocked for six minutes. Lastly, an incident occurred similar to the one in May: after an aircraft was cleared for take-off, the aircraft crossed the stop bar without it being turned off. The aircraft was the only movement at that time, LVO was installed (but not in progress), full visibility of the airfield and take-off ensued without further incident. This last runway event took place in December 2024. No runway excursions occurred in 2024, nor in the other years presented in ***Figure 2.6***.

Concerning taxiways and aprons, one event was reported in 2024 without ATM ground contribution. A helicopter followed the correct procedures, yet workers reported an impact from the downwash and wake turbulence caused by the aircraft. There were also ten taxiway incursions recorded in 2024. None of them had ATM ground contribution. ***Figure 2.6*** provides an overview over the previously mentioned incidents over the past four years. Overall, the amount of incidents increased to a total of 18. Both runway events and taxiway incursions increased by a large amount, while the amount of taxiway or apron events declined to a single incident.

Aside from taxiway and runway incidents, there were other safety occurrences that were monitored by both the airport and skeyes. ***Figure 2.7*** presents the top five most common safety occurrences, except for those mentioned previously. The 32 wildlife reports were mostly incidents concerning birds and some rabbits. When an arriving or departing aircraft would hit an animal, it would create debris that would need to be cleaned up, as it might cause the aircraft to abort take off and could even damage the vehicle. Reports from pilots being inconvenienced by laser beams are also closely monitored. Laser beam incidents have led to more cooperation measures with the local police, informing them promptly when one is reported.

Figure 2.6: *Yearly runway and taxiway safety events*

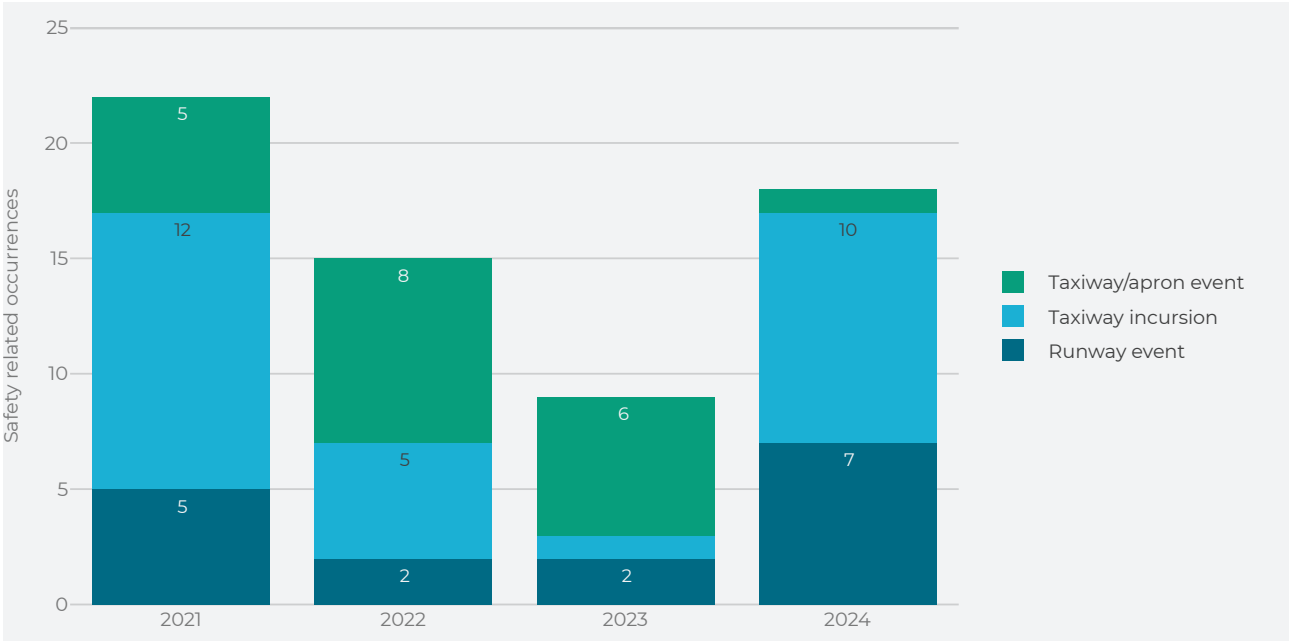
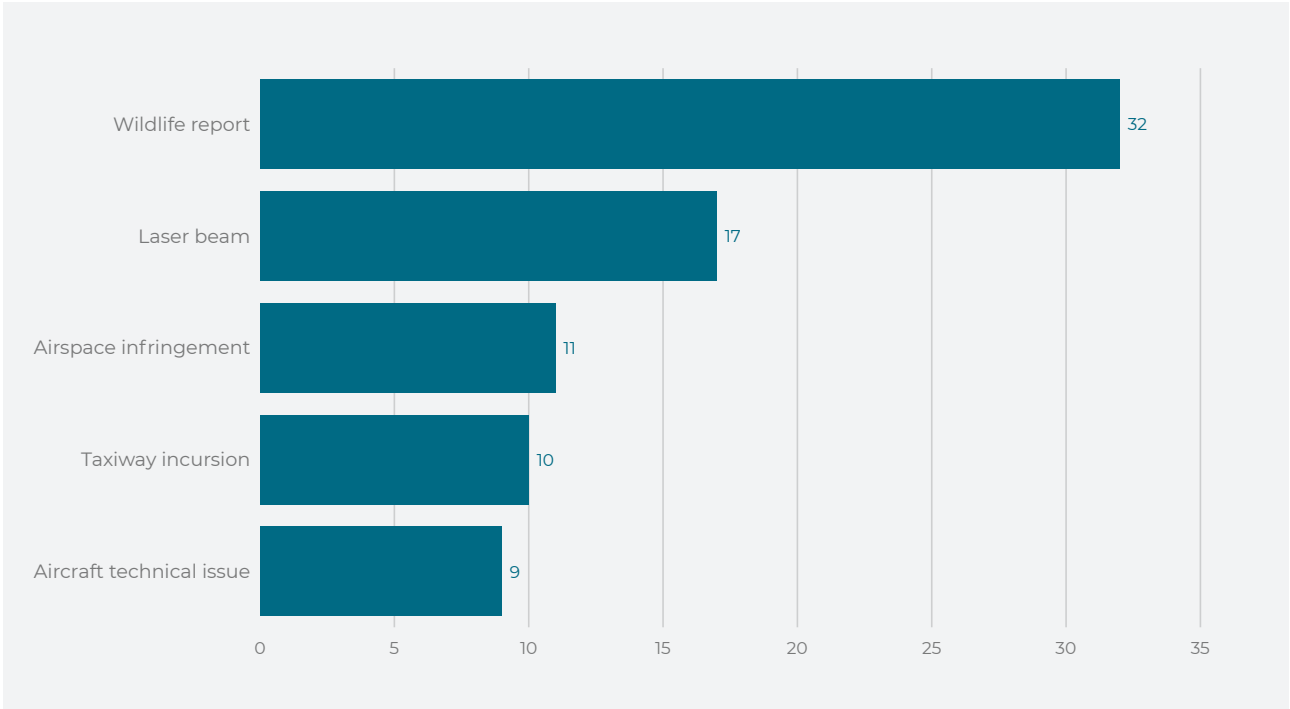


Figure 2.7: *Top 5 causes for missed approaches in 2024*



Improvements And Recommendations

Runway Safety Team fostering shared safety culture

skeyes has established a Local Runway Safety Team (LRST) together with the stakeholders at Liege Airport. All apron events, taxiway incursions, runway incursions, and more, if deemed useful, are discussed in the LRST to present the view of each stakeholder. As such, each stakeholder can focus more easily on possible actions to be taken on their side. An example of such an action was the attempt to reduce the runway incursions at C0 by conducting an awareness campaign and modifying the phraseology used by the ATCOs. This seems to have had a positive result, as in 2024 there was only one such incursion. The assessment is still made during occurrence investigations, to see if the phraseology needs to be further adapted to take in account non-homebased pilots. In September 2024 this was included in the EBLG Operational (Ops) manual.

Ongoing efforts to address runway lighting risks at Liege

In 2022 skeyes recommended enabling the lighting on both runways to be turned on simultaneously. With the goal of preventing incidents such as the runway event in March, where the lighting was set to the runway parallel to the one in use, in order to perform checks. skeyes continuous to advocate for this implementation at Liege Airport.

Enhancing safety at holding points to prevent runway incursions

For runway 04R/22L, all CAT I holding points are to be removed and only CAT II and CAT III will be used. In addition, it was recommended to evaluate the added value of the phraseology “taxi to holding point CAT II/III” as a clearance limit to avoid runway incursions. It is especially useful to prevent incursions when Low Visibility Procedures (LVP) are (being) installed but Low Visibility Operations (LVO) conditions are not yet met. This has been implemented in two steps. The first step is specifically for holding point C0 and was included in the EBLG Ops manual. The second step was the integration in the LVO manual edition 13 within the 4.4.3. installation procedure.

Shaping future airspace with PBN

skeyes designed a PBN (Performance Based Navigation) implementation and transition plan describing the way ahead to 2030. The purpose of the transition and implementation plan 2024/2030 is the establishment of a full PBN environment within the Belgian part of the Brussels Flight Information Region (FIR) and at the aerodromes of Antwerp, Brussels, Charleroi, Kortrijk, Liege and Ostend. Once the full PBN environment is realized, an optimization of this PBN environment will be initiated. This comprises the redesign of airspace as well as the routes which can then be redesigned independently from the ground-based infrastructure and placed at the most strategically beneficial location.

Strengthening ground safety through radar-based monitoring

Furthermore, the Advanced-Surface Movements Guidance and Control System (A-SMGCS) at Liege Airport became operational in 2022 and the operational validation for its safety net started in 2023 and successfully ended in mid-December 2024. This radar monitoring tool provides air traffic controllers with the means to guide and control aircraft and ground vehicles, particularly in poor visibility conditions. It optimizes capacities while ensuring a high level of safety, which is expected to reduce the impact of runway incursions, thanks to an early detection, enabling the ATCO to react more quickly. The A-SMGCS acts as a safety net, enhancing the controllers' situational awareness by monitoring every target on the movement surface. To increase safety even further, skeyes recommends the implementation of 24/7 stop bar usage as an additional barrier against entry on the runway without clearance.

3 CAPACITY & PUNCTUALITY

Airport Capacity

Punctuality

This chapter addresses airport capacity and punctuality. In the first section, the declared capacities for different runway configurations are given along with a view on the effective utilisation of this capacity.

In the second section, the punctuality at Liege Airport is studied. The arrival delay, delay due to regulations placed by Liege Airport on the arrivals, is analysed and the Air Traffic Flow Management (ATFM) delay from the airport's point of view is given, i.e. the impact on traffic to or from Liege Airport caused by regulations not only at Liege Airport, but also in the Belgian en-route airspace and by other ANSPs.

Airport Capacity

The capacity of an aerodrome, defined as the number of operations it can handle in a given time, is influenced by factors such as airport layout, fleet mix of the arriving and departing traffic, ATC procedures, weather conditions and technological aids. Under optimal conditions, a theoretical measure, called **Theoretical Capacity Throughput**, is calculated for each runway configuration. This represents the average number of movements (arrivals and/or departures) that can be performed on the runway system within one hour, based on certain assumptions:

- *A continuous supply of arrivals and/or departures;*
- *Simultaneous Runway Occupancy (SRO) is prohibited (ATC rule);*
- *Safe Wake Vortex separation distances between flights are maintained (ATC rule);*
- *A static fleet mix (unchanging aircraft types);*
- *Unchanging approach and departure procedures;*
- *Optimal operational conditions (e.g., weather and staffing).*

The calculation also incorporates the following parameters:

- *The fleet mix from a monthly sample of traffic;*
- *A nominal radar separation of three NM;*
- *A 15% loss factor in inter-arrival times to account for conservative separation by controllers;*
- *Assumptions for the average Runway Occupancy Time for Arrivals (ROTA);*
- *An average approach speed of 136 knots (adjusted for headwind per runway);*
- *Inter-departure time, determined by the time between take-off clearance and reaching a specified altitude.*

Since safe wake vortex separation distances are specified only for IFR flights, the Theoretical Capacity Throughput applies exclusively to IFR movements and represents the highest number of IFR movements that an aerodrome can handle per hour with a given runway configuration under ideal conditions.

In practice, optimal conditions are rarely achieved. To account for this, the **Declared IFR Capacity** is set at 90% of the theoretical maximum.

For Liege Airport, the declared capacities have been calculated for 04/22. While the airport has two runways 04L/22R and 04R/22L, these runways are too close to be used independently and only one may be used at a time. Therefore, both runways were treated as one runway in the capacity calculations. ***Table 3.1*** shows the declared IFR capacity per runway configuration at Liege Airport. Note that this is only a theoretical calculation and currently not used for schedule coordination purposes.

Table 3.1: *Declared IFR capacity*

Runway Configuration		Declared IFR Capacity (movements/hour)		
Departures	Arrivals	Only Departures	Only Arrivals	Mixed Fleet
04	04	28	28	35
22	22	28	28	34


skeyes
nice to
guide
you

Figure 3.1: *Hourly movements for configuration 22-22*

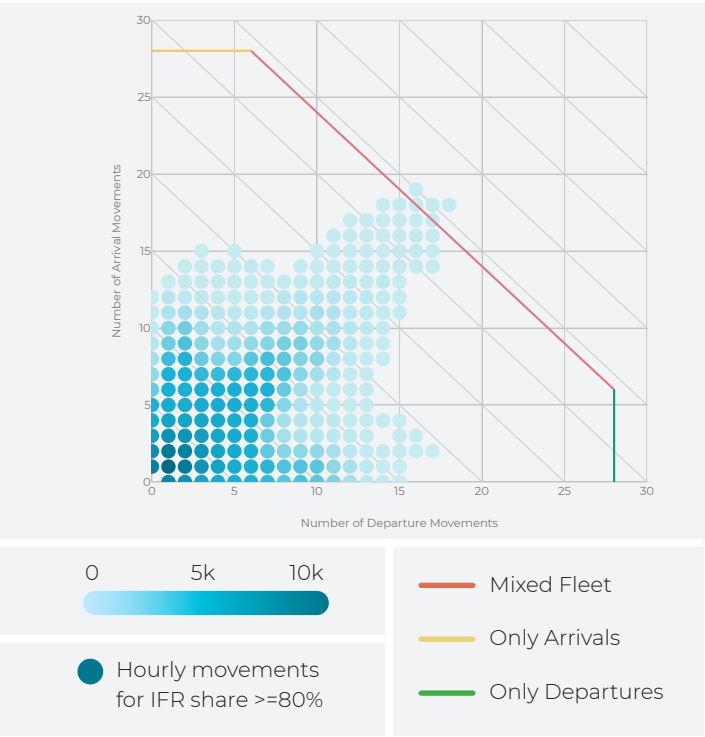
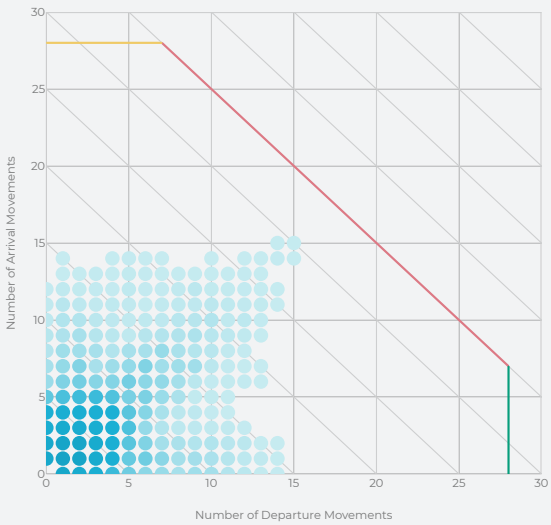


Figure 3.2: *Hourly movements for configuration 04-04*



To get a view on the actual usage of the aerodrome's capacity, the **Effectively Used Capacity** is an important performance indicator for the airport and the air navigation service provider handling the arrivals and departures. For each runway configuration, it compares the theoretical value of the declared capacity to the distribution of the actual number of movements performed within each hour of the year.

Figures 3.1 and ***3.2*** provide a way to visually inspect if the declared capacity has ever been exceeded. In these plots, each dot represents a rolling hour throughout the year of 2024 (with a roll step of one minute), during which the runway configuration was active for at least an hour within the default opening times of the aerodrome and during which there was at least one movement. The measuring points with no arrivals and no departures are disregarded in the graph. The position of the dot indicates the number of arrivals (y-axis) and the number of departures (x-axis). The opacity of the dot indicates if there were many or few hours with this number of arrivals and departures, with more translucency indicating less hours. The histograms on the sides show the distributions of arrivals and departures. The mixed fleet declared capacity is shown by a diagonal red line: at any point on this line, the x-axis value (departures) and y-axis value (arrivals) will add up to the threshold number (total movements). The declared capacity for only departures is shown with a green vertical line and the declared capacity for only arrivals is shown with a yellow horizontal line. Any dot above this line indicates an hour exceeding the declared capacity.

Even though the capacity is only declared for IFR movements, the plots consider both IFR and VFR movements. This is because only considering IFR flights would give a distorted view on the number of hourly movements – especially for airports with high VFR shares. The notation for the runway configurations in this report always mentions first the departure runway first, then the arrival runway , separated by a hyphen.

In 2024, the declared capacity was exceeded 18 times at Liege Airport.[23] Looking at recent years, occasionally the declared capacity was exceeded, however, this was not the case during the previous year, 2023. In 2024 the maximum movements in one hour was recorded on the fourth of June with 36 movements, exceeding the

23. Keep in mind that this number is the amount of rolling hours with steps of one minute, causing overlap.

Figure 3.3: *Hourly movements of hours with 80% IFR movements for configuration 22-22*

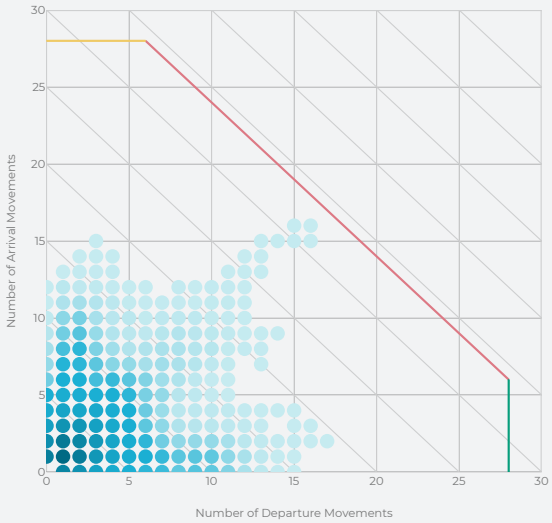


Figure 3.4: *Hourly movements of hours with 80% IFR movements for configuration 04-04*

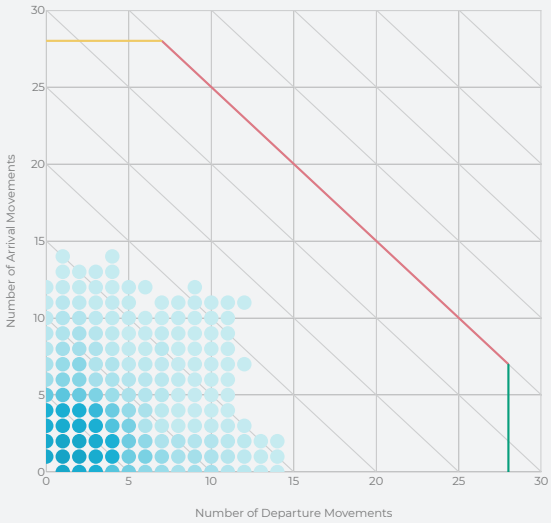


Table 3.2: *Days with hours exceeding the declared capacity*

Runway Configuration		Date	Maximum	% of IFR	% of Departures
Departures	Arrivals	of Occurrence	Extra Movements	at Occurrence	at Occurrence
22	22	Jun. 4	2	53%	50%
		Jun. 23	1	6%	46%

declared capacity by two movements. At this time, 51% of movements were VFR that are not taken into account when the IFR capacity is calculated. However, VFR flights on top of busy IFR hours increase the workload and sometimes generate hours with movements over the declared capacity. Additionally, keep in mind that touch and goes are counted as two movements. There were 14 touch and goes during the busiest hour (resulting in 28 movements) and 40 throughout the day. All were performed by two aircraft as part of training flights. The separate declared capacity for only departures or arrivals was never exceeded in 2024.

Table 3.2 gives figures on the days where the amount of traffic exceeded the declared capacity. As the calculation is based on a rolling hour per minute, the capacity is exceeded for a period which can span a couple of minutes. Each minute accounts for one instance of exceedance, hence the 54 instances of exceedance recorded. The table gives a summary in terms of extra movements (during the time that the traffic exceeded capacity the maximum number of extra movements is given), share of IFR traffic and share of departures.

In 2024, two days saw capacity exceedances, both with runway configuration 22L,22R-22L,22R. In comparison with the prior year, there were no days with exceeded capacity. The capacity is only declared for IFR movements and, therefore, having VFR movements, for which the IFR separation rules do not apply, can result in exceeding the declared capacity.

As VFR movements have an influence on the presented declared capacity plots in ***Figures 3.1*** and ***3.2***, another view is given in ***Figure 3.3*** and ***Figure 3.4***. They show the hourly movements in 2024 for hours with ≥80% IFR, respectively for runway configuration 20 – 20 and for runway configuration 04 - 04. It can be seen that when IFR movements were more than 80% of the total traffic per hour, the declared capacity was never reached in 2024.

Punctuality

Punctuality can be seen as a service quality indicator from a passenger perspective. This section observes one of the factors that influences punctuality: Air Traffic Flow Management (ATFM) delay. ATFM delay is defined as the time difference between estimated take-off time and calculated take-off time of the Network Manager (EUROCONTROL) and is due to ATFM measures to ensure safe handling of operations in the air or at airports. These measures are classified according to the causes listed below:

A - *Accident*
C – *ATC Capacity*
D - *De-icing*
E - *Equipment (non-ATC)*
G – *Aerodrome Capacity*
I - *Industrial Action (ATC)*
M - *Airspace Management*
N - *Industrial Action (non-ATC)*
O - *Other*
P - *Special Event*
R – *ATC Routeing*
S – *ATC Staffing*
T - *Equipment (ATC)*
V – *Environmental Issues*
W - *Weather*
NA - *Not Specified*

The ATFM measures with Air Navigation Service Provider (ANSP) contribution are listed according to the Functional Airspace Block Europe Central (FABEC) performance plan:[24]

C – *ATC Capacity*
R – *ATC Routeing*
S – *ATC Staffing*
T - *Equipment (ATC)*
M - *Airspace Management*
P - *Special Event*

In the remainder of the report, all causes with ANSP contribution are referred to as CRSTMP. Additionally, the measures due to W – Weather are split in a separate category, resulting in three aggregated categories: CRSTMP, Weather and Other categories.

The next section focusses on a key performance indicator: arrival delay. The Airport Arrival ATFM Delay is an indicator of ATFM delays on ground for a flight, due to a regulation placed by the airport of arrival.

After this, the next section of this chapter provides an overview of the influence of ATFM measures on traffic arriving to or departing from Liege Airport, regardless of which unit placed the regulations.

AIRPORT ARRIVAL ATFM DELAY

As of January 1st, 2015, skeyes is subject to an annual target with regard to ATFM arrival delay. ATFM arrival delay is the delay of a flight attributable to terminal and airport air navigation services and caused by restrictions on landing capacity (regulations) at the destination airport. The average minutes of arrival ATFM delay per flight is a performance indicator in accordance with the European Performance Regulation (EU) no 317/2019, Annex 1, section 1, §3.1(b). This indicator is the average time, expressed in minutes, of arrival ATFM delay per inbound IFR flight and is calculated for the whole calendar year. The indicator includes all IFR flights with an activated flight plan submitted to the Network Manager landing at the destination airport and covers all ATFM delay causes excluding exceptional events.[25]

Targets are set on a national level and on an airport level, where the national target is the aggregation of the airport targets. For reference period two (RP2), 2016-2019, the national target was 0.10 minutes/flight, and Brussels Airport and Liege Airport were considered as contributing airports. For reference period three (RP3), 2020-2024, the national target was initially 1.82 minutes/flight for all causes and 0.17 minutes/flight for CRSTMP causes with Brussels Airport the only contributing airport. However, due to the unexpected impact of COVID-19 on the air traffic, the European Commission requested a revision of Union-wide performance targets for RP3. The current proposal only includes arrival delay targets for Belgium as of 2022 (1.08 minutes/flight all causes and 0.12 minutes per flight for CRSTMP causes), and the only contributing airport remains Brussels Airport.

In 2025 the new reference period four (RP4), 2025-2029, starts. The new targets set for this period will bring a change on how the delay for the target is calculated. For RP3 the target was set on minutes/flight for CRSTMP causes, but this will change in RP4 as the target will be set on minutes/flight for all causes.

Despite not having its own target, skeyes registers the arrival delays for Liege Airport as part of a continuous monitoring of the ANSP's performance and internal performance indicator. This indicator is the average time, expressed in minutes, of arrival ATFM delay per inbound IFR flight and is calculated for the whole calendar year. The indicator includes all IFR flights with an activated flight plan submitted to the Network Manager landing at the destination airport and covers all ATFM delay causes excluding exceptional events.[26]

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24. A common FABEC Performance plan https://www.fabec.eu/who-we-are/optimised-performance/a-common-fabec-performance-plan (URL extracted on 25/02/2025)

25. EUROCONTROL, "SES Performance Scheme Reference Period 3 (2020-2024), 2022, https://www.eurocontrol.int/prudata/dashboard/metadata/rp3/ (URL retrieved on 19/04/2023)

26. European Commission, "Regulations," Official Journal of the European Union, p. 67, 2019

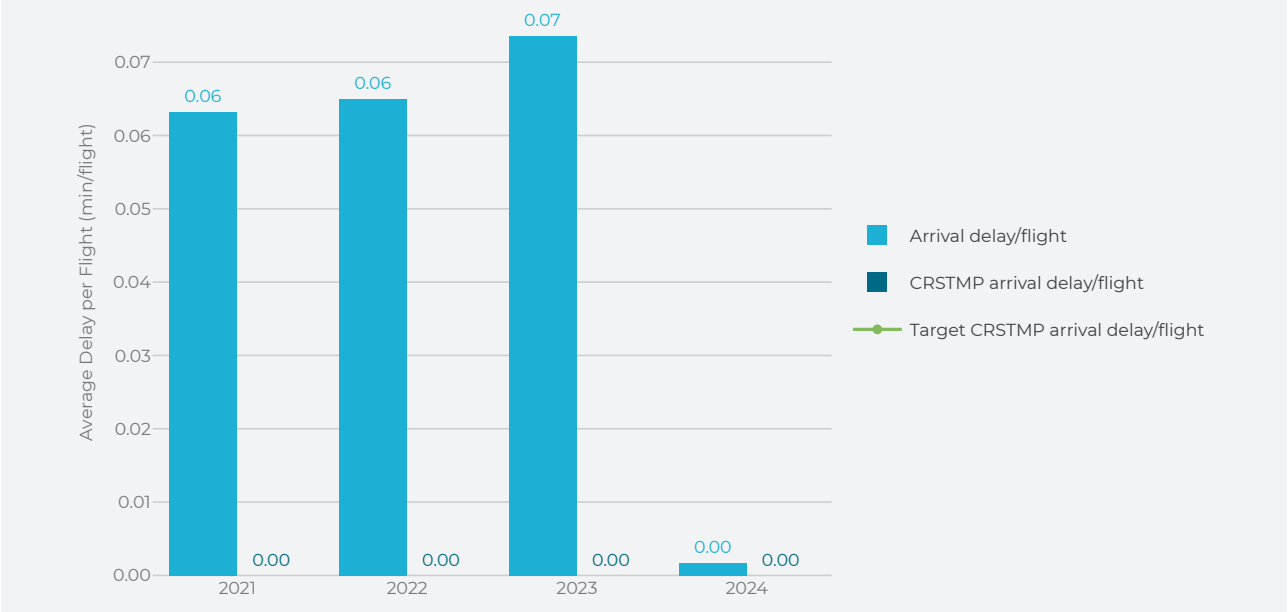
For this performance indicator, a comparison is made over the last four years. ***Table 3.3*** gives the amount of arrival delay of Liege Airport and the total number of arrivals per year. Note that in this section, the number of arrivals and the arrival delay for each flight are calculated by the Network Manager and have been provided by the Performance Review Unit (PRU / EUROCONTROL).[27] In 2024, a total of 27 minutes of arrival delay at Liege Airport were registered. Just as in previous years, the only reason for arrival delay was weather.

Translated into the key performance indicator delay per arrival, this results in a total arrival delay of only 27 minutes in 2024. As the only reason was weather, the CRSTMP (reasons with ANSP contribution) arrival delay was zero minutes. Even though the number of IFR arrivals with flight plan increased from 2023, the amount of ATFM arrival delay decreased by 93%. This can also be seen in ***Figure 3.5***, which shows the arrival delay rates for the past four years. It shall be recalled that for 2020 to 2024 there were no arrival delay targets set for Liege Airport.

Table 3.3: *Number of IFR arrivals and minutes of arrival ATFM delay per reason and per year (with flight plan)*

	Minutes of ATFM Arrival Delay				IFR Arrivals
	CRSTMP	Weather	Other categories	Total	(with flight plan)
2021	0	1,325	0	1,325	20,969
2022	0	1,076	0	1,076	16,568
2023	0	1,077	0	1,077	14,642
2024	0	27	0	27	16,190

Figure 3.5: *Yearly target and actual rate of ATFM delay per IFR arrival*



27. Hence the difference with figures in Chapter 1, where movements are counted using the AMS and the BCAA criteria. The Network Manager only accounts for flights with a registered flight plan.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ACG

ALL ATFM IMPACT ON TRAFFIC AT LIEGE AIRPORT

Besides being delayed by Liege tower, flights to or from Liege Airport can also be delayed by ATFM measures in any ATC sector along their flight route; i.e. en-route or at the other departure or arrival airport as regulations can be put in place at all ATC sectors of the flight plan: en-route sectors, departing airport and destination airport. The impact of all of these regulations give the total ATFM delay of traffic at Liege Airport.

In 2024, compared to 2023, traffic in Europe increased by 5%, reaching 96% of the 2019 traffic level. According to an overview published by EUROCONTROL, the ATFM delays, in terms of delay per flight, were 18% higher than in 2023, despite a significant reduction in strike-related delays. The increase in ATFM delays is primarily due to adverse weather and a lack of capacity.[28]

Figure 3.6 and ***Figure 3.7*** present an overview of the ATFM delay on arriving and departing flights at Liege Airport over the past four years. Delay is attributed to the regulation originating it. For flights with the same airport as origin and destination, if they are impacted by any regulation, the delay is counted in the arrival delay and in the departure delay, as those flights are considered arrivals and departures to/from the airport. As a result, the total ATFM delay is not the sum of delays recorded for arrivals and departures, as this will count delays for the flights with the same origin and destination airport twice.

In 2024, 16,190 IFR flights (with a flight plan) arrived at Liege Airport, of which 1,208 were delayed for a total of 22,476 minutes of ATFM delay. This is an increase of 12% compared to 2023 in terms of total arrival delay. Of the total amount of ATFM delay, 4% (951 minutes) is attributable to skeyes, while 96% (21,525 minutes) is attributable to ATFM measures placed by other ANSPs.

Of the 16,168 IFR departures from Liege Airport, 2,217 flights were delayed by ATFM regulations resulting in a total of 44,274 minutes of delay. This is an increase of 14% compared to 2023 in terms of total departure delay. For departing traffic, 5% (2,006 minutes) of this delay is attributable to skeyes, while 95% (42,268 minutes) is attributable to other ANSPs.

28. EUROCONTROL European Aviation Overview, https://www.eurocontrol.int/publication/eurocontrol-european-aviation-overview (URL retrieved on 23/01/2025)

Figure 3.6: *ATFM delay for IFR arrivals per year and delay origin*

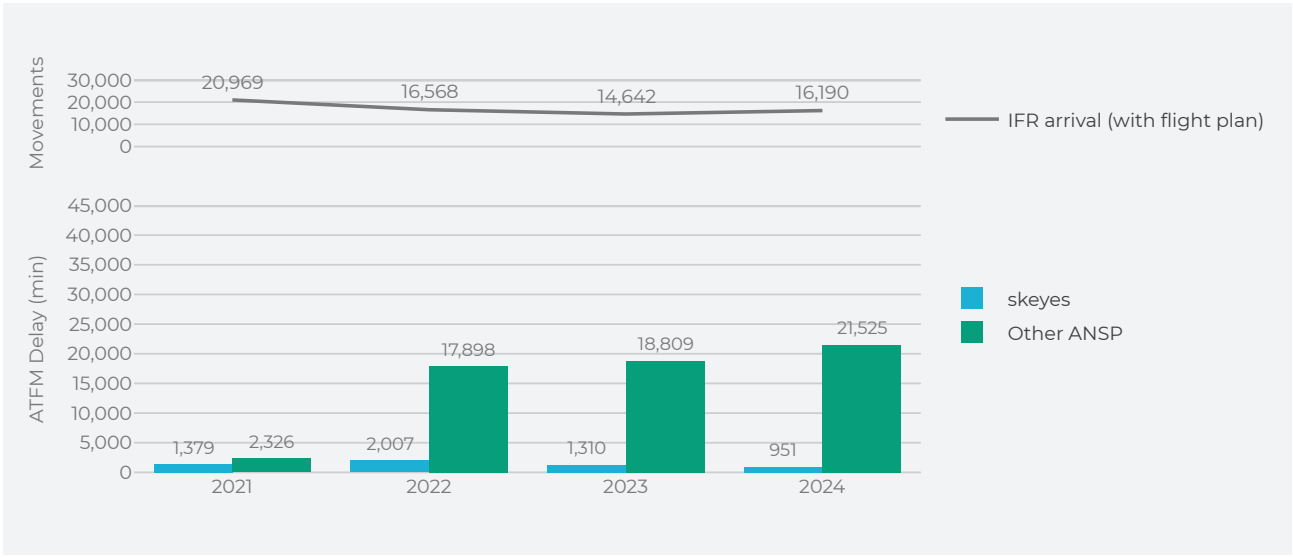
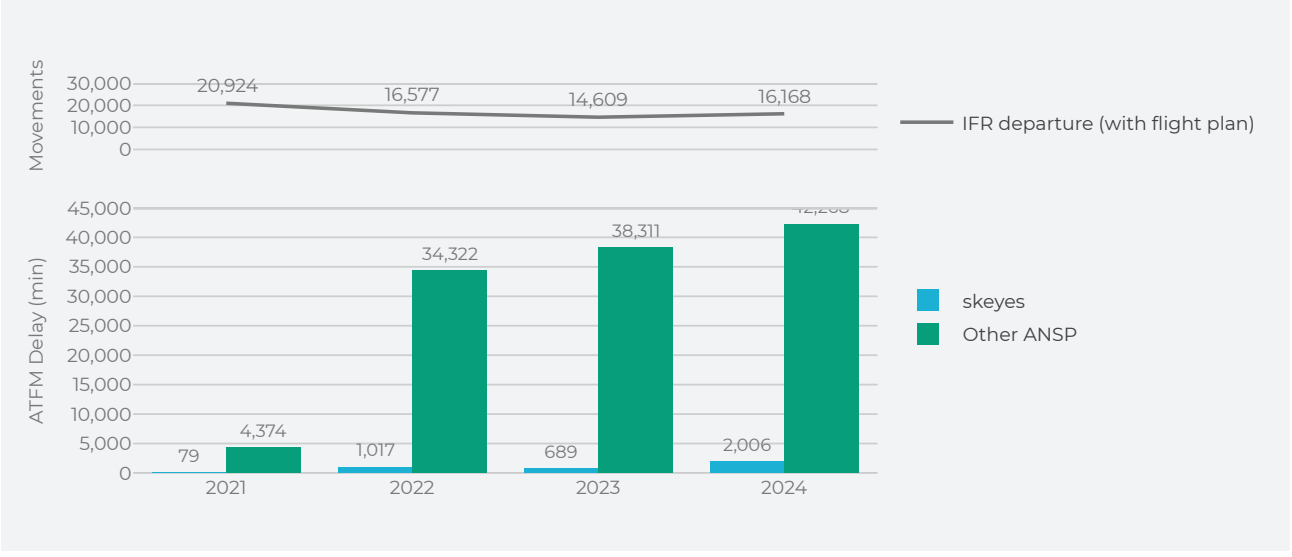


Figure 3.7: *ATFM delay for IFR departures per year and delay origin*



The impact of all these regulations give the total ATFM delay of traffic at Liege Airport. Traffic was mainly impacted by ATC disruptions due to lack of capacity and weather related reasons. The third most common cause was regulations due to staffing issues. The largest contributor to these three kinds of delay was the German ANSP, the Deutsche Flugsicherung (DFS), partly due to the continued implementation of iCAS (a new ATM system). The Hungarian HungaroControl also shares a large part of the responsibility for ATFM delay on Liege traffic, mainly due to the re-routing of traffic flows due to the ongoing Russian invasion of Ukraine, leading to problems regarding ATC staffing and delays classified as "Other".

To give a view on the severity of the impact, the delayed flights can be categorised based on the length of their delay. The following four categories have been established:

- *Between 1 and 15 minutes;*
- *Between 16 and 30 minutes;*
- *Between 31 and 60 minutes;*
- *More than 60 minutes.*

It is clear that for both arriving traffic (***Figure 3.8***) and departing traffic (***Figure 3.9***), a similar distribution is seen:

More than half of delayed flights going to Liege Airport had a delay that did not exceed 15 minutes (55%). For 81%, the delay was below 30 minutes and only 4% of flights going to Liege Airport were delayed by more than 60 minutes.

Similarly, about half of delayed flights departing from Liege Airport had a delay that did not exceed 15 minutes (51%). For 80%, the delay was below 30 minutes and 5% of flights departing from Liege Airport were delayed by more than 60 minutes.

Figure 3.8: *Delayed IFR arrivals per category of delayed time*

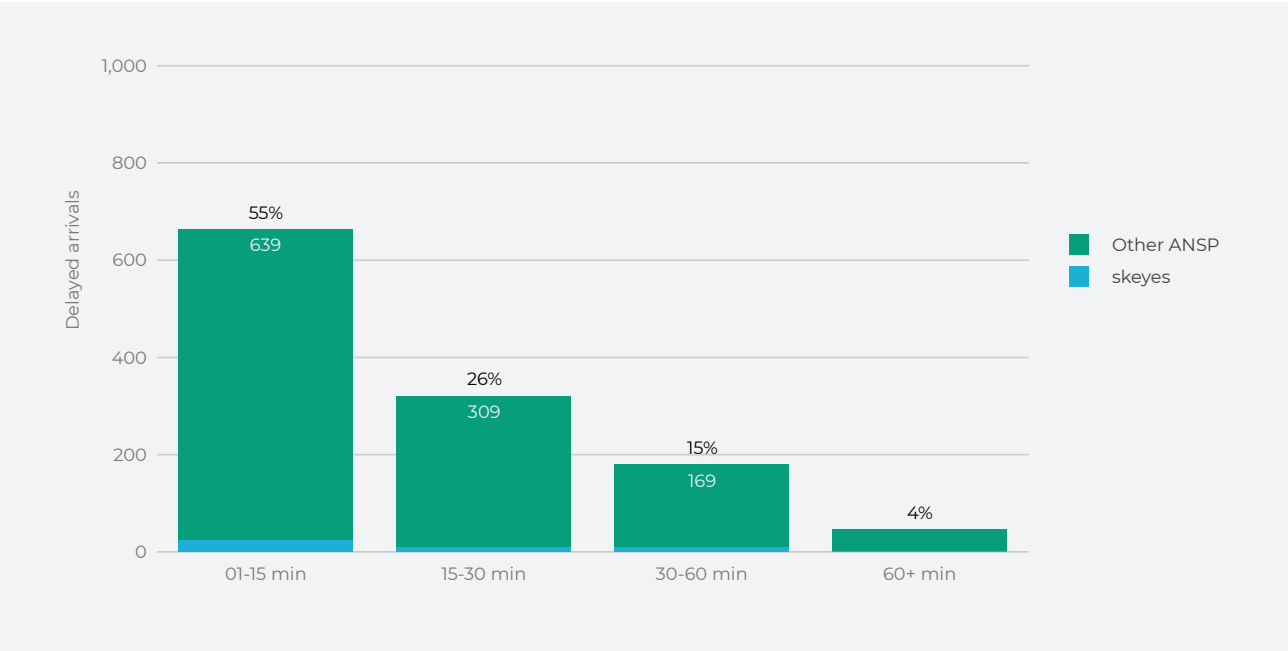
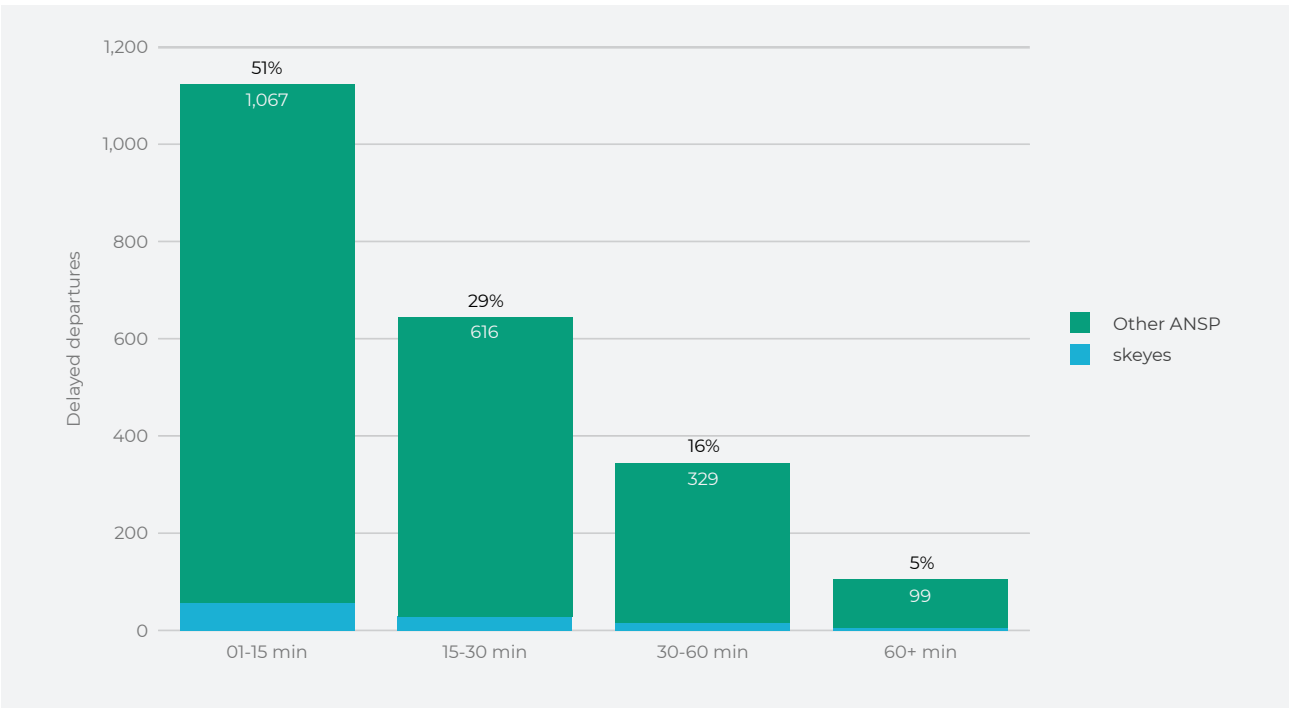
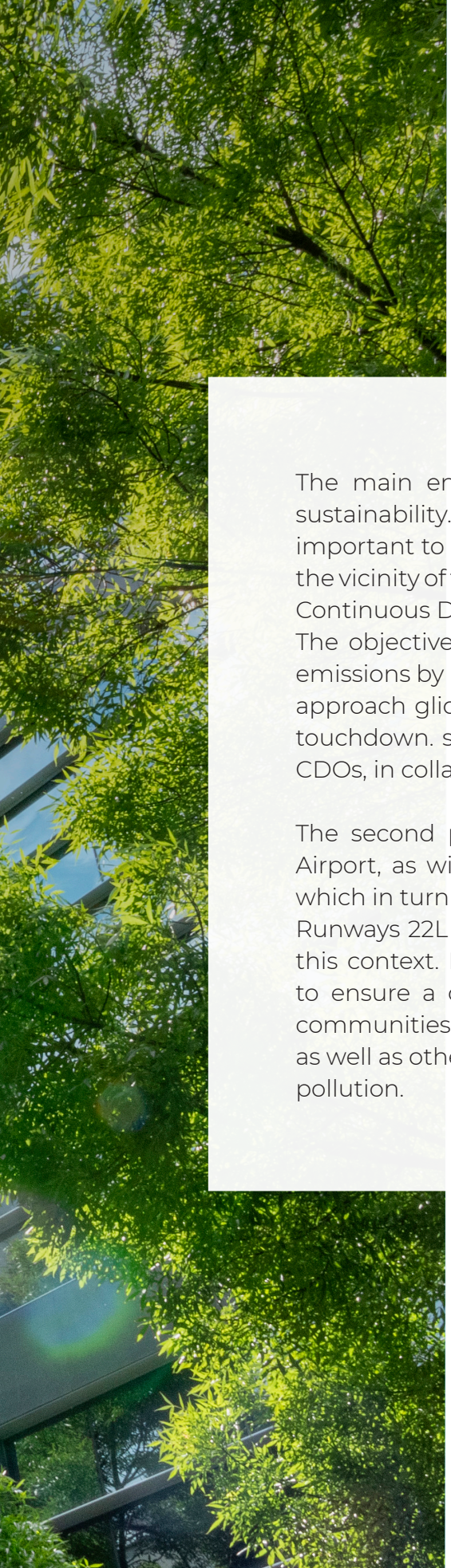


Figure 3.9: *Delayed IFR departures per category of delayed time*




ENVIRONMENT



- **Continuous Descent Operations**
- **Wind Patterns**
- **Considerations and Improvements**

The main environmental challenges of aviation are noise and sustainability. As Liege Airport is located near populated areas, it is important to consider noise and its reduction, as far as possible, in the vicinity of the airport. The first part of this chapter is dedicated to Continuous Descent Operations (CDO), also called green landings. The objective of CDOs is to reduce aircraft noise, fuel burn, and emissions by means of a continuous descent, so as to intercept the approach glidepath at an appropriate altitude for the distance to touchdown. skeyes put in place indicators to monitor the use of CDOs, in collaboration with other members of FABEC.

The second part focusses on the predominant winds at Liege Airport, as wind is a leading factor in the choice of runway use, which in turn has an influence on the noise above the city of Liege. Runways 22L and 22R are preferred over runways 04L and 04R in this context. Furthermore, there are ongoing processes that aim to ensure a continuous dialogue with all the stakeholders and communities for more clarity in the runway configuration choice as well as other incentives, like environmental fees, to reduce noise pollution.


SINGAPORE AIRLINES CARGO

Continuous Descent Operations

A Continuous Descent Operation (CDO) is an aircraft operating technique – enabled by airspace design, instrument procedure design, and facilitated by air traffic control – to allow aircraft to follow an optimal flight path that delivers environmental and economic benefits (reduced fuel burn, gaseous emissions, noise, and fuel costs) without any adverse effect on safety. A CDO allows arriving aircraft to descend continuously from an optimal position with minimum thrust. By doing so, the intermediate level-offs are reduced and more time is spent at more fuel-efficient higher cruising levels, hence reducing fuel burn (i.e. lowering emissions and fuel costs) and producing less noise.[29]

A descent is considered as a CDO if no level off lasting more than 30 seconds is detected. A level off is considered as a segment during which the aircraft has a rate of descent of less than 300 ft/minute. Based on the recommendations made by EUROCONTROL, two CDO performance indicators were developed in 2016:

- *CDO Fuel: binary indicator (yes/no) indicating if a CDO was flown from FL100 to 3000 ft;*
- *CDO Noise: binary indicator (yes/no) indicating if a CDO was flown from FL60 to 3000 ft.*

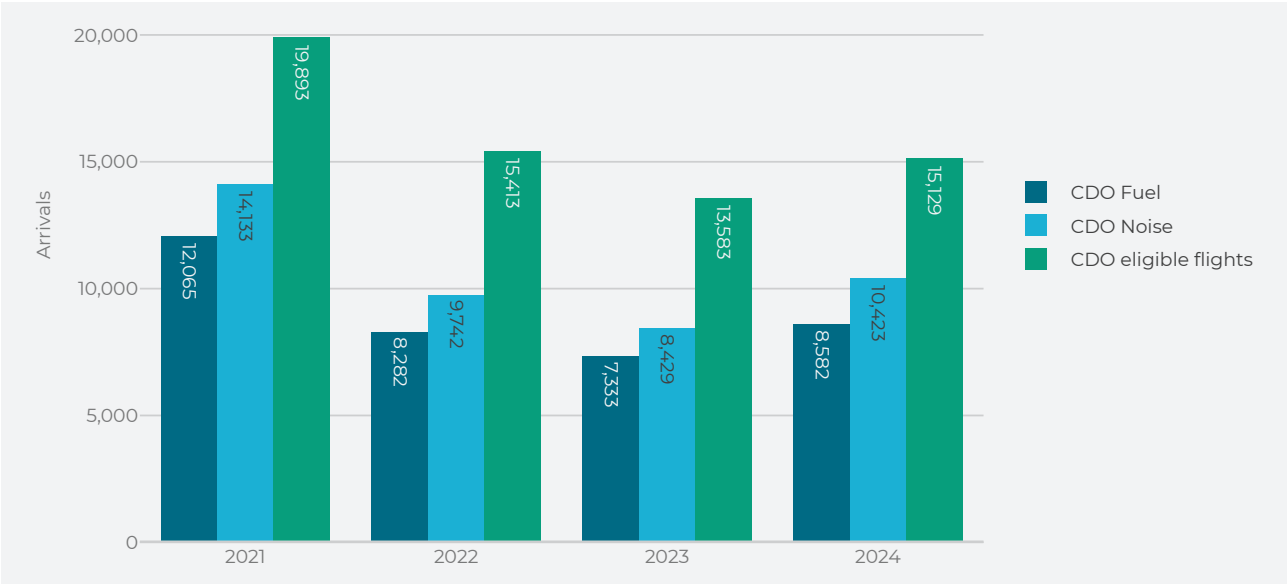
For CDO statistics, a new 'CDO flag' has been incorporated, in order to consider only 'CDO eligible' flights. The following criteria have been defined to flag a movement as CDO eligible flight:

- *It is an IFR arrival;*
- *The aircraft is not categorized as "light", meaning its maximum take-off weight (MTOW) is above 7000 kg.;*
- *It is not a helicopter;*
- *It is not a military flight;*
- *It is not a touch-and-go, i.e. the flight does not involve landing briefly and taking off again;*
- *The observed altitude during the flight must be at or above FL 60 (6,000 ft or 1.8 km).*

29. EUROCONTROL, "European Continuous Climb and Descent Operations Action Plan," [Online]: https://www.eurocontrol.int/publication/european-cco-cdo-action-plan (URL retrieved on 21/02/2024),

The CDO indicators CDO Fuel and CDO Noise are given in ***Figure 4.1***. The graph shows the number of arrivals that have flown a CDO Fuel, a CDO Noise, and the number of arrivals eligible for the CDO statistics, a total of 15,129 in 2024. For consistency, historical CDO statistics are calculated based on the CDO flag. Note that this counting of arrivals differs from the BCAA movements definition used in the previous chapters. The yearly number of CDO Fuel and CDO Noise flown increased in absolute number at a rate slightly higher than the increase in amount of eligible arrivals.

Figure 4.1: *Yearly Comparison CDO Indicators*



The rate of CDO Noise and CDO Fuel flown as a percentage of eligible arrivals per runway is shown in ***Figure 4.2*** and ***Figure 4.3*** respectively. The most used runway, runway 22L, shows a 6% increase in CDO noise in 2024 compared to 2023. For the same runway the amount of CDO fuel remained similar to the last few years, although both these rates are lower compared to the years before 2022. As for runway 04R, the notable decrease over the preceding years has halted and an increase is seen both for CDO fuel and CDO noise.

A multitude of external factors influence CDO statistics, such as:

- Pilots' CDO flying experience;
- Pilots' experience with the airport;
- ATC experience;
- Equipment of the runway;
- Aircraft type and equipment;
- Military airspace being open or closed;
- Traffic flows and traffic streams that can have an impact on the arriving traffic.

Figure 4.2: *Yearly CDO Noise adherence per Runway*

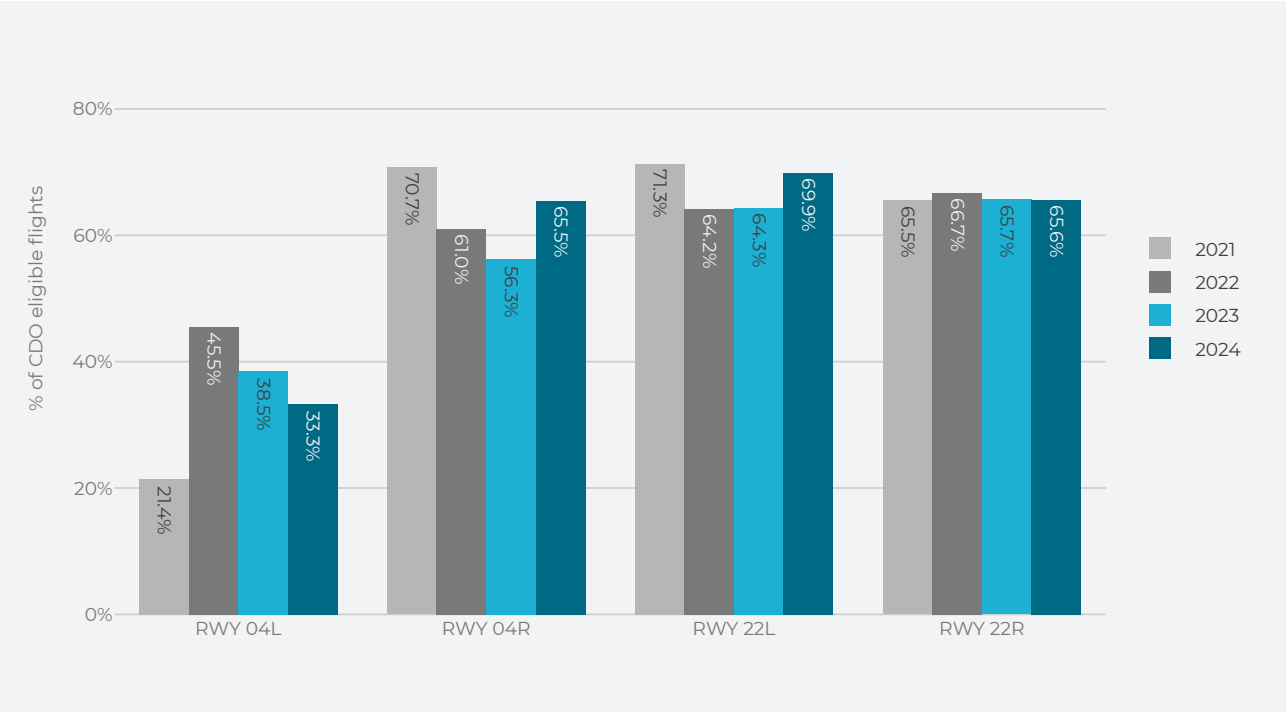
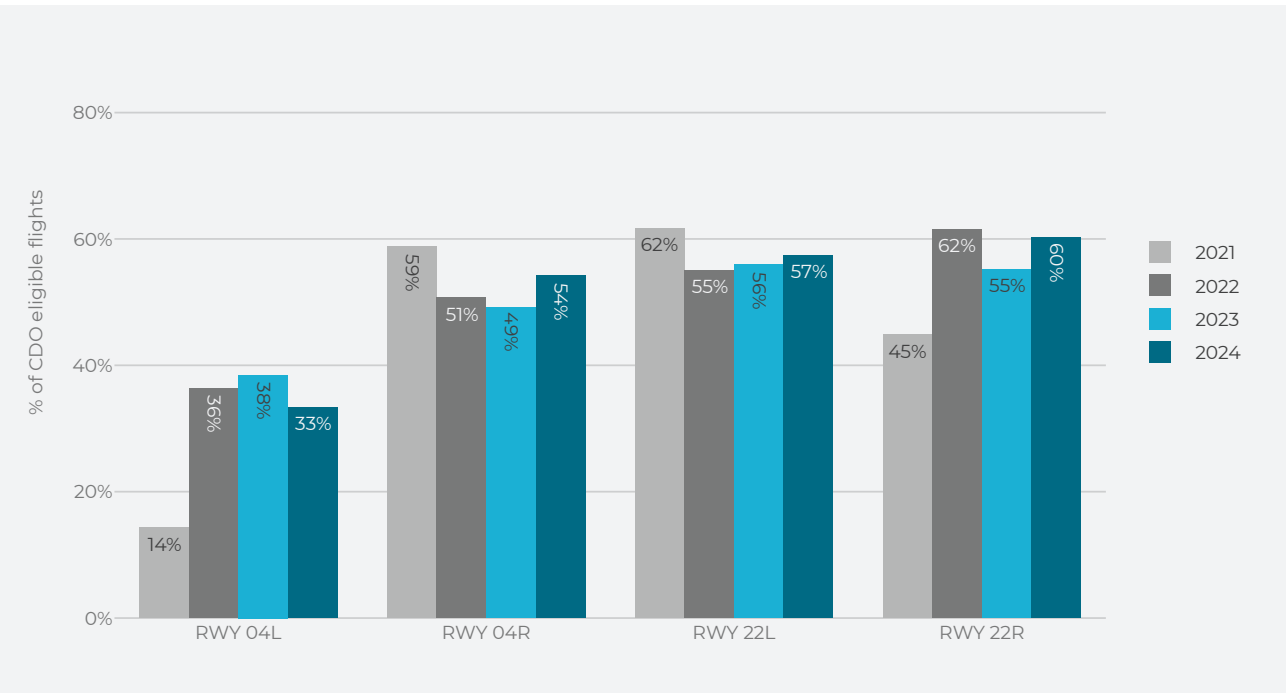


Figure 4.3: *Yearly CDO Fuel Per Runway*



The second method to measure CDOs used by skeyes considers CDO performance by non-binary means, delving into the duration during which an aircraft operates in level-off segment(s). The indicator used by skeyes is the 'Average level-off time below certain altitude'.

The 'Average level-off time below certain altitude' indicator provides a value representing the average time a descending aircraft spends flying level-off within specific altitude ranges. Three distinct altitude ranges are monitored:

- ***10,000 ft to Ground (GND)***
  The upper boundary aligns with the altitude ceiling of 'CDO Fuel';

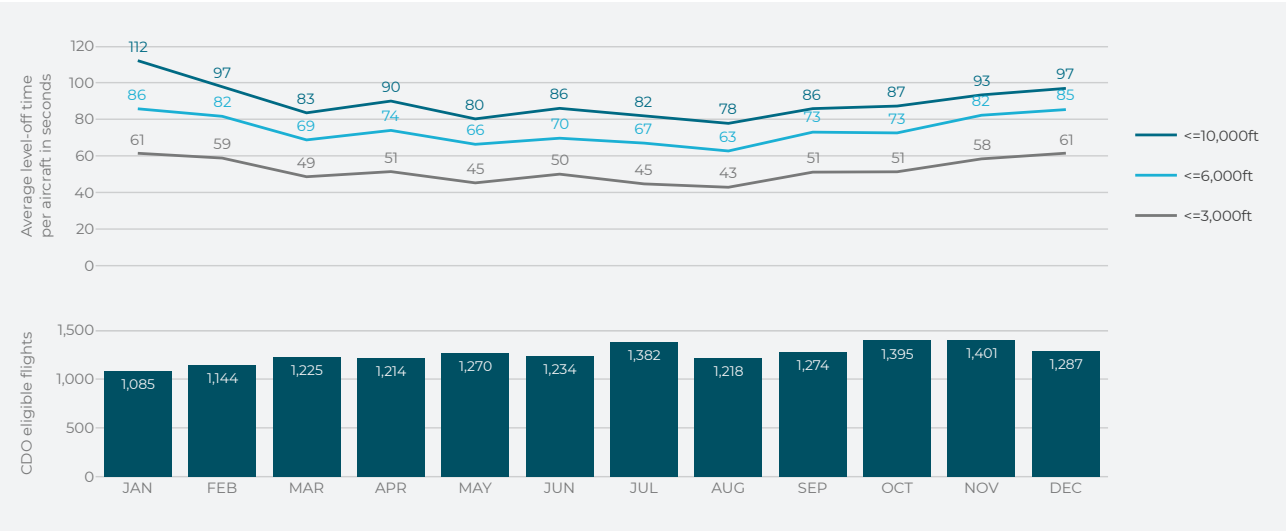
- ***6,000 ft to GND***
  The upper boundary aligns with the altitude ceiling of 'CDO Noise';

- ***3,000 ft to GND***
  This altitude range focuses on level-off segments in low altitudes, which are excluded from 'CDO Fuel' and 'CDO Noise'.

This indicator is based on recommendations from the European CCO/CDO Action Plan and EUROCONTROL ENV Transparency Working Group, emphasizing its alignment with industry best practices and standards.

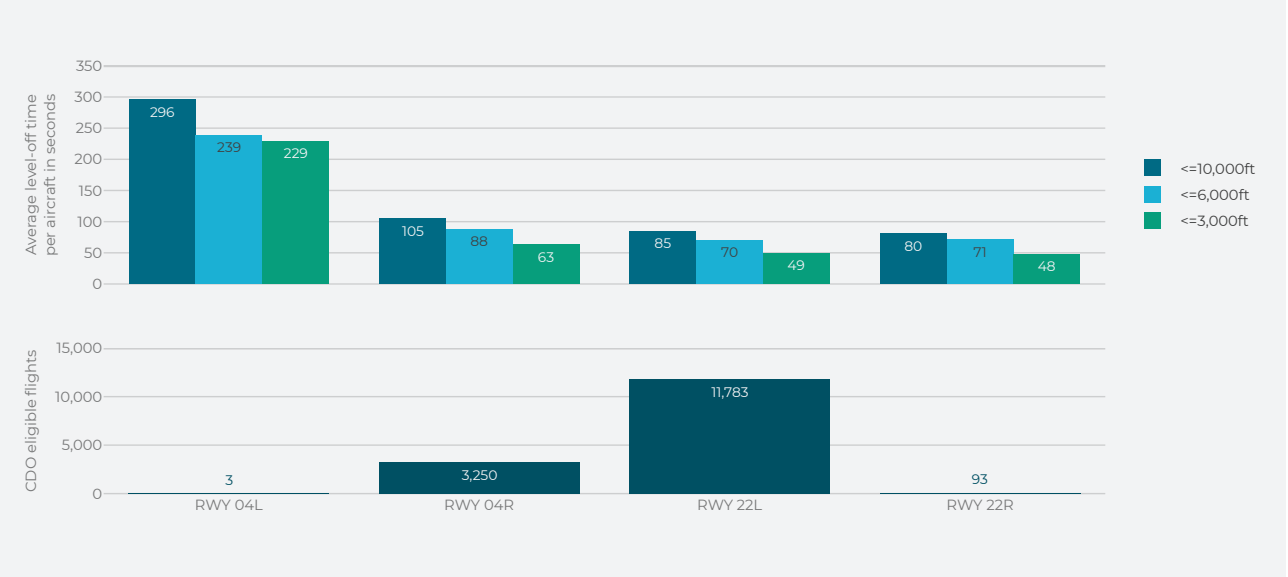
Figure 4.4 shows the monthly evolution of average level-off time below the three monitored altitudes at Liege Airport for 2024. The chart is accompanied by the count of CDO-eligible arrivals, considered for the calculation of the average values. The monthly chart reveals a consistent evolution of average level-off time across all three monitored altitudes, emphasizing that the month-to-month variations were primarily driven by changes in level-off time at low altitudes (≤ 3,000 ft), where the majority of level-off time occurred.

Figure 4.4: *Monthly Average Level-off Time*



In **Figure 4.5**, the distribution of average level-off time across runways in 2024 is depicted, along with the number of arrivals considered CDO eligible. At Liege Airport in 2024, the highest percentage of CDO-eligible arrivals landed on RWY 22L (78%), followed by RWY 04R (21%). The other runways were used for only a fraction of CDO-eligible arrivals. Between the two most used runways, RWY 22L demonstrated slightly better CDO performance in terms of average level-off time compared to RWY 04R.

Figure 4.5: *Average Level-off Time per Runway*



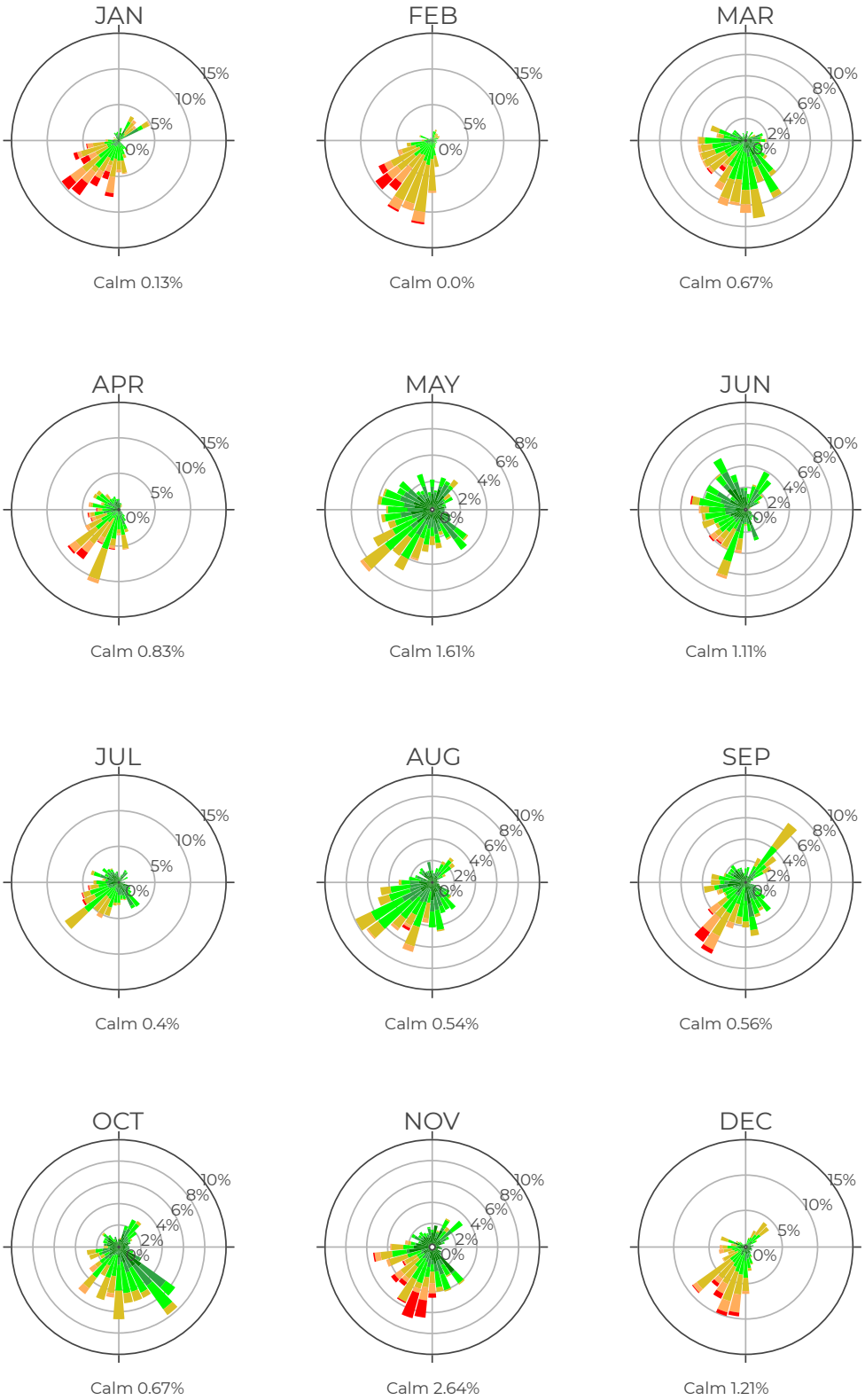
Wind Patterns

One of the main factors for the choice of the runway is wind. At Liege Airport, the wind typically blows in the north-easterly or south-westerly direction, with predominant winds from the south-west. This can also be seen in the wind roses in ***Figure 4.6***. The wind roses show the average wind strength in knots (colour-coded) and the direction the wind is blowing from as the angle of the petal. This way, the wind of the years 2021 to 2024 is summarized.

A monthly view on winds in 2024 is given in ***Figure 4.7***. In January to March and September to December, there were a lot of stronger winds from the south-west or south compared to the rest of the year. In October, some winds from the south-east led to cross winds. The same can be observed from more frequent northerly winds in June, which resulted in a more than average preference for runways 04L & 04R. September was a month with strong winds coming from the north-east, which again explains the higher runway usage of 04L & 04R (see ***Runway Use*** in the Traffic chapter and ***Figure 1.12***). In general, runway usage heavily correlates with wind patterns since the aerodynamics of the aircraft favour head wind for take-off and landings.

Figure 4.6: *Yearly wind roses*

Figure 4.7: *Monthly wind roses in 2024*



Considerations and Improvements

Ongoing efforts to support sustainable operations

skeyes demonstrates its commitment to sustainability in a number of ways, different measures are being investigated or have already been implemented. One of the goals is the promotion and facilitation of the number of CDOs flown to Liege Airport. Some examples of improvements from skeyes include:

- skeyes monitors and adapts operations to enhance flight efficiency, where feasible. As mentioned in the section of the Safety chapter, skeyes designed a PBN implementation and transition plan describing the way ahead to 2030. The purpose of the transition and implementation plan 2024/2030 is the establishment of a full PBN environment within the Belgian part of the Brussels FIR and at the aerodromes of Antwerp, Brussels, Charleroi, Kortrijk, Liege and Ostend. Once the full PBN environment is realized, an optimization of this PBN environment will be initiated. This comprises the redesign of airspace as well as the routes which can then be redesigned independently from the ground-based infrastructure and placed at the most strategically beneficial location. skeyes has been analysing Liege Airports CDO performance and communicated the on-going results with the airport and airlines to continuously improve the environment performance.

- skeyes obtained the GreenATM level 3 accreditation in 2024. The Civil Air Navigation Service Organisation's (CANSO) GreenATM is an environmental accreditation programme to provide air navigation service providers (ANSPs) with an independent, industry-endorsed, accreditation of their environmental efforts.

- skeyes is engaging with airlines to present CDO statistics and communicate the relevant phraseology, while also raising awareness among ATCOs through training courses and regular updates on current performance and statistics.

- As a member of FABEC, skeyes actively participates in workshops and initiatives to improve – amongst others – CDO performance. skeyes also participates in the AVENIR working group, an element in the EUROCONTROL – EASA Joint Working Program, discussing environmental improvements. An output of these discussions is the creation of the Level-off indicators.

- Additionally, the agreement on 'collaborative environmental management' (CEM) at Liege Airport continues to show benefits.

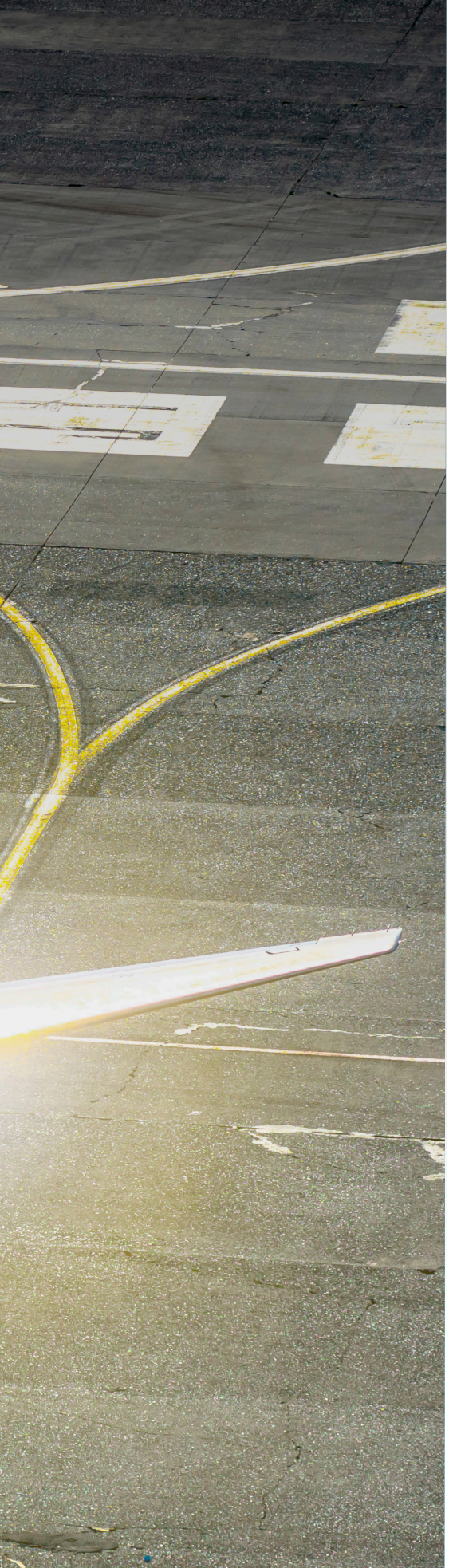
- skeyes continuously expands and renews its toolset for performing (environmental) assessments. For this purpose, skeyesAnalyzer (a web-based radar visualisation tool) was developed and it is being implemented. This tool will – amongst others – assist various skeyes teams in visualizing, retrieving and analysing aircraft track data. The tool will also increase transparency towards the public, as it will comprise a publicly available interface.

Liege Airport's roadmap to environmental sustainability

Apart from skeyes, Liege Airport has its own environmental strategy. In 2024, Liege Airport's Board of Directors adopted an ambitious roadmap defining objectives, indicators and trajectories for the six pillars of the environmental strategy (reduction of CO^2 emissions, noise and quality of life for local residents, maintenance of biodiversity, improvement of air quality, soil/water quality, mobility of workers and heavy goods vehicles). In terms of CO^2, the aim is to reduce emissions by 75% in 2030, 85% in 2040 and to reach net zero carbon in 2050 (scope 1 & 2).[30]

30. **Communiqué de presse: Une excellente année pour Liege Airport.**
(Press release of 10/01/2025)

ANNEX



- **Missed Approaches**
- **Fact Sheets**

Annex A: Missed Approaches

Table 0.1: *Missed approaches per category per runway*

	Reasons	2021	2022	2023	2024
RWY 04R	FOD on the runway	-	-	1	-
	GPWS / obstacle warning	-	-	-	-
	aircraft with technical problems	2	2	-	1
	departing traffic on the runway	1	1	1	-
	other	3	1	1	1
	pilot's error	1	-	-	1
	previous landing on the runway	1	1	-	1
	runway condition	-	-	-	1
	runway incursion	-	-	-	-
	tail wind	-	-	-	-
	taken out of sequence	-	-	-	-
	technical problems of ground equipment	1	-	1	-
	too close behind preceding	2	-	-	-
	training flight	-	-	-	1
	unstable approach	9	5	2	5
	weather - thunderstorm - windshear	7	1	-	-
	weather - visibility	3	2	3	2
	Total	**30**	**13**	**9**	**13**
RWY 22L	FOD on the runway	1	-	-	-
	GPWS / obstacle warning	-	-	-	1
	aircraft with technical problems	1	4	1	1
	departing traffic on the runway	2	2	1	-
	other	4	4	6	6
	pilot's error	-	-	3	2
	previous landing on the runway	3	2	2	2
	runway condition	-	-	-	1
	runway incursion	1	1	-	-
	tail wind	1	-	-	-
	taken out of sequence	-	1	2	-
	technical problems of ground equipment	-	-	1	-
	too close behind preceding	1	1	2	-
	training flight	-	1	1	2
	unstable approach	23	17	11	15
	weather - thunderstorm - windshear	2	8	2	2
	weather - visibility	1	4	5	1
	Total	**40**	**45**	**37**	**33**

No missed approaches for RWY 22R and RWY 04L from 2021 to 2024

Annex B: Fact sheets

TRAFFIC

Yearly Evolution

Movements	2021	2022	2023	2024	2024 vs 2023	2024 vs 2021
IFR	43,611	34,980	30,734	33,400	+9%	-23%
VFR	5,303	6,012	5,090	7,054	+39%	+33%
Total	48,914	40,992	35,824	40,454	+13%	-17%

Quarterly comparison

Movements	2021	2022	2023	2024	2024 vs 2023	2024 vs 2021
Q1	10,881	12,564	7,956	8,940	+12%	-18%
Q2	12,511	9,658	9,466	10,791	+14%	-14%
Q3	13,036	10,236	9,390	10,717	+14%	-18%
Q4	12,486	8,534	9,012	10,006	+11%	-20%

SAFETY

Missed Approaches

46 missed approaches in 2024 (same amount as in 2023).

TOP three causes in 2023:

1. Unstable approach (21);
2. Other (7, see Safety chapter for explanation);
3. Weather - visibility (4).

Safety Occurrences

- 6 runway incursions, 1 with ATM ground contribution;
- 18 other occurrences of runway safety events – double of the previous year (9 in 2023).

Capacity

- Capacity exceeded on two days for RWY 22L only due to majority VFR traffic;
- IFR capacity was never exceeded.

Runway configuration	*Declared IFR Capacity*	*Maximum Movements/Hour*
04	*35 movements/hour*	*37 movements/hour*
22	*34 movements/hour*	*41 movements/hour*

Punctuality

Arrival delay:

- Arrival delay: 0 min/flight;
- CRSTMP delay: 0 min/flight.

ATFM impact:

- Departures: 44,274 minutes of ATFM delay (2,006 due to skeyes' regulations);
- Arrivals: 22,476 minutes of ATFM delay (951 due to skeyes' regulations).

CDO

- Rate of CDO Fuel (57%) and CDO Noise (69%) improved compared to 2023;
- RWY 22L demonstrated slightly better CDO performance compared to RWY 04R;
- The month-to-month variations were primarily driven by changes in level-off time at low altitudes (≤ 3,000 ft), where the majority of level-off time occurred.

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Runway Performance Report **2024**

skeyes / tervuursesteenweg 303 / b-1820 Steenokkerzeel

T +32 2 206 21 11 / F +32 2 206 22 88

Member of FABEC

www.skeyes.be