EUROCONTROL
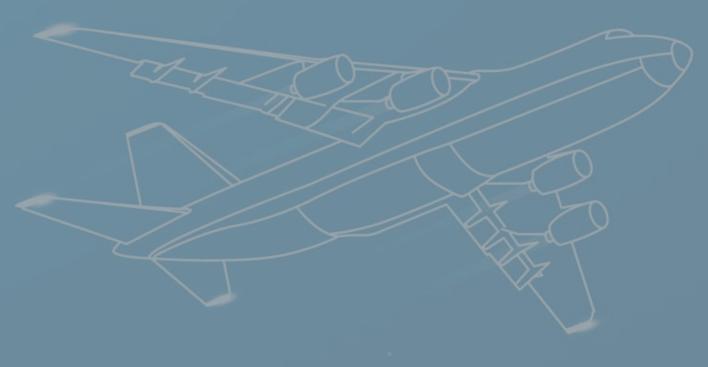MAASTRICHT UPPER AREA CONTROL CENTRE
ANNUAL REPORT 2019

EUROCONTROL

PERFORMANCE THROUGH INNOVATION

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FAST FACTS

MUAC cost-base (M€ – €2019)	2015	2016	2017	2018	2019	2019 ↔ 2018
TRAFFIC						
Movements	1,702,263	1,779,969	1,848,581	1,872,686	1,862,754	-0.5%
IFR flight-hours	600,969	625,901	645,062	667,869	667,596	0.0%
Service Units	6,625,272	7,057,838	7,366,791	7,659,462	7,600,610	-0.8%
Sector Opening Time (SOT) – (hours)	72,850	76,218	77,159	75,275	71,219	-5.4%
Traffic peak (max. number of flights controlled per day)	5,266	5,486	5,689	5,702	5,670	-0.6%
Average flights controlled per day	4,435	4,635	4,831	4,903	4,851	-1.1%
Average flights controlled in summer (May-October) per day	4,855	5,102	5,307	5,342	5,259	-1.6%
STAFF						
MUAC staff (former Lippe staff excluded)	613	616	639	681	699	2.6%
ATCOs in OPS	306	304	302	303	300	-1.0%
ATCOs in OPS (FTEs)	265	267	266	259	255	-1.5%
COST-EFFICIENCY (€2019) [1]						
Inflation rate (Netherlands)	+0.2%	+0.1%	+1.3%	+1.6%	+2.3%	43.8%
Revenues (€M)	€549.3	€546.9	€519.4	€504.4	€475.7	-5.7%
Total fixed-assets at year-end (net book value; €M) [2]	€5.6	€4.0	€5.0	€6.8	€7.5	9.4%
Capital expenditure at year-end (€M)	€73.2	€68.2	€63.9	€60.2	€112.6	86.9%
Cost-base (€M)	€142.7	€150.8	€155.4	€160.2	€170.7	6.5%
Staff costs	€120.4	€125.4	€127.0	€128.1	€137.6	7.4%
Non-staff operating costs	€12.6	€16.4	€19.8	€22.3	€23.0	3.4%
Depreciation	€9.3	€8.6	€8.4	€9.5	€9.8	3.3%
Cost of capital	€0.5	€0.4	€0.2	€0.3	€0.2	-28.0%
Exceptional reduction	0	0	0	0	0	-
Total financial cost/IFR flight-hour [3]	€238	€241	€241	€240	€256	6.6%
Total economic cost/IFR flight hour [4]	€340	€407	€443	€475	€307	-35.5%
MUAC Equivalent Unit Rate [5]	€21.5	€21.4	€21.1	€20.9	€22.5	7.4%

MUAC cost-base (M€ – €2019)	2015	2016	2017	2018	2019	2019 ↔ 2018
CAPACITY						
Productivity	1.97	2.03	2.06	2.22	2.23	0.5%
Total delay (min.)	582,487	982,369	1,232,634	1,482,997	320,571	-78.4%
CRSTMP delay (min.) [6]	393,353	514,499	803,384	927,974	181,387[7]	-80.5%
Average total delay/flight (min.)	0.34	0.55	0.67	0.79	0.17	-78.3%
Average CRSTMP delay/flight (min.)	0.23	0.29	0.43	0.50	0.10	-80.3%
Punctuality (%)	97.7%	96.3%	95.5%	95.4%	98.8%	-
Delayed flights (%)	2.3%	3.7%	4.5%	4.6%	1.2%	-
Delayed flights (WO codes, %)	0.6%	1.3%	1.1%	1.2%	0.4%	-
Delayed flights (CRSTMP codes; %)	1.7%	2.4%	3.5%	3.3%	0.8%	-
Flights with 1-15 min. of delay (CRSTMP codes, %) [8]	1.2%	1.8%	2.5%	2.1%	0.6%	-
Flights with 16-30 min. of delay (CRSTMP codes, %)	0.4%	0.5%	0.8%	0.9%	0.2%	-
Flights with +30 min. of delay (CRSTMP codes, %)	0.1%	0.1%	0.2%	0.3%	0.0%	-
Congested days (minutes of delay > traffic)	30	43	59	90	13	52.5%
SAFETY						
Separation infringements (MUAC contribution)	0	3	2	3	0	-
ENVIRONMENT						
Flown RESTR	0.44%	0.48%	0.45%	0.47%	0.47%	-

(1) Cost-efficiency indicators are calculated on the cost-base.

(2) Total fixed assets, including work in progress.

(3) Total financial cost per flight-hour: ATM/CNS service provision cost per IFR flight-hour.

(4) Total economic cost per IFR flight-hour: key performance indicator used for ATM cost-effectiveness (ACE) benchmarking. It is the sum of ATM/CNS provision costs and ATFM delay costs per IFR flight-hour. This indicator enables the trade-offs between cost and capacity performance to be measured.

(5) The key performance indicator for cost effectiveness defined in the Single European Sky (SES) II Performance Regulation is the unit cost. Since the unit cost is calculated on the basis of consolidated costs and production at national level, the concept of a MUAC equivalent unit cost has been introduced as a performance indicator. This indicator takes into account the specific MUAC costs and production. "Equivalent" indicates that the calculation does not take the full cost of MUAC service provision into account; EUROCONTROL support costs and the cost of using CNS infrastructure, which is made available free of charge by the Four States, are not included.

(6) Minutes of delay allocated to MUAC following an adjustment and reallocation of en-route ATFM delay by NM.

(7) C-ATC Capacity, R-ATC Routeings, S-ATC Staffing, T-ATC Equipment, M-Airspace Management and P-Special event delay

(8) Flights with less than 1 minute of delay are excluded

MUAC PROFILE

The Maastricht Upper Area Control Centre (MUAC) is an international non-profit civil-military integrated air navigation service provider, operated by EUROCONTROL on behalf of the Four States – Belgium, Germany, Luxembourg and the Netherlands.

MUAC ensures that aircraft flying in the upper airspace (above 24,500 feet or 7.5 km) over Benelux and north-west Germany can do so safely and efficiently.

To manage this busy and complex airspace, MUAC is organised on a multinational, cross-border basis. It is a working example of how European cooperation, at both civil and military levels, can result in safety, capacity and efficiency benefits for all.

MUAC is uniquely positioned to provide sustainable air navigation services in a large airspace block, satisfying customer expectations and increasing air traffic demand.

Consolidating airspace across national borders

For nearly 50 years, MUAC has played a pivotal role in integrating European airspace on a functional basis, driven not by national boundaries, but by the operational requirements of international traffic flows.

Thanks to its provision of seamless air navigation services to the upper airspace (above 24,500 feet) of Belgium, north-west Germany, Luxembourg and the Netherlands, MUAC enjoys a leading position in the core area of Europe. In order to maintain this position, it continuously strives to deliver safe, efficient, cost-effective and impartial cross-border air navigation services in a dynamic air transport marketplace.

From 1975 to 2017, German controllers from Lippe Radar have provided military air traffic control in the Hannover Upper Information Region (UIR) – the upper airspace (above 24,500 feet) of north-west Germany – from the premises of MUAC. On 1 January 2017, Lippe Radar was integrated into MUAC, laying the foundations for fully integrated civil-military air traffic management.

Since April 2017, military traffic in the upper airspace of the Amsterdam Flight Information Region (FIR) has also been handled by MUAC controllers. With this development, MUAC became the first cross-border civil-military ANS provider in Europe.

On 22 December 2016, EUROCONTROL and Belgian Defence signed an agreement for the provision, by MUAC, of air traffic control data services to Belgian Air Defence. The shared ATS system became operational in 2019 at the air traffic control centre (ATCC) for en-route military operations and at the ATC towers in Beauvechain, Florennes, Kleine-Brogel and Koksijde for approach and tower operations.

One of MUAC's flagship activities is the development and implementation of leading-edge infrastructure and technology solutions to ensure that customers and stakeholders benefit from the highest levels of performance. MUAC's active involvement in SESAR (Single European Sky ATM Research) is instrumental in meeting this objective.

Mission and vision

MUAC's mission is to lead the way by providing safe and efficient cross-border ATM to all airspace users while developing and integrating cutting-edge systems and services with our partners.

MUAC's vision:
• MUAC is a leading innovator recognised for its outstanding ATM services and systems that set the standard for the industry.
• MUAC provides its ATM services and systems to airspace users, Network Manager and ANSPs.
• As a leading innovator, MUAC is a strategic partner of choice.

Geographical scope

The area of responsibility of MUAC in Belgium, Germany, Luxembourg and the Netherlands consists of the Brussels UIR (Upper Information Region), the Amsterdam FIR and the Hannover UIR from flight level 245 to flight level 660.

The MUAC area of responsibility is a complex and dense airspace in the close vicinity of major airports, including Amsterdam, Brussels, Copenhagen, Düsseldorf, Frankfurt, London and Paris. MUAC interfaces with a large number of civil and military area control centres and upper area control centres.
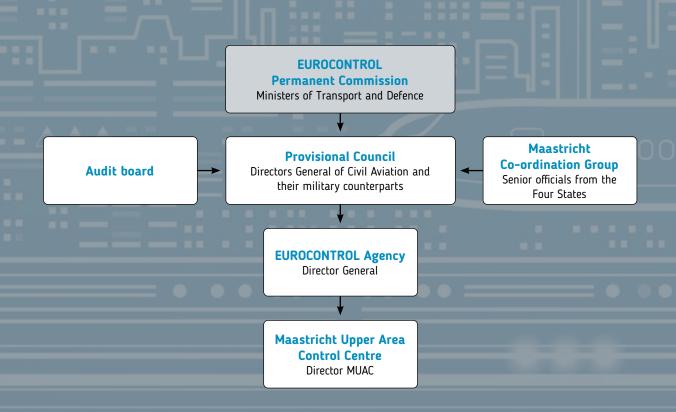
OVER 17% OF ALL EUROPEAN FLIGHTS USE MUAC'S AIRSPACE

CORPORATE GOVERNANCE

MUAC is operated by EUROCONTROL on behalf of Belgium, Germany, Luxembourg and the Netherlands on the basis of the Agreement relating to the Provision and Operation of Air Traffic Services and Facilities by EUROCONTROL at the Maastricht Upper Area Control Centre (the "Maastricht Agreement"), signed on 25 November 1986. EUROCONTROL is an international organisation established under the EUROCONTROL Convention of 13 December 1960, subsequently amended on 12 February 1981.

In line with Article 15 of the EUROCONTROL Amended Convention, air traffic services at MUAC are provided in accordance with the national regulations in force in the respective territories and airspaces concerned.

The Maastricht Co-ordination Group was established to facilitate decision-making by determining a common position for the Four States (Belgium, Germany, Luxembourg and the Netherlands) in all matters relating to the operation of air traffic services at MUAC. Day-to-day responsibility for operations has been delegated to the Director of MUAC by EUROCONTROL's Director General. Each of the Four States retains its own regulatory competence.

**EUROCONTROL
Permanent Commission**
Ministers of Transport and Defence

Audit board

Provisional Council
Directors General of Civil Aviation and their military counterparts

**Maastricht
Co-ordination Group**
Senior officials from the Four States

EUROCONTROL Agency
Director General

**Maastricht Upper Area
Control Centre**
Director MUAC

Regulation

In addition to the international regulatory regime, air navigation service provision at MUAC is subject to four national regulatory regimes, each specifically defining applicable rules and regulations. Over recent years, regulation and oversight of MUAC have been exercised in a coordinated manner by the Four States' National Supervisory Authorities (4NSAs). In 2017, military regulations expanded the scope of applicable regulations.

Supervision and oversight

Further to the adoption of Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004, laying down the framework for the creation of the Single European Sky (the framework Regulation), each of the Four States has established National Supervisory Authorities (NSAs). In Belgium, it is the Belgian Supervisory Authority for Air Navigation Services (BSA-ANS); in Germany, the Federal Supervisory Authority for Air Navigation Services (BAF); in Luxembourg, the Civil Aviation Authority (CAA Luxembourg); and in the Netherlands, the Human Environment and Transport Inspectorate (ILT) of the Ministry of Infrastructure and Water Management.

The 4NSAs have created two bodies to support the oversight of MUAC: the NSA Committee, representing all four NSAs, having a coordination and advisory role for the relevant national decision-making authorities on oversight issues; and the Common Supervisory Team, composed of personnel from the cooperating NSAs, who have an executive role in performing document examinations, audits and inspections. The Dutch Military Aviation Authorities (MAA) perform the oversight on MUAC as an ANSP for military traffic and as a Training Organisation for air traffic controllers (ATCOs).
The oversight of service provision to Germany for the military traffic is performed by the 4NSA committee, which includes the BAF (Germany) and is supported where needed by the German MAA.

Designation of MUAC as an air traffic service provider

In accordance with Article 8 of Regulation (EC) No 550/2004 of the European Parliament and of the Council of 10 March 2004 on the provision of air navigation services in the Single European Sky (the service provision Regulation), EUROCONTROL was designated as an air traffic service provider in the Netherlands, by amendment to the Aviation Act in October 2007. Belgium, Germany and the Netherlands maintain the designation of EUROCONTROL as an air traffic service provider as per the Maastricht Agreement and the relevant national laws.

Certificates

In line with Single European Sky legislation, MUAC holds the certificate for the provision of air navigation services in the European Community. The certificate was granted in 2006 by the Netherlands' Transport and Water Management Inspectorate and Directorate General for Civil Aviation and Freight Transport.

In 2009, the Belgian Supervisory Authority for Air Navigation Services certified MUAC for the provision of unit and continuation training for air traffic controllers and for the provision of training to certify the roles of on-the-job training instructors, competence examiners and/or competence assessors of the delivery of air traffic services. This certificate was updated in 2011 pursuant to Commission Regulation (EU) No 805/2011.

In 2015 MUAC was certified as provider of Communication and Surveillance Services by the Dutch NSA.

MUAC is, as of 1 January 2017, accredited to provide ATC to the German Air Force. In 2017, MUAC was also accredited by the Dutch MAA to provide ATC to the Royal Netherlands Air Force (RNLAF).

ISO 9001 certificate

An important milestone in 2018 was MUAC's periodic certification in September/October by DNV GL (Det Norske Veritas Germanischer Lloyd) to the ISO 9001:2015 standard.

In order to be certified, the organisation must demonstrate that it has implemented quality management requirements for all areas of the organisation, ranging from people and training to services and infrastructure. MUAC's compliance with ISO 9001 is a key priority, since it is a prerequisite for meeting the requirements of the Single European Sky.

Furthermore, the ISO 9001:2015 certificate is a mark of quality for external and internal stakeholders and will function as Acceptable Means of Compliance (AMC) when it comes to meeting the quality elements of the new EU common requirements 2017/373 for ANSPs, applicable as from 2 January 2020.

Controller licensing

Since March 2010, the Belgian Civil Aviation Authority has been the licence-issuing authority for air traffic controllers and student air traffic controllers at MUAC. MUAC controllers hold a Belgian ATC licence for the delivery of services in Belgian, Dutch, German and Luxembourg airspace. The licences are issued in accordance with Commission Regulation (EU) 2015/340 of 20 February 2015, laying down technical requirements and administrative procedures relating to air traffic controllers' licences and certificates pursuant to the new Basic Regulation (EC) No 2018/1139 of the European Parliament and of the Council. The certificate was issued by BSA-ANS on 13 December 2016.

Enterprise risk management

MUAC continuously strives to improve its risk management processes and all business risks are reviewed based on how they impact the achievement of MUAC's strategic objectives.

The business risk management process is aligned with the Agency risk management process and facilitates risk identification and monitoring. Risks, which are assessed to impact the achievement of MUAC's business objectives, are registered and maintained in MUAC's corporate risk register. Each risk identified requires a mitigating action, reducing the probability of the risk materialising and/or its impact.

MUAC's risk register is updated every quarter, based on assessments by the responsible risk owners and ultimately decided by the MUAC Board. Risks which are escalated to Agency level are shared and discussed with the Agency Risk Management Group on a quarterly basis, consolidated in the Agency Risk Register and tabled for discussion at subsequent Agency Board Meetings.

MAASTRICHT COORDINATION GROUP

Belgium

Head of Delegation

Mr Patrick VANHEYSTE
Federal Public Service for Mobility and Transport
Director Belgian Supervising Authority for ANS

Other participants

Mr Theo NSENGIMANA
Belgian Civil Aviation Authority

Maj. Nancy LESIRE
Belgian Armed Forces – Air Component

Ms Peggy DEVESTEL
skeyes

Mr. Pieter VERSTREKEN
Belgian Civil Aviation Authority
Chair of the BFWG-4 during 2019

Germany

Head of Delegation

Mr Dirk NITSCHKE
Federal Ministry of Transport and Digital Infrastructure

Other participants

Ms Bernadette KING
Federal Ministry of Transport and Digital Infrastructure

Lt. Col. Andreas HABRUNNER
Federal Ministry of Defence

Lt. Col. Rene BANSEMER
German Air Force Air Operations Command

Mr Dirk MAHNS
Deutsche Flugsicherung

Luxembourg

Head of Delegation

Mr Pierre JAEGER
Director General of Civil Aviation

Other participants

Mr Ender ÜLCÜN
Ministry of Sustainable Development and Infrastructure
Chair of the Maastricht Coordination Group during 2019

Netherlands

Head of Delegation

Ms Marjan van GIEZEN
Ministry of Infrastructure and Environment

Other participants

Mr Eric DE VRIES
Ministry of Infrastructure and Environment

Mr Ference VAN HAM
Ministry of Infrastructure and Environment

Lt. Col. Leon CREMERS
Ministry of Defence

Mr Bert ROLVINK
Luchtverkeersleiding Nederland

Observers

Mr Emil KARLSSON
Staff Committee Servants

MANAGEMENT

Director General of EUROCONTROL

Mr Eamonn BRENNAN

MUAC Board

Mr John SANTURBANO
Director

Niels LOKMAN
Chief Operating Officer

Martin SCHNEIDER
Head of Current Operations

Razvan MARGAUAN
Head of Technical Systems

Chris JEEVES
Head of Strategy and Performance Management (acting)

Chris STADLER
Head of ATM Strategy

Bart VANDERSMISSEN
Head of Change Management

Daniel LIU
Head of Human Resources Management (acting)

MCG CHAIR'S STATEMENT

One of MUAC's strengths has always been to be flexible and adaptable to the situation – transforming challenges into opportunities. Never has this strength been put to the test to such a degree than during the events of 2020. The impact of the COVID-19 pandemic on the aviation industry has been dramatic as lockdowns across the globe forced airlines to ground entire fleets with the attendant effects on airports, states and ANSPs. The effect was felt only too strongly in the centre as sadly a member of the Security and Safety Team succumbed to the virus.

This statement was intended to be a short overview of the performance of the centre in 2019 where MUAC met the demand from the airspace users and did so with an impressive safety record, low delay and within budget.

However, it is important to address the situation following the outbreak of the pandemic. As a critical infrastructure, providing services to both civil and military customers, MUAC must both continue to operate during the crisis and provide the highest possible level of service throughout the recovery period and beyond.

As a result, MUAC has taken extensive measures to protect the health of its employees and maintain its operations and has a solid recovery plan in place to support the airlines and military partners as confidence returns and flights return to our skies.

I am confident in MUAC's ability to weather this storm and to emerge fit for the challenges ahead.

You will read in this report about the good performance of MUAC over the course of 2019. This performance would not be possible without the dedication and effort from the employees of the centre. MUAC strongly believes in its employees and their potential and has made substantial efforts to foster engagement and innovation at all levels of the organisation.

It is the spirit from staff that drives the culture and it is this culture that will be required as we emerge from lockdown ready to provide the outstanding quality of service on which MUAC has built its reputation.

Ender ÜLCÜN
Chairman of the Maastricht
Co-ordination Group during 2019

Last year I remarked on 'how MUAC's genetic make-up is programmed to take on such a challenge and that its DNA, consisting of all those values and competences which make it able to adapt and adjust to the changing environment, is to be found in all MUAC staff'. At that time I was talking about the demand of traffic, however, it is clear to me that the principle holds true irrespective of the challenges being faced.

The events of the recent months have highlighted for me the resourcefulness and the work ethic that exists in MUAC. As director, I am confident in the way that we responded to the crisis and have seen at first-hand how MUAC is able to adapt and simply 'make things work' in very difficult circumstances.

Looking back on 2019, MUAC handled a similar volume of traffic as in 2018 but with a substantially improved performance. There were no category A or B safety infringements – only the second year in recent memory where this was achieved. It is worth remembering that safety is the cornerstone of any ANSP's activities and in MUAC it is always the first priority.

Overall, MUAC handled 1,862,754 flights in 2019. Thanks to a number of measures including eNM/2019, Free Route Airspace, MUAC Customer Initiative etc., MUAC was able to handle the demand with a 78% delay reduction compared to the previous year. 98.8% of flights were on time with an average delay of only 0.17 min/flight. Controller productivity also reached 2.23 flight hours/ATCO hour, the highest ever in the centre.

The financial outturn for 2019 was within the agreed budget and at the end of RP2 I can report that for the 5-year period, the MUAC outturn was €15M under the RP2 plan while we delivered 2.1M more service units than was originally forecasted.

In addition to providing the best possible services, our teams also devote a great deal of effort in regularly consulting our customers, both civil and military, and getting direct feedback from them. The feedback is positive, they are all aware of our challenges and appreciate the efforts we are making.

In December 2019, we successfully transitioned to 24/7 Free Route Airspace. This contributes to reducing the environmental footprint of aviation. Indeed, I am convinced that the topic of environment deserves our full attention. In 2019 I took on the role of Champion Environment within FABEC and together with my team have started a number of initiatives locally in MUAC, in the FABEC sphere and also with EASA.

Looking forward, it is clear that 2020 presents an exceptional challenge to the aviation industry and I am confident that MUAC together with all stakeholders – ANSPs, airlines and states, will thrive and stay true to the goal of providing outstanding civil-military integrated services.

John Santurbano
Director, MUAC

PERFORMANCE THROUGH INNOVATION
2019 HIGHLIGHTS

03 / MAR

The collaboration agreement with iTEC Alliance members is signed on 13 March 2019.

NM, MUAC and other partners receive the Single European Sky Innovation Award for interoperability with the EUROCONTROL Network Manager on 12 March 2019.

04 / APR

On 25 April 2019, cross-border free route airspace managed by MUAC, NAVIAIR, LFV and DFS allows cross-border free route operations. Airspace users planning to fly in the upper airspace between Belgium, Luxembourg, the Netherlands, Germany, Denmark and Sweden can now do so irrespective of airspace boundaries.

06 / JUN

The 100,000th candidate worldwide completes the FEAST test and it happens at MUAC.

The new EUROCONTROL website is launched with the aim to strengthen stakeholder engagement as well as sharing essential ATM data in a transparent manner.

The first two military controllers, former DFS (Lippe), complete their civil training.

07 / JUL

On 10 July 2019, Ms. Cora Van Nieuwenhuizen, Minister of Infrastructure and Water Management of the Netherlands, visits MUAC.

Aircraft operated by easyJet start exchanging Automatic Dependent Surveillance – Contract (ADS-C) data with MUAC air traffic controllers on 25 July 2019.

10 / OCT

On 16 October 2019 MUAC and NATS start operating cross-border arrival management (XMAN) for London Gatwick Airport as part of the SESAR2020 PJ 25 Project XSTREAM.innovation across all areas of MUAC activities.

The MUAC Innovation Lab – the InnoLab - sees the light of day. The goals of the InnoLab are to foster collaboration and engagement among all staff and drive innovation across all areas of MUAC activities.

11 / NOV

The third OAT@MUAC military customer forum takes place in Genk on 6 and 7 November. Participants include military representatives from Germany, Belgium, the Netherlands, the European branch of the United States of America, as well as delegates from the DFS.

29 delegates representing airlines, freight operators, Computerised Flight Plan Service Providers, airline associations and the US Air Force meet in Amsterdam for the MUAC plenary customer consultation meeting on14 and 15 November.

12 / DEC

On 2 December 2019, the Shared Air Traffic Services System 2 (SAS2) is put into service by the Belgian Ministry of Defence at the skeyes site in Steenokkerzeel, and at the military airbases in Beauvechain, Kleine-Brogel, Koksijde and Florennes. The Belgian military air traffic controllers and the civil air traffic controllers at MUAC now work with a single air traffic management (ATM) system.

As the last step of the programme's incremental deployment, MUAC implements H24 free route airspace operations in its area of responsibility on 5 December 2019.

KEY RESULTS
KEY RESULTS VS 2019 ANNUAL PLAN TARGETS AT A GLANCE

MUAC	Target 2019	Result
Traffic forecasts *(STATFOR Oct. 2018 – Baseline)*	MUAC: + 2.7% Brussels: + 3.0% DECO: + 2.9% Hannover + 2.7%	MUAC: - 0.5% Brussels: - 2.2% DECO: - 0.2% Hannover: - 0.4%
Safety	Effectiveness of safety management - Achieve a minimum level 4 (or 80%) in each of the 5 Management Objectives.	**In place** ✅
	RAT methodology applied for severity classification for all reported occurrences (i.e. 100% by the end of RP2)	**100% applied** ✅
	No CAT. A+B incidents – (threshold is max. 3 incidents)	**No severity A&B incidents** ✅
	Just culture – preparation for 2019 target	In progress
Capacity *(average delay per flight in minutes)*	0.18 (all delay causes)	**0.17** ✅
	0.14 (CRSTMP delay causes)	**0.10** ✅

MUAC	Target 2018	Result
Environment *(reduced route extension)*	Not directly applicable at single ANSP level (see next table). However, MUAC contribution to the FABEC KEA indicator is measured via internal targets: Monitoring of improvement of REDES and RESTR indicators Annual target for: planned REDES (max 7.50%) actual REDES (max 3.90%) planned RESTR (max 1.80%) actual RESTR (max 0.55%)	 **7.70%** ✗ **4.12%** ✗ **1.80%** ✓ **0.47%** ✓
Cost-efficiency *(Cost-base and MUAC equivalent unit cost (€2018).* *For RP2, MUAC is subject to traffic risk sharing.*	Approved MUAC cost-base after the Administrative Reform: €179.3 M (excluding frozen staff costs) The equivalent unit cost is a monitoring value as no target was set in the Annual Plan. However, the equivalent unit cost, planned for 2019, was €26.5 (equating to €179.3M and 6.7 M service units)	**€ 170.7M** ✓ **€ 22.5** ✓ (equating to €170.7 M and 7.6 M service units).
Customer Orientation	More than 80% satisfaction rating with 30 key accounts, with a lowest rating of 60%	**86%** highly satisfied. ✓

	Actual	Actual	Actual	Actual	Target	Actual
	2015	2016	2017	2018	2019	
Level of safety management effectiveness	✅	✅	✅	✅	Min. D Safety culture Min. C	✅
Application of the severity classification based on the Risk Analysis Tool (RAT) methodology	✅	✅	✅	✅	**100%**	✅
Reporting Just Culture by 2019	In progress	In progress	On hold	On hold	To be initiated	In progress
Capacity *(average delay per flight in minutes)*	0.34 ❌	0.55 ❌	0.67 ❌	0.79 ❌	0.18	0.17 ✅
Environment *(KEA)*	3.34% ❌	3.40% ❌	3.23% ❌	3.25% ❌	2.96%	3.32% ❌
Cost-efficiency	Considered at national level (see previous table)					

MANAGEMENT REPORT

2019 was marked by a slight traffic decrease (-0.5%), contrary to all scenarios forecasted by STATFOR in October 2018 for 2019. At sector group level, Brussels faced the most significant traffic reduction. Hannover and DECO also experienced traffic decreases, however not as dramatic with values closer to the levels of 2018.

Although the beginning of the year started with a 1.2% growth of traffic (Jan-Apr), the start of the summer season (May-Oct) changed the trend and kept traffic at a lower level particularly in the month of May.

In 2019, unit rates decreased for Belgium (€2.0 in real terms), for Germany (€3.3 in real terms) and for the Netherlands (€4.3 in real terms) - excluding route charges as a reason for traffic decrease.

While the eNM/S19 measures contributed to a positive impact on delay, reducing congestion in the busiest areas also implies flights flying longer which, in combination with other factors, hampered the achievement of network related environment targets (actual and planned REDES).

Despite the challenges mentioned above, MUAC managed to achieve the targets of delay/flight for the first time in RP2, suggesting that changes at network level are key factors for reaching the higher efficiency in traffic management.

IN 2019, AIR TRAFFIC DECREASED BY **0.5%** OVER 2018, REACHING A TOTAL OF **1,862,754** FLIGHTS.

TRAFFIC CHALLENGES

In 2019, air traffic decreased by 0.5% compared to 2018, reaching a total of 1,862,754 flights.

The all-time traffic peak of flights handled in a single day was not surpassed in 2019 and remains at 5,702 flights handled on 29th June 2018. In 2019, the average number of controlled flights in a day decreased by 52 to 4,851 flights.

The summer months saw a 0.9% decrease in traffic compared to 2018, mainly driven by Brussels sector group. In summer (May-October) MUAC controlled 83 less flights each day on average, reaching 5,259 flights.

As in previous years, traffic did not develop as expected across all sector groups. In fact, all three sector groups handled fewer flights than expected, with Brussels sector group experiencing significantly lower traffic volumes than predicted by the STATFOR forecasts published in October 2018.

Traffic demand across sector groups was heavily influenced by the eNM/S19 initiative. This initiative was aimed at reducing congestion while maximising the overall network capacity, however the effects on traffic were not reflected in the forecast.

Inaccuracy in traffic prediction was a recurrent theme for MUAC during RP1 and RP2, exposing the centre to the associated business risks. The availability of a reliable traffic-forecast is crucial in determining the effectiveness of an ANSP's business plan. Nevertheless, as the eNM/S19 measures served to smooth the traffic delivery to MUAC, the positive effects on reducing delay were clearly visible.

Having benefited from the changes at network level, MUAC managed to improve and achieve the delay/flight targets and a punctuality rate higher than the previous years.

MUAC traffic (2018 vs. 2019; %)	2018	2019	%
MUAC traffic - NM	1,872,686	1,862,754	-0.5%
Traffic Brussels – MOST*	893,029	873,068	-2.2%
Traffic DECO – MOST*	733,118	731,566	-0.2%
Traffic Hannover – MOST*	730,295	727,088	-0.4%

*MOST: Maastricht Operational Statistics Tool

Actual traffic change in 2019 vs. STATFOR forecast (Oct. 2018)		MUAC	Brussels	DECO	Hannover
2019 (Data source: MOST)	Cumulative	-0.5%*	-2.2%	-0.2%	-0.4%
STATFOR 2018 (Oct. 2018)	High	3.8%	4.0%	3.9%	3.9%
	Baseline	2.7%	3.0%	2.9%	2.7%
	Low	1.3%	1.7%	1.3%	1.1%

*Data source: Network manager
Actual traffic change in 2019 vs. STATFOR forecasts (Oct. 2018)

SAFETY

In line with Commission Regulation (EU) No 691/2010, laying down a performance scheme for air navigation services and network functions, the three primary, leading safety performance indicators, which are closely monitored at MUAC, are the effectiveness of the Safety Management System (SMS), the application of the severity classification of the Risk Analysis Tool (RAT) and the reporting of Just Culture.

Lagging safety performance indicators such as the trend in separation infringements provide additional data which help to establish safety trends.

Over the course of 2019, MUAC's reporting culture continued to be positive and overall safety performance was good since we had zero (0) risk-bearing incidents in the airspace. The last time this was achieved was in 2015.

During the reporting period, there were three technical failures, of which two shared the same root cause in the data processing function and one in the communication function resulted in traffic restrictions being applied.

However, all the other lagging indicators remained within the defined threshold whilst traffic was one of the highest of the past years.

Leading safety performance indicators

Effectiveness of Safety Management

The internal MUAC goal for 2019 was to achieve a minimum of level 4 (level D) in all five Management Objectives: MO1 – Safety Policy and Objectives, MO2 – Safety Risk Management, MO3 – Safety Assurance, MO4 – Safety Promotion and MO5 – Safety Culture. As you can see below MUAC has achieved this target.
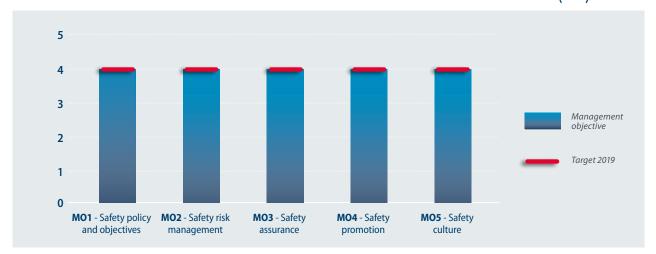
Application of the severity classification of the Risk Analysis Tool (RAT)
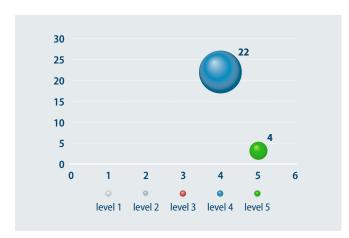
MUAC continues to classify all its Separation Minima Infringements (SMI) and ATM Specific Technical Events (ATM-SE) using the RAT methodology, as required by the performance scheme.
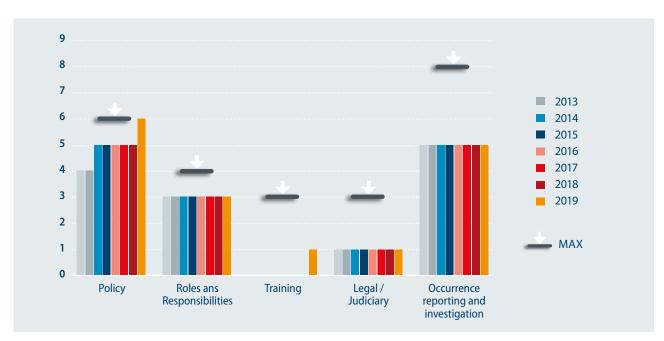
Reporting of Just Culture

The reporting of Just Culture remains consistent with the previous year. The Just Culture project, established in 2014, continued to achieve important milestones such as the publication of the EUROCONTROL Just Culture Implementing Rule (IR). The project will continue in 2020 with the implementation of a Just Culture Committee and related training.

EFFECTIVENESS OF SAFETY MANAGEMENT – MANAGEMENT OBJECTIVES (MO) 2019

Legend:
- Management objective
- Target 2019

X-axis categories:
- **MO1** - Safety policy and objectives
- **MO2** - Safety risk management
- **MO3** - Safety assurance
- **MO4** - Safety promotion
- **MO5** - Safety culture

◀ EFFECTIVENESS OF SAFETY MANAGEMENT SCORE 2019

- level 1
- level 2
- level 3
- level 4
- level 5

Values shown: 22, 4

X-axis categories: Policy, Roles ans Responsibilities, Training, Legal / Judiciary, Occurrence reporting and investigation

Legend:
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- MAX

▲ JUST CULTURE KEY PERFORMANCE INDICATOR

A survey of the Just Culture at MUAC was conducted in 2019. This graph shows the number of positive answers to the 24 questions (broken down into five domains) which were included in the Just Culture questionnaire. The questionnaire gave only two possible answers ("Yes" - 1 and "No" – 0).

SAFETY

Lagging safety performance indicators

The frequency of severity A and B incidents plotted against time is the basis for the internal lagging safety key performance indicator for 2019.
The MUAC Annual Plan defines the ceiling for this self-imposed value. Additional activities are triggered whenever the ceiling is exceeded, leading to further analysis as to the existence of systemic issues which may have caused these occurrences.
For MUAC, the most important safety goal is to ensure that, within its area of responsibility, it does not contribute to any accidents or any separation infringements.
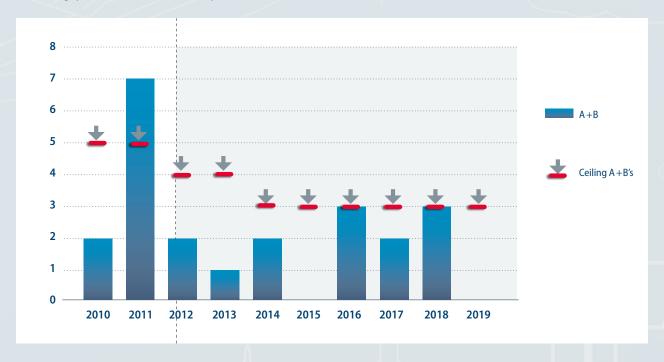
For 2019, a ceiling of three Severity A and B incidents was set to take into account the variability of the diverse factors affecting safety performance. The actual number of severity A and B separation infringements attributed to MUAC was zero (0).

In addition to this lagging performance indicator on the severity A and B infringements, another internal key performance indicator is the total number of severity C and severity E separation minima infringements with a MUAC contribution. The aim of these indicators is to provide an 'early warning' that the KPI for severity A+Bs may be under threat. It allows MUAC to get a more complete picture of the overall risks.

A ceiling of 10 severity C and 25 severity E separation minima infringements with a MUAC contribution was imposed for 2019 with the actual number of incidents amounting to: severity C – 4 and severity E – 16.
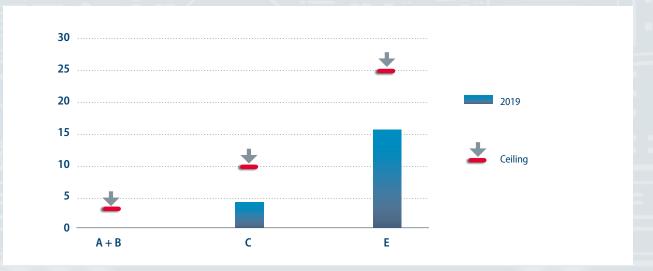
SEVERITY A AND B SEPARATION INFRINGEMENTS ATTRIBUTABLE TO MUAC (2010–2019)

Severity A and B incidents refer to serious and major incidents respectively. Severity A (serious) refers to an incident where an aircraft proximity occurred in which there was a serious risk of collision. Severity B (major) denotes the occurrence of an aircraft proximity in which the safety of the aircraft may have been compromised. The severity scoring system, based on the Risk Analysis Tool (RAT), was introduced in 2012.

SEVERITY A, B, C AND E SEPARATION INFRINGEMENTS ATTRIBUTABLE TO MUAC IN 2019

These safety performance indicators are the main lagging indicators. However, they alone do not reveal all the weaknesses in the safety performance of individual system elements. Therefore, several additional safety indicators, designed to provide a deeper understanding of safety performance, are also tracked.
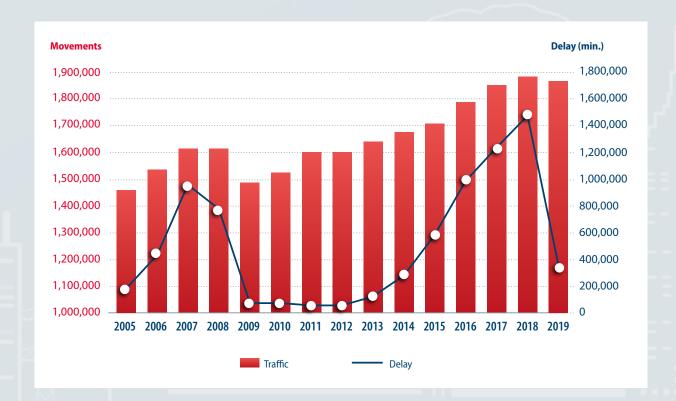
CAPACITY

In 2019, MUAC generated 320,571 minutes of delay, equal to a decrease of 78.4% over the previous reporting year. 181,387 minutes were attributed to CRSTMP factors (i.e. all causes of delays except W-Weather and O-Others), equal to a decrease of 80.3% when compared with the previous year.

Movements

Delay (min.)
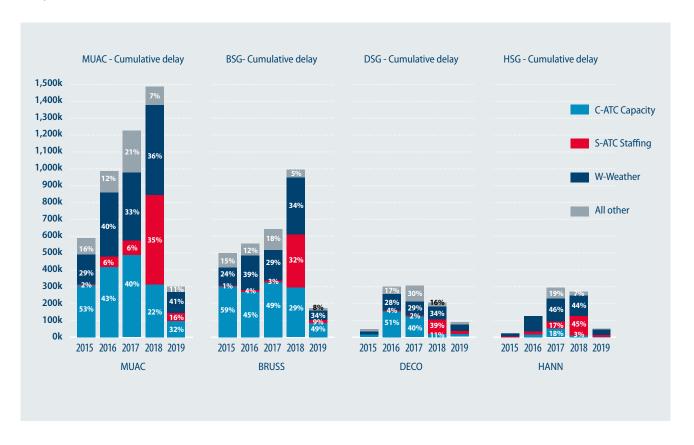
TRAFFIC AND ATFM DELAY TRENDS 2005-2019

2019 saw a decrease in traffic of 0.5% while ATFM delays dropped by 78.4%.

The volume of delays reported for the years 2005-2009 in the ATM Cost-Effectiveness (ACE) Benchmarking Report differs from the figures reported in the chart above due to the exclusion of tactical delays on the ground (engine off) below 15 minutes.

CAPACITY

MUAC - Cumulative delay

|	2015	2016	2017	2018	2019
All other	16%	12%	21%	7%	11%
W-Weather	29%	40%	33%	36%	41%
S-ATC Staffing	2%	6%	6%	35%	16%
C-ATC Capacity	53%	43%	40%	22%	32%

MUAC

BSG- Cumulative delay

	2015	2016	2017	2018	2019
All other	15%	12%	18%	5%	8%
W-Weather	24%	39%	29%	34%	34%
S-ATC Staffing	1%	4%	3%	32%	9%
C-ATC Capacity	59%	45%	49%	29%	49%

BRUSS

DSG - Cumulative delay

	2015	2016	2017	2018	2019
All other		17%	30%	16%	
W-Weather		28%	29%	34%	39%
S-ATC Staffing		4%	2%		11%
C-ATC Capacity		51%	40%		

DECO

HSG - Cumulative delay

	2015	2016	2017	2018	2019
All other			19%	7%	
W-Weather			46%	44%	
S-ATC Staffing			17%	45%	
C-ATC Capacity			18%	3%	

HANN

Legend:
- C-ATC Capacity
- S-ATC Staffing
- W-Weather
- All other
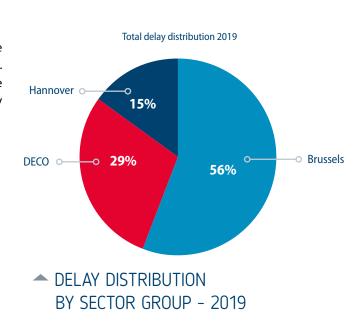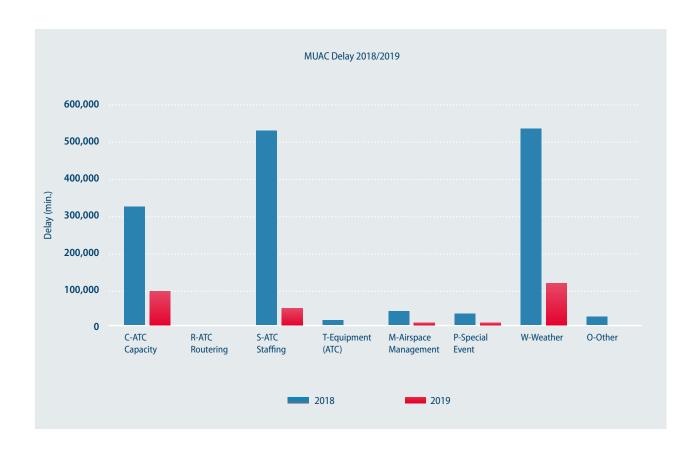
▲ MINUTES OF EN-ROUTE ATFM DELAY (2015-2019)

This chart shows the distribution and evolution of the minutes of en-route ATFM delay between 2015 and 2019. W-Weather and C-ATC Capacity were the main reasons for delay, generally in the Brussels sectors, nevertheless values are significantly lower than in previous years. Note that with the implementation of the GCE agreement, the staffing delay was also significantly reduced in 2019.

With 56% of total delay, the Brussels sectors were responsible for the majority of the delay in 2019. Notably, the delay was more evenly shared as the Brussels sector's contribution to the total delay dropped from 67% in 2018.

Total delay distribution 2019

- Hannover 15%
- DECO 29%
- Brussels 56%

▲ DELAY DISTRIBUTION BY SECTOR GROUP - 2019

MUAC Delay 2018/2019

Delay (min.)

600,000

500,000

400,000

300,000

200,000

100,000

0

C-ATC Capacity | R-ATC Routering | S-ATC Staffing | T-Equipment (ATC) | M-Airspace Management | P-Special Event | W-Weather | O-Other

▬ 2018   ▬ 2019

🔺 MINUTES OF EN-ROUTE ATFM DELAY BY CAUSES OF DELAY (2017/2018)

This chart shows the distribution of the minutes of en-route ATFM delay in 2018 and 2019. Delay decreased across all reasons.
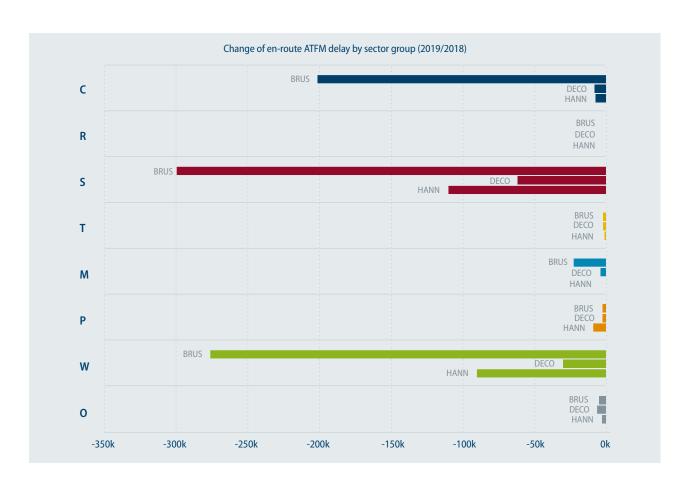
With 132,550 minutes of delay, W-Weather contributed most to the MUAC total delay in 2019 (41%) followed by C-ATC Capacity with 102,680 minutes (32%).

While the eNM/S19 measures had an effect on MUAC traffic, and therefore on delay, it is worth noting that the delay situation in 2019 was also influenced by disruptions in the network.
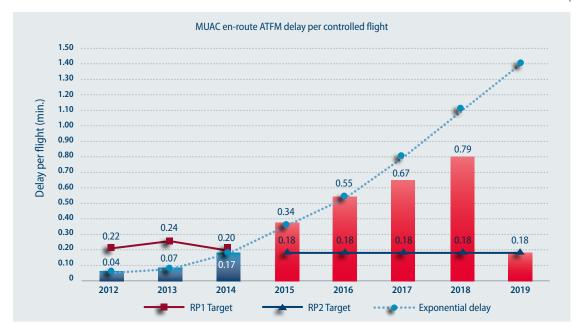
CAPACITY

MUAC delivered a greatly improved delay performance in 2019, meeting the target of 0.18 minutes of average delay per flight for the first time in RP2 with 0.17 minutes of delay per flight.

The positive outcome of delay/flight in 2019 is the result of various reasons: traffic decrease, network disruptions together with the positive effects of mitigation actions launched by MUAC during RP2, also in cooperation with external stakeholders (e.g. the eNM/S19 and the Customer Initiative).

Change of en-route ATFM delay by sector group (2019/2018)

CHANGE OF EN-ROUTE ATFM DELAY BY SECTOR GROUP (2019/2018)

This chart displays the yearly variation and distribution by sector group of the minutes of en-route ATFM delay in 2019 versus 2018.

MUAC en-route ATFM delay per controlled flight

▲ AVERAGE EN-ROUTE ATFM DELAY PER CONTROLLED FLIGHT (2012–2019) AND RP TARGETS (2012–2019)

In 2019, MUAC's average en-route ATFM delay per controlled flight decreased from 0.79 to 0.17 minutes.

Punctuality

Some 98.8% of total flights were delay-free versus 95.4% in 2018[1], and only 0.8% of flights were held up by CRSTMP causes of delay versus 3.3% in 2018.

Flights that experienced more than 30 minutes of delay decreased from 0.3% (5,846 flights) to 0.03% (620 flights) of the total controlled flights.

Considering the improvement over the previous years and the low number of flights delayed together with the fact that most of these delays are generated during peak hours in the summertime, when traffic demand reaches its highest levels, in particular in highly congested sectors, MUAC performance in 2019 can be evaluated as positive.

Furthermore, outstanding performance in ATCO productivity and sector productivity, coupled with a continued development of leading-edge technology, demonstrates that MUAC's contribution to the aviation industry remains unquestionably outstanding.

Traffic subject to delay	2019	%	2018	%
TOTAL FLIGHTS	**1,862,754**	**100%**	**1,872,686**	**100%**
On-time flights	1,840,154	98.8%	1,786,718	95.4%
-->Total flights subject to delay	22,600	1.2%	85,968	4.6%
-->Total flights subject to W-O delay	7,958	0.4%	23,398	1.2%
-->Total flights subject to CRSTMP delay	**14,642**	**0.8%**	**62,570**	**3.3%**
-->Total flights subject to CRSTMP delay (1-15 min.)	10,895	0.6%	39,861	2.1%
-->Total flights subject to CRSTMP delay (16-30 min.)	3,127	0.2%	16,865	0.9%
-->Total flights subject to CRSTMP delay (>30 min.)	620	0.0%	5,844	0.3%

▲ BREAKDOWN OF FLIGHTS SUBJECT TO DELAY – 2019 vs 2018

ATCO productivity

With 2.23 IFR flight-hours per air traffic controller-hour, MUAC improved air traffic controller productivity throughout the 2019 business cycle, attaining a new all-time record. In fact, with similar IFR flight-hours (0% difference), coupled with a decrease in ATCO hours on duty (-0.3%), controller productivity increased by 0.3% during the reporting year. This is a class leading result.

MUAC	2018	2019	% variation
IFR flight-hours controlled	667,869	667,596	0.0%
ATCOs/OPS hours on duty	300,285	299,377	-0.3%
ATCO productivity	**2.22**	**2.23**	**0.3%**

▲ AIR TRAFFIC CONTROLLER (ATCO) PRODUCTIVITY 2018–2019

ATCO productivity increased from 2.22 in 2018 to 2.23 in 2019. This indicator is the ratio between IFR flight-hours controlled and ATCO-hours on duty.
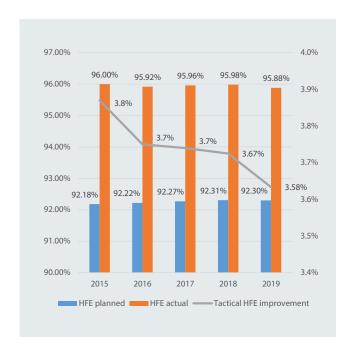
ENVIRONMENT

Reducing route extension

Year on year MUAC strives to increase flight efficiency under the pressure of high traffic demand. Route extensions arise due to a variety of causes - such as areas of bad weather, military activity, ATFM restrictions etc. And though most of those factors are outside of MUAC control, we nevertheless strive to reduce the environmental impact of aviation by offering shorter routes and fuel-optimal vertical flight profiles, whenever possible.
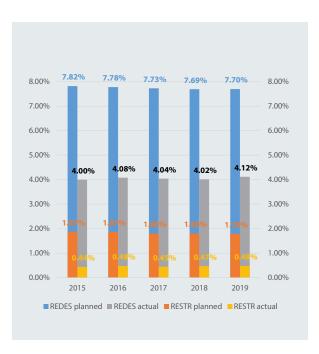
From 2009 on, MUAC monitors horizontal flight efficiency (calculated as the ratio of route extension relative to the approach of the flight to its destination as realized in MUAC airspace) both for the actually flown trajectories - REDES_actual/RESTR_actual, and for the last filed flight plans - REDES_planned/RESTR_planned.

Despite the progress in FRA implementation, MUAC horizontal flight efficiency did not show substantial improvement in 2019. One of the main reasons behind this is the deviation of flights from the most direct route as a result of the implementation of NM19 summer measures to mitigate delays. Horizontal flight efficiency based on the last filed flight plan showed a small decrease in 2019 (92.30%) compared to 2018 (92.31%). Reversing the positive trend of 2016 – 2018, actual horizontal flight efficiency shows a decrease of 0.10% from 95.98% in 2018 to 95.88% in 2019.

The difference between the planned and actual flight extension, tactical HFE improvement, has gone down to 3.58% in 2019. The graph shows a steadily diminishing gap between planned and actual figures

▲ MUAC FLIGHT EFFICIENCY
   BASED ON ACTUAL TRAJECTORY

▲ MUAC FLIGHT EFFICIENCY
   BASED ON FILED FLIGHT PLAN

which indicates some progress in bringing the filed flight plans closer in accordance with the actual trajectories flown. Although it would be beneficial (for predictability purposes at least) to decrease this difference further, it is unlikely to vanish completely in the foreseeable future.

Looking deeper into flight efficiency we can notice that the internal component of route extension based on the actual trajectory (RESTR_actual) has remained relatively constant and has stayed well inside our target: the very small number for RESTR actual (only 0.48%) indicates that almost all flights in the MUAC area are flying directly. The remaining 3.64% (3.55% in 2018) of route extension (REDES_actual – RESTR_actual) shows the interface component, or the network contribution to flight inefficiency which, for the most part, does not depend on MUAC operations. The internal component of flight extension implied by the planned trajectories (RESTR_planned)

however remained at the same level in the last years - 1.80%, and improved slightly in 2019 to 1.79%. The remaining 5.89% of the extension (REDES_planned - RESTR_planned), the network component, should be attributed to the existing route structure, airspace design, allocation of military areas, but also to drawbacks in flight planning process, leaving significant space for improvement.

Meanwhile we can state that the flight efficiency improvement brought by MUAC controllers during the tactical phase (among other things - by giving directs to airliners and using available military areas), resulted in a total distance reduction of more than 8,141,700NM (approximately 4.76NM per flight), saving 48,850 tons of fuel and reducing CO_2 Emission by 162,830 tons in 2019.

COST-EFFICIENCY

Positive financial results and a substantial improvement in total economic cost

In 2019, the cost-base amounted to €170.7M. In real terms, costs were up by 6.5% compared to 2018, mainly driven by higher staff costs. Nevertheless, MUAC managed to stay well within its agreed 2019 cost-base of €179.2M, thereby saving €7.6M, mostly in operating costs.

MUAC recorded a total financial cost per IFR flight-hour of €256, a value which is slightly higher than in 2018 (€240 in €2018).

Despite the increase in unit financial costs, ATFM delay costs decreased substantially in 2019, reducing the overall MUAC economic cost to €307 per IFR flight-hour – a decrease of 35%.

An ongoing important and beneficial impact on efficiency was the contribution of the eNM/S19 measures. By acting to maximise the overall network throughput, traffic was more evenly distributed both geographically and in time. In a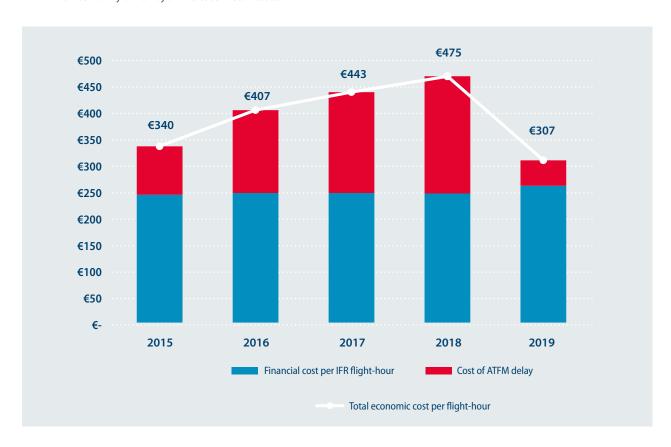ddition, the high levels of professionalism and commitment consistently demonstrated by MUAC staff, coupled with the timely and proactive managerial decisions relating to the efficient allocation of resources and investments, undoubtedly contributed to the maintenance of high standards in such an extremely challenging and constantly changing environment.

The key performance indicator for cost-effectiveness, defined in the SES II Performance Regulation, is the Determined Unit Cost. Since this is calculated on the basis of consolidated costs at national level, the concept of an MUAC equivalent unit cost was introduced as a performance indicator, taking the specific MUAC service provision costs into account. 'Equivalent' indicates that the calculation does not take the full cost of MUAC service provision into account. For example, EUROCONTROL support costs and the cost of using CNS infrastructure (which is made available free of charge by the Four States) are not included. The target was more than achieved with an actual cost per service unit of €22.5.

MUAC COST-BASE 2015-2019 (€M - €2019)	2015	2016	2017	2018	2019	Trend 2018 / 2019
Staff costs	120.4	125.4	127.0	128.1	137.6	7.4%
Non-staff operating costs	12.6	16.4	19.8	22.3	23.0	3.4%
Depreciation costs	9.3	8.6	8.4	9.5	9.8	3.3%
Cost of capital	0.5	0.4	0.2	0.3	0.2	-28.0%
Exceptional reduction	0.0	0.0	0.0	0.0	0.0	-
Total costs (€ M)	**142.7**	**150.8**	**155.4**	**160.2**	**170.7**	**6.5%**

⏫ GAT COST-BASE 2015–2019 (€M - €2019)

In 2019, the MUAC cost-base increased by 6.5% in real terms.
This was mainly driven by an increase in staff costs.

⏫ TOTAL ECONOMIC COST PER IFR FLIGHT-HOUR (€2019) – TREND 2015–2019

The total economic cost per IFR flight-hour controlled (or unit economic cost) is a standard key performance indicator used in the ATM Cost-Effectiveness (ACE) benchmarking reports, produced by the Performance Review Commission (PRC). It is the sum of ATM/CNS costs (or financial cost) and ATFM delay costs per IFR flight-hour.

The MUAC unit financial costs increased to €256; however, the MUAC unit economic cost for 2019 decreased by 36% due to a decrease in unit delay costs from €235 to €51 in real terms.

COST-EFFICIENCY

ACE report highlights MUAC's strengths and challenges

In May 2020, the ATM Cost-Effectiveness (ACE) 2018 Benchmarking Report was released. It should be noted that the ACE 2018 Benchmarking Report is published in 2018 values, while this Annual Report is expressed in 2019 values, taking into account an inflation rate of 2.3%.

The productivity and financial cost-effectiveness indicator confirmed MUAC's ranking among the top-performing ANSPs in Europe in 2018.

On the other hand, the economic gate-to-gate cost-effectiveness indicator deteriorated, reaching €465 (€2018) per IFR flight-hour. This was the result of an increased en-route ATFM delay in the airspace controlled by MUAC, which accounted for 50% of its total economic costs in 2018. This was the second highest in Europe, well above the pan-European average (24%).

MUAC economic effectiveness further deteriorated in 2018 due to an increasing amount of delay. From a financial point of view, unit ATM/CNS provision costs slightly decreased in 2018 (-0.4%). This result was mainly driven by a significant decrease in ATCO
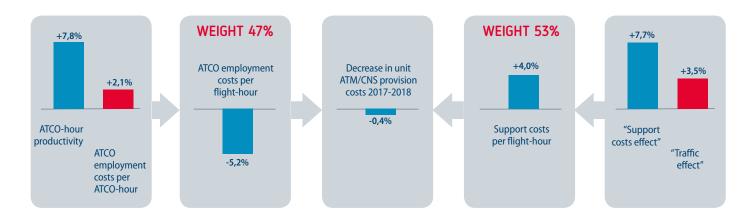
employment costs per flight-hour (-5.2%), which partially offset by a deterioration in unit support costs (+4.0%).

MUAC economic effectiveness further deteriorated in 2018 due to an increasing amount of delay. From a financial point of view, unit ATM/CNS provision costs slightly decreased in 2018 (-0.4%). This result was mainly driven by a significant decrease in ATCO employment costs per flight-hour (-5.2%), which partially offset by a deterioration in unit support costs (+4.0%).

Service units and revenue distribution to States

The number of service units produced within MUAC airspace decreased by 0.8% in 2019 while overall revenues decreased by some €28.8M to €475.7M. The national unit rates in all countries also decreased in 2019 which served to dampen revenues.

Despite the substantial decrease in revenues for 2019 it is worth mentioning that over the 5-year RP2, MUAC delivered an additional 2.1M service units compared to the original RP2 performance plan.

+7,8%	WEIGHT 47%		WEIGHT 53%	+7,7%
+2,1%	ATCO employment costs per flight-hour	Decrease in unit ATM/CNS provision costs 2017-2018	+4,0%	+3,5%
ATCO-hour productivity		-0,4%	Support costs per flight-hour	"Support costs effect"
ATCO employment costs per ATCO-hour	-5,2%			"Traffic effect"

▲ CHANGES IN THE FINANCIAL COST-EFFECTIVENESS INDICATOR (€2018) 2017–2018

SUs and Revenue distribution – 2019/2018 (€2019)							
	2018		2019		SUs 2019/2018 (%)		
State	SUs	Route charges	Revenues (M)	SUs	Route charges	Revenues (M)	Revenues 2019/2018 (%)	
Belgium/Luxembourg	1,930,965	€ 69.1	€ 133.39	1,892,266	€ 67.1	€ 127.0	-2.0%	-€6.4
Netherlands	2,395,386	€ 60.2	€ 144.2	2,395,810	€ 56.9	€ 136.3	0.0%	-€7.8
Germany	3,333,111	€ 68.1	€ 226.9	3,312,534	€ 63.8	€ 211.2	-0.6%	-€15.7
MUAC	**7,659,462**	**-**	**€504.4**	**7,600,610**	**-**	**€474.6**	**-0.8%**	**-€29.9**

▲ SERVICE UNITS, NATIONAL UNIT RATES AND REVENUES PER SECTOR GROUP (€M – €2019) – TREND 2018-2019

Revenues distributed to States decreased by €29.9M (in real terms) in 2019.

3,312,534, Amsterdam-FIR, 43.58%

1,892,266, Brussels-UIR, 24.90%

2,395,810, Hannover-UIR, 31.52%

▲ SERVICE UNITS IN 2019

Breakdown of service units in the Amsterdam FIR, the Brussels UIR and the Hannover UIR, respectively.

CUSTOMER ORIENTATION

Civil and military customer requirements continued to be captured and closely monitored with regular customer consultations and bespoke bilateral meetings. Civil aircraft operators continued to provide valuable input to deploy new ATM concepts and technology, which transformed the basis of MUAC's service to customers. Thanks to the Customer Initiative and the ATM Portal, significant benefits were unlocked for airline operations by shifting the focus towards high-value results.

Customer relationship management

Civil customer consultation and involvement

Over the reporting period, customer satisfaction reached 86.3% satisfaction for MUAC services in general and 91.7% for MUAC's consultation efforts as bilateral collaborative avenues and enhanced service levels continued to be explored with airspace users during consultation meetings. Detailed business results were shared on a regular basis with aircraft operators via various reporting tools. Individual CPDLC reports were also made available on request to aircraft operators.

The Plenary Customer Consultation Meeting was held on 14 and 15 November 2019, with 29 delegates representing airlines, freight operators, Computerised Flight Plan Service Providers, airline associations and the US Air Force. Following the success of the previous year's collaborative approach, several interactive workshops were organised about high-interest topics such as automation and ATM; Flexible Use of Airspace/Airspace Management; free route airspace; the Customer Initiative and ATM Portal; planning for summer 2020 and beyond and an ideation workshop. The meeting also concentrated on MUAC performance, a review of summer 19 and eNM measures, the outlook for 2020 and main capacity enablers, future developments and the outlook for RP3. A list of opportunities was jointly drawn up at the end of the meeting, the follow-up of which is being closely monitored. The meeting was rated as successful by the participants as it addressed their main concerns and provided them with a good platform to express themselves and request clarifications.

For the third consecutive year, building on the experience gained so far and bolstered by further collaborative workshops together with stakeholders, the Customer Initiative and the ATM Portal provided aircraft operators (passenger and freight) with an enhanced tailor-made service on the back of highly positive responses from the aircraft operators.

This included improved focus on high-value flights, tactical delay avoidance, best routeings/city pair routes, flight planning support, advice on avoiding congested areas, Flexible Use of Airspace and advice on eNMS19. The development of the ATM Portal brought about additional features and functionality such as new automated criticality parameters and HMI features, bringing a bigger picture and faster response times that enable improved live customer service from the FMP position. The summer 2019 trial delivered further considerable improvements. Successful actions on 'priority' flights doubled over the previous year, 1 in 2 'critical' flights were improved and 78% of all extra flight requests were captured. Whilst more aircraft operators joined the ATM Portal customer group, groundwork also started on expansion of the ATM Portal to network FMP partners. DFS and Reims ACC declared intentions to join.

A further development came late 2019 when work started on a new regular AIRAC aircraft operators briefing service aimed at providing updates on RAD, best routeings and general flight planning improvements.

Military Customer Consultation

Over the reporting period, MUAC continued to improve and strengthen its relationship with its military and special operations partners, both by means of bespoke bilateral meetings and the annual military customer consultation - OAT@MUAC. The third annual military customer consultation was convened on 6-7 November 2019. Participants included military representatives from Germany, Belgium, the Netherlands, the European branch of the United States of America, as well as delegates from the DFS Deutsche Flugsicherung GmbH. On the first day, representatives concentrated on strategic topics such as e.g. military airspace requirements, the Netherlands airspace revision or the integration of remotely piloted aircraft systems (RPAS). During the second day, operational topics were raised with the audience in order to strengthen the mutual understanding of all parties involved – an essential tenet for good and essential cooperation. MUAC's next Military Customer Consultation Meeting is scheduled for 4 and 5 November 2020.

PERFORMANCE INTERDEPENDENCIES

Managing competing Key Performance Areas (KPAs) under a customer orientation perspective

MUAC is subject to a set of regulatory targets set by the European Commission (EC) through its Performance Review Body (PRB). These are grouped into four Key Performance Areas (KPAs): Safety, Capacity, Environment and Cost-Efficiency. The main objective of the Performance Regulation is "to increase the economic, financial and environmental performance of the provisions of the Air Navigation Services in Europe" keeping safety standards and procedures constantly at their highest levels.

The KPAs are strongly interrelated and consequently exert an influence on each other. For instance, any new project increasing capacity will also impact on the cost-efficiency area. On the other hand, aggressive cost-reduction measures might result in a critical loss of capacity.

The logic behind the existence of direct links between performance areas is accepted by the aviation community, although the establishment of a standard formula which describes these quantitative interdependencies is challenging.

However, for each KPA it is nevertheless feasible to estimate approximate costs.

Costs attributable to main KPAs

ANSPs are accountable to their stakeholders for the provision of air traffic control services in the most efficient way and in accordance with the highest safety standards. In this context, MUAC's motto is "Service first, safety always". However, safety is not easily quantifiable and any attempt to economically measure it presents tangible difficulties and uncertainties.

Moreover, cost-efficiency refers to direct costs borne by the Four States in running ATM activities at MUAC while environmental and delay costs are directly borne by airlines.

Environmental costs refer to the extra cost of the jet fuel burned to fly the route extension between the actual flown route and the theoretical shortest distance (great circle) between departure and arrival points. The cost of extra time to fly longer routes is not considered in this analysis due to the relatively small size of MUAC airspace. A sharp decrease in jet fuel price in 2015 reduced the overall economic impact of the route extension in RP2.

Costs of delay are a linear function of the average cost per minute of delay and the total minutes of ATFM en-route delays generated.

It is difficult to estimate the optimal point between cost-efficiency and capacity. For example, by how much are the costs of delay reduced when a unit of cost on the cost-efficiency side is increased? Furthermore, the current scheme does not take into account the effects of non-forecast sharp variations of traffic demand due to changes in uncontrollable factors such as route charges in neighbouring states. When this occurs, particularly in already congested airspaces, it unexpectedly exposes ANSPs to exponential amounts of delay. However, the ANSPs' strenuous efforts to meet extra traffic demand in the interest of their customers and the network in general are not compensated by the current regulatory framework. On the contrary, minutes of delay generated by unexpected traffic demand are not exempted or reallocated in the context of the FAB incentive scheme.
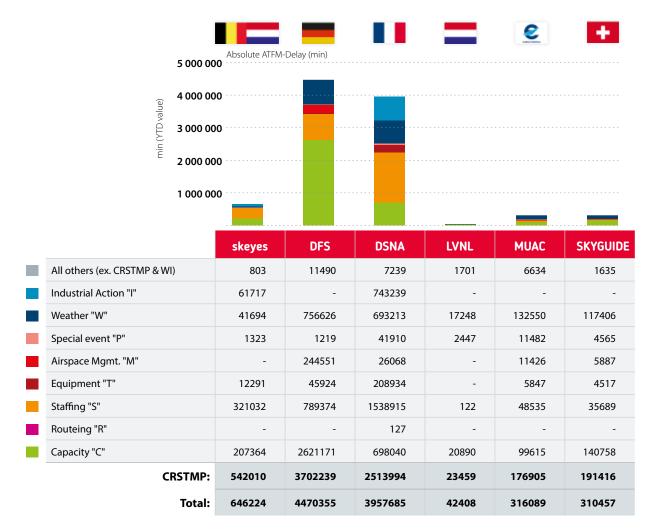
That aside, the way the Route Charges scheme is currently set up poses an additional uncontrollable challenge which can negatively impact and eliminate any positive results achieved in other ANSP-controllable performance areas.

MUAC'S CONTRIBUTION TO FABEC PERFORMANCE

The FABEC performance plan was drawn up to cover SES Performance Plan Reference Period 2 (RP2 - 2015 to 2019). It incorporates the key performance areas of safety, environment and capacity for the whole region, while military mission effectiveness and cost-efficiency targets are addressed at national level. MUAC cost-efficiency targets were agreed by the Four States. Air traffic volumes in FABEC airspace increased by 1.0% in 2019 from 6,179,458 flights to 6,240,724. The number of IFR flights was significantly above the STATFOR baseline scenario published in March 2015 (+11.3%) on which the RP2 performance plan was based. In 2019, LVNL, MUAC and skyguide all achieved their respective CRSTMP en-route ATFM delay targets per flight.

The eNM/S19 initiative over the summer, aimed at reducing FABEC and network delay by redistributing traffic flows to less congested sectors contributed to FABEC members returning en-route delay (all causes) of 1.56 average delay mins/flight compared to 2.12 in 2018 and CRSTMP delay of 1.15 compared to 1.40 in 2018.

The reasons underlying the non-achievement of this target are manifold and vary from centre to centre. On the one hand, a few centres started experiencing staff shortages as a result of a mismatch between planned and actual traffic demand. On the other hand, heavy congestion on specific complex sectors negatively contributed to the average delay per flight value.

Absolute ATFM-Delay (min)

min (YTD value)

	skeyes	DFS	DSNA	LVNL	MUAC	SKYGUIDE
All others (ex. CRSTMP & WI)	803	11490	7239	1701	6634	1635
Industrial Action "I"	61717	-	743239	-	-	-
Weather "W"	41694	756626	693213	17248	132550	117406
Special event "P"	1323	1219	41910	2447	11482	4565
Airspace Mgmt. "M"	-	244551	26068	-	11426	5887
Equipment "T"	12291	45924	208934	-	5847	4517
Staffing "S"	321032	789374	1538915	122	48535	35689
Routeing "R"	-	-	127	-	-	-
Capacity "C"	207364	2621171	698040	20890	99615	140758
CRSTMP:	**542010**	**3702239**	**2513994**	**23459**	**176905**	**191416**
Total:	**646224**	**4470355**	**3957685**	**42408**	**316089**	**310457**

▲ EN-ROUTE ATFM DELAY PAER CONTROLLED FLIGHT

OPTIMISING AIRSPACE DESIGN

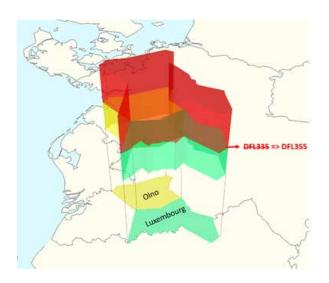## Optimising airspace design and usage for sustained performance

Brussels Sector Group 355E Project

The eastern part of the Brussels Sector Group is a crossing point where various important traffic flows are meeting, with most aircraft in their climbing or descending phase of flight. Furthermore, the airspace structure in that region is characterised by complicated interfaces between several busy ATC-units and by the presence of a number of military training areas. All this, together with a high traffic demand, results in frequent heavy workload situations in the East of the Brussels Sector Group The involved sectors ('Luxembourg' and 'Olno' sectors) can be combined or split in function of the expected workload. These sectors can also be vertically divided in a 'Low' and 'High'-partition, with FL335 as the 'Division Level' (DFL).

MUAC is continuously in search of optimising its capacity to handle traffic safely and expeditiously. In that context, a study was initiated to investigate a more efficient DFL in the East of the Brussels Sector Group. The study showed that, with the current traffic composition, a raise of the division level from the existing DFL335 to a new fixed DFL355 would lead to an overall better traffic distribution between the High and Low partition of the Olno and Luxembourg sectors.

A project was started to implement this airspace change. Internal MUAC procedures had to be adapted, and a training program was set up for the operational staff, including simulator training for the Brussels Sector Group controllers. The necessary technical changes were also prepared. Although the impact on surrounding ATC centres remained limited, certain 'Letters of Agreement' (LoAs) with external civil and military partners had to be modified. The implementation of this DFL-change is planned for the 27th February 2020.

Free Route Airspace Maastricht (FRAM2)

The FABEC Free Route Airspace Programme defines a stepped and gradual implementation approach whereby FABEC area control centres will develop and implement cross-border free route airspace FABEC-wide. In line with these plans, MUAC has embarked, in 2017, on its Free Route Airspace Maastricht (FRAM2) Project with the aim of introducing FRA operations across the MUAC airspace in a phased approach. On 5 December 2019, the last phase of FRAM2 has been concluded during which FRA is available on a H24 basis. The expected gains for airline operators range from €4.4M per year for Phase 1 to €26.0M per year for Phase 3.

Cross-border Arrival Management - XMAN

The goal of XMAN is to decrease aircraft holding times at congested airports by reducing their cruising speeds during the final en-route phase of flight. In doing so, flight efficiency is increased as fuel burn levels and CO2 emissions fall. Moreover, less airborne congestion in terminal areas will also contribute to improved operational safety by reducing pilot/ATC workload.

After the successful implementation of the XMAN London Heathrow concept in November 2015, MUAC continues to support further trials and implementations of XMAN with other airports. The success of the XMAN London Heathrow project was recognised at the 2015 World ATM Congress, where it was honoured with a Jane's Award for its outstanding achievement in the Enabling Technology category.

In 2019, MUAC took part in the successful operational trials for London-Gatwick and Paris Charles de Gaulle airports. Both as part of FABEC projects and the SESAR Demonstration "xStream", that won the ATM Awards 2019 in the 'Environment' category and the "Overall Excellence in ATM Award".

The operational trial for London-Gatwick was followed by the implementation of the procedure on a permanent basis. Similar plans are udner discussion for Paris Charles de Gaulle.

In line with the requirements set out in the European Pilot Common Project (PCP) Implementing Rule, the XMAN procedure will be extended to a total of 25 European airports by January 2024. To secure MUAC performance, we actively support the Multi-AMAN Integration work package.

After these activities under SESAR2020 Wave 1 were completed by the end of 2019, they are further coordinated only through the FABEC XMAN Programme.
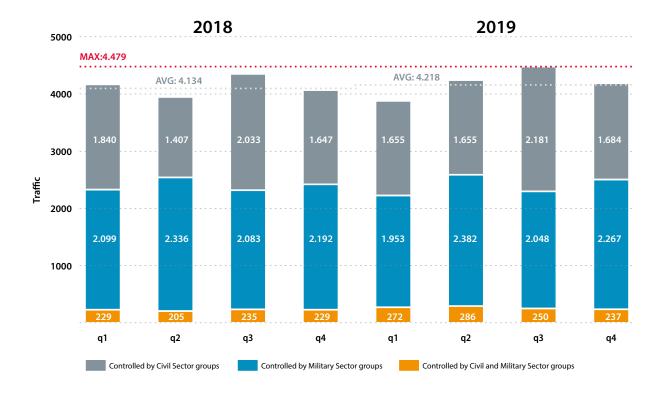
Cross border civil/military operations and Flexible Use of Airspace

The legal and institutional integration of the task of controlling Operational Air Traffic (OAT) took place as early as 2017. It was in 2019 when the major cross-training programme was set up for MUAC flight data staff and ATCOs really started to bear fruit. The highlight was without a doubt the issuing of civil endorsements for the Hannover East sectors to 'military' ATCOs.

In December 2019, the Belgian Air Force took the Shared ATS System (SAS2) in operations for en-route military operations at the Air Traffic Control Centre (ATCC) and for approach and tower operations in the military ATC towers of Beauvechain, Florennes, Kleine-Brogel and Koksijde.

The trend of steady increase in overall number of military flights continued in 2019. The four MUAC sector groups controlled 16870 flights over the year in the Amsterdam FIR above FL245, the Brussels UIR and Hannover UIR. This was an increase of 2% compared to 2018. Although military traffic represented less than 1% of overall MUAC traffic, because of the associated complexity and priority support, to military flights required 7% of MUAC operations personnel. In total 469 Airbus serial production flights were supported with a peak of 171 flights in Q4.

Number of military flights (OAT and GAT) per quarter in the BR UIR, HAN UIR and AMS FIR above FL245

MUAC supported all major military exercises in its Area of Responsibility during the actual operations but also in the planning phase. MUAC staff participated as ATS experts in the exercise staff during NATO exercise Cold Igloo.

Additionally, in close co-operation with the military airspace users, military planners and Airspace Management Cells (AMCs) within Belgium, Germany and The Netherlands, MUAC has implemented several Flexible Use of Airspace (FUA) initiatives. As a result of these initiatives (e.g. FL365+ project in Belgium and the TRA302 trial in Germany), civil airspace users have been given the option to flight plan through military areas when these areas are not being used by the military. This enhanced cooperation provides benefits to the civil users by allowing them to flight plan shorter routes, and by giving them additional route options. While resulting in better predictability for MUAC and the Network as a whole, the impact on military planning flexibility has been minimal.

REDMIS (Re-Design Military Sector Layout)

After one year of experience with civil-military integration, it was recognized that the historical sectorisation inherited from the States could be improved significantly.
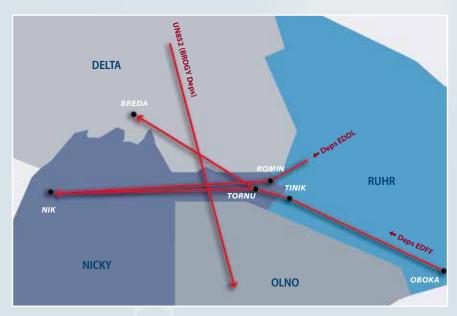
REDMIS optimised the layout of the Military Sector Group by implementing a fourth virtual sector in order to meet operational requirements and allow an efficient use of staff resources. The change was implemented in March 2019.
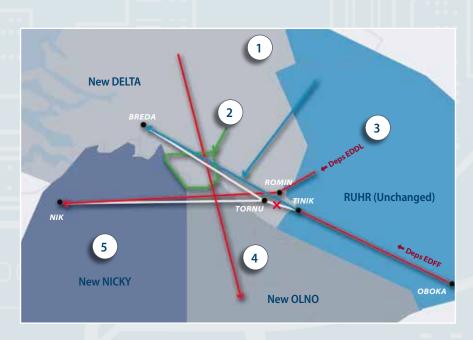
Nicky-Olno-Ruhr-Delta Re-Design (NORD)

The area around TORNU is a complex portion of airspace. The complexity in the area concerned (see figure) is due to the current internal MUAC sectorisation (Delta, Nicky, Olno, Ruhr), complex subjacent sectorisation (Brussels ACC, Amsterdam ACC, Langen ACC), the presence of a military area TRA North B and interfering departure routes from Frankfurt, Amsterdam and Dusseldorf.

The NORD project simplifies the interface by reshaping the sector boundaries and adapt the relevant procedures (see figure). The change was implemented in February 2019.

OPTIMISING AIRSPACE DESIGN

▲ CURRENT MUAC SECTOR BOUNDARIES AROUND THE AREA OF TORNU

▲ GENERAL OVERVIEW OF THE NORD CHANGES

1 Creation of Mandatory segment TINIK-BREDA (U229 becomes 'Dormant')

2 Creation of the VELED RELEASE Area

3 Revision of LoA with Brussels ACC regarding transfer conditions of Departures EDDL via ROMIN

4 Redesign of the Nicky / Olno / Delta / Ruhr sectors

5 Revision of the LoA with the Belgian Air Force regarding OAT via GIX

INNOVATION & DEVELOPMENT

ATC2ATM

This operationally focused programme looks at a horizon of 2025 and beyond. The intention is to provide the required capacity to meet the SES performance targets within budgetary and staffing constraints. MUAC productivity is to increase in line with, or ahead of, the expected traffic growth. ATC2ATM intends to introduce an evolution in the concept of operations, including new roles, procedures and tools bridging the gap between the ATFCM and ATC functions and making the most efficient use of staff and airspace. The programme will improve post-ops processes, data analysis and traffic prediction to optimise the effectiveness of ATM decision making and to improve the planning and execution of daily operations. As a result, flows will be optimally routed through the MUAC airspace so that workload is balanced across the sectors and traffic is streamlined before it reaches the ATCO in order to operate safely and efficiently.

The main deliverables for 2019 were:

Central Supervisory Suite 2.0

The CSS 2.0 (Central Supervisory Suite 2.0) project continued the use of the AAPF concept and tools to optimise the daily operational supervision and to allow Ops room supervisors to better support ATCOs at times close to execution. After the second operational trial of the new concept in summer 2019, the project has achieved its objectives i.e. improved CSS' perception by ATCOs and improved situational awareness by CSS. Running two consecutive ops trials had an impact on both ATCO and CSS staff resulting in an improved sector opening management and

overall atmosphere, which together with other (internal and external) changes, contributed to an outstanding operational productivity increase in years 2017-2019.

Optimised Sector Manning

The project develops a new concept of operations and required systems support to improve offload sectors management, focusing initially on the Multi-Sector Planner (MSP) role in two sectors in DECO sector group. Three simulations performed in 2018 proved the concept to be ready for an operational trial, which has been executed in November 2019. The new concept envisaged for a tactical use in offload traffic scenarios, would allow for a more efficient transitions in opening and closing sectors. In 2020 two other concepts (Assistant Controller and Offload Controller respectively) aimed at increased tactical flexibility will be simulated and compared with results of previous trials.

Post-OPS Analysis & Business Intelligence (PABI)

In 2019, Post-OPS analysis processes were further improved through the evolution of the Sector Opening Tables Architect (SOTA) tool, streamlining and enhancing the establishment of optimal daily sector opening schedules for the predicted traffic. Mid 2019 work also commenced on the new SOTA's component (Scheduling App) allowing to analyse the traffic situation at D-20 required for ASM negotiations with our military partners, in support of the forthcoming FUA cell. On the Business Intelligence side, the integration of the Data

INNOVATION & DEVELOPMENT

Warehouse infrastructure was completed, the STORM data lake migrated, and EDPR-compliant access control mechanism implemented. Development of the Data Warehouse processing and presentation pipeline commenced with the new governance structures (BICB, BITT). The RP3 BI strategy were established, internal self-service BI tool training was provided, and a DWH sandbox environment created that already provides early benefit to operational business analysts (e.g. analysing the causal factors of the significant MUAC sector productivity increase from 2017 to 2019).

Traffic Prediction Improvements (TPI)

After successful initial implementation of a machine-learning algorithm to predict horizontal flight routes, MUAC has continued investigating how Artificial Intelligence (AI) can bring tangible benefits to sector workload prediction and the optimisation of traffic regulations, problems that are difficult to solve with traditional software logic. In 2019 the route prediction has been extended to the full 4D trajectory profile, including speed, rate of climb/descent and top of descent. On top of that, a new AI algorithm has been developed that can predict how Air Traffic Controllers handle the sector sequence of a flight path, resulting in considerable improvements to sector workload forecasts as AI can understand how controllers transfer flights from one sector to another. Lastly, an AI algorithm has been developed with colleagues of the EUROCONTROL Experimental Centre in Bretigny to improve prediction of aircrafts take-off times by up to 30% in a 1h-6h horizon - the AI algorithm is able to detect patterns in aircraft turn-around times at airports, congestion, and the impact of a delay assigned to a flight. All above solutions are planned to be implemented in operational systems in 2020.

Customer service

ATM-P

The ATM Portal project delivered an airline operator portal in 2018. It has been used since early summer to support the Customer Initiative 2018 and 2019 trials. Airlines were invited to report on their flights with highest business value, as well as to report on unforeseen business critical issues during daily operations. Without discrimination, and in close collaboration with NMOC, airspace users have thus been helped to save over hundreds of thousands of minutes of delay. Access to the portal overall facilitated better support to the most business-critical flights for the eight partners involved.

2019 saw more partners joining, more integration with the NM B2B services and joined collaboration with other ANSPs.

**Customer Initiatives
'Priority Punctuality Service'**

Through auto-detection software implementations in the ATM Portal and corresponding improved operational procedures, the service to high importance flights has been expanded to flights with critical impact from delay, such as risk on diversion in view of airport curfew, passenger claims and schedule disruption.

The number of airlines delivering their priority flights has been expanded to 17, with multiple fleets per aircraft operator.

With ongoing quality and efficiency improvements, the Customer Service is delivering a protection from delay impact on business-critical flights roughly twice better than on non-critical flights.

The project and achieved Customer Service results has been received with high interest, so that preparations could be made for roll-out to other en-route ATC Units and further expansion of participating airlines.

SESAR2020 validations & demonstrations

ADS-C

As part of the SESAR2020 projects linked to the new ADS-C (i.e. Projects 18 for validations of an enhanced Trajectory Predictor and PJ31 for live demonstrations), MUAC provided the downlinked Extended Projected Profile (EPP) and discrepancy indication (when not equal to the FDPS flight plan) to a sub-set of controllers in pre-operational fashion. The pre-operational demonstrations of MUAC started in July 2019 and are planned to continue till at least mid 2020 under the SESAR2020 Wave 1 PJ31. Demonstrations are proposed to further continue under a new SESAR2020 Wave 2 project call PJ38 till end 2022.

Interoperability via Flight Object

As part of the SESAR2020 Project 18, MUAC supports the validation of the Flight Object to introduce seamless coordination between centres as well as sharing a continuous real-time update of the flight plan. The first validation took place during April 2019 and work continued afterwards to evolve on functionality, a bigger validation scenario and maturity for Exercise #2 planned for June 2020.

MUAC is working on preparations for deployment together with the IOP-partners, linked to PCP AF#5 (SWIM Blue Profile).

Data services

SAS2

The SAS2 project is the development and deployment/implementation of a Shared ATC System 2 (SAS2) used by Belgian Defence to provide OAT services. The implementation was fully achieved in December 2019: remote CWPs are installed at skeyes Steenokkerzeel site and at the Belgian Defence ATC Towers and are connected through a dedicated Virtual Private Network to the PRI-ATS system in the ONL and TTI partitions at MUAC.

ADAAS

The ADaaS Study has deployed a prototype to demonstrate that ATM data can be provided as a service by one distributed ATM System to one or more civil Air Traffic Service Units (ATSUs). The ADaaS Study also investigated how an existing ICT infrastructure of MUAC has to be modified to become a 'state-of-the-art' Data Centre from which an ADSP can deliver services.

Proactive manpower planning

The manpower requirement is continuously monitored with regards to both the controller and support functions.

Ab-initio recruitment is reviewed on a quarterly basis with the aim to balance the expected traffic demand, ATCO outflow and capacity gains from system and procedure developments.

For the support functions, the objective was to contain, or where possible lower, staff numbers by assessing the business need for every support function prior to filling it.

Ab Initio training at ENAC

In 2019, 9 ab-initio students obtained ATCO licences in MUAC. AI74 started with 10 students in March 2019 and AI75 began with 16 students in October.

A number of students are at various stages of their training both in ENAC and MUAC. While it is too early to draw meaningful conclusions (only the first 'ENAC course', AI69, is fully checked out), the initial results are positive, and MUAC is optimistic that the overall pass rate will exceed initial expectations.

Unit training at MUAC

The team has worked intensively on designing, developing and delivering a new unit course. A detailed evaluation of the course delivery has led to further improvements and a next step in the pedagogical design of the training.

Coaching teams

The new concept of coaching (smaller dedicated teams, trained with the 'OJTI' (On-the-Job Instructor) master classes (a course developed and delivered to train the OJTIs to apply a more 'reflective' coaching style compared to the past)) has proven its worth.

MUAC OAT provision

The EOS (Executive Operations Support) Assistants have been further trained on the job to obtain full qualifications and the first Assistants have now finished their training.

Other training

The Training Organisation has also delivered training for the CSS (Room Supervisors and Assistant Duty Supervisors (AtDSUPs), recurrent refresher training, adapted refresher and Unit training and customised training in support of project implementations.

Welfare services

Since 2018, the MUAC welfare officer is established as an essential function for the centre. She offers confidential support and advice to all staff members (serving and retired, and their families) experiencing personal, family or professional difficulties, and helps resolve them. She is also part of the team working on the onboarding process for expats working for MUAC, to make the transition to the Maastricht area as smooth as possible.

The Welfare Officer is a member of the social-medical team and as such, plays an active role in the process of reintegration after long-term absence of staff members. Additionally, she contributes to pro-active and preventative policies and initiatives in the area of health and wellbeing, such as the Energy and Resilience Management project, in order to further support the overall wellbeing of staff members.

Energy and Resilience Management

The MUAC Energy and Resilience Management Project has transitioned from project to an important cornerstone of the MUAC culture and, over the years, has become popular amongst employees throughout the organisation. Its aim is to implement a structural approach to energy and resilience management in order to support staff in boosting their own level of engagement and happiness both at work and in their private life, thus preventing burnout.

The Energy and Resilience Management support network is available to support staff in facing their challenges, with individual coaching sessions, trainings and workshops. In the course of the project the ops room staff, including system control staff, have the opportunity to utilise an online development application, the GRIP, to work on their personal improvement areas. Those who have participated in the project initiatives have certainly developed skills and attitudes that will be key for the future of our jobs.
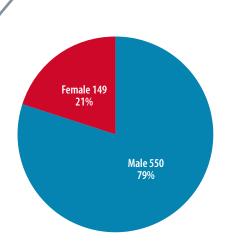
Social dialogue
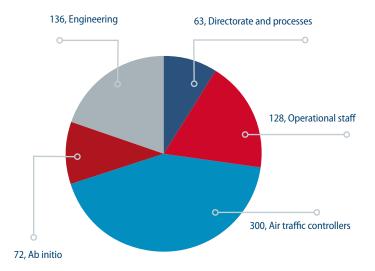
Social dialogue activities in 2019 continued at both Agency and MUAC levels through the Agency consultation process involving the trade unions and meetings of the Staff Committee Servants, who represent MUAC staff with MUAC senior management.

These discussions covered a number of different topics but, in particular, focussed on mitigations for the staffing delay experienced in 2018 and forecast to increase. Discussions on amendments to the conditions of employment to absorb the extra workload were successfully concluded with a view to increasing the capacity MUAC can offer to the airspace users, while also addressing the health and wellbeing of staff. The effect of this agreement can clearly be seen in the reduction of staffing delay in 2019 when compared to the previous year.

Within MUAC, management provided regular feedback to the Staff Committee Servants on MUAC's main activities and its involvement within FABEC. On the basis of close dialogue between the Staff Committee and MUAC management, issues were raised, discussed and followed up.

STAFF STATISTICS

Female 149
21%

Male 550
79%

▲ GENDER DISTRIBUTION
(31 December 2019)

136, Engineering

63, Directorate and processes

128, Operational staff

300, Air traffic controllers

72, Ab initio

▲ BREAKDOWN OF STAFF in the different
core business units (31 December 2019)

— Support staff (excl. Lippe) — ATCOs — Ab Initios
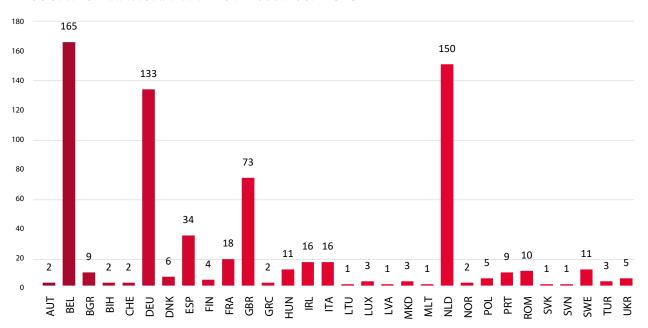
▲ AGE PROFILE – 31 December 2019

Air traffic controllers per sector group (2014-2019, 31 December)						
	2014	**2015**	**2016**	**2017**	**2018**	**2019**
Brussels	107	107	106	107	112	112
DECO	97	100	100	98	96	94
Hannover	101	99	98	97	95	94
TOTAL	**305**	**306**	**304**	**302**	**303**	**300**

Staff intake and outflow (2014-2019, 31 December)	2014	2015	2016	2017	2018	2019
Retirements	1	3	2	2	9	9
Other outflow*	8	18	4	6	6	13
TOTAL outflow	**9**	**21**	**6**	**8**	**15**	**22**
Recruitment (except air traffic controllers)	2	2	9	7	25	16
Student air traffic controllers (ab initio and conversion)	0	8	0	25	26	26
TOTAL intake	**2**	**10**	**9**	**32**	**51**	**42**

* *Other outflow refers to student air traffic controller dismissals, resignations, early terminations of service, transfers to other EUROCONTROL units, unpaid leave, invalidity, end of contract, contract terminations or death in service.*

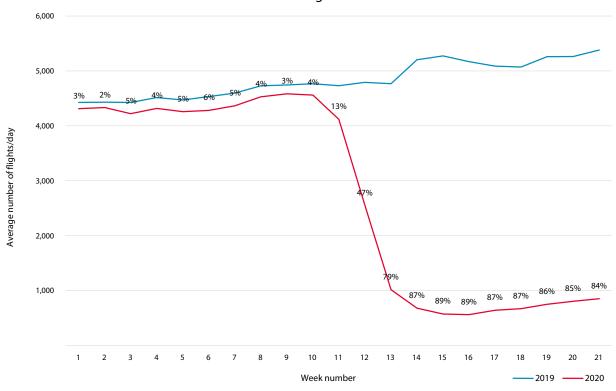▼ COUNT OF NATIONALITY – 31 December 2019

BUSINESS OUTLOOK

2020 is an extraordinary year for the aviation industry, the effect of the global measures taken to combat the spread of the COVID-19 virus is plain to see. The aviation industry has been particularly hard hit, as airlines ground their fleets; traffic levels have plummeted.

Given the pressure on all actors in the industry, MUAC is committed to playing its part. The Director MUAC has been in regular contact with stakeholders to inform them about the situation in MUAC. Assurances have been made that the measures taken in the centre will enable us to both continue to operate during the crisis and to provide the highest possible level of service throughout the recovery period and beyond.

MUAC has been proactive in protecting the health of its employees and maintain its operations in both civil and military operations since the outbreak of the COVID-19 crisis. Air traffic control is a critical national infrastructure and it is clear that the combined support of Eurocontrol and the MUAC staff will be critical for the full duration of the recovery period (however long that may be) and beyond as airlines demand the highest level of service quality and availability from MUAC.

MUAC flight variation

Average number of flights/day vs Week number. Lines for 2019 and 2020.

Data labels (2020 percentage variation by week):
3%, 2%, 5%, 4%, 5%, 6%, 5%, 4%, 3%, 4%, 13%, 47%, 79%, 87%, 89%, 89%, 87%, 87%, 86%, 85%, 84%

The MUAC Board has analysed the MUAC strategy and priorities with the ultimate objective of providing the Centre with adequate tools and initiatives to adapt to the challenges of the coming years.

The new Agreement on the establishment of the Maastricht Decision-Making Body (MDMB) as the main executive body of MUAC, with increased decision-making power and more autonomy, is expected to be implemented by end 2021. This should provide MUAC and the Four States with the necessary agility to make rapid, independent and sound decisions in this dynamic business environment.

The Board will promote further cooperation with key partners and stakeholders (e.g. FABEC, NM, military partners etc.), and will ensure that MUAC's role as a key player on the European ATM scene will enhance the solutions and agreements required to tackle the upcoming challenges.

In the medium-long term, "innovation" will remain a pivotal element of the MUAC strategy. As an outstanding service provider, MUAC has to be effective, continue to grow and be at the forefront of technical and operational innovations while remaining an attractive employer. In this regard, a number of initiatives and studies are on the table, including our ATC2ATM programme, the Business Intelligence activities, Shared Systems and automation – all key to our future development. In parallel, the Board will promote internal initiatives to ensure the best use of available platforms, fora and resources to come up with new creative, innovative and effective ideas.

The environmental footprint of the centre is being reviewed and new studies kicked-off to reduce MUAC's direct environmental impact and to look for initiatives to minimise the impact from the aircraft under our control.

The Board is doing its utmost to ensure MUAC's prominent place on the ATM scene as Europe's top performing ANSP.

The MUAC Board

FINANCIAL ACCOUNTS

Annual accounts

EUROCONTROL produces annual accounts which provide a consolidated view of the Agency's financial situation and budgetary performance. In line with the applicable financial regulations, the specific performance of MUAC is identified in Part III of the Agency's accounts. This report includes an excerpt of the data available in the Agency's Annual Accounts in order to present a reference Balance Sheet and Statement of Financial Performance for MUAC. The Agency's Annual Accounts are produced in accordance with the principle of a true and fair view.

The Agency's accounts, including Part III, which relates to MUAC, are audited by the Audit Board with the assistance of external consultant auditors. The Annual Accounts, including the auditor's opinion, are subsequently submitted to the Commission via the Provisional Council. The Commission gives a final ruling on the Accounts and decides on the discharge to be given to the Director General in respect of his financial and accounting management.

The figures presented in this report are therefore subject to the approval of the Audit Board and the Provisional Council, which was received in June 2020.

Accounting principles and general notes on accounting matters

The main accounting principles underlying the present financial statements are set out below.

Since 2011, the financial statements with regard to expenditure and receipts have been prepared based on the International Financial Reporting Standards (IFRS), based on the provisions of the Financial Regulations of the Agency and their Rules of Application.

The Agency's policy regarding fixed assets is based on the revised Director General Decision XI/7(2020), dated 01/01/2020 and the Decision of the Director CF (DCF/II/04 dated 01/01/2020). Fixed assets are entered at their historic value and amortised over their useful lifetimes, in accordance with amortisation rates, which apply equally to the calculation of the investment costs to be recovered from the airspace users through the EUROCONTROL part of the cost-base (based on ICAO rules adopted by the Permanent Commission).

Following a decision by the Provisional Council in November 2004, the Agency applies International Accounting Standard 38 (IAS 38) and, as of 1 January 2006, capitalises only intangible assets that fully comply with this standard. Following this principle, only computer software for which EUROCONTROL owns intellectual property rights is capitalised.

Concerning operating expenditure, contributions from the Four States participating in MUAC are calculated based on an agreed cost-sharing formula. At year end, the over/under payment of contributions is calculated by comparing the level of expenditure with the level of contributions paid.

Investments are fully financed with bank loans. Therefore, the residual value of fixed assets on the Balance Sheet is fully compensated by an equivalent amount of loans. In the Statement of Financial Performance, the amortisation charge for the year is balanced by contributions from the Four States.

In accordance with Article 23 of the Financial Regulations, any over/under payments of contributions are deducted from/added to contributions for the subsequent year.

In accordance with Article 29 of the Financial Regulations and, as approved by the Permanent Commission, the Annual Accounts incorporate both the Budgetary and the Financial Accounts.

The 2019 Budgetary Accounts, which determine the amount of contributions due from the Member States in 2019, are based on the IFRS principles (with some exceptions). Similarly, the 2019 EUROCONTROL cost-base, which has been charged to the users through the route charges recovery cost mechanism, is also based on the IFRS principles (with some exceptions). The exceptions to IFRS are listed in Article 6 of the Rule of Applications to the Financial Regulations in the areas of contributions to social security schemes, compensation of national taxes and provisions.

BALANCE SHEET (NOMINAL VALUES)

ASSETS	2018	2019
FIXED ASSETS		
Buildings & installations	31,279,769	32,821,964
Equipment	25,437,951	22,502,980
Vehicles	24,787	75,749
Work in progress	2,136,613	901,291
TOTAL FIXED ASSETS	**58,879,120**	**56,301,983**
CURRENT ASSETS		
Contributions to be received	25,420,797	27,709,760
Intercompany receivables	13,968,134	14,979,674
Deferred charge	11,373,885	12,358,213
Other debtors	1,594,217	1,448,218
TOTAL CURRENT ASSETS	**52,357,033**	**56,495,866**
OVERALL TOTAL	**111,236,153**	**112,797,849**

LIABILITIES		
CURRENT LIABILITIES		
Contributions to be reimbursed to Member States	7,218,104	6,112,886
Deferred income	34,939,685	39,872,250
Other creditors	6,820,598	9,437,630
Accrued charge	3,378,647	1,073,100
TOTAL CURRENT LIABILITIES	**52,357,033**	**56,495,866**
OTHER LIABILITIES		
Loans > 1 year	58,879,120	56,301,983
TOTAL OTHER LIABILITIES	**58,879,120**	**56,301,983**
FINANCIAL POSITION		
TOTAL FINANCIAL POSITION	**-**	**-**
OVERALL TOTAL	**111,236,153**	**112,797,849**

STATEMENT OF FINANCIAL PERFORMANCE (NOMINAL VALUES)

	2018			2019		
	GAT	**OAT**	**TOTAL**	**GAT**	**OAT**	**TOTAL**
COSTS						
Remunerations	133,446,457	3,792,743	137,239,200	144,954,811	4,587,818	149,542,630
Revenue related to remunerations	-1,400,761	-39,812	-1,440,573	-1,480,850	-46,869	-1,527,719
Revenue related to KLU	-719,122	-20,438	-739,560	-209,373	-6,627	-216,000
Revenue related to SESAR 2020	-1,014,981	-28,847	-1,043,828	-1,042,301	-32,989	-1,075,290
Revenue related to SAS-2	-1,584,954	-45,047	-1,630,001	-910,506	-28,818	-939,324
Revenue related to NL OAT service provision	-2,867,107	-81,487	-2,948,594	-2,978,680	-94,275	-3,072,955
Revenue related to DECEA	-610,039	-17,338	-627,377	-365,467	-11,567	-377,034
Revenue related to other services				-369,675	-11,700	-381,375
Revenue related to services	-8,196,964	-232,969	-8,429,933	-7,356,852	-232,844	-7,589,697
STAFF COSTS	-125,249,493	-3,559,774	-128,809,267	137,597,959	4,354,974	141,952,933
Staff-related costs: training and travel costs	4,531,544	342,284	4,873,829	5,046,258	361,382	5,407,640
External assistance	5,827,489	440,172	6,267,660	6,724,145	481,542	7,205,686
Accommodation	3,862,294	291,733	4,154,028	3,761,212	269,355	4,030,567
Communications	1,783,634	134,724	1,918,358	1,746,511	125,074	1,871,585
Data processing	5,140,549	388,284	5,528,834	5,188,989	371,603	5,560,592
General administration	420,664	31,774	452,439	344,557	24,675	369,232
Finance & Insurance	273,048	20,624	293,672	286,751	20,535	307,286
Unrecoverable VAT	12,732	962	13,694	10,013	717	10,730
Miscellaneous revenue	-90,523	-5,945	-96,468	-79,453	-5,636	-85,089
OPERATING COSTS	21,761,432	1,644,612	23,406,044	23,028,982	1,649,247	24,678,229
DEPRECIATION COSTS	9,317,270	0	9,317,270	9,848,720	0	9,848,720
COSTS OF CAPITAL	294,523	0	294,523	216,797	0	216,797
TOTAL COSTS	156,622,718	5,204,386	161,827,104	170,692,458	6,004,221	176,696,678
INTERNAL TAX	-38,263,082	-1,087,492	-39,350,574	-41,730,070	-1,320,756	-43,050,826
CONTRIBUTIONS	118,359,636	4,116,894	122,476,530	128,962,388	4,683,465	133,645,852

GLOSSARY OF ACRONYMS

A

AAPF	Advanced ATFCM/ASM Planning Function
Ab-Initio	Air Traffic Controller student
ACC	Area Control Centre
ACE	ATM Cost-Effectiveness
ADaaS	ATM Data as a Service
ADS-C	Automatic Dependent Surveillance - Contract
ADSP	ATM Data Service Provider
AMC	Airspace Management Cell
	Acceptable Means of Compliance
AMAN	Arrival Manager
ANSP	Air Navigation Service Provider
ASM	Airspace Management
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Controller
ATC2ATM	Air Traffic Control to Air Traffic Management
ATDSUP	Assistant Duty Supervisor
ATFCM	Air Traffic Flow and Capacity Management
ATFM	Air Traffic Flow Management
ATM	Air Traffic Management
ATMP	Air Traffic Management Portal
ATM/CNS	Air Traffic Management/Communications, Navigation and Surveillance
ATM-SE	Air Traffic Management Specific Technical Events
ATN	Aeronautical Telecommunications Network
ATS	Air Traffic Services
ATSEP	Air Traffic Safety Electronics Personnel
ATSU	Air Traffic Service Unit

B

BAF	Bundesaufsichtsamt für Flugsicherung/Federal Supervisory Authority for Air Navigation Services
BSA-ANS	Belgian Supervisory Authority for Air Navigation Services
B2B	Business to Business

C

CAA	Civil Aviation Authority
CNS	Communications, Navigation & Surveillance
CO2	Carbon dioxide
CPDLC	Controller-Pilot Data Link Communications
CRSTMP	Capacity, Routeing, Staffing, Equipment, Management, Special Event
CSS	Central Supervisory Section
CWP	Controller Working Position

D

DARP	DECO Airspace Redesign Project
DCFI	Directorate Central Route Charges Office, Finance and central IT
DECEA	Departmento de Controle do Espaço Aéreo
DNV GL	Det Norske Veritas Germanischer Lloyd
DR	Directorate Resources

E

EC	European Commission
ENAC	Ecole Nationale de l'Aviation Civile
EOS	Executive Operations Support
EPP	Extended Project Profile
EU	European Union
EUROCONTROL	European Organisation for the Safety of Air Navigation

F

FAB	Functional Airspace Block
FABEC	Functional Airspace Block Europe Central
FANS	Future Air Navigation System
FDPS	Flight Data Processing System
FIR	Flight Information Region
FRA	Free Route Airspace
FRAM2	Free Route Airspace Maastricht
FTE	Full-Time Equivalent
FUA	Flexible Use of Airspace

G

GAT	General Air Traffic
GCE	General Conditions of Employment

H

HR	Human Resources
HRS	Human Resources Staff
H24	Hours 24, availability 24 hours/day, 7 days/ week

I

IAS	International Accounting Standards
ICAO	International Civil Aviation Organization
ICT	Information and Communication Technology
iFMP	Integrated Flow Management Position
IFR	Instrumental Flight Rules
IFRS	International Financial Reporting Standards
ILT	Inspectie Leefomgeving en Transport / Human Environment and Transport Inspectorate
IOP	Interoperability
IR	Implementing Rule
ISO	International Organization for Standardization

K

KEA	Horizontal en-route flight efficiency of actual trajectory
KLU	Koninklijke Luchtmacht
KPA	Key Performance Area
KPI	Key Performance Indicator
KWh	Kilowatt hour

L

LED	Light Emitting Diode
LVNL	Luchtverkeersleiding Nederland

M

MAA	Military Aviation Authorities
MAKC	Maastricht Knowledge Centre
MCG	Maastricht Co-ordination Group
MDMB	Maastricht Decision Making Body
MO	Management Objective
MoU	Memorandum of Understanding
MOST	Maastricht Operational Statistics Tool
MSP	Multi Sector Planning
MUAC	EUROCONTROL Maastricht Upper Area Control Centre

N

NATO	North Atlantic Treaty Organization
NM	Nautical Miles
	Network Manager
NMOC	Network Manager Operations Centre
NORD	Nicky-Olno-Ruhr-Delta Re-Design
NUT	New Unit Training
N-VCS	New Voice Communication System

O

OAT	Operational Air Traffic
OJT	On-the-Job Training
OJTI	On-the-Job Training Instructor
ONL	Online
OPS	Operations

P

PABI	Post-OPS Analysis and Business Intelligence
PC	Provisional Council of EUROCONTROL
PCP	Pilot Common Projects
PRB	Performance Review Body
PRC	Performance Review Commission
PRI-ATS	Primary Air Traffic System

R

RAT	Risk Analysis Tool
REDES	Route Efficiency in approaching DEStination
REDMIS	Re-Design Military Sector Layout
RESTR	Route Efficiency in Straightness of Trajectory
RNLAF	Royal Netherlands Air Force
RP1	Reference Period 1 (2012-2014)
RP2	Reference Period 2 (2015-2019)

S

SAS	Shared ATS System
SES	Single European Sky
SESAR	Single European Sky ATM Research
SMI	Separation Minima Infringements
SMS	Safety Management System
SOT	Sector Opening Time
SOTA	Sector Opening Tables Architect
SSM	Support Services Management
STATFOR	EUROCONTROL Statistics and Forecast Service

T

TPI	Traffic Predictions Improvements
TRA	Temporary Reserved Area
TTI	Test and Training Integration

U

UIR	Upper Information Region
US	United States

V

VAT	Value Added Tax
VDL	VHF Digital Link

W

WO	Weather, Other

X

XMAN	Cross-Border Arrival Management
4ACC	4 ACC (NATS-London, DSNA-Reims, MUAC, DFS-Karlsruhe)
4NSA	Four States' National Supervisory Authorities

Annual Report 2019

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