member of FABEC

EUROCONTROL

EUROCONTROL
MAASTRICHT UPPER AREA
CONTROL CENTRE

ANNUAL REPORT 2018

EMBRACING THE FUTURE

Annual Report 2018

EUROCONTROL

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Fast Facts

MUAC – Fast Facts	2014	2015	2016	2017	2018	2018 ↔ 2017
TRAFFIC						
Movements	1,671,185	1,702,263	1,779,969	1,848,581	1,872,686	+1.3%
IFR flight-hours	587,342	600,969	625,901	645,062	667,869	+3.5%
Service Units	6,473,244	6,625,272	7,057,838	7,366,791	7,659,462	+4.0%
Sector Opening Time (SOT) – (hours)	70,511	72,850	76,218	77,159	75,275	-2.4%
Traffic peak (max. number of flights controlled per day)	5,272	5,266	5,486	5,689	5,702	+0.2%
Average flights controlled per day	4,367	4,435	4,635	4,831	4,903	+1.5%
Average flights controlled in summer (May-October) per day	4,818	4,855	5,102	5,307	5,342	+0.7%
STAFF						
MUAC staff (former Lippe staff excluded)	624	613	616	639	681	+6.6%
Former Lippe staff [1]	-	-	-	48	47	-2.1%
ATCOs in OPS	305	306	304	302	303	+0.3%
ATCOs in OPS (FTEs)	268	265	267	266	259	-2.6%
COST-EFFICIENCY (€2017) [2]						
Inflation rate (Netherlands)	+0.3%	+0.2%	+0.1%	+1.3%	+1.6%	-
Revenues (€M)	€493.9	€539.9	€537.5	€510.5	€495.8	-2.9%
Total fixed-assets at year-end (net book value; €M) [3]	€75.7	€71.5	€66.6	€62.5	€58.9	-5.8%
Capital expenditure at year-end (€M)	€5.4	€5.4	€3.9	€4.8	€6.7	+36.3%
Cost-base (€M)	€150.0	€139.5	€147.5	€151.9	€156.6	+3.1%
Staff costs [4]	€127.6	€117.7	€122.6	€124.1	€125.2	+0.9%
Non-staff operating costs	€12.3	€12.3	€16.1	€19.4	€21.8	+12.2%
Depreciation	€9.6	€9.1	€8.4	€8.2	€9.3	+13.6%
Cost of capital	€0.5	€0.5	€0.4	€0.2	€0.3	+29.7%
Exceptional reduction	-	-	-	-	-	-
Total financial cost/IFR flight-hour [5]	€255	€232	€236	€236	€235	-0.4%
Total economic cost/IFR flight hour [6]	€305	€333	€399	€434	€465	+7.2%
MUAC Equivalent Unit Cost [7]	€23.2	€21.1	€20.9	€20.3	€20.4	+0.7%

MUAC – Fast Facts	2014	2015	2016	2017	2018	2018 ↔ 2017
CAPACITY						
Productivity	1.96	1.97	2.03	2.06	2.22	+7.8%
Total delay (min.)	280,673	582,487	982,369	1,232,634	1,482,997	+20.3%
CRSTMP delay (min.) [9]	155,367	393,353	514,499	803,384	927,974 [8]	+15.5%
Average total delay/flight (min.)	0.17	0.34	0.55	0.67	0.79	+18.8%
Average CRSTMP delay/flight (min.)	0.09	0.23	0.29	0.43	0.50	+14.0%
Punctuality (%)	98.9%	97.7%	96.3%	95.5%	95.4%	-
Delayed flights (%)	1.1%	2.3%	3.7%	4.5%	4.6%	-
Delayed flights (WO codes, %)	0.4%	0.6%	1.3%	1.1%	1.2%	-
Delayed flights (CRSTMP codes; %)	0.7%	1.7%	2.4%	3.5%	3.3%	-
Flights with 1-15 min. of delay (CRSTMP codes, %) [10]	0.5%	1.2%	1.8%	2.5%	2.1%	-
Flights with 16-30 min. of delay (CRSTMP codes, %)	0.2%	0.4%	0.5%	0.8%	0.9%	-
Flights with +30 min. of delay (CRSTMP codes, %)	0.0%	0.1%	0.1%	0.2%	0.3%	-
Congested days (minutes of delay > traffic)	6	30	43	59	90	+52.5%
SAFETY						
Separation infringements (MUAC contribution)	2	0	3	2	3	-
ENVIRONMENT						
Flown RESTR	0.47%	0.44%	0.48%	0.45%	0.47%	-

(1) Former Lippe staff became part of MUAC staff as of 1 January 2017.

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

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

(4) Former Lippe staff costs are not included in this item.

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

(6) 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.

(7) 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.

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

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

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

MUAC Profile

The Maastricht Upper Area Control Centre (MUAC) is an international non-profit 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 more than 45 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.

Since 1975, 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 will become 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.

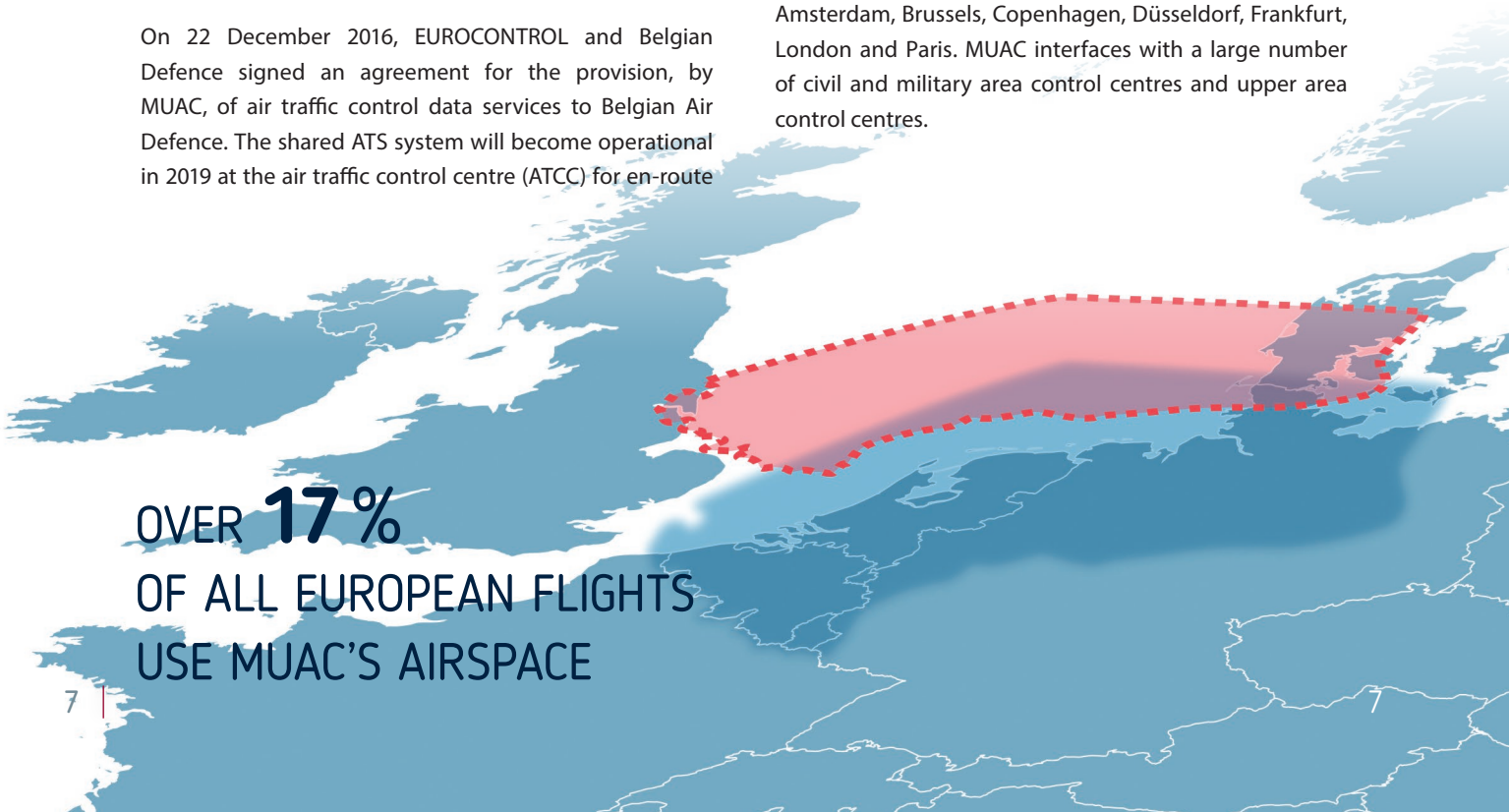
One of MUAC's flagship activities is the development and implementation of leading-edge infrastructure and technology solutions to ensure that customers and stakeholders benefit from the highest levels of performance. MUAC's active involvement in SESAR (Single European Sky ATM Research) is instrumental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

Mission and vision

MUAC's mission is to provide cross-border Air Traffic Management (ATM) to civil and military airspace users in the core area of Europe, as well as to develop, integrate and provide state-of-the-art ATM systems and services. MUAC's vision is to be recognised as an outstanding provider of ATM and ATM-related systems and services. MUAC is a leading innovator in its area of competence.

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

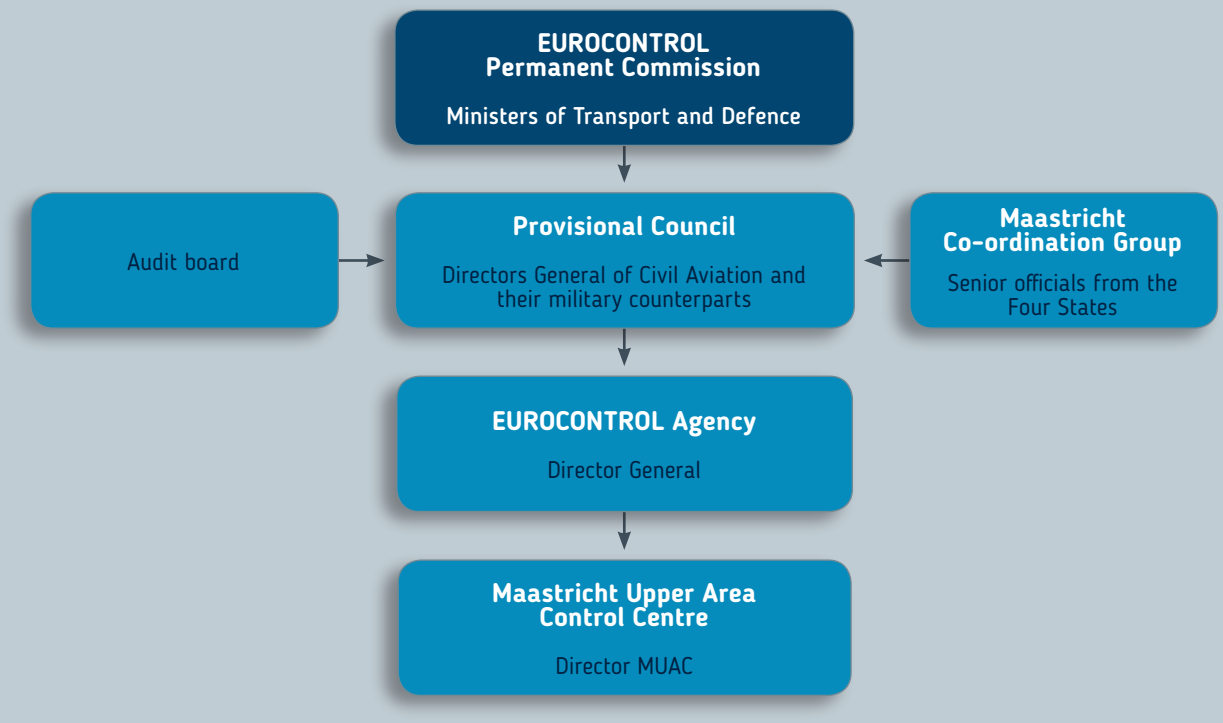
7

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.



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, as a result of an audit, 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) No. 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

During 2018, MUAC further strengthened its risk management processes and all business risks have been 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
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Belgian Armed Forces – Air Component

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Ms Hilde VAN DEN HOUTEN
skeyes

Mr Geoffray ROBERT
skeyes

Germany

HEAD OF DELEGATION

Mr Dirk NITSCHKE
Federal Ministry of Transport and Digital Infrastructure

OTHER PARTICIPANTS

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Federal Ministry of Transport and Digital Infrastructure

Lt. Col. Matthias GRALL
Federal Ministry of Defence

Col. Andreas HOPPE
Federal Ministry of Defence

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

Mr Andreas PÖTZSCH
Deutsche Flugsicherung

Luxembourg

HEAD OF DELEGATION

Mr Pierre JAEGER
Director General of Civil Aviation

OTHER PARTICIPANTS

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Directorate of Civil Aviation

Mr Ender ÜLCÜN
Ministry of Sustainable Development and Infrastructure

Netherlands

HEAD OF DELEGATION

Mr Paul VAN GURP
Ministry of Infrastructure and Environment
Chair of the Maastricht Coordination Group during 2018

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 Volker DICK
Staff Committee Servants

Mr Frederic DELEAU
Staff Committee Servants

Management

DIRECTOR GENERAL OF EUROCONTROL

Eamonn BRENNAN

MUAC BOARD

John SANTURBANO

Director

Ian MIDDLETON

Head of Operations Domain

Peter NAETS

Head of Engineering Domain

Niels LOKMAN

Head of Strategy and Performance Management

Chris STADLER

Head of OPS Strategy & Development

Bart VANDERSMISSEN

Head of Change Management

Daniel LIU

Head of Support Services Management

Morten HANSEN

Head of Safety, Quality & Security

Paul VAN GURP
Chairman of the Maastricht Co-ordination Group during 2018

MCG CHAIRMAN & DIRECTOR GENERAL'S STATEMENT

Over the course of the years MUAC has indisputably proven its capacity to quickly adapt to a very mutable business environment and transform challenges into concrete opportunities. Today MUAC is facing a significant increase in demand for travel, fuelled by the ongoing economic recovery which, given the capacity issues, is giving rise to undeniable financial setbacks for airlines and problems for passengers, posing a potential risk to MUAC's international image and reputation.

MUAC's top priority is to offer customer-oriented, innovative and tailored services to civil and military airspace users based on safety, quality and cost efficiency.

Eamonn BRENNAN
Director General
EUROCONTROL

Although MUAC has been confronted with an insatiable growing demand, excellent results have been achieved in the safety area. This was made possible by a pervasive safety culture, investment in developing human resources and the use of systems that can be described as leading edge in the industry.

Every flight controlled by MUAC requires the effort of many employees and partners. MUAC believes that the best way to provide customers with an unparalleled service is by drawing on the energies of individuals in different roles to create a continuous, cohesive stream of ideas and strengths following a single path. To interact with customers with a genuinely supportive attitude requires not just improving knowledge, techniques and other day-to-day skills, but also a strong customer-orientated mentality.

MUAC strongly believes in its employees and their potential and encourages initiatives stemming from a diverse group of staff with different experiences, values and perspectives to constantly generate new value. We acknowledge and fully support any strategy aimed at promoting diversity and changing workstyles, while also taking a serious interest in the well being of the employees. But we also recognise that all these good internal initiatives and projects are insufficient to solve today's traffic situation.

The Centre has reached full saturation in certain sectors and room for manoeuvre is limited by the current legal and social framework in which it operates. MUAC alone cannot overcome the current and future challenges. A more integrated holistic approach, where all partners in the Air Traffic Management (ATM) community need to co-operate closely with each other is now required.

We are fully committed to engaging on the upcoming capacity challenges in the core FABEC airspace and support MUAC in accomplishing its business mission and vision, thereby creating greater value for all its stakeholders. Together with MUAC, we aim to enhance a long-term sustainable business development in one of the most efficient ATC centres in Europe. The best quality of service to European passengers is what drives us, and MUAC is a centre that leads by example!

Paul VAN GURP and Eamonn BRENNAN

DIRECTOR'S STATEMENT

No one can deny that we are operating in a time characterized by high uncertainty and pressure which requires, among other things, a strong capacity to adapt to the changing circumstances. When I joined MUAC more than one year ago, I highlighted how proud I was to lead and be part of a team of professionals who commit every day to offering the best services to the customers.

Today I can confirm 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.

A deeper analysis on core competitiveness during the reporting period clearly shows that 2018 witnessed strong growth in aviation transport demands across all Europe. Despite a continuous traffic increase, the number of separation infringements remained at a stable level year on year, with only 3 severity B separation infringements with a MUAC contribution in 2018. Safety is the raison d'etre of MUAC and the first priority in all our activities. MUAC is fully committed to providing its staff with the training they need to achieve the highest level of safety performance.

Overall, according to the Network Manager, MUAC handled 1,871,686 flights in 2018, which was 1.3% more than the previous year. Thanks to the 4ACC initiative, the DARP (DECO Airspace Redesign Project) project and the MUAC Customer Initiative, MUAC was able to offer additional capacity while mitigating delays.

Indeed, total delay was 20% higher than in 2017. 95.4% of flights were on time in 2018, with an average delay of 0.79 min/flight. Delays are clearly increasing year on year and increasing our capacity will remain one of our key priorities in 2019.

On the positive side, controller productivity reached 2.22 flight hours/ATCO hour, the highest so far (in 2017 the figure was 2.06).

The MUAC equivalent unit rate and the financial unit cost targets were met, but the target for economic unit cost was not, owing to the increase in the unit cost of delay.

In addition to providing the best possible services to our customers, our teams also devote a great deal of effort to regularly meeting our customers, both civil and military, and getting direct feedback from them. The general feedback was positive, they are all aware of our challenges and appreciate the efforts we are making in trying to unlock more and more capacity despite the saturation of some parts of our airspace.

Furthermore, we had three examples of particularly successful international cooperation projects in 2018, namely:

- the important cooperation achieved with the Brazilian partners, delivering our TimeZone tool for them through Maastricht ATM Knowledge Center (MAKC);
- the SAS2 agreement with the Belgian Ministry of Defence, and
- the ADaaS arrangements with Slovenia.

Our recruitment and training cycle are finally in full swing again. We had 6 successful ATCO students last year, who obtained their licences with 2 unit endorsements and

> I would like to express my sincerest appreciation to the whole MUAC staff for the outstanding results achieved in 2018. Once again, MUAC has been confronted with unprecedented traffic demand, which undoubtedly added heavy workload to the (extra)ordinary tasks of my staff.

can now work independently, and 51 more are at various stages of their training or cross-training.

Following the civil-military integration in 2017, three quarters of our flight data operators have now completed their conversion training and are allowed to work at both civil and military working positions. Fully operational military and civil integration is still a long way off, but big steps were taken in 2018, especially in aligning procedures, thanks to a lot of work and very motivated staff.

With a 99.9% stability rate in 2018, MUAC's ATC system again enjoyed very high availability, thanks to our professional support teams and engineers. They have also been successfully exploring and deploying machine-learning techniques and software, thus improving sector planning and post operational analysis with historic "big" data. Our engineering team systematically seeks out innovative technologies and astute operational solutions in order to serve our customers.

With free route airspace moving to phase 2 in December 2018, we will contribute to reducing the environmental footprint of aviation. In 2017, we started with night-time free route while full weekends have now been added.

CPDLC log-on rates increased by 20% (FANS) and 25% (ATN), which is an encouraging improvement and may help ease the workload of our controllers as well as unlocking some precious additional capacity.

Last but not least, the recent agreement with the social partners on amendments to the General Conditions of Employment (GCE), once approved by the Four States, will give us the possibility to mitigate our shortage of ATC staff in the years to come and will enable us to meet our business objectives in a sustainable manner. I would like to express my deepest appreciation and gratitude to all those colleagues who have worked hard to transform this challenging negotiation into a concrete win-win opportunity.

This was just a snapshot of the productive year at our Centre, but I genuinely hope that, despite the currently challenging environment, it demonstrates our clear commitment to moving step by step towards realising our vision statement of "being recognised as an outstanding provider of ATM and ATM-related systems and services and as a leading innovator in its area of competence".

John Santurbano
Director, MUAC

2018 Highlights

Performance through innovation

01

MUAC becomes the very first ANSP in Europe to use the Network Manager's new Regulation Proposal Service operationally paving the way for significant operational benefits.

02

The first group of fully rated civil-military EOS (Executive Operations Support) flight data operators obtains full qualifications.

05

The Four En-Route Centre Initiative – or 4ACC/NM Initiative - aimed at optimising traffic flows at network level, is launched.

For the 16th consecutive year, the ATM Cost-Effectiveness (ACE) 2017 Benchmarking Report confirms MUAC as one of Europe's best-performing ANSPs with the highest controller productivity.

EUROCONTROL signs the European Commission's Declaration on equal opportunities for women and men in the transport sector.

06

MUAC signs the ADaaS2 – "Cluster Development project" and DECEA agreement with Slovenia Control and Brazil, respectively.

MUAC safely handles a new all-time daily traffic peak of 5,702 flights on 29 June.

10

The 95th Maastricht Coordination Group (MCG) takes place at MUAC on 24 October.

MUAC receives certificates of accreditation for the provision of OAT and the training of personnel handling OAT in the upper airspace of the Amsterdam FIR.

A new group of ATCO students (AI73) starts their Basic Training module at ENAC (Toulouse).

MUAC launches the first Open-Day to encourage young people to become air traffic controllers.

03

A third layer in the DECO sector group is implemented.

A new group of ATCO students (AI72) starts their Basic Training module at ENAC (Toulouse).

MUAC and the Founding Members of the iTEC Collaboration sign a Memorandum of Understanding (MoU) to jointly develop components that will enable interoperability between their respective Air Traffic Management systems.

04

The 2018 MUAC Safety Performance Report highlights MUAC's overall positive safety performance.

The 94th Maastricht Coordination Group (MCG) takes place at MUAC on 24 April.

07

Local HR and finance support staff are transferred back to MUAC line management, marking a step towards the greater management independence granted to MUAC by the Provisional Council.

08

The first former Lippe controller receives a positive checkout in the Hannover West sector.

11

MUAC executives meet airlines, airline associations and computerised flight plan service providers in London at its plenary customer consultation meeting.

The second "OAT@MUAC" Military Customer Forum takes place at the Dutch Air Force airbase in Eindhoven.

12

MUAC signs a Letter of Intent with skeyes and Belgian Defence to manage Belgian airspace with one single system as of 2024.

Free Route Airspace (FRA) is extended to weekends.

MANAGEMENT REPORT

Key Results

Key results vs 2018 Annual Plan targets at a glance

MUAC	Target 2018	Result
Traffic forecasts *(STATFOR Oct. 2017 – Baseline)*	MUAC: +2.3% Brussels: +2.3% DECO: +2.2% Hannover: +2.7%	MUAC: +1.3% Brussels: +2.0% DECO: +5.3% Hannover: +1.1%
Safety	Effectiveness of Safety Management - Achieve a minimum level 4 (or 80%) in each of the 5 Management Objectives. RAT methodology applied for severity classification for all reported occurrences (i.e. 100% by the end of RP2). No CAT. A+B incidents - (threshold is max. 3 incidents) Just culture - preparation for 2019 target.	**A minimum Level 4 in all MOs still to be achieved.** **1 MO at level 3** ✗ **100% applied** ✓ **Three severity A&B incidents** ✓ In progress
Capacity *(average delay per flight in minutes)*	0.18 (all delay causes) 0.14 (CRSTMP delay causes)	**0.79** ✗ **0.50** ✗ FABEC financial penalty € 0.8 M

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 Monitoring of horizontal flight inefficiency: planned REDES (max 7.50% in 2019), actual REDES (max 3.90% in 2019) planned RESTR (max 1.80% in 2019) Annual target for actual RESTR: 0.55%	 7.69% 4.02% 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: €164.5 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 2018, was €24.3 (equating to €164.5 M and 6.8 M service units)	M€ 156.6 ✓ € 20.4 ✓ (equating to €156.6 M and 7.7 M service units).
Customer Orientation	More than 80% satisfaction rating with 30 key accounts, with a lowest rating of 60%	85% highly satisfied, lowest rating 75% ✓

Key results vs RP2 targets at a glance

	Actual	Actual	Actual	Target	Actual	Target
	2015	2016	2017	2018		2019
Safety Level of safety management effectiveness	✓	✓	✓	Min. C	✓	Min. D Safety culture Min. C
Safety Application of the severity classification based on the Risk Analysis Tool (RAT) methodology	✓	✓	✓	>=80%	**100%**	100%
Safety Reporting Just Culture by 2019	In progress	In progress	On hold	n/a	On hold	To be initiated
Capacity *(average delay per flight in minutes)*	0.34 ✗	0.55 ✗	0.67 ✗	0.18 ✗	0.79 ✗	0.18
Environment *(KEA)*	3.34% ✗	3.40% ✗	3.23% ✗	3.05% ✗	3.25% ✗	2.96%
Cost-efficiency	Considered at national level (see previous table)					

2018 was marked by a moderate traffic increase (i.e. +1.3%), just above the low traffic scenario forecasted by STATFOR in October 2017 for 2018. At sector group level, DECO faced significant traffic demand following the introduction of a third layer in March. Hannover experienced a reduction of traffic after the launch of the 4ACC initiative. However, when this initiative ended in November, traffic in Hannover bounced back. Coping with these seasonal, unpredicted traffic variations is usually very challenging for an ANSP, mainly due to the intrinsic rigidities of several endogenous and exogenous factors which regulate and affect this business.

Furthermore, average daily traffic continued to increase robustly, in particular in winter. Last summer proved to be extremely challenging as demonstrated by the fact that the previous 2017 all-time traffic record was broken again, reaching a new high on 29 June.

In 2018, unit rates did not vary significantly for Belgium (-1€ in real terms) while they moderately decrease for Germany (-4€ in real terms) and more significantly for the Netherlands (-8€ in real terms). Cheaper route charges in the Netherlands positively contributed to a more balanced traffic redistribution over the three sector groups and limited the exponential effects of delay in the congested sectors of Brussels.

Despite the delivery of higher-than-planned capacity, the aforementioned challenges hampered the achievement of capacity and economic cost-effectiveness targets. Nevertheless, MUAC managed to minimise the effect of factors beyond its control and to maintain similar punctuality rates to those recorded in the previous year.

IN 2018, AIR TRAFFIC INCREASED BY **1.3%** OVER 2017, REACHING A TOTAL OF **1,872,686** FLIGHTS.

Traffic challenges

A new all-time traffic peak of 5,702 flights handled in a single day was reached on 29 June 2018. Moreover, in 2018, the average number of controlled flights in a day increased by 72 to reach 4,903 flights.
The summer months saw a 0.7% increase in traffic compared to 2017, mainly driven by the DECO and Brussels sector group. In summer (May-October) MUAC controlled 35 more flights each day on average, reaching 5,342 flights. This also indicates an increasing traffic demand pressure during the winter schedule.

As in previous years, traffic did not develop as expected across all sector groups. In fact, whilst the Hannover sector group handled slightly fewer flights than expected in the lower range (i.e. 0.1% less than predicted) the DECO sector group experienced significantly higher traffic volumes than predicted by the STATFOR forecasts published in October 2017.

Traffic demand across sector groups was heavily influenced by the launch of the 4ACC initiative in the summer and the third layer of DECO in March.

These initiatives were aimed at reducing congestion while increasing capacity, but they also contributed to the intensification of traffic unpredictability. Inaccuracy in traffic prediction was a recurrent theme for MUAC during RP1 and RP2, hence exposing the Centre to the associated business risks.

Indeed, given the current business environment, the availability of an effective traffic-forecasting tool will be crucial in determining the success or failure of an ANSP's business plan.
These factors undoubtedly affected MUAC's ability to reduce CRSTMP delay in 2018. Furthermore, in summer 2018 adverse weather conditions once again severely impacted operations in the most congested and complex sectors in Brussels. MUAC is exposed to an exponential increase in delay when saturated sector groups are hit by violent and persistent adverse meteorological events.

Despite the aforementioned challenges, MUAC managed to maintain a punctuality rate comparable to the previous year.

MUAC traffic (2017 vs. 2018; %)	2017	2018	%
MUAC traffic - NM	1,848,581	1,872,686	1.3%
Traffic Brussels – MOST*	875,717	893,029	2.0%
Traffic DECO – MOST*	696,388	733,118	5.3%
Traffic Hannover – MOST*	722,656	730,295	1.1%

*MOST: Maastricht Operational Statistics Tool

Actual traffic change in 2018 vs. STATFOR forecast (Oct. 2017)		MUAC	Brussels	DECO	Hannover
2018 (Data source: MOST)	Cumulate	1.3%*	2.0%	5.3%	1.1%
STATFOR 2018 (Oct. 2017)	High	3.4%	3.6%	3.2%	3.9%
	Baseline	2.3%	2.3%	2.2%	2.7%
	Low	1.0%	0.9%	0.9%	1.2%

*Data source: Network manager

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 2018, MUAC's overall safety performance was good and the reporting culture continued to be positive despite three risk-bearing incidents in the airspace.

During the reporting period, there were three technical failures. One failure in the surveillance function and two failures in the communication function resulted in traffic restrictions being applied in January (radars), March and September (N-VCS). However, all the other lagging indicators remained within the defined threshold values despite the increase in traffic.

Leading safety performance indicators

Effectiveness of Safety Management

The internal MUAC target up to 2019 is 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. This target has not been achieved because of the lack of clearly defined accountabilities of the Safety Manager with respect to the MUAC Director. A plan has been drafted to address and resolve this issue in 2019.

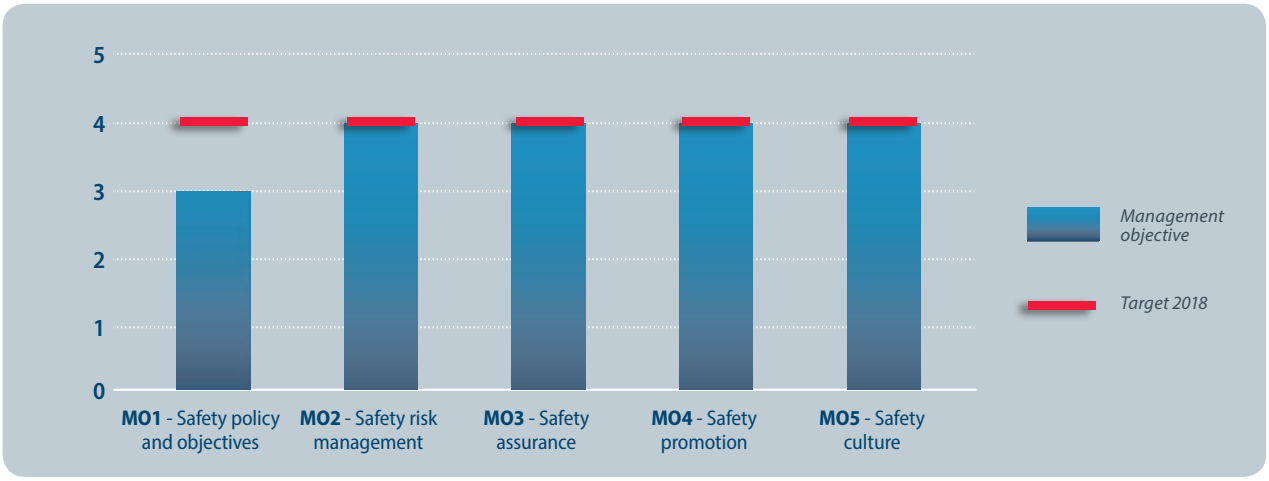
Application of the severity classification of the Risk Analysis Tool (RAT)

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.

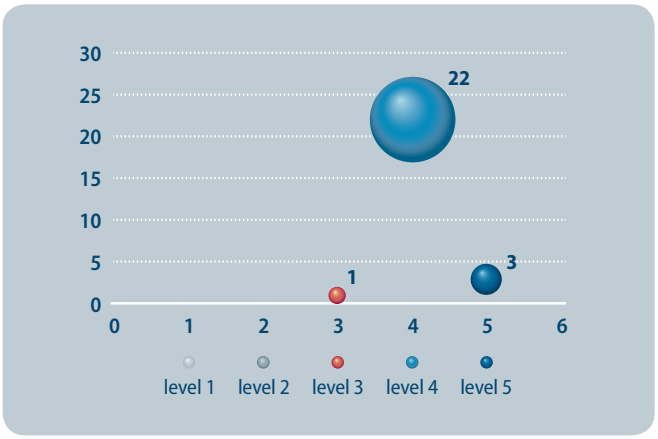
Reporting of Just Culture

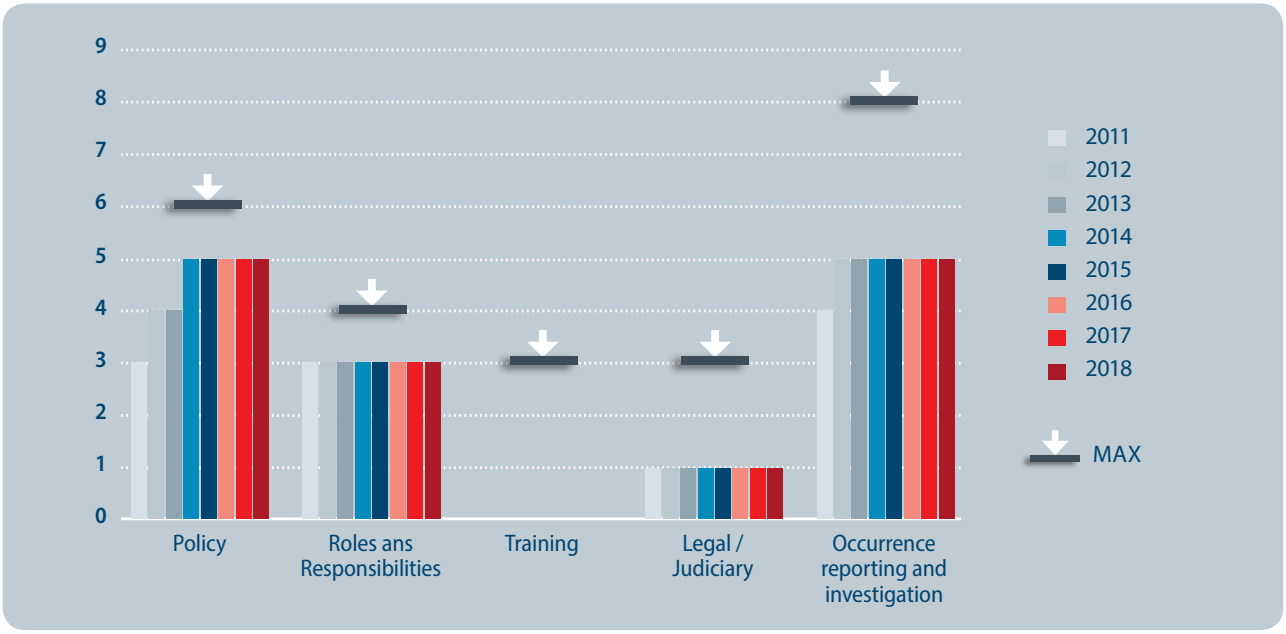
The reporting of Just Culture remains consistent with the previous year. The Just Culture project, established in 2014, is aimed at achieving the targets set for RP2 in the FABEC Performance Plan. Due to the extensive and extended consultation between the Director General and the social partners, the publication of the EUROCONTROL Just Culture Implementing Rule (IR) has been delayed. This has led to MUAC placing the Just Culture project on hold pending agreement of the IR.

EFFECTIVENESS OF SAFETY MANAGEMENT - MANAGEMENT OBJECTIVES (MO) 2018



EFFECTIVENESS OF SAFETY MANAGEMENT SCORE 2018





JUST CULTURE KEY PERFORMANCE INDICATOR

A survey of the Just Culture at MUAC was conducted in 2018. 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 2018.

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.

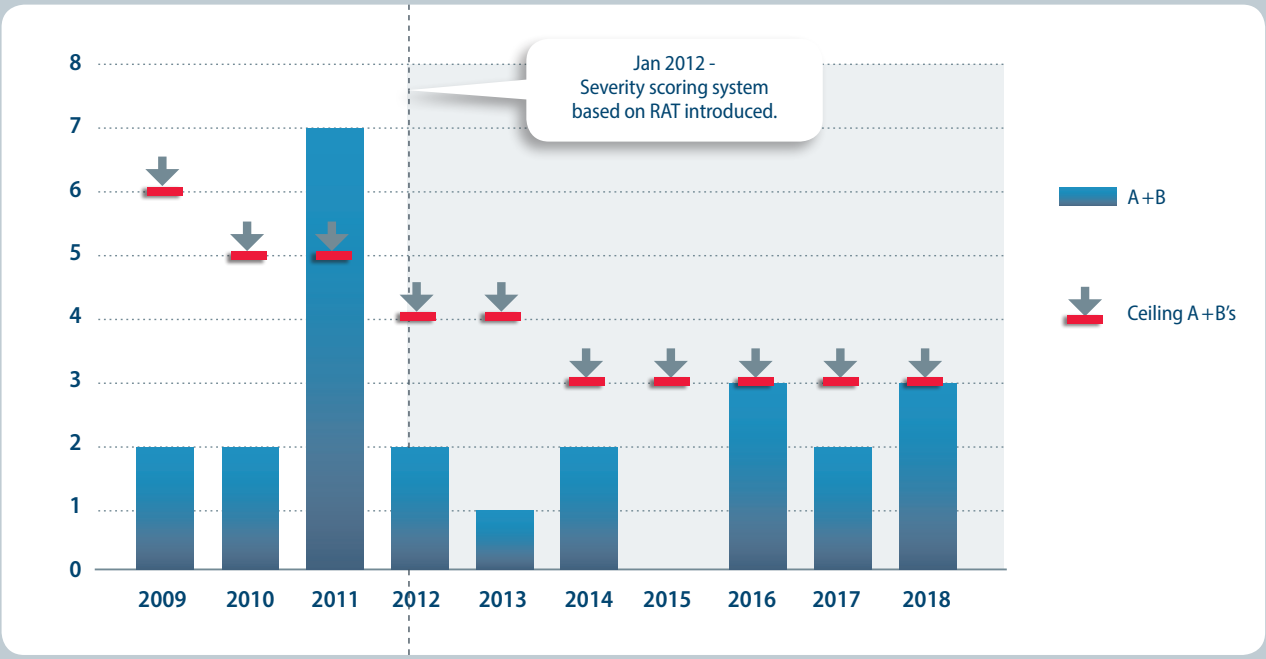
For 2018, a ceiling of three Severity A and B incidents was set to take into account the variability of the diverse factors affecting safety performance. The actual number of severity A and B separation infringements attributed to MUAC was three (3) (0 severity A and 3 severity B incidents). MUAC performed an additional investigation and analysis of whether systemic issues exist that might have caused these occurrences. The conclusion was that no systemic issues were found, even after analysis of all severity A and B events, 13 in total, from 2012 up to 2018.

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 2018 with the actual number of incidents amounting to: severity C - 6 and severity E - 21.

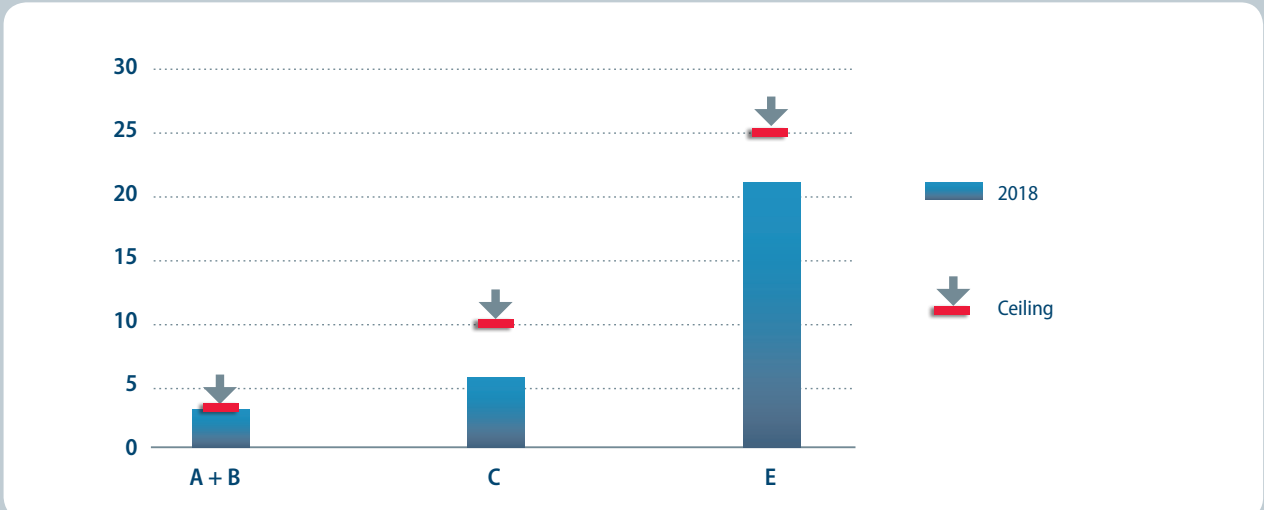
SEVERITY A AND B SEPARATION INFRINGEMENTS ATTRIBUTABLE TO MUAC (2004-2017)

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.



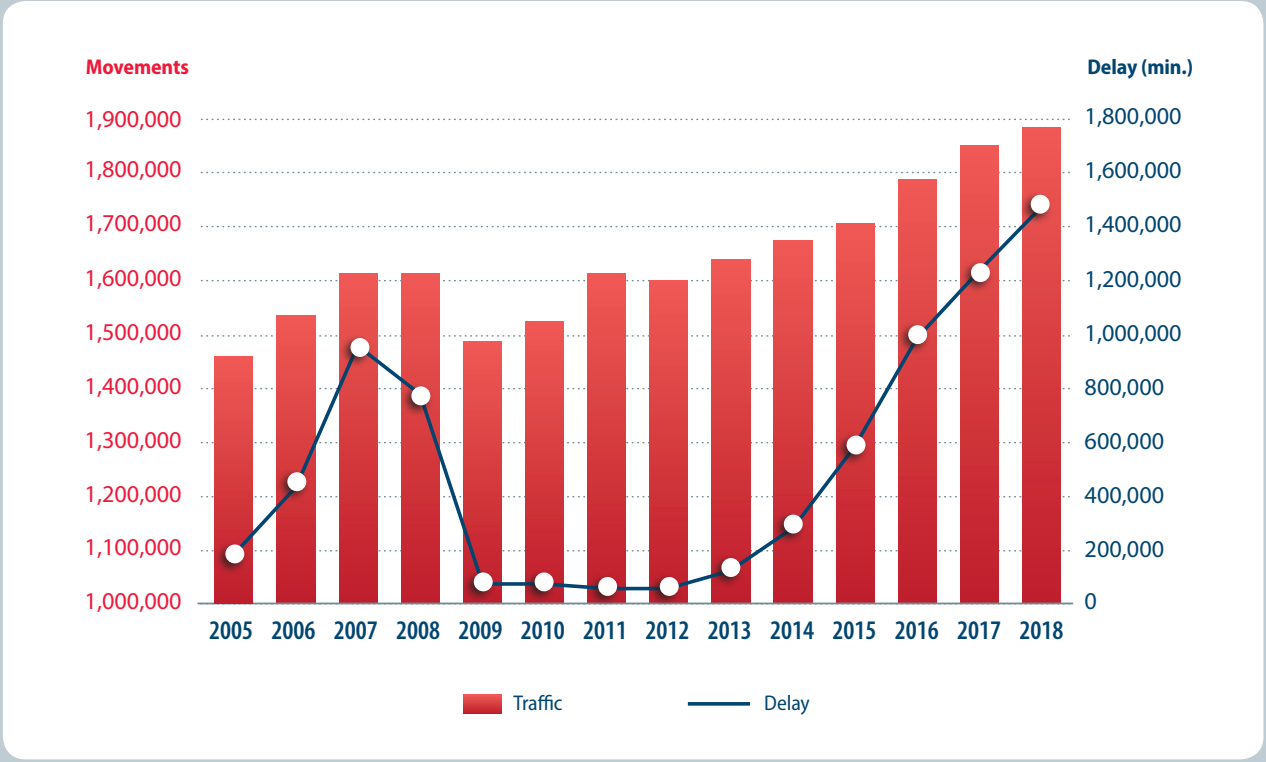
SEVERITY A, B, C AND E SEPARATION INFRINGEMENTS ATTRIBUTABLE TO MUAC IN 2017

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

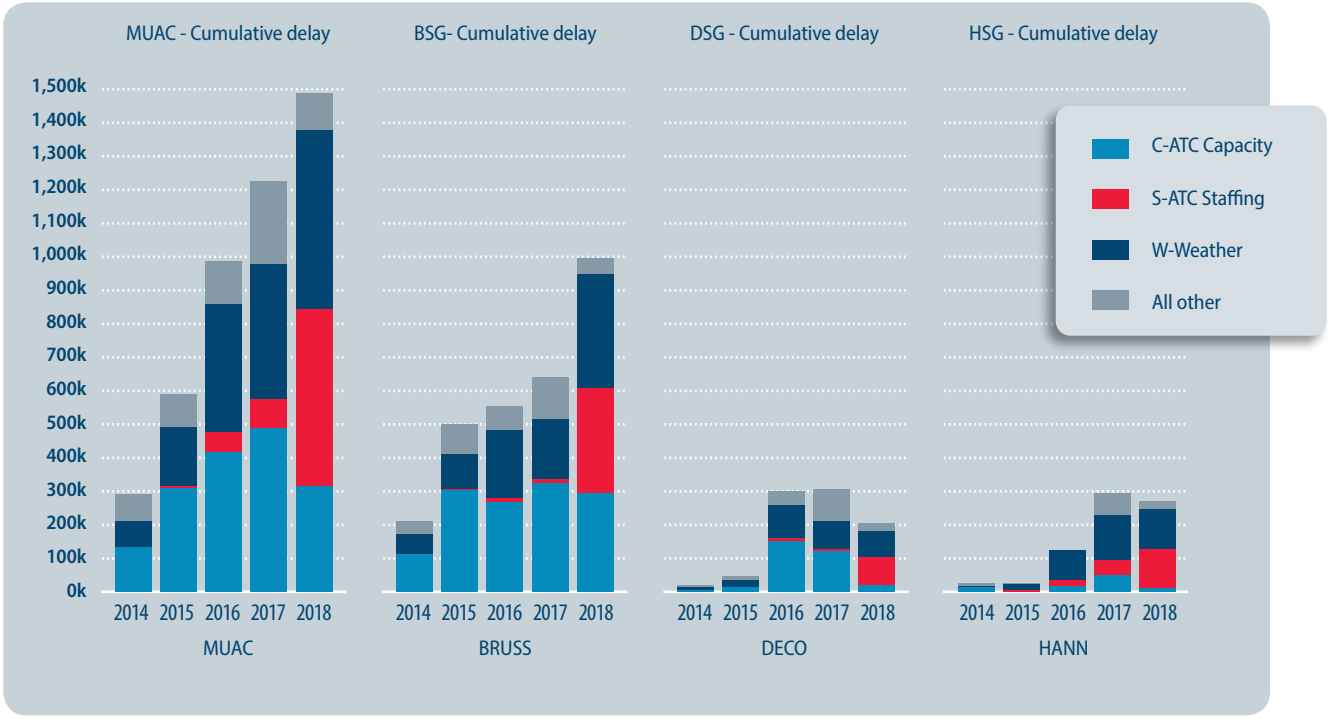
In 2018, MUAC generated 1,482,997 minutes of delay, equal to an increase of 20% over the previous reporting year. 927,974 minutes were attributed to CRSTMP factors (i.e. all causes of delays except W-Weather and O-Others), equal to an increase of 16% when compared with the previous year. Nevertheless, the CRSTMP delay increase in 2018 would have been higher if weather had been less disruptive in May.



TRAFFIC AND ATFM DELAY TRENDS 2005-2018

2018 saw an increase in traffic of 1.3% while ATFM delays rose by 20% to reach a new 14-year peak. The main challenge for the years to come will be to reduce ATFM en-route delays by handling higher amounts of traffic through a set of projects aimed at expanding capacity, improving trajectory predictions and adequately replacing expected ATCO outflows.

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.

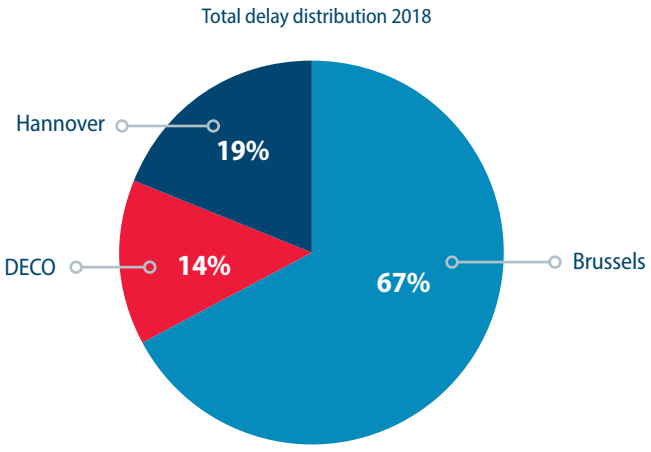


MINUTES OF EN-ROUTE ATFM DELAY (2014-2018)

This chart shows the distribution and evolution of the minutes of en-route ATFM delay between 2014 and 2018.
Delay in the Brussels sector for W-Weather, S-ATC Staffing and C-ATC Capacity drove the majority of MUAC increase in 2018.

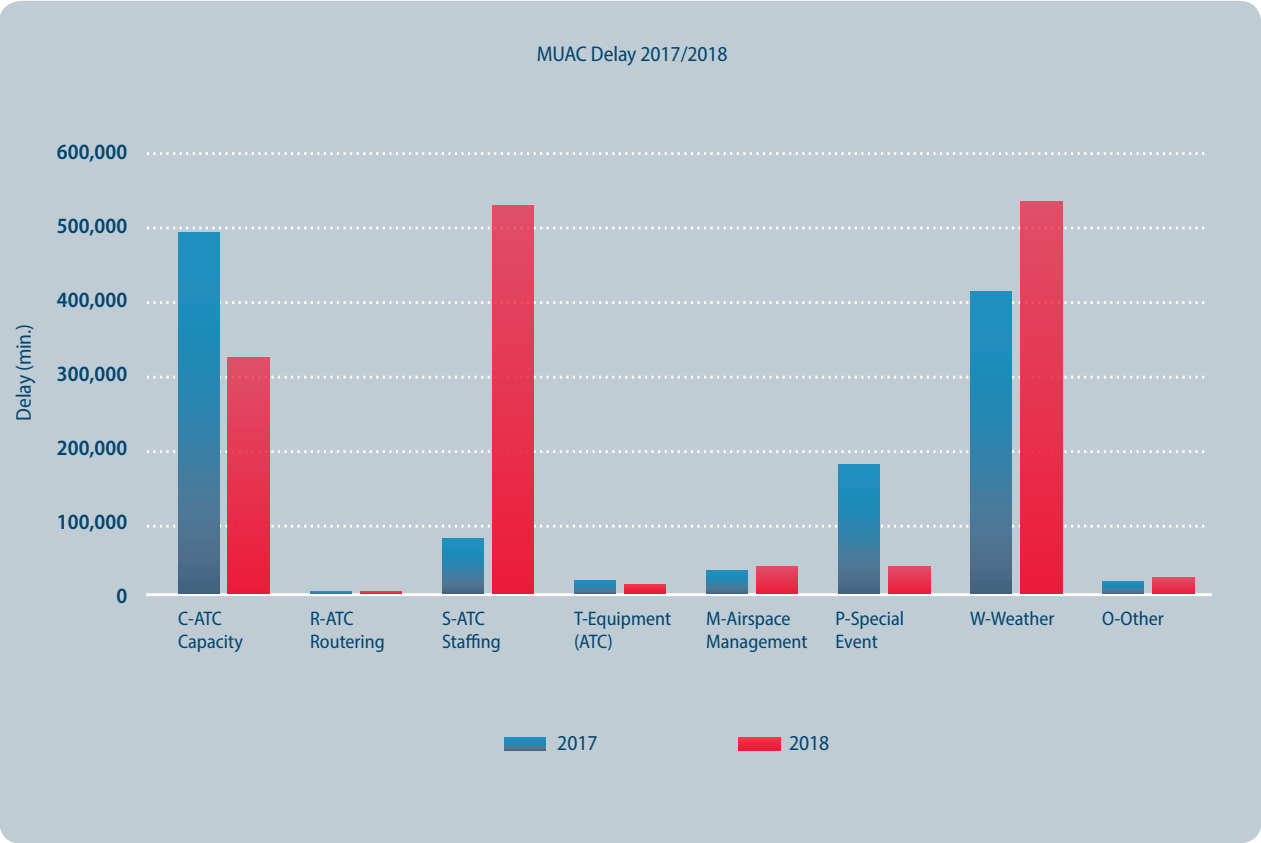
Furthermore, with 67% of total delay, the Brussels sectors were responsible for the majority of the delay in 2018. Notably, the Brussels sector's contribution to the total delay grew from 52% in 2017.

With 532,111 minutes of delay, W-Weather contributed most to the MUAC total delay in 2018 (36%) followed by S-ATC Staffing with 524,661 minutes (35%).



DELAY DISTRIBUTION BY SECTOR GROUP - 2018

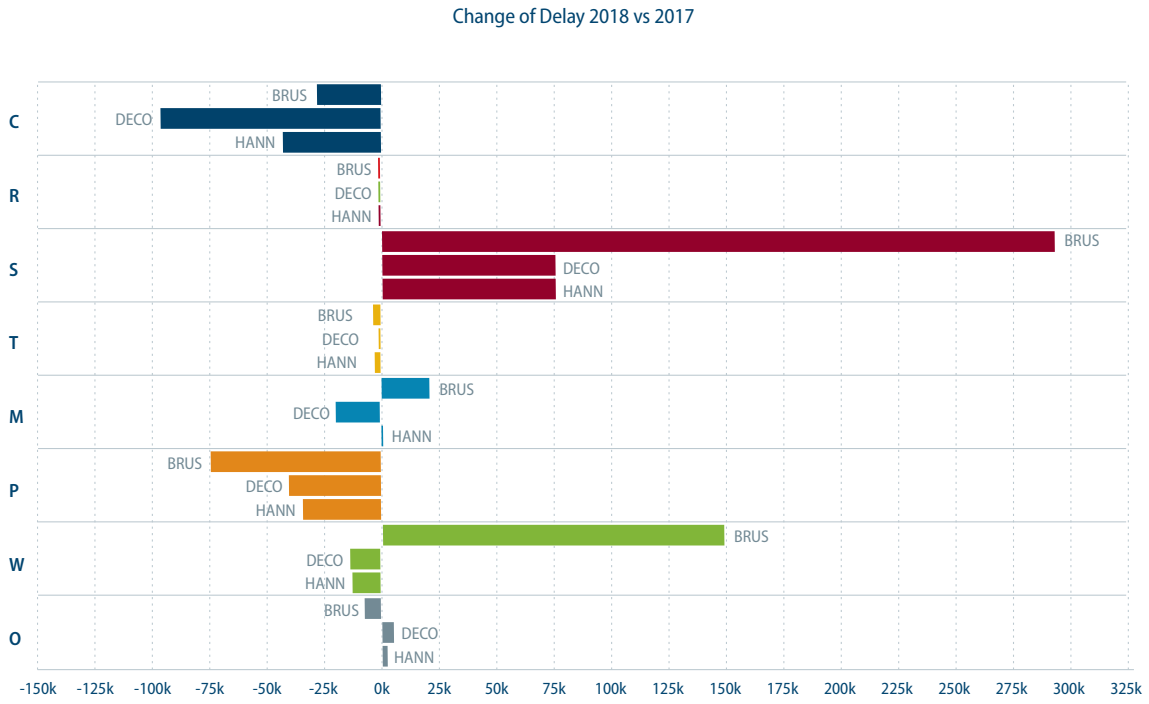
Capacity



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 2017 and 2018. W-Weather and S-ATC Staffing related delay drove the majority of MUAC increase in 2018.

Additional minutes of C-ATC Capacity delay were masked by the allocation of these delays to other causes. Indeed, any C-ATC Capacity improvement experienced in 2018 was completely offset by a deterioration of delay generated by staff shortages and adverse weather conditions, in particular in the Brussels sectors. Furthermore, the magnitude of meteorological effects on delay was exacerbated by high complexity levels in the congested Belgian airspace.



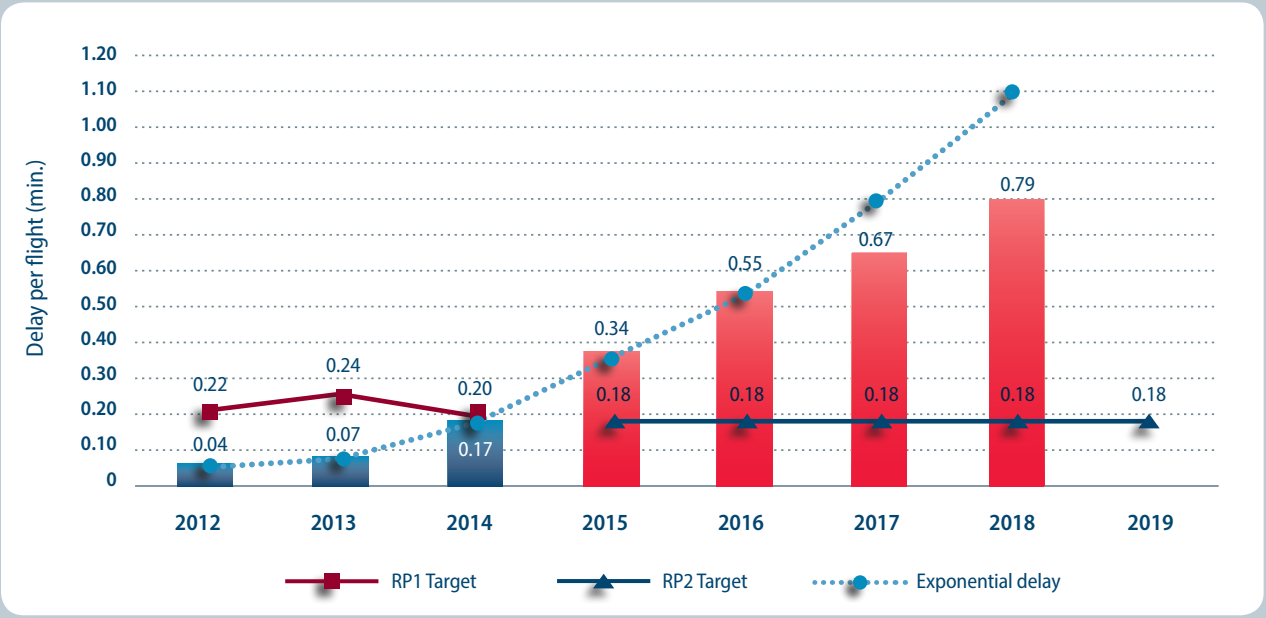
CHANGE OF EN-ROUTE ATFM DELAY BY SECTOR GROUP (2018/2017)

This chart displays the yearly variation and distribution by sector group of the minutes of en-route ATFM delay in 2018 versus 2017.

More than 1,060,000 minutes of delay (i.e. 71% of total delay) were generated between May and August, when MUAC was often confronted with excessive peaks in traffic demand, in particular in the Brussels sectors.

Despite the fact that MUAC delivered considerably higher than planned capacity in 2018, the target of 0.18 minutes of average delay per flight was not met, instead increasing to 0.79 minutes per flight from 0.67 in 2017 and 0.55 in 2016.

Capacity



AVERAGE EN-ROUTE ATFM DELAY PER CONTROLLED FLIGHT (2012-2018) AND RP TARGETS (2012-2019)

In 2018, MUAC's average en-route ATFM delay per controlled flight increased from 0.67 to 0.79 minutes.

In the past, the introduction of a third layer in the Brussels sectors did not help to mitigate the effects of saturated airspace and the consequent deterioration of this indicator in RP2.

However, the delay/flight value has increased at a slower pace than in 2016 and 2017 due to the positive effects of mitigation actions recently launched by MUAC, also in cooperation with external stakeholders (e.g. the 4ACC Initiative and the Customer Initiative).

Furthermore, MUAC launched more intense ab-initio recruitment campaigns with the aim of rebalancing the expected shortages of air traffic controllers due to natural outflows over the coming years.

MUAC also implemented a third layer in DECO with the objective of offsetting traffic congestion in Brussels by providing airlines with alternative routings.

MUAC is actively exploring alternative ways to exploit productivity, improve cost-efficiency and capacity by proactively investing resources in promising technology such as CPDLC, business data intelligence and automation. However, MUAC is also well aware that the current demand and saturation challenge cannot be easily tackled without a global and cooperative airspace restructuring approach between MUAC and its main partners.

Punctuality

Some 95.4% of total flights were handled delay-free versus 95.5% in 2017[1], and although punctuality has continued to deteriorate in RP2, only 3.3% of flights were held up by CRSTMP causes of delay versus 3.5% in 2017.

However, flights that experienced more than 30 minutes of delay increased from 0.2% (3,746 flights) to 0.3% (i.e. 5,846 flights) of the total controlled flights. MUAC will investigate and come up with ad-hoc measures to mitigate expensive disruptions to its customers.

Nevertheless, considering 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 2018 can generally be evaluated as positive.

Furthermore, outstanding performance in throughput, 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.

[1] According to the NM database. Flights recorded with less than 1 minute of ATFM delay were excluded.

ATCO productivity

With 2.22 IFR flight-hours per air traffic controller-hour, MUAC improved air traffic controller productivity throughout the 2018 business cycle, attaining a new all-time record. In fact, following a rise of IFR flight-hours (+3.5%), coupled with a decrease in ATCO hours on duty (-3.9%), controller productivity increased by 7.8% during

the reporting year. The main factor explaining this efficiency gain is that MUAC did not have enough staffing availability to adapt the sector openings to the growing demand. A further increase in productivity is expected in 2019.

Mitigating the effects of Frisian Flag

The annual NATO Frisian Flag exercise presents many challenges for both MUAC and aircraft operators. Major efforts were made in April 2018 to ensure safe and efficient operations as well as to mitigate route extensions and high delays in the Delta and Jever sectors.

Traffic subject to delay	2018	%	2017	%
TOTAL FLIGHTS	**1,872,686**	**100%**	**1,848,581**	**100%**
On-time flights	1,786,718	95.4%	1,764,794	95.5%
-->Total flights subject to delay	85,968	4.6%	83,787	4.5%
-->Total flights subject to W-O delay	23,398	1.2%	19,572	1.1%
-->Total flights subject to CRSTMP delay	**62,570**	**3.3%**	**64,215**	**3.5%**
-->Total flights subject to CRSTMP delay (1-15 min.)	39,861	2.1%	46,405	2.5%
-->Total flights subject to CRSTMP delay (16-30 min.)	16,865	0.9%	14,064	0.8%
-->Total flights subject to CRSTMP delay (>30 min.)	5,844	0.3%	3,746	0.2%

BREAKDOWN OF FLIGHTS SUBJECT TO DELAY – 2018 vs 2017

MUAC	2017	2018	% variation
IFR flight-hours controlled	645,062	667,869	+3.5 %
ATCOs/OPS hours on duty	312,422	300,285	-3.9 %
ATCO productivity	**2.06**	**2.22**	**+7.8 %**

AIR TRAFFIC CONTROLLER (ATCO) PRODUCTIVITY 2017-2018

ATCO productivity increased from 2.06 in 2017 to a staggering 2.22 in 2018. This indicator is the ratio between IFR flight-hours controlled and ATCO-hours on duty. In 2018, MUAC controlled more IFR flight hours (+3.5%) with a lower number of ATCO-hours on duty (i.e. -3.9%), hence generating a 7.8% increase in productivity.

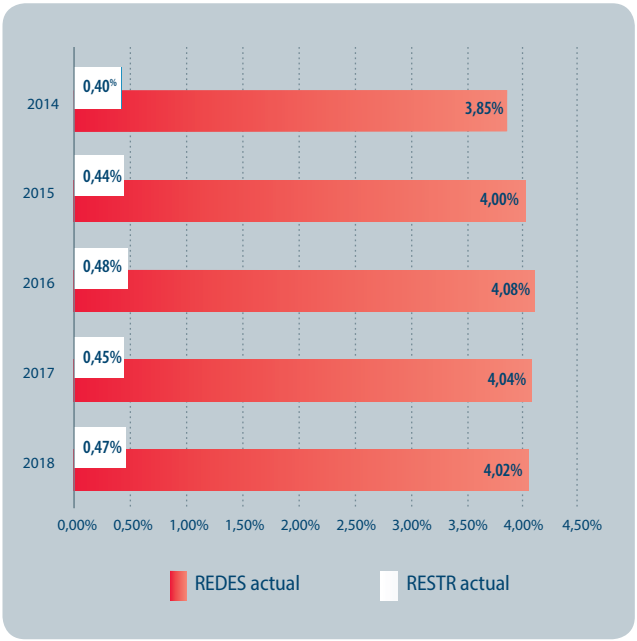
Environment

Reducing route extension

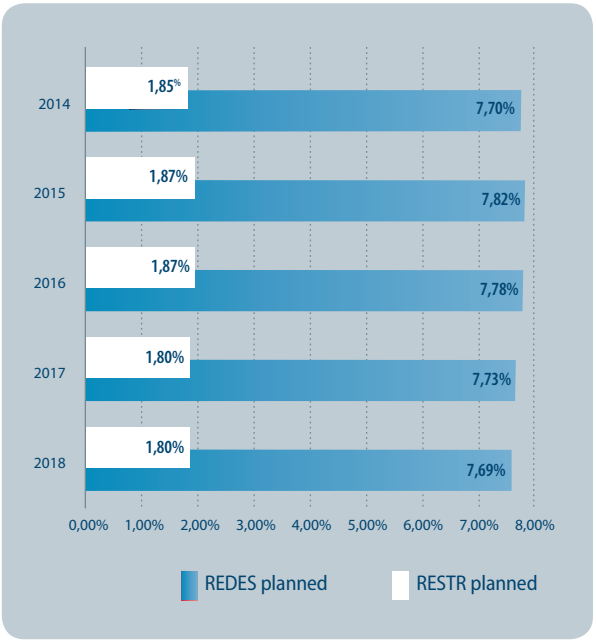
Year after year MUAC strives to increase flight efficiency under tremendous pressure of constant traffic growth. Route extensions arise frequently due to a variety of causes - such as areas of bad weather, military activity, ATFM restrictions, etc. And though most of those factors are way outside MUAC control, we nevertheless strive to reduce the environmental impact of aviation by offering shorter routes and fuel-optimal vertical flight profiles, whenever it is possible.

From 2009 on MUAC monitors horizontal flight efficiency (calculated as a ratio of route extension relative to the approach of the flight to its destination realized in MUAC airspace) both for the actually flown trajectories – REDES actual, and for the last filed flight plans – REDES planned.

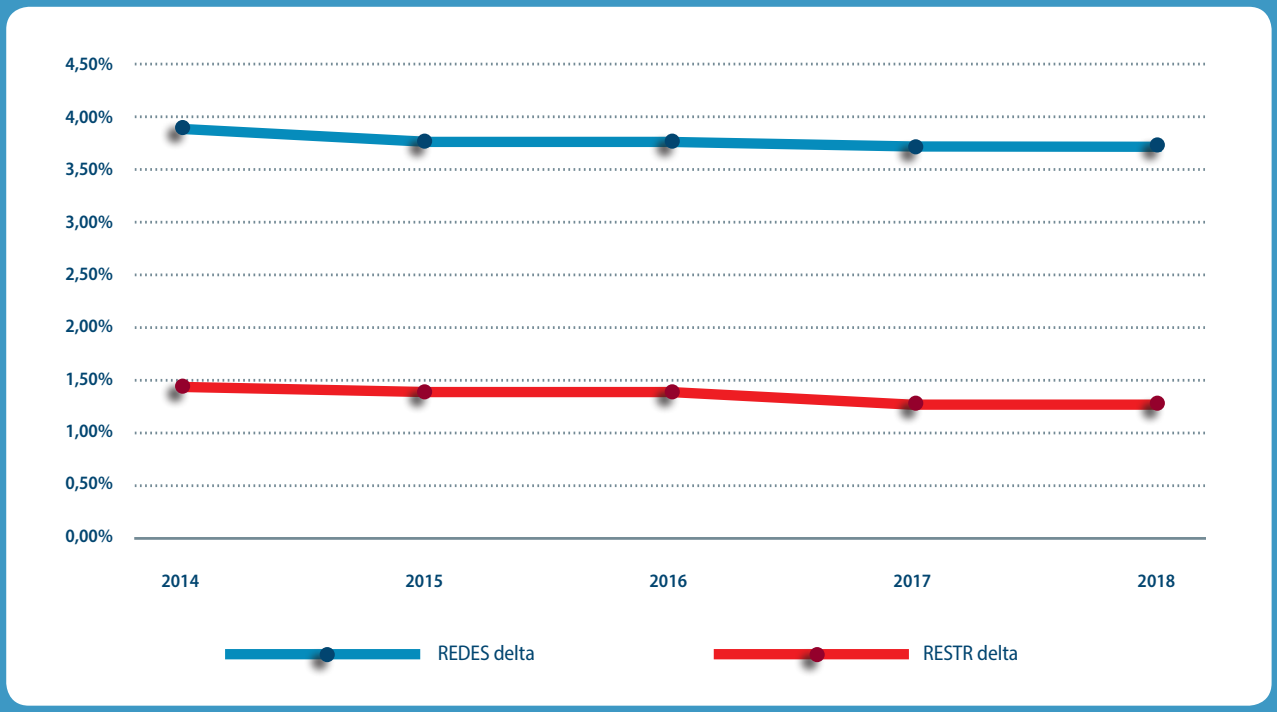
Reversing the negative upward trend of 2014 – 2016, actual horizontal flight (in-)efficiency (REDES actual) now shows an improvement for two years in a row - from 4.08% (extension) in 2016 to 4.04% in 2017, and further - to 4.02% in 2018, and this despite the traffic increase over the same period. The internal component of route extension (RESTR actual) stays well inside our target: a very small extension of only 0.47% actually means that almost all flights in the MUAC area are flying direct. The remaining 3.55% of route extensions present the interface component or the network contribution to flight inefficiency, which for the most part, does not depend on MUAC operations.



MUAC FLIGHT EFFICIENCY BASED ON ACTUAL TRAJECTORY



MUAC FLIGHT EFFICIENCY BASED ON FILED FLIGHT PLAN



TACTICAL FLIGHT EFFICIENCY IMPROVEMENT

A certain improvement of flight planning is evidenced by the reduction of REDES planned by 0.04% - from 7.73% in 2017 to 7.69% in 2018. This is the result of FRA implementation progressing, as well as a number of cross-border initiatives. The internal component of flight extension implied by planned trajectories, however, remains at the same level as last year - 1.80%. The remaining 5.89% of extension, or the network component, should be attributed to the existing route structure, airspace design, allocation of military areas, but also to drawbacks in the flight planning process, leaving significant space for improvement.

The difference between planned and actual flight extension (i.e. REDES planned and REDES actual), dropped to 3.67% in 2018. The graph shows a steadily diminishing gap between planned and actual figures, which demonstrates some progress in bringing the filed flight plans closer in line 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.

Meanwhile we can state that the flight efficiency improvement brought by MUAC controllers during the tactical phase (e.g. by giving directs to airliners and using available military areas), resulted in a total distance reduction of more than 8,135,000 NM (approximately 4.68 NM per flight), saving 48,800 tons of fuel and reducing CO2 emissions by 162,670 tons in 2018.

Energy-saving initiatives and sustainable building elements

In compliance with the environmental legislation in force in the Netherlands, the local authorities are provided with an evaluation of MUAC's annual energy consumption. During 2018, the replacement of various lighting fixtures by LED lighting in combination with movement detection, generated an estimated electricity consumption reduction of more than 22,000 KWh/year, as well as a CO2 reduction of over 14.7 t compared to 2017.

Cost-efficiency

Positive financial results despite continuous deterioration in economic cost

In 2018, the cost-base amounted to €156.6 M. In real terms, costs were up by 3.1% compared to 2017, mainly driven by higher non-staff operating costs (i.e. +€2.4 M), depreciation costs (i.e. +€1.1 M) and staff costs (i.e. +€1.1M). Nevertheless, MUAC managed to stay well within its agreed 2018 cost-base of €164.5 M, thereby saving €7.9 M, mostly in staff and operating costs.

Following a 3.5% increase in IFR flight-hours controlled, MUAC scored a total financial cost per IFR flight-hour of €235, a value which is slightly lower than in 2017 (€236 in €2018).

The total economic cost per IFR flight-hour (also referred to as 'unit economic cost') is used as the main indicator of overall performance as it incorporates both the cost of delay and the financial cost of ATM service provision. In this context, the cost of ATFM delay, which had been estimated by the University of Westminster at some €100 per minute in 2015, was updated to €104 per minute due to an increase in the inflation rate for the EU as a whole in 2018.

Despite a slight decrease in unit financial costs, ATFM delay costs increased in 2018, pushing the overall MUAC economic cost up to €465 per IFR flight-hour – an increase of 7.2%. It should be noted that in 2017 MUAC unit economic costs had increased by 8.9%, indicating that despite the difficulties faced by MUAC in 2018, the deterioration in quality of service was, to a certain extent, contained.

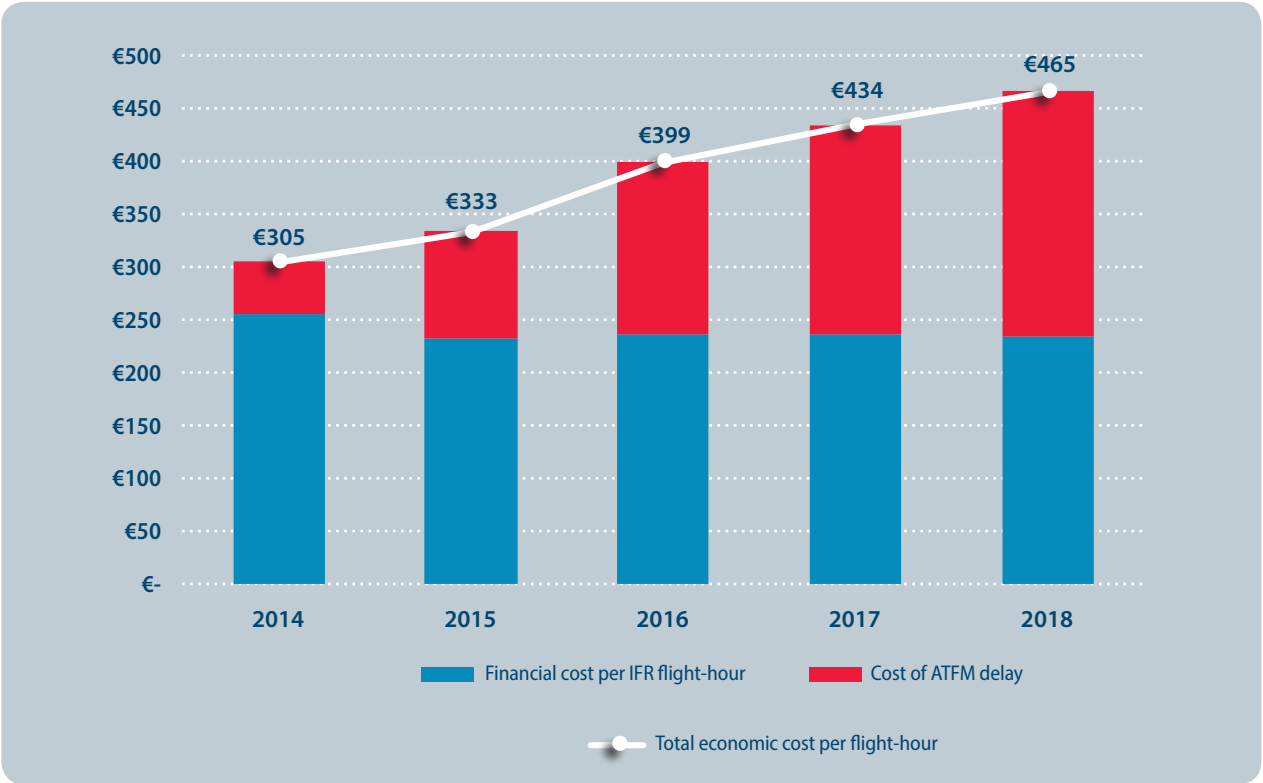
Without doubt, an important and beneficial impact on efficiency came about thanks to a downward adjustment of national unit rates in the Netherlands, eventually supporting traffic shifts to DECO from other MUAC sectors. Nevertheless, the high levels of professionalism and commitment consistently demonstrated 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 a 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 €20.4, significantly under the €24.3 ceiling. This welcome undershoot was accomplished thanks to the combined impact of a reduction in the MUAC cost-base and a significant increase in the number of service units.

MUAC	2014	2015	2016	2017	2018	Trend 2017 / 2018
Staff costs	127.6	117.7	122.6	124.1	125.2	+0.9%
Non-staff operating costs	12.3	12.3	16.1	19.4	21.8	+12.2%
Depreciation costs	9.6	9.1	8.4	8.2	9.3	+13.6%
Cost of capital	0.5	0.5	0.4	0.2	0.2	+29.7%
Exceptional reduction	0.0	0.0	0.0	0.0	0.0	-
Total costs (€ M)	**150.0**	**139.5**	**147.5**	**151.9**	**160.6**	**3.1%**

GAT COST-BASE 2014-2018 (€M - €2018)

In 2018, the MUAC cost-base increased by 3.1% in real terms. This was mainly driven by an increase in non-staff operating costs, depreciation costs and staff costs.



TOTAL ECONOMIC COST PER IFR FLIGHT-HOUR (€2018) - TREND 2014-2018

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 slightly decreased to €235; however, the MUAC unit economic cost for 2018 increased by 7.2% due to an increase in unit delay costs from €199 to €231 in real terms.

Cost efficiency

ACE report highlights MUAC's strengths and challenges

In May 2019, the ATM Cost-Effectiveness (ACE) 2017 Benchmarking Report was released. It should be noted that the ACE 2017 Benchmarking Report is published in 2017 values, while this Annual Report is expressed in 2018 values, taking into account an inflation rate of 1.6%.

The productivity and financial cost-effectiveness indicator confirmed MUAC's ranking among the top-performing ANSPs in Europe in 2017.

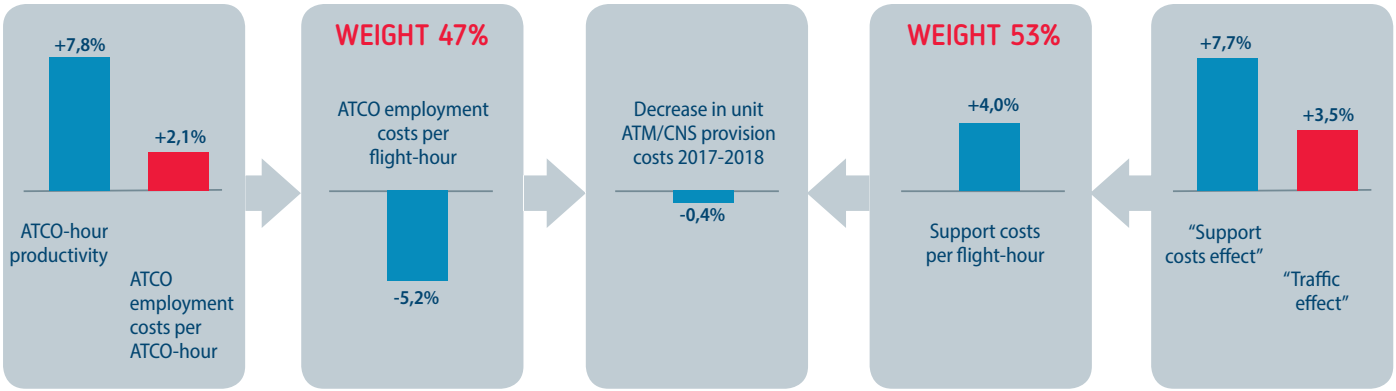
On the other hand, the economic gate-to-gate cost-effectiveness indicator deteriorated, reaching €427 (€2017) per IFR flight-hour. This was the result of an increased en-route ATFM delay in the airspace controlled by MUAC, which accounted for 46% of its total economic costs in 2017. This was the second highest in Europe, well above the pan-European average (16%).

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 has already initiated a series of activities and projects to minimise the effects of controllable events and maximise the ratio between resources and outputs in an attempt to mitigate delays in the coming years.

Service units and revenue distribution to States

The number of service units produced within MUAC airspace increased by a significant 4.0% in 2018 with all areas experiencing robust increases. The national unit rate in the Netherlands decreased by a staggering 12.7% in 2018 (from €67.4 to €58.8 in real terms) after a constant value over the previous five years. This made Dutch airspace more attractive to users and, together with the 3rd layer, played a pivotal role in triggering traffic shifts across MUAC airspace, in particular from Brussels to DECO sectors. Furthermore, the moderate increase in jet fuel price did not prevent airlines from filing longer but cheaper routes.

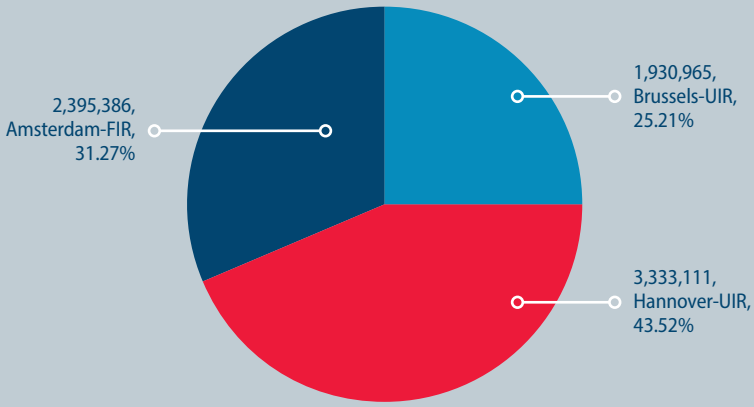


CHANGES IN THE FINANCIAL COST-EFFECTIVENESS INDICATOR (€2018) 2017-2018

State	SUs and Revenue distribution - 2018/2017 (€ 2018)							
	2017			2018			SUs 2018/2017 (%)	Revenues 2018/2017 (%)
	SUs	Route charges	Revenues (M)	SUs	Route charges	Revenues (M)		
Belgium/Luxembourg	1,894,206	€ 69.1	€ 130.9	1,930,965	€ 67.8	€ 130.9	1.9%	€0.0
Netherlands	2,250,542	€ 67.4	€ 151.7	2,395,386	€ 58.8	€ 140.9	6.4%	-€10.7
Germany	3,222,043	€ 70.7	€ 228.0	3,333,111	€ 67.2	€ 224.0	3.4%	-€4.0
MUAC	**7,366,791**	-	**€510.5**	**7,659,462**	-	**€495.8**	**4.0%**	**-€14.7**

SERVICE UNITS, NATIONAL UNIT RATES AND REVENUES PER SECTOR GROUP (€M - €2018) - TREND 2017-2018

Revenues distributed to States decreased by a staggering €14.7 M (in real terms) in 2018, driven by a strong reduction in revenues generated on behalf of the Netherlands (-€10.7 M).



SERVICE UNITS IN 2018

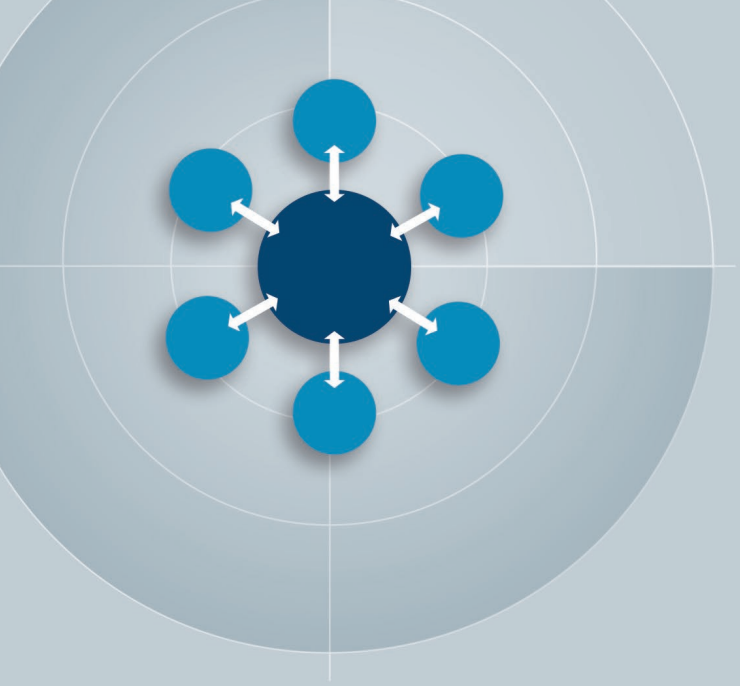
Breakdown of service units in the Amsterdam FIR, the Brussels UIR and the Hannover UIR, respectively. Service units increased by 4.0% over 2017.

Despite a staggering decrease in revenues for 2018 (-€14.7 M in real terms), MUAC's financial result was quite remarkable (€495.8 M), especially when compared to the average yearly revenues generated during the first reference period (€479.1 M in real terms).

Maastricht ATM Knowledge Centre (MAKC)

The MAKC has provided continued support to the Brazilian ANSP, DECEA (Departmento de Controle de Espaço Aéreo) according to the agreed work plan. Additionally, the MAKC provided support for a EUROCONTROL report for the Spanish DGCA and ENAIRE, regarding the efficiency of Barcelona airspace. Continued support has also been given to the Norwegian ANSP, AVINOR, however at a slightly slower pace than previous years.

Further ANSPs, around the world, have approached MAKC for support, but so far it has not been able to conclude further contract agreements.



CUSTOMER ORIENTATION

Customer relationship management

Civil customer consultation and involvement

Throughout 2018, several initiatives were launched, involving different stakeholders in the airspace user community in order to address the high traffic demand experienced in MUAC airspace, in particular via innovative solutions.

The MUAC Customer Initiative focused on the most penalised flights, saving some 150,000 minutes for more than 5,000 flights. To this end, the ATM Portal was further developed to offer more user-friendly features and to effectively capture flight data and aircraft operator requirements. The MUAC Customer Initiative elicited a very positive response from aircraft operators and consequently it was decided to extend the trial to 2019, exploring how it might be rolled out at network level at a later stage.

Bilateral collaborative avenues and enhanced service levels continued to be explored with airspace users during consultation meetings. Transparent business information was shared on a regular basis with aircraft operators via various reporting tools. In spite of the capacity issues faced by MUAC over 2018, customers of MUAC services in general gave a satisfaction rating of 85% and an overall satisfaction rating of 93% for MUAC's consultation activities.

In addition, MUAC's Plenary Customer Consultation Meeting was held at London Heathrow on 14 and 15 November 2018. A total number of 28 delegates joined the meeting, including airline representatives, Computerised Flight Plan Service Providers, airline associations, the US Air Force and a Network Manager Aircraft Operator Liaison Officer. The meeting was interactive and covered topics such as the airlines' views about network performance in 2018, the NM 4 ACC initiative, the capacity plan for 2019 and beyond, strategy and investments, a 360-degree panel on collaborative solutions and the MUAC Customer Initiative and ATM Portal. In addition, four interactive workshops on Flexible Use of Airspace/Airspace Management, Free Route Airspace, a demonstration of the ATM Portal and MUAC performance were organised to facilitate exchanges between MUAC experts and the airline representatives. A list of concrete actions was jointly drawn up at the end of the meeting, the follow-up of which will be closely monitored. The meeting was rated as successful by the participants as it addressed their main concerns and gave them enough opportunity to express themselves and request clarifications.

Military customer consultation

In order to improve and strengthen MUAC's relationship with its military and special operations partners, a comprehensive Military Stakeholder Relations and Consultation Plan was drawn up for the 2018 reporting period.

The second "OAT@MUAC" Military Customer Forum was convened on 7 and 8 November 2018. The delegates were military representatives from the Royal Netherlands Air Force, the Royal Belgian Air Force, the German Air Force and the NATO E3-A Component Geilenkirchen, represented by the flying community of their respective air forces. In 2018, the Forum concentrated on the latest ATM developments affecting military customers. Topics such as OAT service provision in general, MUAC's perspective on Free Route

Over the reporting period, MUAC continued to capture and respond to customer requirements by means of individual customer consultations. Aircraft operators continued to work closely with MUAC airspace network and planning experts to achieve a better, more efficient and customer-driven route network and ensure the smooth phasing-in of new programmes and initiatives.

Airspace, the civil perspective on Flexible Use of Airspace, the internal workflow enabling large-scale military flying exercises and CPDLC for the military customers stimulated healthy debate among the audience.

In addition, MUAC experts visited various airbases in order to identify possible optimisation opportunities in the planning process and to get to know those in charge. This was rounded off by several visits to MUAC by key military partners, e.g. the Deputy Commander of the German Air Operations Command and the Commander of the Netherlands Military Aviation Authority, who awarded the certificate confirming MUAC as a military ATS provider.

Customer satisfaction survey

2018 also saw the launch of the three-yearly Stakeholder Review and Customer Satisfaction Survey, the results of which became available in March of 2019, providing valuable feedback for improvement plans.

CPDLC awareness campaign generates 25% increase in log-ons

A wide-ranging CPDLC awareness campaign targeting aircraft operators was launched in 2018. By the end of the year, the awareness campaign (which used different channels, ranging from bilateral meetings, social media, fact sheets for crews to various publications) generated an increase of 25% (ATN) and 20% (FANS) in log-on rates. CPDLC usage in MUAC airspace stood at 30% at the end of 2018. It is estimated that if 70% of all traffic used CPDLC, capacity could potentially increase by 10 to 25%, depending on airframe capabilities in terms of trajectory exchange (ADS-C).

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.

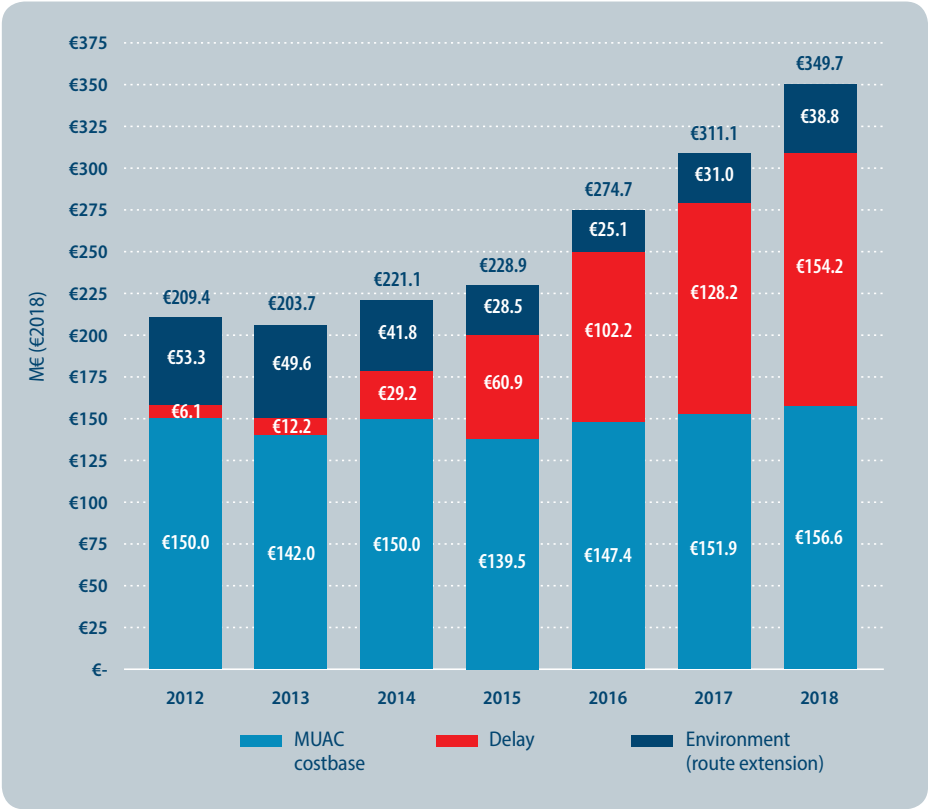
Costs attributable to main KPAs

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 relative 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.



TOTAL COST PER KEY PERFORMANCE AREA (€M - €2018) TREND 2012-2018

The total cost for the environment is calculated by multiplying the route extension expressed by the number of extra Nautical Miles (NM) flown by aircraft and the average cost of jet fuel burned per NM. Cost-efficiency costs refer to the MUAC cost-base. Costs of delay have been calculated according to the methodology reported in the ACE Benchmarking Reports, which is total minutes of ATFM en-route delays multiplied by €104.

An analysis of the evolution of total costs between 2012 and 2018 suggests that some performance areas are highly impacted by factors which are not directly under MUAC control. In particular, despite a moderate decrease in environmental costs (from €41.8 M in 2014 to €38.8 M in 2018) the cost of delay has significantly increased in RP2 from €29.2 M in 2014 to €154.2 M in 2018, thereby driving the total cost to a new peak in 2018.

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.

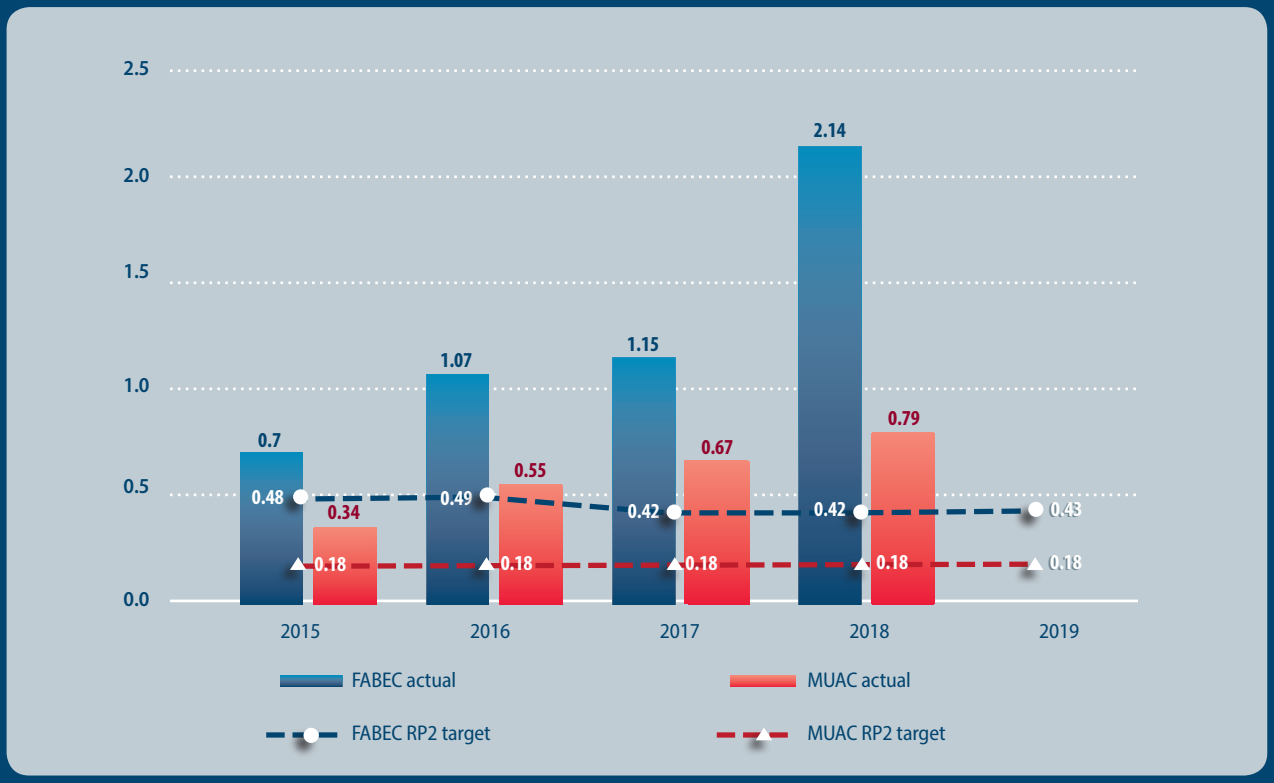
MUAC'S CONTRIBUTION TO FABEC PERFORMANCE

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 3.4 percent from 5,989,779 flights in 2017 to 6,179,458 flights in 2018 and, for the third consecutive year, all FABEC control centres recorded a robust traffic increase. That said, there are still some significant variations between control centres and individual sectors. Notably, 2018 FABEC IFR traffic was above the STATFOR low-growth scenario published in February 2015 and used as a reference for the FABEC performance plan.

Despite the launch of the 4ACC initiative in the summer, aimed at reducing FABEC and network delay by redistributing traffic flows to less congested sectors, FABEC members missed the en-route ATFM delay per flight target. Indeed, the 2018 en-route ATFM delay per flight (all causes) significantly deteriorated, reaching 2.14 minutes per flight compared with 1.15 minutes per flight in 2017. This value stands five times higher than the target of 0.42 minutes of ATFM delay per flight set for FABEC.

The reasons underlying the non-achievement of this target are manifold and vary from centre to centre. On the one hand, 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 an overall deterioration in the average delay per flight value.

Furthermore, in the summer, the operational performance for the core FABEC areas (including MUAC airspace) was particularly affected by violent and enduring negative weather conditions. This was exacerbated by the fact that adverse weather hit congested sectors in the most complex airspace of Europe, hence generating a leverage effect across several ACCs.

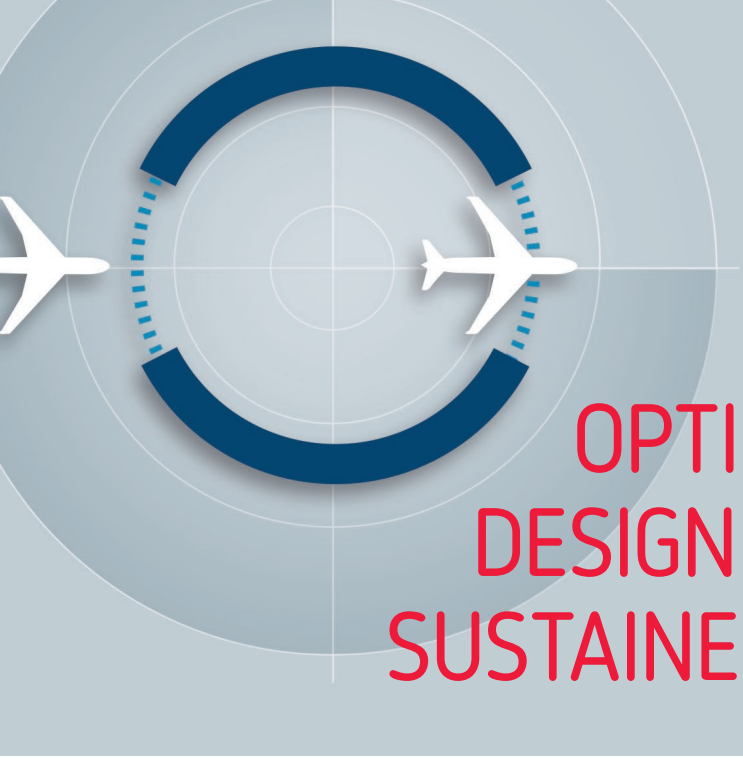


AVERAGE DELAY PER FLIGHT (MINUTES) IN THE FABEC AND MUAC AREA DURING RP2

The FABEC incentivised en-route ATFM delay (also known as 'CRSTMP delay') came in at 1.42 minutes per flight. This represents a year of severe deterioration in performance compared with the previous year's 0.76 minutes per flight, and exceeds the target value of 0.33 minutes per flight.

With the exception of LVNL, all the other FABEC ANSPs contributed to overshooting the FABEC CRSTMP target beyond the dead band (i.e. +10%), resulting in FABEC having to accept a financial penalty. The penalty is shared among those ANSPs that did not achieve their set targets, in accordance with a methodology that takes into account a weighted percentage of their revenue/budgetary contribution and performance share. The total FABEC penalty has been estimated at some €10.8 M, of which €0.8 M will be borne by MUAC.

For 2019, MUAC will focus on additional countermeasures which will be beneficial for FABEC. Thanks to the signature of a mutual agreement with the local trade unions, MUAC will benefit from additional ATCO shifts which will be employed to provide more sector openings, in particular in the Brussels and DECO sector group. Furthermore, in summer a new ACC initiative will be launched in cooperation with the Network Manager. MUAC will also contribute to the FABEC Free Route Airspace Programme by implementing Phase 3 of the Free Route Airspace (FRA) programme, making it available H24. By developing and implementing cross-border free route airspace, MUAC and its partners will continue to push forward a key element of the FABEC airspace strategy aimed at achieving greater operational efficiency.



OPTIMISING AIRSPACE DESIGN AND USAGE FOR SUSTAINED PERFORMANCE

Free Route Airspace Maastricht (FRAM2)

Free Route Airspace Maastricht (FRAM2)

Just as aircraft manufacturers and operators are making considerable advances in reducing their environmental impact, the air traffic management sector is also introducing new concepts and procedures in order to improve its own environmental credentials. Flagship initiatives, such as the deployment of a Free Route Airspace (FRA), provide a potential to significantly reduce aviation's environmental footprint and improve its overall efficiency and predictability.

Since 2011, a dense network of over 500 direct routes has been implemented in MUAC airspace. Of these, 35% are available 24 hours a day (H24), 50% are available during weekends and nights, with the final 15% only available at night. Furthermore, as part of close cooperation with our neighbouring ANSPs, the network of direct, flight-plannable cross-border routes has been considerably expanded, creating a large-scale direct routing airspace over Belgium, most of Germany, Luxembourg and the Netherlands.

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 on its Free Route Airspace Maastricht (FRAM2) Project with the aim of introducing FRA operations across the MUAC airspace in a phased approach. The first phase, where FRA is available during the night, was implemented on 7 December 2017. The second phase extends the time availability of FRA to the weekend and was implemented on 6 December 2018. MUAC is now preparing Phase 3, with FRA available H24. Implementation of Phase 3 is planned for 5 December 2019. The expected gains for airline operators range from €4.4 M per year for Phase 1 to €26.0 M 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.

During 2017, preparations started in support of the introduction of trials at London-Gatwick and Paris Charles de Gaulle airports, both as part of FABEC and SESAR projects.

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.

Third Layer sectorisation project in the Delta sector

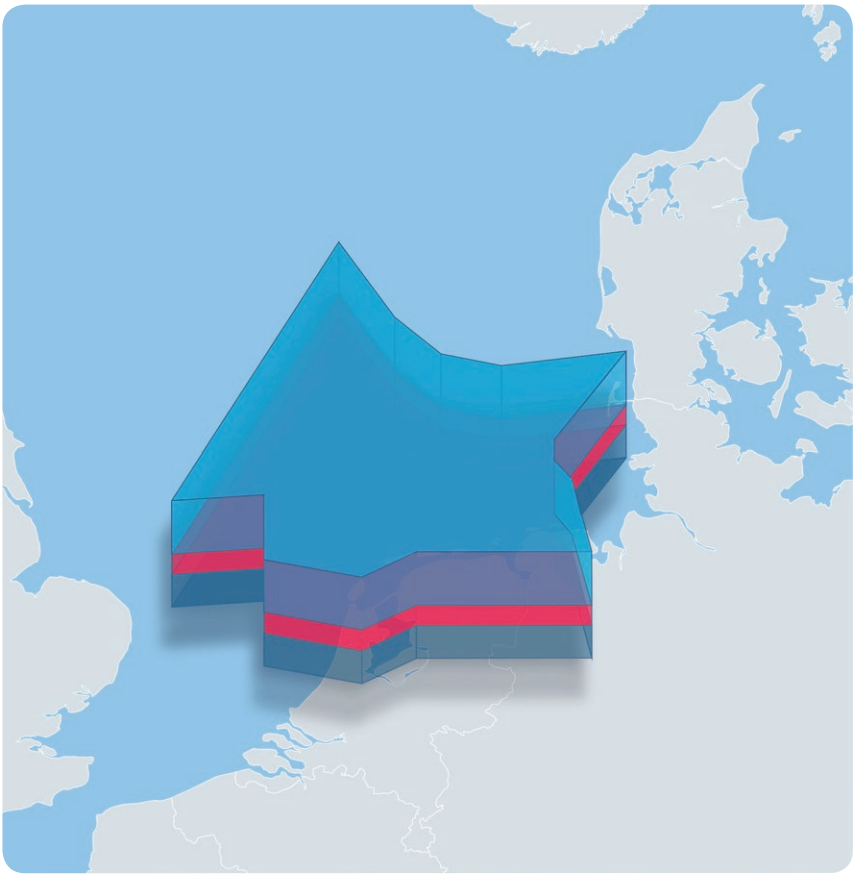
In 2017 a start was made on introducing a 3rd layer in the Delta sector, known as the 'Delta Airspace Re-design Project' (DARP). This fulfilled its expectations by creating a capacity gain in the Delta sector of approximately 10%. The DARP project was implemented in March 2018.

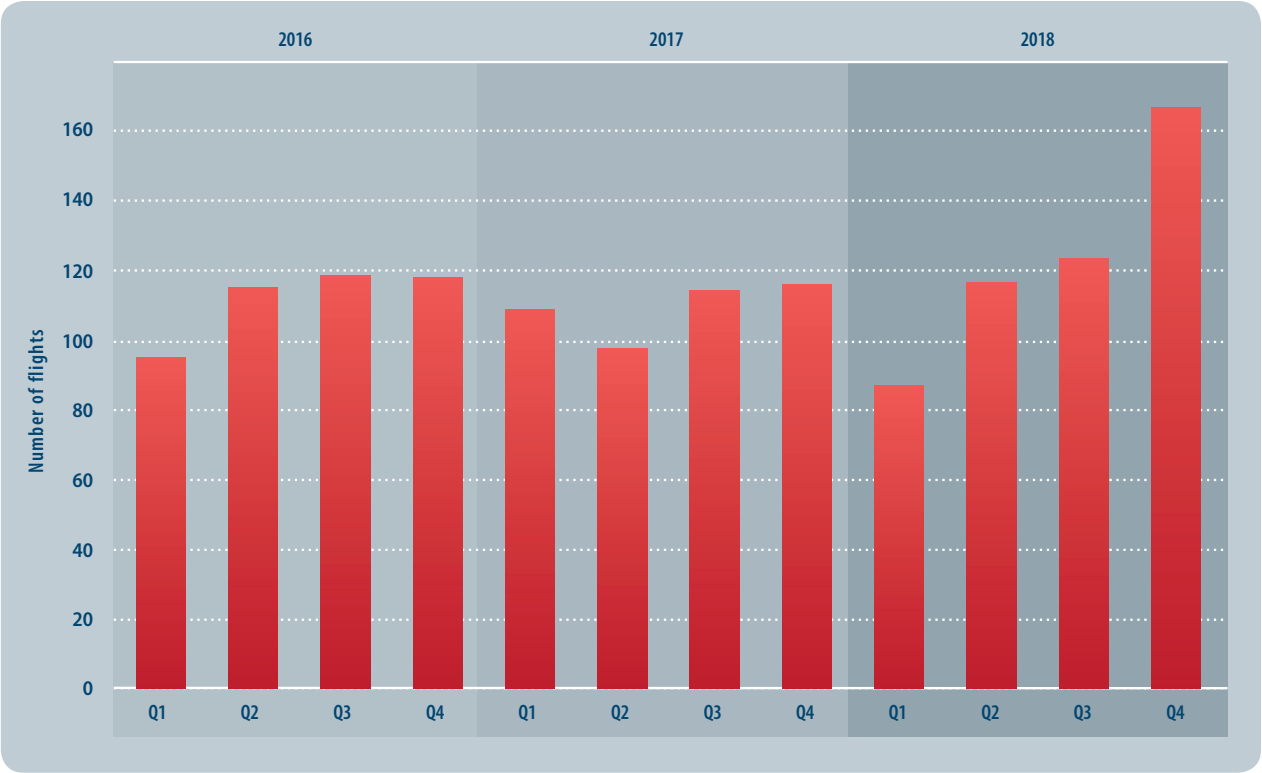
Cross-border civil/military operations and Flexible Use of Airspace

The legal and institutional integration of the task of controlling Operational Air Traffic (OAT) took place as early as 2017. However, in 2018 operational integration really took off. A major cross-training programme was set up for MUAC flight data staff and ATCOs. The highlight was without a doubt the issuing of civil endorsements for the Hannover East sectors to 'military' ATCOs.

Work continued on the Shared ATS System (SAS2) with the Belgian Air Force. SAS2 is set to become operational in December 2019 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.

A small increase of 1.2% in the overall number of military flights was observed during 2018. The four MUAC sector groups controlled on average 1,250 flights a month. 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.





NUMBER OF AIRBUS TEST FLIGHTS PER QTR

On the civil special operations side more Airbus serial production flights were supported than ever before. The order list for the 320 family assembled in Finkenwerder near Hamburg is long. In the last quarter of 2018 the Military Sector Group controlled 165 test flights, which is 34% higher than the previous peak.

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)

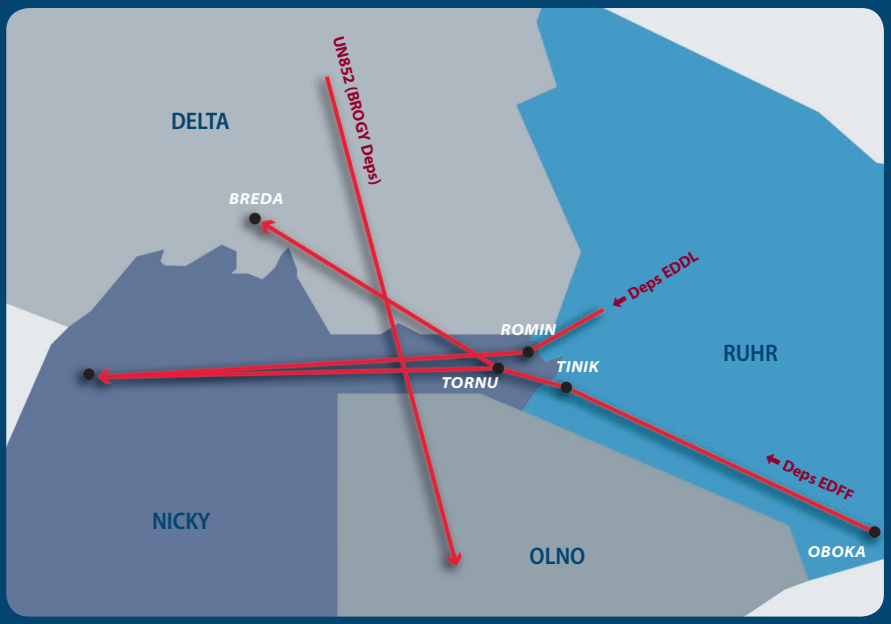
After one year of experience with civil-military integration, it was recognized that the historical sectorisation inherited from the States could be improved significantly.

REDMIS will be optimising the current 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 implementation of REDMIS is planned for 2019.

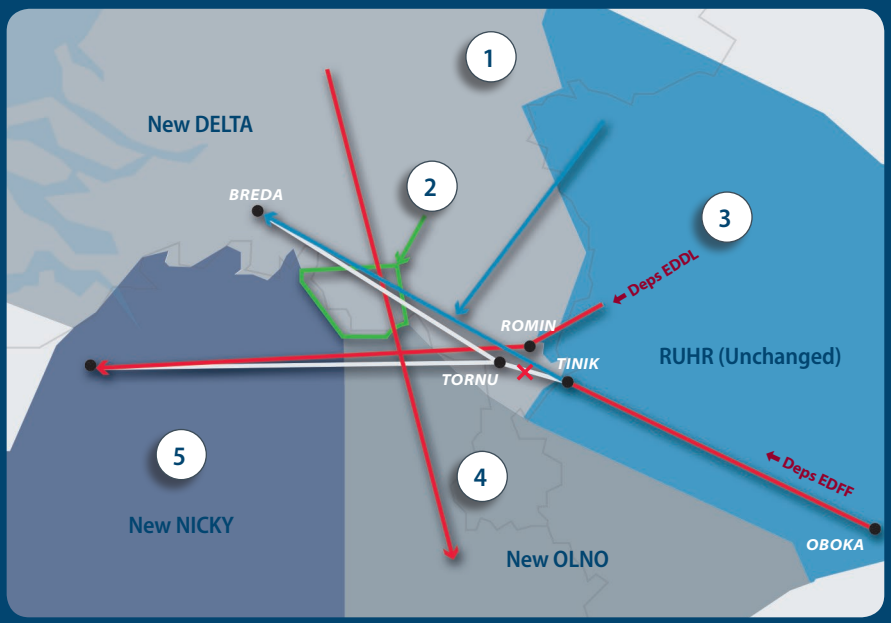
Nicky-Olno-Ruhr-Delta Re-Design (NORD)

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 will simplify the interface by reshaping the sector boundaries and adapt the relevant procedures (see figure). Implementation is scheduled for 2019.



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 2018 were:

Advanced ATFCM/ASM Planning Function (AAPF)

The AAPF (Advanced ATFCM Planning Function) project delivered an initial operational concept to bridge the gap (roles, tools, procedures) between ATFCM and ATC processes, and submitted it to an operational trial in the DECO sector group in the summer of 2017. The outcome of this trial led to further refinement of the concept, which was extensively trialled in all sector groups in April-May 2018.

Central Supervisory Suite 2.0

The CSS 2.0 (Central Supervisory Suite 2.0) project continues the use of the AAPF concept to optimise the daily operational supervision and to allow Ops room supervisors to better support ATCOs at times close to execution. A first operational trial of the new concept took place in summer 2018; a subsequent trial is planned for summer 2019.

Multi-Sector Planner

The project develops an MSP concept and required systems support, focusing initially on two sectors in DECO sector groups. Three simulations were performed in 2018, proving the concept to be feasible and ready for operational trial, planned for 2019. The new role is envisaged for tactical use in low traffic scenarios, allowing for more efficient transitions between opening and closing sectors.

Post-OPS Analysis & Business Intelligence (PABI)

In 2018, Post-OPS analysis processes were significantly improved through the initial deployment of the Sector Opening Tables Architect (SOTA) tool, streamlining and enhancing the establishment of optimal daily sector opening schedules for the predicted traffic. By systematically scoring and reviewing all opening and closing of sectors, and all usage of regulations and scenarios, including their delay generation during the day of operation, MUAC is now able to keep airspace access restrictions to a strict minimum. MUAC also procured and deployed in 2018 Data Warehouse infrastructure capable of processing the vast amounts of precious operational

data continuously recorded, including the full history of evolution of predictions, enabling in 2019 a deep insight into residual uncertainty and its reflection in the safety margins encoded into the declared sector capacities.

Traffic Prediction Improvements (TPI)

Thanks to a state-of-the-art machine learning algorithm (neural network) that was trained on 3 years of historic data, the prediction of flight routes in the iFMP tool has been improved considerably, reducing average lateral errors by up to 50% for certain traffic flows. This has led to a more accurate forecast of sector workload, and a more optimal way to decide which flights to regulate. This solution was highlighted in the keynote of the TensorFlow Dev Summit in the US as one of the examples of application of leading industry framework for artificial intelligence originally developed by Google. Research is ongoing to also improve the prediction of the speed profile, the vertical profile (rate of climb/descent, top of descent) and take-off time by machine learning. The first results are expected in 2019.

Air Ground Data Link in operation since 2003

In 2018, Data Link usage in MUAC airspace increased further, meanwhile 38% of all traffic initiates the Log-On process to MUAC, again significantly increasing the Log-On rate from the previous year.

To further improve VDL Mode 2 performance, MUAC will further filter poorly performing avionics through improved white list filtering as better latency and improved end-to-end performance are key factors in increasing ATM capacity in the challenging summer ahead.
Since multi-frequency deployment of the ATN (Aeronautical Telecommunications Network), the VDL (VHF Digital Link) unfortunately failed to produce further performance increases, underlining the urgent need for further action in the technical domain.

MUAC hopes that these technical challenges can still be meet with the now fast-approaching retrofit deadline.

Customer service

ATM Portal

The ATM Portal project delivered an airline operator portal in 2018. It has been used since early summer to support the Customer Initiative 2018 trials. Eight 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 150,000 minutes of delay, spread over 5,300 flights and distributed over 300 airlines. Access to the portal overall facilitated better support to the most business-critical flights for the eight partners involved.

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

SESAR2020 validations & demonstrations

ADS-C

As part of the SESAR2020 projects linked to the new ADS-C (i.e. Projects 18 for validations and PJ31 for live demonstrations), MUAC will provide 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. Development has progressed throughout 2018, and trials will start in May 2019.

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. Validation preparation over 2018 has been targeting the formal validation exercise in April 2019.

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

Data services

SAS2

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

ADaaS (ATM Data as a Service)

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 ATM Data Service Provider can deliver services.

PEOPLE

Proactive manpower planning

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

The number of employees working full-time (Full-Time Equivalents – FTEs) increased by 32 FTEs, mainly driven by the intake of ab initio trainees.

For the support functions, the objective was to contain, or where possible lower, staff numbers to meet the MCG (Maastricht Co-ordination Group) task of assessing the business need for every support function prior to filling it. In the second half of 2017, additional resources were approved to address the capacity-related issues. This has resulted in organisational changes that were approved in late 2017 and the effects of which will become apparent in 2019.

Ab Initio training at ENAC

In 2018, 6 of the AI69 students obtained their ATCO licence in the Brussels sectors.

10 students from AI70 started their ATC Unit training at MUAC, after they successfully finished pre-transition training at the ENAC. They all successfully completed Module 1 (Transition) and Module 2 (Pre-OJT) and subsequently advanced to Module 3 (OJT).

14 out of 15 students of the AI71 intake started their ATC Unit training at MUAC in November.

10 students from the AI72 group started their basic training at the ENAC in March and they all successfully completed their rating training on 14 December.

In October, 16 AI73 students started their basic training at the ENAC.

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. As of 2018, Ab-Initio groups will be trained using upgraded NUT 1.1 course material.

Over the reporting period, the number of employees increased by 6.6%, from 639 in 2017 to 681 in 2018, mainly due to an intensification of ab-initio intakes (+19 staff) and operational staff (+15 headcounts). The number of Air Traffic Controllers (ATCOs) rose slightly from 302 to 303. High ATCO outflow to retirement is expected over the next 10 years. Ab initio intake has commenced and will be maximised to 36 student per annum in the coming period.

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.
In October 2017, the first 'Lippe Conversion Course' (LC1) started, followed in January 2018 with LC2. LC3 started in October 2018.

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

On 1 June, MUAC welcomed on board a full-time welfare officer. 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 Project

The MUAC Energy and Resilience Management Project has been running since September 2016 and, over the years, has become popular amongst employees throughout the organisation. Its aim was 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 project approach is in line with both the current and upcoming regulations for ATCOs and ATSEPs and the MUAC obligation to deliver a sustained performance in line with demand from our external stakeholders.

Even after the project closes, the Energy and Resilience Management support network will remain 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 also had 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

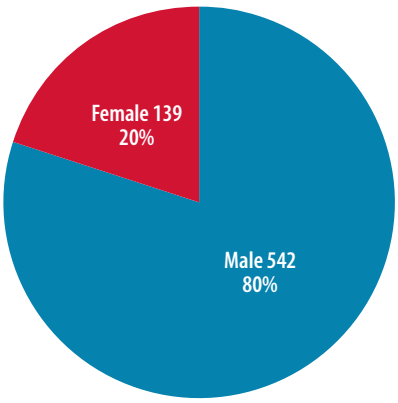
Social dialogue activities in 2018 continued at both Agency and MUAC levels through the Agency consultation process involving the trade unions and meetings of the Staff Committee Servants, who represent MUAC staff, with MUAC senior management.

These discussions highlighted the impact on MUAC staff working conditions and workload as a consequence of the unforeseen increase in traffic demand and the pressure on costs over Reference Period 2. Discussions on amendments to the conditions of employment to absorb the extra workload were carried out throughout 2018 with a view to increasing the capacity MUAC can offer to the airspace users, while also addressing the health and wellbeing of staff.

MUAC also participated in the Agency consultation regarding the new Agency employment framework. Within MUAC, management provided regular feedback to the Staff Committee Servants on MUAC's main activities and its involvement within FABEC as well as the ongoing implementation project of the Maastricht Agreement with a view to implementing greater management independence for MUAC, as set out in PC decisions 128 & 129 in December 2016. On the basis of close dialogue between the Staff Committee and MUAC management, issues were raised, discussed and followed up.

Transfer of former HRS/DCFI staff

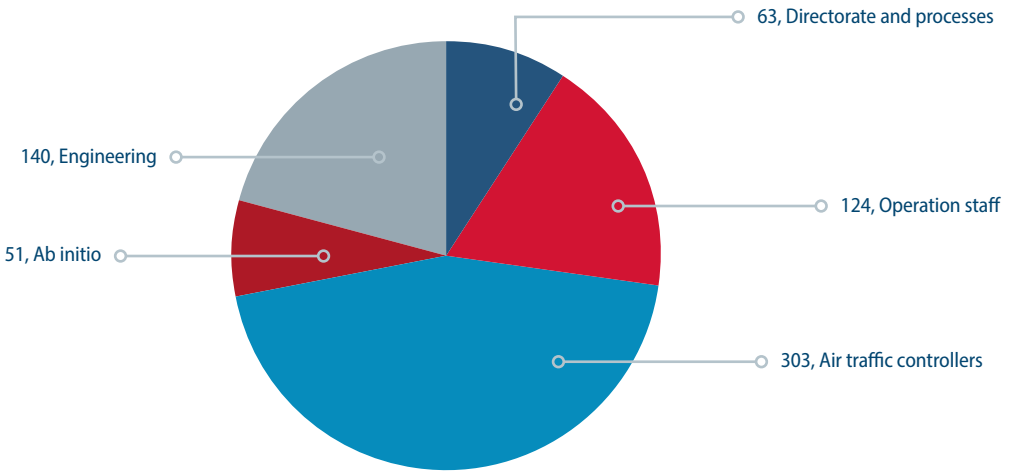
In 2018, the former Directorate Resources (DR) was dissolved at Agency level and staff distributed to HRS and DCFI respectively. The staff allocated to these units but located at MUAC were transferred to MUAC on 1 July 2018 under the SSM structure as part of the agreed management autonomy for MUAC. The move will allow MUAC to execute support processes in the areas of HR and finance with its own staff under its own responsibility and is expected to improve the handling times of these processes for MUAC.



GENDER DISTRIBUTION (31 DECEMBER 2018)

Staffing trends (2014-2018, 31 December 2018)	
2014	624
2015	613
2016	616
2017	639
2018	681

Breakdown of staff in the different core business units (31 December 2018)	
Directorate and processes	63
Operational staff	124
Air traffic controllers	303
Ab initio	51
Engineering	140
TOTAL	**681**
Lippe Staff	47



Former Lippe Staff: 47

In accordance with the revision of the Maastricht Agreement (scheduled to enter into force in 2020), which grants greater management independence to MUAC, as of 1 July local HR and Finance support staff were transferred back to MUAC line management and are now reported under the core business unit "Directorate and processes".

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

AGE PROFILE (excluding former Lippe staff) - 31 December 2018

The legal retirement age for MUAC ATCO and non-ATCO employees is set at 55-57 and 60-66 years, respectively. The age pyramid shows that, despite four major spikes, ATCO staff is distributed more evenly than staff working in support functions, with the latter clearly unbalanced on the 50 to 53-year range.

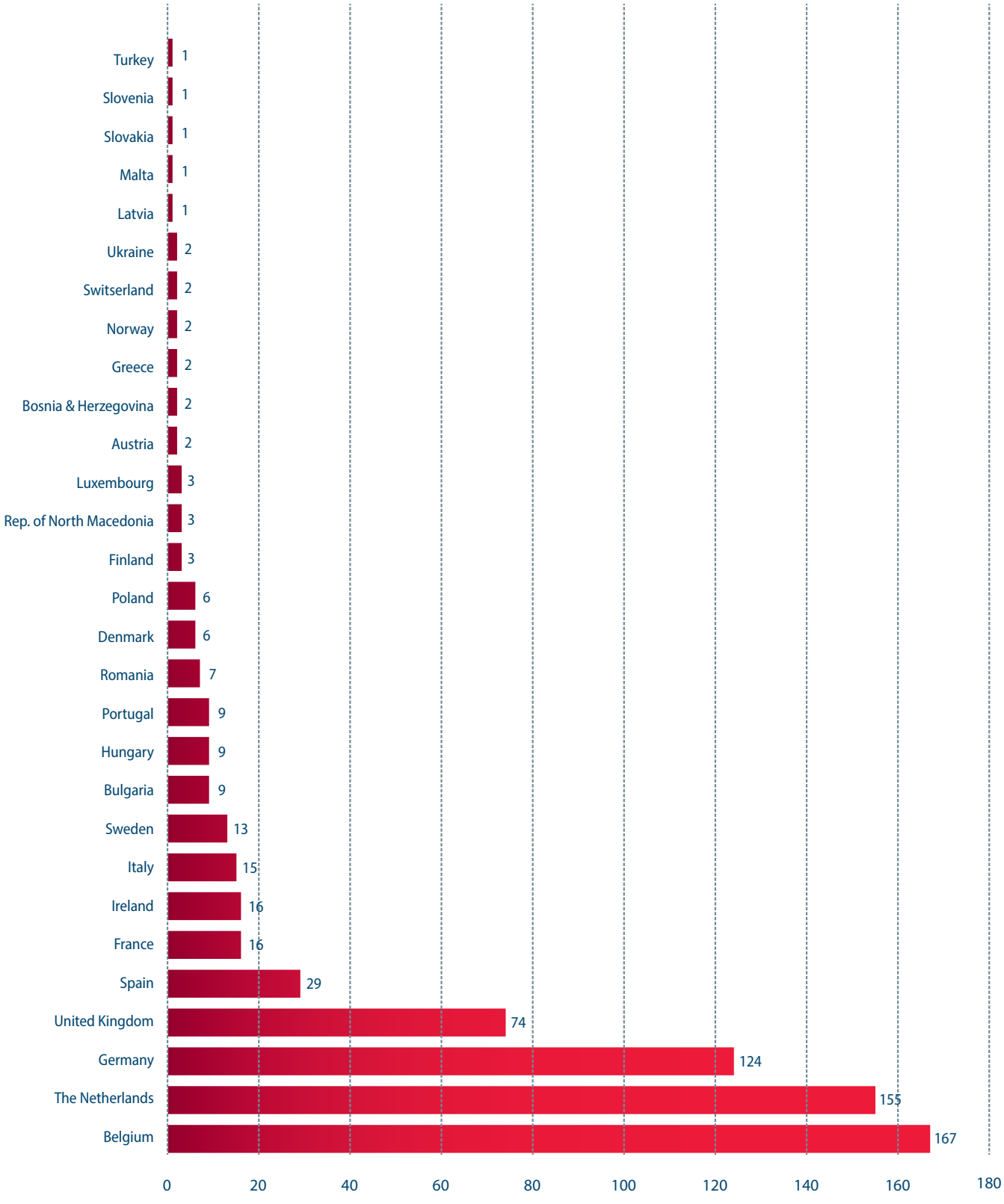
MUAC is tackling the expected outflow of ATCOs over the next five years by maximising the intake of Ab initios. Furthermore, in the course of 2019, MUAC management and trade union representatives reached an agreement on amendments to the General Conditions of Employment (GCE), which will give MUAC the possibility to mitigate the shortage of ATC staff in the years to come by gradually delivering over 3,000 additional ATC shifts per year.

MUAC (2014-2018, 31 December)	2014	2015	2015	2017	2018
Newly qualified air traffic controllers	9	3	2	0	6

Staff intake and outflow (2014-2018, 31 December)	2014	2015	2016	2017	2018
Retirements	11	3	2	2	9
Other outflow*	18	18	4	6	6
TOTAL outflow	**29**	**21**	**6**	**8**	**15**
Recruitment (except air traffic controllers)	2	2	9	7	25
Student air traffic controllers (ab initio and conversion)	0	8	0	25	26
TOTAL intake	**2**	**10**	**9**	**32**	**51**

* *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.*

STAFF NATIONALITIES IN 2018



Business outlook

According to the Network Manager, European traffic is expected to continue its staggering growth over the coming years, so it is clear that the current critical capacity situation will not improve quickly. Many European ANSPs – even those which were not particularly affected by capacity problems last year – are bound to face restrictions this year.

In line with recent European trends, MUAC was confronted with a continuous delay increase caused by significant traffic growth, in particular in the congested sectors of Belgian airspace. For MUAC, the operational conditions will continue to be challenging in the nearly future: flows will shift owing to capacity shortages in neighbouring airspace, and complexity will increase, hence potentially placing MUAC in a critical situation.

The MUAC Board pro-actively revised and updated the MUAC strategy with the ultimate objective of providing the Centre with adequate tools and initiatives to adapt and ultimately succeed against the expected capacity challenges of the next decade.

Besides, 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 freedom from the EUROCONTROL PC, is expected to be implemented early 2020. This should provide MUAC and the Four States with the necessary agility to make rapid, independent and sound decisions in this dynamic business environment.

More than ever, in 2019 the key word will be "cooperation". MUAC staff, together with its social partners, NM, neighbouring ANSPs, and the Four MUAC States, will work together to resolve the capacity problem. The eNM initiative and the customer initiative, for instance, are clear examples of successful collaboration which will continue to bring concrete benefits to the overall stakeholder community.

On the staffing side, the Board commits to making sure that the required resources will be available and directly linked to the Centre's ability to improve its capacity. For instance, Ab Initio recruitment campaigns will continue and will reach the maximum intake in the coming years. The Board is aware of the recent improvement in the conversion rate of Ab Initios and acknowledges the exceptional professionalism of colleagues in the recruitment and training section. This is also another clear example of how MUAC is capable of planning and putting in place fruitful and cost-efficient long-term strategies.

Furthermore, the recent agreement with social partners on amendments to the General Conditions of Employment (GCE), although not ratified by the Four MUAC Member States yet, opens up a great opportunity to mitigate staff shortages in the years to come and will enable MUAC to meet its business objectives in the short-medium term.

In parallel, the Board will promote further cooperation with key partners and stakeholders (e.g. FABEC and 4ACC Initiative), 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 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 Board is doing its utmost to make MUAC visible on the ATM scene, promote cooperation with stakeholders and partners and incentivise initiatives tackling the ongoing capacity challenge. The clear focus is keeping MUAC in a 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 2019.

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 on the basis of 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(2018), dated 20/04/2018 and the Decision of the Director CFI (CFI/II/04 dated 04/10/2018). 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 on the basis of 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.

Concerning investments, a mechanism for pre-financing investments by the Agency is in place, ensuring that 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 2018 Budgetary Accounts, which determine the amount of contributions due from the Member States in 2018, are based on the IFRS principles (with some exceptions). Similarly, the 2018 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.

STATEMENT OF FINANCIAL PERFORMANCE (NOMINAL VALUES)

BALANCE SHEET (NOMINAL VALUES)

ASSETS		2017	2018
FIXED ASSETS			
	Buildings & installations	31,686,263	31,279,769
	Equipment	26,349,883	25,437,951
	Vehicles	30,984	24,787
	Work in progress	3,437,310	2,136,613
	TOTAL FIXED ASSETS	**61,504,440**	**58,879,120**
CURRENT ASSETS			
	Contributions to be received	23,721,841	25,420,797
	Intercompany receivables	12,758,138	13,968,134
	Deferred charge	10,983,483	11,373,885
	Other debtors	834,050	1,594,217
	TOTAL CURRENT ASSETS	**48,297,511**	**52,357,033**
OVERALL TOTAL		**109,801,951**	**111,236,153**

LIABILITIES			
CURRENT LIABILITIES			
	Contributions to be reimbursed to Member States	7,566,248	7,218,104
	Deferred income	32,423,658	34,939,685
	Other creditors	4,337,255	6,820,598
	Accrued charge	3,970,350	3,378,647
	TOTAL CURRENT LIABILITIES	**48,297,511**	**52,357,033**
OTHER LIABILITIES			
	Loans > 1 year	61,504,440	58,879,120
	TOTAL OTHER LIABILITIES	**61,504,440**	**58,879,120**
FINANCIAL POSITION			
		0	0
	TOTAL FINANCIAL POSITION	**0**	**0**
OVERALL TOTAL		**109,801,951**	**111,236,153**

	2017			2018		
	GAT	OAT	TOTAL	GAT	OAT	TOTAL
INCOME						
Member State contributions			124,058,324			129,694,633
Internal Tax			38,316,444			39,350,575
TOTAL INCOME			162,374,768			169,045,208
COSTS						
Remunerations	-127,877,887	-3,804,976	-131,682,863	-133,446,457	-3,792,743	-137,239,200
Receipts related to remunerations	1,308,920	38,947	1,347,866	1,400,761	39,812	1,440,572
Receipts related to KLU Project	718,190	21,370	739,560	719,122	20,438	739,560
Receipts related to SESAR Joint Untertaking	920,101	27,377	947,478	1,014,981	28,847	1,043,828
Receipts related to SASS-2	895,995	26,660	922,655	1,584,954	45,047	1,630,001
Receipts related to OAT Service provision	1,819,027	54,125	1,873,152	2,867,107	81,487	2,948,595
Receipts related to sale of services	67,717	2,015	69,732	610,039	17,338	627,377
STAFF COSTS	-122,147,937	-3,634,483	-125,782,420	-125,249,494	-3,559,773	-128,809,267
PENSIONS PBO	0	0	0	0	0	0
Staff-related costs: training and travel costs	-2,473,943	-213,011	-2,686,954	-4,531,544	-342,284	-4,873,829
External assistance	-4,298,854	-370,139	-4,668,993	-5,827,489	-440,172	-6,267,660
Accommodation	-5,255,642	-452,520	-5,708,162	-3,862,294	-291,733	-4,154,028
Communications	-1,782,787	-153,501	-1,936,288	-1,783,634	-134,724	-1,918,358
Data processing	-4,718,591	-406,279	-5,124,870	-5,140,549	-388,284	-5,528,834
General administration	-331,791	-28,568	-360,359	-420,664	-31,774	-452,439
Finance & Insurance	-274,387	-23,625	-298,012	-273,048	-20,624	-293,672
Unrecoverable VAT	-9,295	-800	-10,096 -800	-12,732	-962	-13,694
Sale of goods	8,860	0	8,860	11,823	0	11,823
Miscellaneous receipts	50,428	4,342	54,769	78,701	5,945	84,645
OPERATING COSTS	-19,086,003	-1,644,102	-20,730,105	-21,761,430	-1,644,613	-23,406,044
	-19,076,708					
DEPRECIATION COSTS	-8,072,445	0	-8,072,445	-9,317,270	0	-9,317,270
INTEREST PAID	-223,549	0	-223,549	-294,523	0	-294,523
TOTAL COSTS	**-149,529,934**	**-5,278,585**	**-154,808,520**	**-156,622,717**	**-5,204,386**	**-161,827,104**

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
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

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 2018

EUROCONTROL

Annual Report 2018

EUROCONTROL

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