EUROCONTROL

# Network Manager Annual Report

2018

SUPPORTING EUROPEAN AVIATION

FOUNDING MEMBER SESAR JOINT UNDERTAKING

NETWORK MANAGER

# FOREWORD BY THE CHAIRMAN OF THE NETWORK MANAGEMENT BOARD, SIMON HOCQUARD

*Dear colleagues, it is my pleasure to introduce the Network Manager Annual Report for 2018.*

*I am pleased to say that traffic continued to grow across the European network during 2018 showing that Europe's economy remains strong and healthy. As a result, the year 2018 was yet another year of records, however records can unfortunately be negative as well as positive and 2018 provided us with a number of both.*

*It is worth highlighting some of these record figures for 2018:*

- *More than 11 million flights for the first time;*
- *Top 20 busiest days ever were all in 2018;*
- *7th September saw 37,101 flights safely handled in one day;*
- *Annual traffic increase of 3.8% compared to 2017.*

*Whilst these facts are extraordinary and we should all be proud of them, this has highlighted that there were some real capacity shortages in places across Europe unable to meet this level of demand. Combined with unprecedented levels of convective weather and numerous social issues, this resulted in significant delays across the network of 1.73 minutes per flight, which is:*

- *Double 2017 delay performance, and*
- *More than three times above the SES performance target.*

*I am pleased to report that whilst this level of demand and constraining factors needed constant working through nearly every day across the summer, the level of cooperation and problem solving across all the network stakeholders was truly inspiring. The NM proposing and implementing network solutions could only have been successful with the strong cooperation with operational stakeholders and was critically important in handling the summer traffic, with capacity mitigations requiring moving large numbers of traffic from constrained centres to adjacent ACCs and all being handled safely.*

*In April, the NM flight planning system outage demonstrated the importance of such systems to the European aviation network. In all such crises ATM often responds professionally and calmly, and I am pleased to report that the NM's response continued with that type of response. In all such events there are lessons to be learned and knowledge to be gained, which was also the case here, and I look forward to how the NM will modernise its systems to help prevent these types of outages occurring in the future.*

*The Network Management Board has been far more involved with the operational aspects of the European Network as a consequence of the capacity crunch for both 2018 (and now 2019) than in previous years. Special meetings and task forces were held to provide valuable contribution along with gaining firm commitment from stakeholders to help mitigate the delay situation. The NMB demonstrated its ability to deliver and to constantly provide good governance. And I believe the quality of meetings has much improved.*

*Summer 2018 was a wake-up call to us all and I am pleased to see everyone's response to help ensure that we do better in 2019. Using the momentum we have now, we must all continue to work together to support the growth of European aviation. We all need to, and shall, engage in solving the strategic issues facing the network such as supporting and implementing the Airspace Architecture Study which was developed by the SESAR JU and NM.*

*Finally, I would like to express my thanks to Joe and the team for their tireless commitment and hard work for 2018. As Joe now moves towards a well-earned retirement, I would like to personally thank him for all his efforts in making European network management a success.*

*I now wish every success to his successor Iacopo Prissinotti and I am looking forward to working together with him and the NMB.*

# MESSAGE FROM THE DIRECTOR NETWORK MANAGEMENT, JOE SULTANA/EXECUTIVE SUMMARY

*What has changed in 2018 which has dramatically reversed the progress in performance seen in Europe in the last 5 years?*

*Disruptions due to strikes went up, disruptions due to convective weather increased, delays due to lack of staffing significantly higher within a context of a 3.8% average traffic increase is the answer.*

*Mitigation measures were introduced to limit the delays and Network Manager actions led to an added value to the network of more than 12% in terms of delay reductions but remedial actions to increase capacities are not readily available in the short term. If they were, the political pressure and the costs of these delays on the flying passengers would make it happen.*

*The European system needs a game changer if it is to manage safely the traffic levels seen in 2018 which were higher than the previous record 2008 levels. Some ANSPs have delivered more capacity but we need to create more capacity across the network in a more coordinated manner.*

*The main lesson learned out of the operational performance of the network in 2018 is that it needs a commonly supported network-wide operational concept and a buy-in towards a network centric approach. Multilateral cooperation is needed to overcome operational deficiencies in one part of the network but which impact a much larger airspace. Converging ATM technical developments are necessary for these evolutions to have a positive impact across the network.*

*Cross-border free route airspace is a typical network wide operational concept which despite weather and geopolitical disruptions, is giving results in line with the SES performance targets.*

*2018 has been the siren call for this network-centric approach. It has also seen the Network Manager start the changes necessary to prepare itself for the future. A new architecture for the NM technical system has been developed. A related Long Term Investment Programme elaborated. The joint SJU/NM Airspace Architecture study addressing short/medium and longer term proposals completed. An updated Network Functions Regulation finalised. The nomination of EUROCONTROL as Network Manager for period 2020-2029 confirmed. The process to select a new Director Network Management initiated and as a result Mr Iacopo Prissinotti will assume responsibility to deliver the Network Functions on 1 July 2019.*

*2018 is past. It is now a time of challenges, a time of change, a time to build on the results of the last seven years of Network Management, a time to deliver the Single European Sky.*

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# 1. NETWORK MANAGER BUSINESS EVOLUTION

## 1.1 BACKGROUND

The European Union established the Network Manager[1] (NM) under the Single European Sky (SES) II package agreed in 2009 to perform the tasks necessary for the execution of the network functions. NM coordinates the various network functions in order to develop consistent short and long term optimisation solutions to have seamless European airspace, better managed at network level, compliant with the performance objectives.

The NM's strategic objectives are laid out in the Network Strategy Plan (NSP). The NSP and the Network Vision for the second reference period (RP2) and beyond were approved by the EC Decision No 4660 in July 2014.

NM's own performance targets and objectives are described in the Network Performance Plan (NPP). The current NPP covers the RP2 of the SES performance scheme (2015-2019), and was formally approved by the Commission Implementing Decision (EU) 2016/1373 of 11 August 2016.

NM works closely with airlines, air navigation service providers, civil/military airspace users and airports to create the operational partnerships needed to achieve the SES performance targets for all States included in the pan European 'network'[2].

This is NM's[3] annual report covering its activities in 2018.

### NM regulatory framework evolution

The revised NM Regulation received the positive opinion of the Single Sky Committee No 70 on 27-28 November 2018 and was published in the EU Official Journal as Regulation (EU) 2019/123 of 24 January 2019. The revised Performance and Charging Regulation received the positive opinion of an ad hoc SSC on 17 December 2018, expecting publication in early 2019. The revised text of the NM Regulation brought new tasks for EUROCONTROL as NM such as monitoring of CNS infrastructure, provision of tools, processes and consistent data, including flight plan processing, European data management systems and aeronautical information relevant for the execution of the network functions. The Cooperative Decision Making (CDM) processes provide for more robust procedures and escalation process in case of lack of commitment by operational stakeholders.

In July 2018 in a response to an invitation by the European Commission, EUROCONTROL started the process of renewed appointment as Network Manager for RP3 and RP4 (2020-2029). The proposal by EUROCONTROL had been endorsed by PC/50 on 29 November 2018 and was then submitted to the EC on 17 December 2018. The main points of the proposal and the process for appointment were presented at the ad hoc NMB on 25 October 2018.

The process for the new appointment should continue with the appointment decision by the EC after an advisory procedure by the SSC in the first half of 2019.

### NM Certification

On 24 July 2018 NM submitted its application for certification to EASA in the framework of the Regulation (EU) 2017/373. On 9 November 2018 the certification process was officially started. A combined initial certification and continued oversight programme was proposed by EASA. NM submitted to EASA all the necessary elements demonstrating compliance. Several iterations and on site audits are expected to complete the certification by Q3 2019.

## 1.2 BUSINESS IMPROVEMENT INITIATIVES

NM is constantly reviewing methods and organisation for delivering operations and services to meet the performance targets in a cost efficient manner. It is therefore regularly proposing to the governing bodies a number of business improvement initiatives to achieve that goal.

In preparation for its re-appointment as Network Manager there were some **key Business Initiatives** that NM had undertaken, from an operational and technical perspective:

- **Airspace Architecture Study** – work on this study continued throughout 2018 and a comprehensive description of the outcome of the study had been given during a dedicated workshop organised by the SESAR Joint Undertaking (SJU) on 20-21 November 2018. NM's involvement had been mainly on the airspace design, operational practices and operational performance evaluations part of the report. For most of its contributions, NM used input from the regular NM activities, e.g. the long-term evolution of the airspace network and capacity performance assessments.
- **Future technical architecture study** – the study provides a basis for rebuilding the NM system in accordance with the latest technical evolutions and

1 Commission Regulation (EU) 677/2011 of 07 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions (NM regulation)

2 States include: EU Member States, non-Member States that are members of EUROCONTROL or have concluded an agreement with the Union on the implementation of the Single European Sky or are participating in a functional airspace block.

3 As requested by article 20 of NM regulation

ensuring that the NM systems continue to be fit for purpose, bringing the NM systems in line with the European digital strategy (more details under Development in Operations and Infrastructure);
- **Long Term Investment Plan** – as a policy, new investments would be funded through capital expenditure. A 10-year investment plan, covering the upgrade of network systems and tools is being prepared for inclusion in the NM Business Plan 2020 – 2029. Further work will be required during 2019 to re-evaluate the NM work programme and the associated budget (including human resources) and investment plan, to respond to the new activities and tasks from the new NM regulation (on the assumption that EUROCONTROL is appointed as Network Manager for RP3 and RP4).

Other Business Initiatives were progressed during 2018 to improve the business delivery of NM functions and services to stakeholders.

- Following the design and setup in 2017, the IT services were delivered centrally in 2018. This enabled synergies both in staff and procurement of IT services.
- The cost allocation methodology (CAM) for support costs was approved and is now in operation Agency wide. The CAM allocates support costs based on well-defined sharing keys for every support service. The setup of Service Level Agreements and a Service Level Management governance structure for the support functions complements the CAM;
- NM continued to scrutinise all expenditure through the implementation of an Expenditure Review Panel (ERP). This panel reviews all contracts and procurement plans against the business needs and strategic alignment before the expenditure is made. In doing so, the operating costs are minimised;
- In view of the ongoing projects and limited operating resources, all NM procurement plans were reviewed and prioritised by the Director NM at various moments during the year.

The NM **Human Resources Policy** aims to improve the knowledge, skills and capabilities of staff, harnessing their talent to help them achieve their potential. The NM Directorate Staff Plan outlines the skills needed over the short and medium term to perform NM functions. The HR Review Panel supports the Director to recruit in line with the business needs and priorities. NM has developed a plan that ensures that all recruitments are closely aligned to the staffing plan. NM continued to ensure that staff engaged in projects elsewhere in the Agency are charged to the relevant directorates.

## 1.3 NM RISK MANAGEMENT

Identifying and mitigating risks on the European ATM network is one of NM's highest priorities. The NM Risk Management process covers risks to the NM work programme delivery and to NM business continuity, including those derived from network performance, safety and crisis risks. NM business risks are regularly reported to meetings of NDOP and NMB.

The full loss of the flight planning service (IFPS) is a high impact risk. Following the NM system outage (3 April 2018) NM conducted a full review of the back-up solutions needed to ensure the continuity of service. These solutions include:

- reinforced communication redundancy (will become operational in Q2 2019) and
- a back-up system for flight plan distribution within the network by introducing a cloud based basic IFPS that can convert received flight plans and forward them to the correct addresses in the required format (a call for tender will be published in 2019 with the operational implementation foreseen for 2020).

'Cyber Security' covers the risk for partial or complete unavailability of NM services due to a cyber-attack. As part of the NM Security Management System, NM started to deploy the operations centre for cyber security and detection of incidents on its services, which is planned to become operational in 2019. The NM, NM Operation Centre (NMOC) and IFPS business continuity arrangements are addressing also the cyber security requirements.

The NM budget risk for 2018 has been properly managed and mitigated through appropriate management measures.

# 2. GOVERNANCE MATTERS

## 2.1 GOVERNING BODIES AND ARRANGEMENTS - NM SUPERVISION

The Network Management Board (NMB) was established to adopt measures related to the governance of the network functions and to monitor their performance. The revised NM regulation amended the role, the composition and the tasks of the NMB as of the start of RP3.

The NMB held regular meetings in April, July and December 2018. NMB/22 in July 2018 established an Operational Performance Task Force to examine several ideas for options to mitigate and address performance gaps for summer 2019. On 25 October 2018 an ad-hoc NMB meeting was dedicated to reviewing the issues with the network performance in Summer 2018 and approved an NM Action Plan for Summer 2019.

To monitor the execution of this NM Action Plan, NMB/23 requested that as of January 2019, NM issue a monthly progress report on the development and implementation of the measures with an attached quick escalation process to NMB and SSC in cases of repetitive or structural failure to implement. Separately, NM will implement a capacity optimisation team to monitor the implementation of mitigation measures, post-ops monitoring of the results, including identification of the delay attribution and, where measures were not implemented, contacting individual ACCs or ANSPs and escalating to NDOP if needed.

In addition, the NMB approved a number of key strategic deliverables including: the NM Work Programme, the Annual Report 2017, and the Network Operations Plan. The NMB reviewed the implementation of the Network Strategy Plan and network and NM performance throughout 2018, and endorsed the 2019 budget.

In line with the enhanced role given by the revised NM regulation the Network Directors Operations (NDOP) has been involved in progressing actions related to operational safety studies, improving network capacity performance, airspace and route network design, airports integration, sustainability and strategic projects, notably n-Conect and flight plan evolution. NDOP reported its conclusions and recommendations to the NMB.

NDOP directly involves ANSPs, military partners, airspace users and airports. Its three meetings in 2018 were therefore the main fora for the preparation, review and implementation of mandated operational and technical actions, and played a key role in performance improvement.

NDOP also met in September 2018 to address the growing traffic demand in the future and decide potential high priority and longer-term actions and measures in order to improve the capacity situation in the next years. The agreed Work Capacity Plan identified actions in the areas of enhanced cooperation at network level, predictability, enhanced ATCO and airspace flexibility, ATFCM techniques, weather, and airports.

The NM CDM and associated teams (NETOPS, Airports, AIM/SWIM, Safety, CNS Infrastructure) provided expert input and coordination within the scope of the NM functions. These teams are open to experts from all NM's stakeholders and are tasked with developing and reviewing specific technical and operational NM proposals at expert level. They are supported by appropriate expert sub-structures. The NDOP structure includes mechanisms for the direct involvement of ANSPs, military partners, airspace users and airports. Its three meetings in 2018 were therefore the main fora for the preparation, review and implementation of mandated operational and technical actions, and played a key role in performance improvement.

### Stakeholder Cooperation

The 21st NM User Forum held on 24-25 January 2018 in Brussels brought together 250 professionals and managers involved in air traffic management, airline or airport operations. The presentations and discussions addressed three key topics:

- understanding dynamic airspace;
- integration of airports in the network;
- weather challenges in ATM.

The **Network Cooperative Decision Making** (CDM) process was followed as required through the established groups.

The European Aviation Safety Agency (EASA) conducted five NM oversight audits (from April to September 2018) of compliance to requirements applicable to NM that covered Haren and Bretigny sites. An unscheduled EASA audit for the 3 April outage was performed on 18-19 April 2018. NM responded to the identified areas for improvements through dedicated action plans, which were overseen by EASA to confirm their appropriateness and sufficiency to identify and mitigate the existing risks.

To date, EASA has not identified any significant non-compliance (i.e. level I finding) with applicable

requirements or organisational procedures and manuals in their continued oversight programme. In 2018, EASA issued three "Letters of Acceptance" for the deployment of two key NM releases with a condition on testing on the operational platform - this condition is still applicable - virtual infrastructure introduction into service and storage provisioning for Haren and Bretigny operations. In total around thirty safety-related changes were notified to EASA for the continuous improvement of the NM functional system.

## 2.2 NM BUDGET

NM and the dedicated NMB Task Force prepared the 2018 budget and the multi-annual Work Programme in line with the requirements of the amended NM regulation and reflected in the relevant NM CDM process. The Single Sky Committee (SSC) gave its positive opinion on the 2018 NM budget during SSC/66 on 24-25 October 2017. At its 20th meeting, the Network Management Board endorsed the NM 2018 Budget, taking into account its multi-annual dimension. The approved NM budget for 2018 is 183,190K€.

The budget covers all activities falling under the Network Manager[4]. It excludes the activities carried out by the NM Directorate which are not covered by the Network Management Functions and parts of the transversal activities that are conducted for the benefit of other EUROCONTROL Agency activities.

NM and the dedicated NMB Task Force prepared the 2019 budget and the multi-annual Work Programme in line with the requirements of the amended NM regulation and reflected in the relevant NM CDM process. The Single Sky Committee (SSC) gave its positive opinion on the 2019 NM budget during SSC/70. At its ad-hoc session on 25 October 2018, the Network Management Board agreed that the endorsement process for the 2019 NM budget would be handled in a written procedure and the NMB authorised the Chairman to endorse the budget after fulfilment of the two conditions set at NMB/22 and following a positive opinion from SSC/70. Once the Chairman had endorsed the budget, the PC/50 would be informed so as to be able to approve the Agency budget, including Part IX. The 2019 NM budget was therefore formally endorsed by the NMB Chairman through a letter sent to all NMB Members on 28 November 2018. The approved NM budget for 2019 is 183,515K€.

## 2.3 INVESTMENT, EXPENDITURE AND REVENUES

The approved NM budget for 2018 is well within the cost efficiency target included in the NM performance plan. The approved NM cost base for 2018 is 183,9M€, which is lower than foreseen in the NPP (220.3M€). This is the result of savings and cost reductions made in the previous years. Hence, NM will meet the cost efficiency target for 2018 by staying within its approved budget.

The 2018 annual accounts of the Network Manager are not yet certified by external accountants. The information in this section is therefore indicative until the accounts are closed and audited. The tables below show the budgetary outturn, cost base and contributions compared with the plan. The 2018 execution is at 183.8M€, 0.1M€ below the approved cost base.

NM took measures during the execution of the budget in 2018 to stay within the approved cost base. This meant scrutinising the procurement plans and slowing down recruitments. The budget situation was challenging mainly due to the transition cost of contract renewals. Unlike in 2017, staff costs did not exceed the planned cost in 2018.

The cost per service unit was 1.10€, 16 cents lower than 2017, a 12% reduction.

[4] It includes activities from the amended NM regulation, notably safety management; EAD activities were taken out from NM budget since 2014 as they are not included in the NM regulation.

| COSTBASE (CONTRIBUTIONS + INTERNAL TAX) 2018 (in M€) | | | |
|---|---|---|---|
| **DETAIL BY NATURE** | **BUDGET** | **OUTTURN** | **UNSPENT** |
| STAFF COST | 87.9 | 88.5 | - 0.6 |
| OPERATING EXPENDITURE | 31.7 | 31.6 | 0.1 |
| CONTRACT STAFF PAID BY OPERATING EXPENDITURE | 0.0 | 0.3 | - 0.3 |
| DEPRECIATION AND COST OF CAPITAL | 0.5 | 0.3 | 0.1 |
| INDIRECT COST | 33.0 | 31.4 | 1.7 |
| ALLOCATION OF PAST | 20.1 | 20.1 | 0.0 |
| TAX COMPENSATION & ANCILLARY BENEFIT DISTRIBUTION | 10.8 | 11.7 | - 0.8 |
| **TOTAL COSTBASE** | **183.9** | **183.8** | **0.1** |

| BUDGET/CONTRIBUTIONS 2018 (in M€) | | | |
|---|---|---|---|
| **EXPENDITURE** | **BUDGET** | **OUTTURN** | **UNSPENT** |
| STAFF REMUNERATION | 83.0 | 83.5 | - 0.6 |
| ART 41 | 2.8 | 2.8 | 0.0 |
| ETS | 3.2 | 3.2 | - 0.1 |
| OPERATING EXPENDITURE | 35.6 | 34.4 | 1.2 |
| CONTRACT STAFF PAID BY OPERATING EXPENDITURE | 0.0 | 0.3 | -0.3 |
| DEPRECIATION AND COST OF CAPITAL | 0.5 | 0.3 | 0.1 |
| INDIRECT COST | 33.0 | 31.4 | 1.7 |
| ALLOCATION OF PAST (PBO and pensioners before 2005) | 20.1 | 20.1 | 0.0 |
| TAX COMPENSATION & ANCILLARY BENEFIT DISTRIBUTION | 10.8 | 11.7 | - 0.8 |
| **TOTAL EXPENDITURE** | **188.9** | **187.8** | **1.1** |
| **REVENUES** | **BUDGET** | **OUTTURN** | **UNSPENT** |
| INTERNAL TAX | -24.4 | - 25.2 | 0.8 |
| INTERNAL TAX ETS | - 0.9 | - 0.9 | 0.0 |
| STAFF REVENUES | - 1.0 | - 1.1 | 0.1 |
| OTHERS REVENUES (signed agreements + UUP) | - 2.6 | - 2.6 | 0.0 |
| UPP REVENUES | - 1.3 | - 0.2 | -1.1 |
| **TOTAL REVENUES** | **- 30.3** | **- 30.1** | **- 0.2** |
| **TOTAL CONTRIBUTIONS** | **158.6** | **157.7** | **0.9** |
| **INVESTMENT EXPENDITURE** | **0.0** | **0.0** | **0.0** |

# 3. NM ACHIEVEMENTS IN 2018

The performance targets and objectives are captured in the **Network Performance Plan** (NPP). Full 2018 results were presented to NMB and are part of a separate document "Report on the Implementation of the NPP and NSP".

## Network Capacity

The main performance indicator is the en-route ATFM delay measured in minutes per flight.

The combination of high levels of demand (especially in central and eastern Europe) with a major drop in capacity at two centres in the core area (Marseille and Karlsruhe), and a record number of adverse weather events and industrial actions severely disrupted network operations in summer 2018.

To mitigate known capacity constraints, NM in cooperation with the ANSPs concerned launched several initiatives, notably the NM/4ACC/11ANSPs initiative that implemented a large set of measures aimed at diverting demand from the risk areas.

External factors such as airspace restrictions and volatile geo-political situations continued to create disruptions in the network.

Traffic in 2018 reached record levels, passing 11 million flights for the first time, with an annual increase of 3.8% compared to 2017. The top 20 busiest days ever were all in 2018. The south-east axis had particularly high traffic, with most of the ACCs in Central and Eastern Europe recording growth levels near or above 8%.

En-route ATFM delay was 1.73 min/flt in 2018 double that of 2017. ATC capacity, en-route weather and ATC Staffing were the main causes of en-route delay.

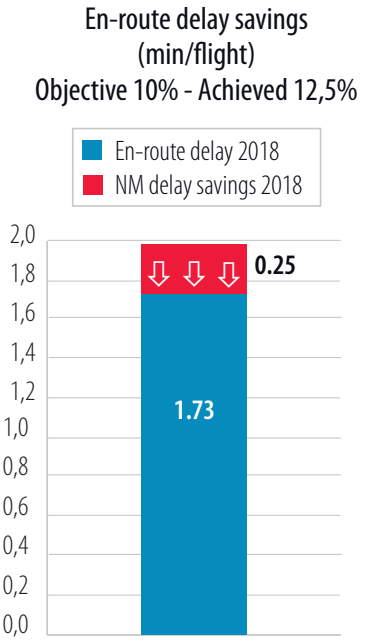
More details in Chapter 4 section Operations Planning.

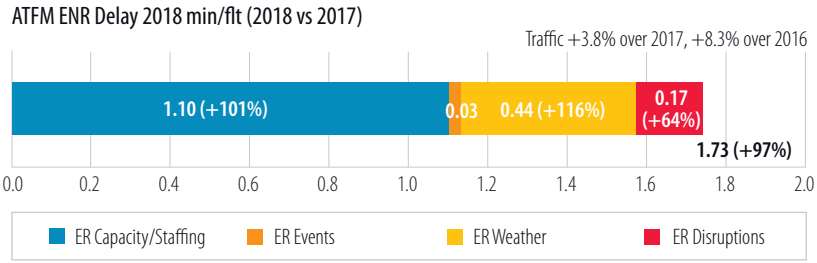
## NM's contribution to delay savings

The NPP defines a range of indicators so that stakeholders understand NM's added value for ATM network performance. The main objective for NM is to reduce the total en-route ATFM delays by 10%.

NM delivered on its commitment to reduce both en-route and airport delays.
In 2018, en-route delay savings exceeded 2,700,000 minutes from direct actions in NMOC (2,500,000 minutes) and re-routings proposals (RRPs) proposed and followed by airlines (200,000 minutes). Together these are equivalent to 0.25 min/flt – without this, the delay in 2018 would have been 1.98 min/flt. This equates to 12.5% of the annual network en-route delay, meeting the 10% objective.

Delay savings were calculated conservatively, only taking into account RRPs and NMOC direct action (i.e. force CTO/CTOT and override slot).



## Environment - Flight Efficiency

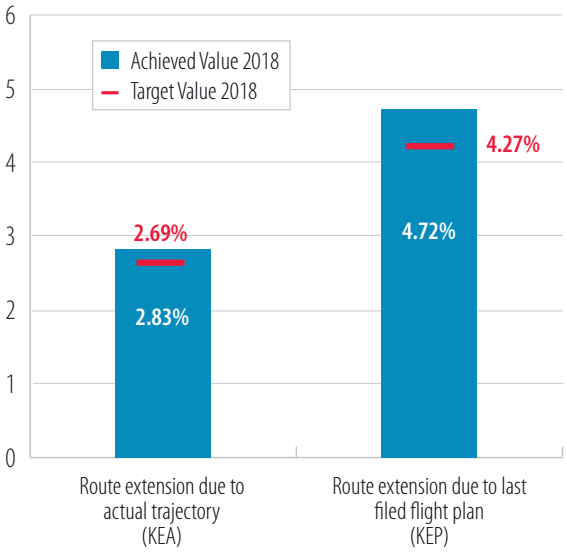
The NPP has two environment targets. The corresponding indicators are based on route extension from an optimum defined by the great circle distance, one due to the actual flown route (KEA) and the other due to the last filed flight plan (KEP).

The flight plan indicator KEP improved again in 2018, but at a slower rate than in 2017, reaching 4.72%, a reduction of 0.02pp over 2017. It is however still above the target of 4.27%. The KEP for NM area showed similar improvement, reaching 4.59% in 2018.

The actual trajectory indicator KEA on the other hand deteriorated slightly over 2017. The SES value of 2.83% was above the target of 2.69% while the KEA for the entire NM area was 2.79% for the same target. It is encouraging to report that during the spring 2018 KEA was almost reaching the target, only deteriorating significantly afterwards due to capacity, weather and industrial actions. This indicates that the network, when not disrupted by significant capacity disruptions, has the potential to meet the environment targets.

This 2018 performance is explained by the interaction of various factors:
On one hand are the inefficiencies caused by the on-going crises in Ukraine, the Middle East, and south Mediterranean, as well as capacity shortfalls, industrial actions and weather.
The impact of strikes amounted to over 1.5 million nautical miles while the Ukraine crisis amounted to over 2.6 million nautical miles lost in 2018. The contribution of the implementation of measures aimed at off-loading traffic from Karlsruhe UAC (as part of the 4ACC initiative) had a limited 2D impact as the re-routings applied led to only 3.5 nautical miles flown extra for the re-routed flights.

On the other hand, flight efficiency registered significant improvement brought by the implementation of Free Route Airspace (FRA) projects, which now cover the majority of European airspace. This has notably reduced fuel consumption and emissions. This is clearly shown when we look at the evolution of the flight efficiency airspace design indicator DES, which improved by 0.16pp in 2018 while the KEP indicator only improved by 0.03pp. The FRA programme helped to absorb the inefficiencies and make progress on the KEP indicator.




The differences between KEA and KEP and the trends identified for a number of flows in Europe clearly demonstrate that the airspace structure and the procedures implemented allow an efficient use of the airspace. At the same time, they indicate that there is a shift in traffic due to differences in user charges that impact both flight efficiency and traffic predictability.

The NM supported the airlines to optimise their flights from a flight efficiency perspective. The group re-routing tool (GRRT) provided better opportunities not only for refiling shorter and more efficient routes but also to allow airlines to identify possible inefficiencies in their flight planning. Re-routing proposals (RRPs) for flight efficiency were provided to the airlines that opt-in for this service. The NM Guidance Material for Computer Flight Plan Service Providers (CFSPs) supports an improvement of the flight plans filed on behalf of the air operators.

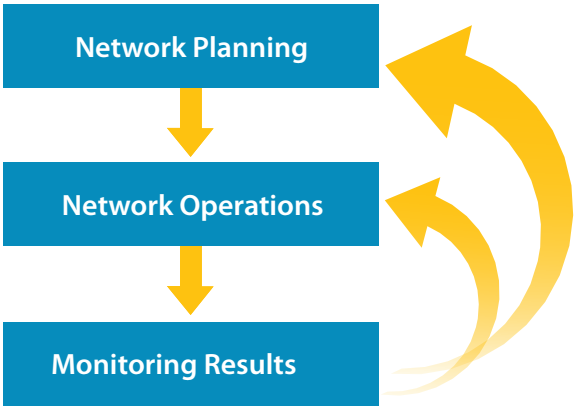
The NM combined GRRT and RRP mechanism delivered savings of more than 59,000 nautical miles in 2018. While the combined proposals made exceeded the 5% objective of the NM flight efficiency savings, due to low acceptance rate the confirmed route changes matching the proposals were much lower than the objective.

Full coverage of the Network Performance is addressed in the Network Operations Report 2018[5].

[5] Published at https://www.eurocontrol.int/publication/annual-network-operations-report-2018

# 4. NM AREAS OF ACTION

NM consolidates and coordinates the activities of the network to continuously improve network performance. NM's planning, operations and continuous monitoring activities are closely interconnected to ensure that network performance is achieved.




NM safeguards the general interest of the network and applies its network focus when analysing the real operational issues.

## Monitoring and reporting

NM presented regular, timely and accurate reports on the overall performance of the network to NDOP and NMB throughout 2018. NM also monitored the actions in the NDOP Work Capacity Plan.

NM published regular Network Operations Reports to stakeholders. NM implemented an improved, dashboard based on the NM interactive reporting tool. ATFCM statistics in general and ATFM compliance data in particular were also moved from static pdf reports to an interactive dashboard. These new tools provide a better service to NM stakeholders both in the presentation of the data and the ease of accessing and retrieving it.

NM collected and provided ATM performance data to the EC and Performance Review Body (PRB) in the framework of the Performance regulation.

A continuous monitoring of results against targets and/or objectives triggered remedial action by the internal NM Performance Steering Committee, when required.

In 2018 NM monitored the sector configurations against the planned NOP values and both actual and forecasted traffic. This allowed the identification of the main causes of lack of capacity during summer season. NM discussed these specific issues directly with the ACCs concerned. Lessons learned were used at strategic level to plan the distribution of available ATC sectors for the next summer season.

The monitoring results were considered in both the planning (e.g. additional actions or critical areas) and operational phases (e.g. identifying daily the 'high risk' delay areas). The results enabled NM pro-actively to act when a problem occurred.

## Network Planning

### Operations Planning

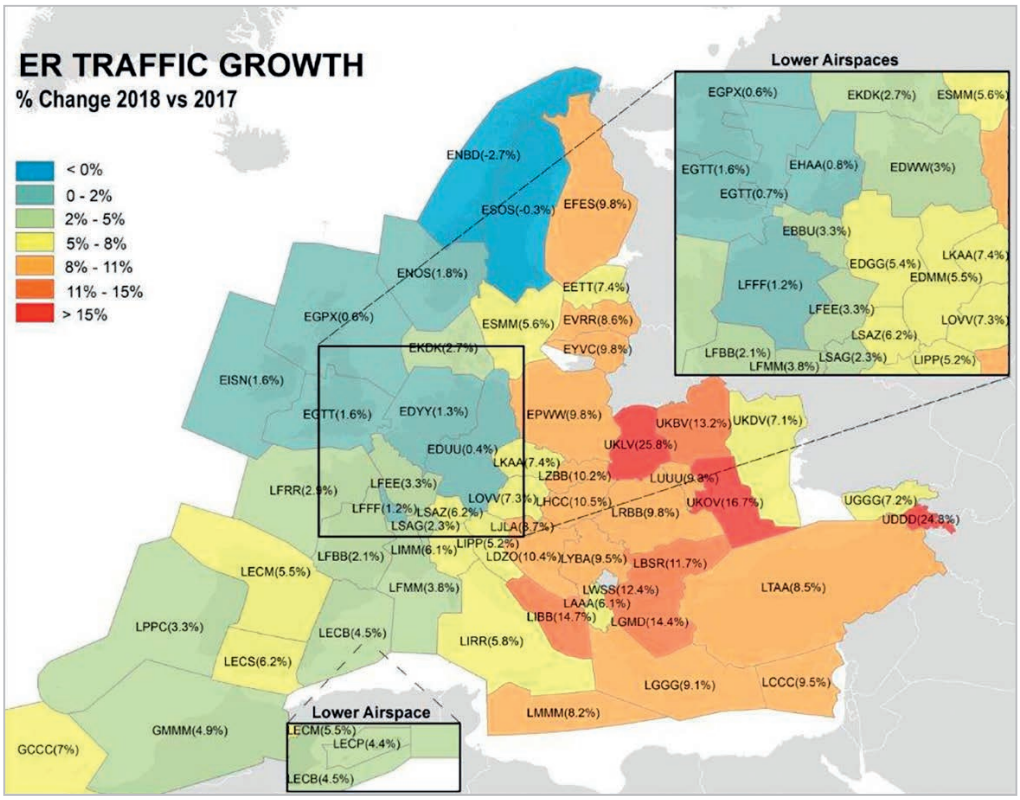
The Network Operations Plan (NOP) implements the Network Strategy Plan on an operational level and is a key NM deliverable. NMB approved the NOP 2018-2019/22 in July 2018.

NM produced traffic forecasts in February and September 2018 in support of operational planning. It quantified the capacity of the network, identified individual ACCs' needs and provided operational performance forecasts for delivering the ATFM function. This was done in close cooperation with ANSPs, which gave further input to the operational measures identified.

NM's performance analysis identified a number of critical areas and investigated the underlying causes; NM developed an action plan that proposed additional measures for Cyprus, Czech Republic, Maastricht UAC, France (Bordeaux, Brest, Reims and Marseille ACCs), Germany (Karlsruhe UAC), and Portugal.

NM joined forces with four ANSPs (Germany-DFS, France-DSNA, EUROCONTROL-MUAC and United Kingdom-NATS) to engage into a common preparation of the summer 2018 known as the NM/4ACC/11ANSPs Initiative. This addressed one of the most complex areas in Europe that experienced a high traffic growth over past years and that required a cross-border and network approach. It focused on optimising the en-route flows through the centres to increase the overall capacity and throughput. As a result, some mitigation measures were agreed by all ACCs (including other impacted ACCs), allowing to plan for an improved summer 2018 situation at network level. It is estimated that the initiative saved approximately 5.2 million minutes of delay, close to 0.5 minutes per flight.

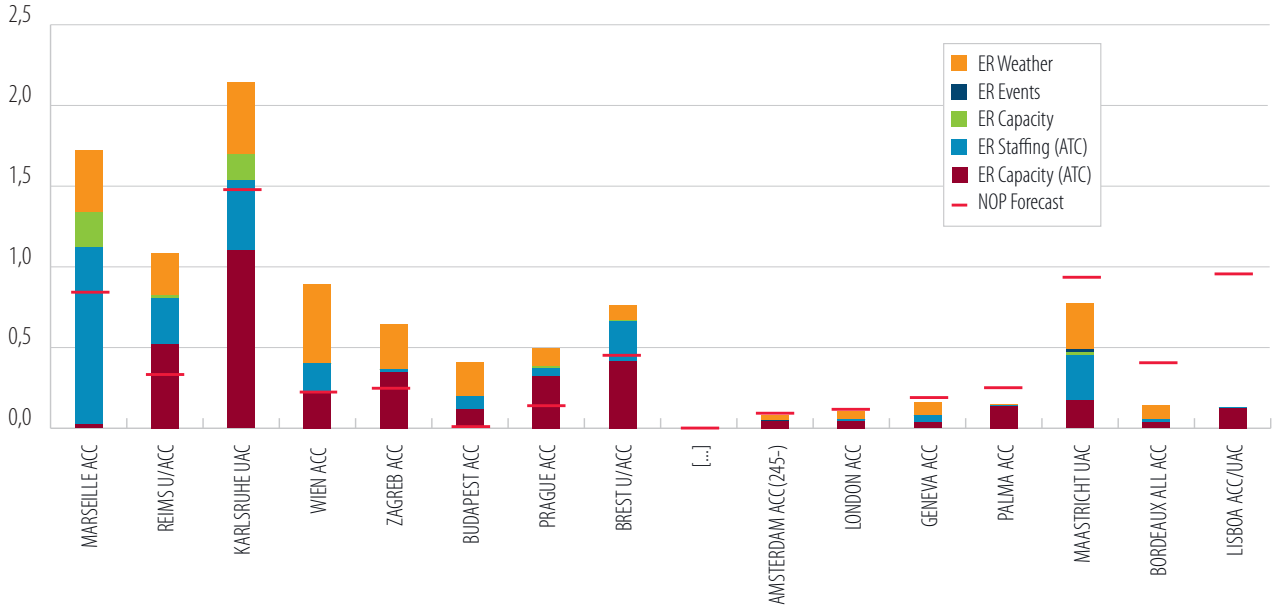
Network traffic increased by 3.8% in 2018, which was between February 2018 baseline and high forecast (3.3% and 4.6% respectively). ACCs in Central and Eastern Europe registered the highest traffic growth, fuelled by an increase in traffic flows to Turkey and Greece (especially from Germany) and by the recovery of Russian traffic to the Mediterranean.




The en-route ATFM delay in 2018 was 1.73 min/flt (all reasons included), which was above the NOP's annual delay forecast of 1.35 min/flt (including industrial action and technical disruption). The difference to the 1.73 min/flt was mainly due to capacity/staffing, weather and disruptions.

31 ACCs had higher delays than forecast (only capacity, staffing, events and weather reasons). 20 ACCs recorded fewer delays than forecast. The main differences are in the chart below.

**2018 En-route Delays, Achieved vs Forecast**
**Capacity, staffing, events and weather reasons**



In 2018 the effective capacity indicator decreased by 5.76% over the whole European ATM network, when compared to 2017.

## Major ATM changes

NM prepared a **transition plan for major projects** as part of the NOP and continuously updated the plan during 2018.

There were a number of system implementations in 2018, notably the stripless system in London TC (EXCDS), which had the biggest impact, ATM system upgrade in Brussels ACC, as well as procedures and airspace interface changes. There was no major network impact from these events. Events accounted for 0.03 min/flt, which is the same as in 2017.

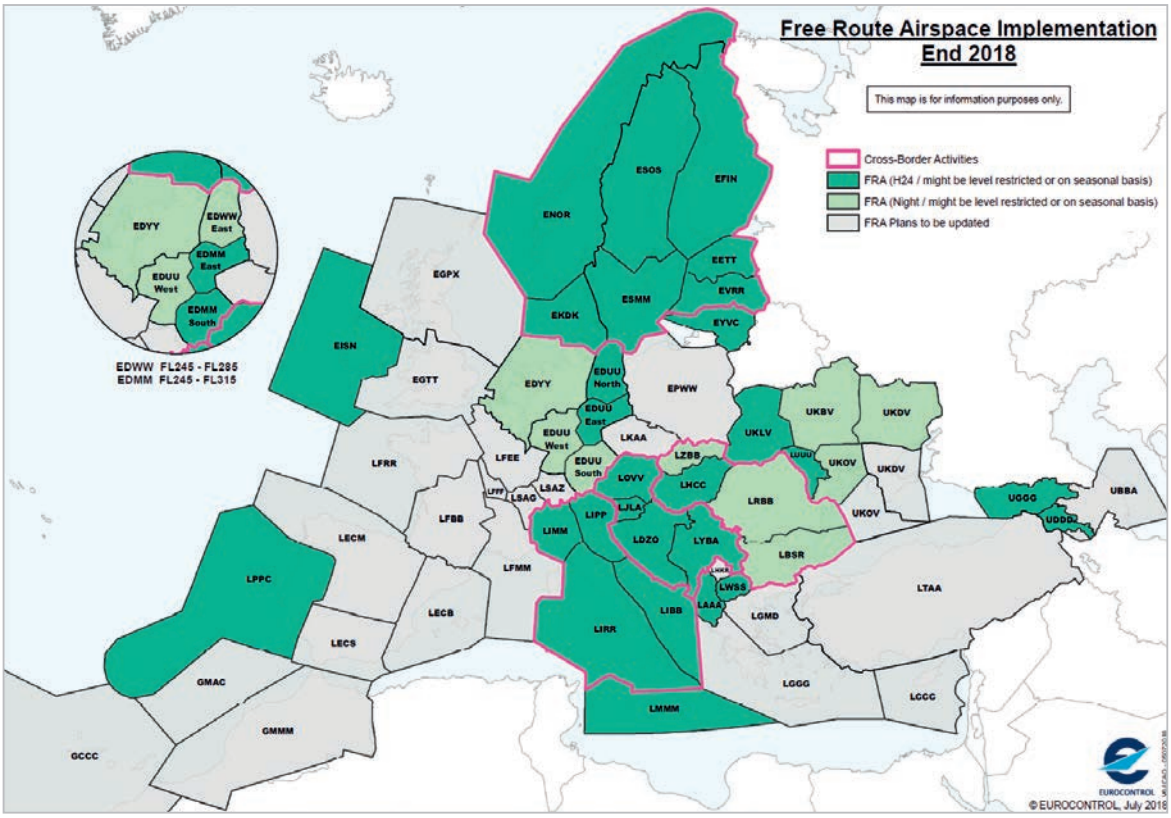
## Functional Airspace Blocks

NM has established cooperation with all the FABs to facilitate harmonised developments, operational interconnectivity between the FABs and within the FABs and at European network level. NM experts continued to be involved in several FAB working groups to facilitate the development of plans and their implementation. This was particularly relevant with the implementation of the FRA initiatives within or between all FABs.

## Route Network Design

The European Route Network Improvement Plan (ERNIP) is part of the NOP, and is a key NM deliverable. The NMB approved several updates to various ERNIP parts.

NM's European Route Network Design function was executed in close cooperation with States and ANSPs to ensure that the European airspace can accommodate additional capacity needs. More than 130 airspace improvement packages were developed and implemented in the 12 months prior to summer 2018. This helped ensure that the airspace design performance indicator achieved its objective. 31 ACCs achieved full 24hrs FRA implementation (including Sofia ACC during the winter period) and 7 ACCs full FRA implementation during the night. Cross-border FRA was implemented in 2018 by countries in northern Europe, southeast, and central southeast Europe.

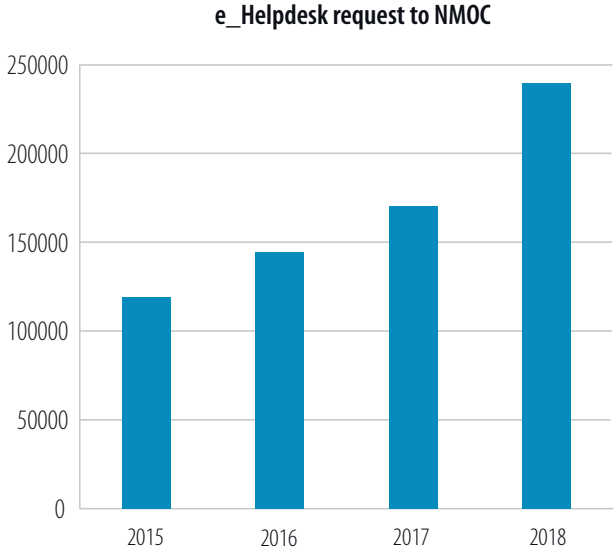


## Network Operations

The NM Operations Centre (NMOC) delivers core operational services across several domains. NMOC's main function is network flow and capacity management but it addresses a number of other functions such as flight planning operations, ATM access gateway, the airport function, and crisis and contingency management.
NMOC concentrates on anticipating problem areas and providing network solutions using CDM processes and its mature network flow management procedures.

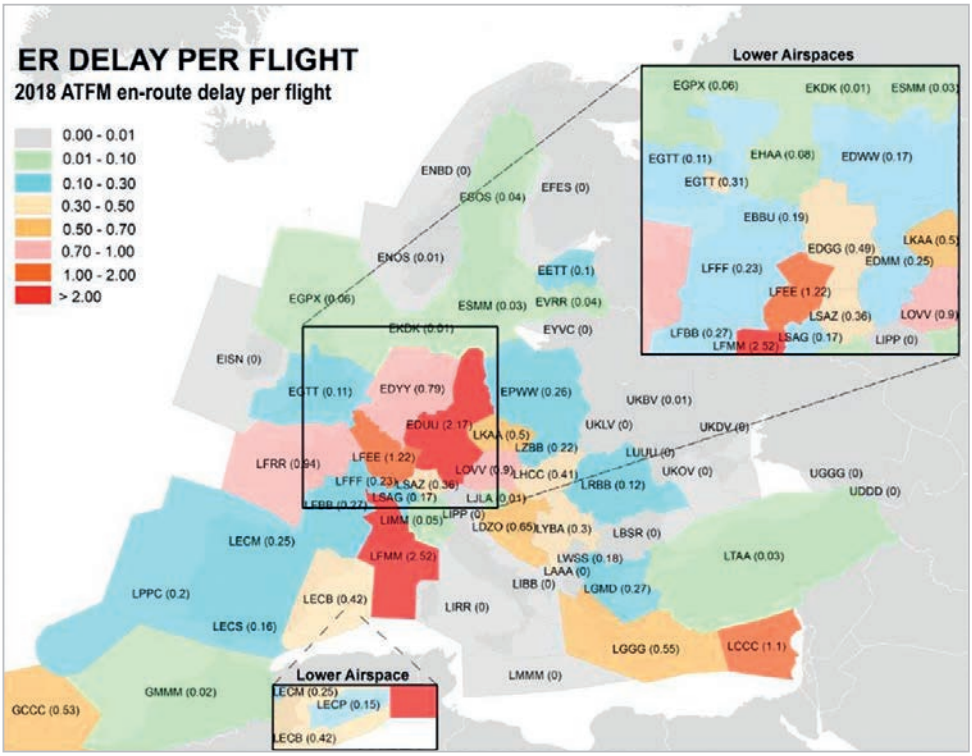
Summer 2018 was very busy for the NMOC staff.
As mentioned above, NMOC staff delivered the ATFM delay savings by their actions in tactical operations. There were on average 318 daily actions to save delays in 2018, which increased to more than 600 daily during July. This resulted in 2,700,000 minutes of en-route delay saved (+79% over 2017) and 700,000 of airport delays saved (+13% over 2017). NMOC also saved delays by other capacity optimisation techniques and pre-tactical planning, but these savings are not currently quantified.
NMOC staff also supports ANSPs and AOs during operations. The number of e-Helpdesk requests grew by 40% in 2018, with a peak of 2444 requests on 28 July 2018 and 189 requests received between 15-16:00 hour during the same day.

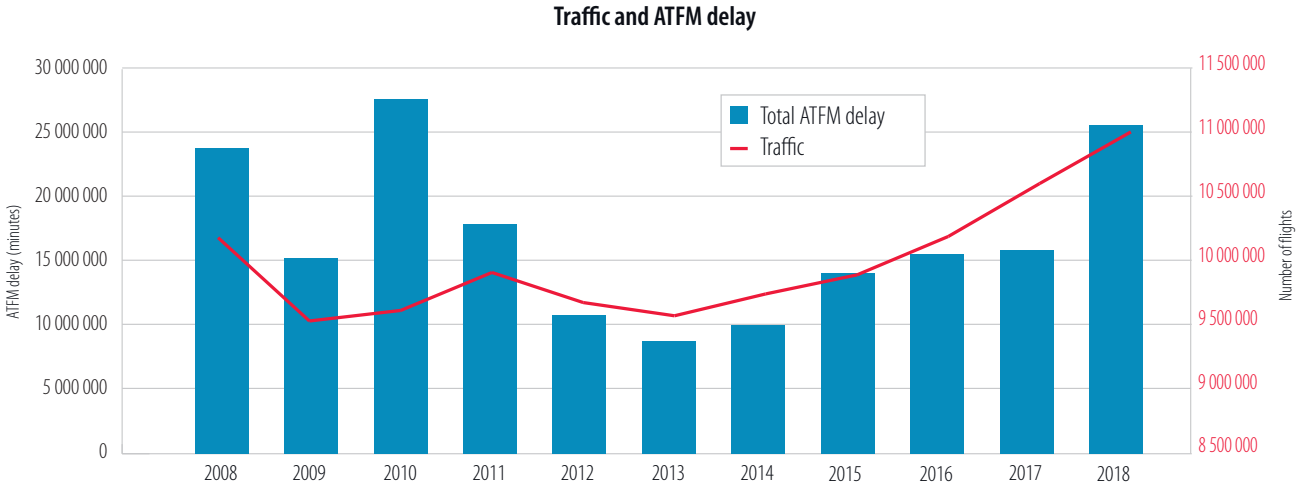
NM organised a Weather Forum in May 2018, to examine ways of collaboration and agree a way forward to improve




management of weather so that operational and business planning at network level becomes part of day-to-day activity. This concluded in an action plan to put in place a new concept of operations for the management of weather induced capacity reductions.

This new approach became even more relevant as weather effects during summer 2018 were significant. Large areas have been impacted by bad weather generating a very high amount of weather delay, exacerbated by a structural lack of capacity in some areas. A better






handling of the situation during times where large areas are impacted by weather requires a more network-oriented approach. This will be addressed through the preparation of new network CDM procedures for the management of en-route weather with the definition of roles and responsibilities and with a more NM-oriented decision making on en-route weather management. This is now part of the action plan for the preparation of summer 2019.

The map on page 18 presents the 2018 en-route ATFM delays (min/flt) for all the ACCs within the NM area (represented by the ICAO four letter code).

Marseille and Karlsruhe ACCs combined caused 36% of all en-route ATFM delays. Limited capacity, recurrent staffing issues and disruptions impacted operations, including in neighbouring ACCs. Maastricht, Reims and Brest ACCs were the other centres with average ATFM delay above 3,000 minutes per day during the summer. Unexpected capacity issues occurred in some ACCs in central and south-eastern Europe, partly driven by the high demand levels, namely in Vienna, Zagreb, Prague and Budapest ACCs.

## NM Outage

On 3 April 2018 NM suffered an outage of its technical system affecting primarily its ATFM and CCAMS operational services.

The outage of ETFMS resulted in the application of the NM ATFM Procedural Contingency Plan, which was correctly executed through all phases. This plan includes precautionary reductions in sector capacities and lower departure rates from airports. Whilst this ensured a safe level of traffic throughout the European ATM network, by design it had a negative impact on network performance. Measures were immediately taken by the NM teams in order to prevent the repetition of such a failure and 14 further measures to be implemented have been identified in the Technical Problem Report that was presented to the EC, EASA, NMB and EUROCONTROL Permanent Commission.

## Airports

**Airport Collaborative Decision Making (A-CDM)** facilitates the integration of major airports into the network and delivers more accurate departure time information. During 2018 Naples and Amsterdam Schiphol airports fully implemented A-CDM making 28 airports in total, potentially covering 36.5% of the departures in the NM area. However, in 2018, due to local issues, only 26 airports were sending Departure Planning Information (DPI) messages, covering 34% of the departures. The two remaining airports are expected to be reconnected with NMOC in 2019.

Ibiza, Menorca, Lanzarote and Fuerteventura airports connected to NM as ATC Advanced Tower airports, making 23 airports in total, covering 9.7% of departures in the NM area.

A-CDM and Advanced Tower together currently provide NM with departure planning information for 43.7% of departures in the NM area.

Summer 2018 was once again challenging due to the long-standing problems at the Greek island airports, i.e. airport layout, passenger terminal capacity and limitations on aircraft parking positions. These problems are unlikely

to be resolved in 2019 with work-in-progress following the privatisation of the airports to provide sufficient airport infrastructure and technological modernisation in the coming years. To overcome these difficulties, NM activated the airport function within the NMOC, which provided tactical support at hot-spot airports.

Arrival delays at all Greek destinations during the summer season increased due to a combination of high traffic increase (+10.4% over 2017) causing most airports to operate at their limit and unavoidable adverse knock-on effect of regulations applied in Athens airport.

The First Rotation Hours Optimisation Trial (FROT), addressing recurring ATFM arrival regulations in Zurich continued in 2018. Compared to 2017, the Zurich aerodrome capacity arrival ATFM delay minutes reduced by 27%, thus lowering the network impact. Moreover, the flight planning better matched the arrival airport slot. The feedback from SWISS showed that the reduction in ATFM arrival delays contributed to an improved passenger connectivity during wave three.

Since March 2018, RECAT-EU minima is fully operated for arrivals and departures at London Heathrow, enhancing time-based separation - a world first - allowing for 24 additional movements per day. RECAT-EU minima is now deployed at four European airports (Paris/Charles de Gaulle, Leipzig/Halle, London/Heathrow and Toulouse/Blagnac), with Vienna expected to follow in early 2019.

The Enhanced Information Exchange (EIE) process in which airports share data with NMOC has continued and evolved throughout the year. In this process, airports report expected capacity impacts caused by weather or other events during the ATFM pre-tactical phase of operations. In 2018, the implementation of the tactical diversion capabilities information provision and the introduction of an emergency reporting process have been the two major developments of the EIE process. As of 2018, in addition to airports, airlines can also subscribe to receive EIE information.

On request of Airports Council International (ACI) Europe, NM has taken the lead in three projects for Airport Operations Plan (AOP)-NOP connection under the Central European Facilities (CEF). However, it was identified that the concepts required further validation and development for operational maturity, which is leading to some delay. NM has established working arrangements for filling the gaps but also faced budget and resource constraints.

## Special Events

The Network Manager cooperated closely with the North Atlantic Treaty Organization (NATO) and military authorities from several States in the preparation and coordination of several large scale military exercises. These preparations meant that such exercises led to a minimal impact on network operational performance.

### Industrial Action

French industrial action, notably at Marseille ACC, contributed to most of the industrial action delays in 2018, which represented 7.7% of total en-route delay in 2018. There were 1,134,000 minutes of direct en-route delays from industrial action plus 330,000 minutes of indirect delays in the neighbouring ACCs due to on-loaded traffic. Flights planning to avoid affected areas added 1,500,000 nautical miles to their trajectories.

Despite the heavy impact, the strike mitigation process is now mature: effective collaboration with ANSPs, military authorities and airspace users strongly minimised the disruption. NM undertook specific actions to manage disruptions including:

- Operational strike procedures are documented; country-specific ones already exist for France, Italy, Greece and Portugal and they are being expanded to cover Germany, Hungary, Romania and Spain;
- neighbouring ACCs provided extra capacity at key periods, which was encouraged by the existence of the post-ops delay adjustment process that allows the re-assignment of the incurred delay to the striking ACCs;
- NM will further investigate providing routes by disabling RAD restrictions, which proved successful this year;
- NM made good use of alternative routes through Oceanic and North African airspace;
- NM started to publish proposed mitigation measures ahead of the tele-conference (TC) so that air operators could provide better feedback at the TC;
- Post operations reports for major strikes are available on the NOP portal.

## Network Crisis Management

The European Aviation Crisis Coordination Cell (EACCC) held three meetings in 2018: March, June and November. EACCC maintains the Risk Register listing the risks for ATM in Europe that could lead to an aviation network crisis as well as the risk assessment and their associated mitigations.

EACCC members review and endorse the Risk Register at each formal meeting. The Risk Register is shared with the States Focal Points via the EACCC website to be used for:

- Local preparedness - guidance on where to concentrate resources;
- Network preparedness - inform EACCC of raised risk.

The annual workshop for EACCC State Focal Points (SFPs) took place at EUROCONTROL HQ in Brussels on 14 June 2018. More than 40 participants attended, the majority of them aviation crisis management State Focal Points from 22 states, European Commission, ICAO EUR/NAT, ICAO Medical Officer Montreal and members of the EACCC. The workshop focussed on the amended Network Function Implementing Rule and its impact on SFPs together with EACCC exercises.

### Disruptions and crises

In 2018 a number of disruptions impacted the European network that did not require activation of the EACCC. During these events NM was in close contact with the operational stakeholders directly concerned to ensure appropriate mitigations could be put in place.

### Crisis exercise

On 13-14 March 2018 the EACCC organised the crisis manager exercise: EACCC18 ATM Coordination/Cyber. This table-top exercise simulated a network crisis resulting from a pan-European cyber-attack affecting radar processing systems and the management of the response to the related crisis in cooperation with the Member States and aviation stakeholders concerned.

The exercise was attended by 80 participants including members of EACCC, the 17 participating States and their ANSPs, aircraft operators, Computer Emergency Response Team for the EU (CERT-EU), who also represented EASA and European Centre for Cybersecurity in Aviation (ECCSA), and the Network Manager Operations Centre. The exercise tool support was provided by the EC Joint Research Centre. EU Agency for Network and Information Security (ENISA) supported the preparation of the exercise scenario.

### Operations under difficult network conditions

Network and local operations continued to be affected by extraordinary events in Ukraine, Syria, Libya, Iraq and Egypt. NM worked with airlines, ANSPs, ICAO and the adjacent regions to find mitigating solutions for these disruptions for both the planning and operational perspective. Notably, major efforts were made by Turkey to continuously adapt to changing operating conditions at the Eastern interfaces and by Cyprus that has experienced intensive military activity within Nicosia FIR.

## Developments in operations and infrastructure

The main vehicle delivering new or updated key functionalities for the NM operational system is the NM system release. NM Releases 22 and 22.5 were implemented in 2018 including changes related to the evolution of existing business services, but also to the introduction of new business services and new technologies.

NM implemented the extended DPI concept, which enables both earlier and enriched provision of departure information. The objective is to advance the integration of airports with the network through enhanced information sharing between the AOP and the NOP. The changes support validation exercises on the NM validation systems (in 2018 and 2019) and will only be ready for full operations in 2019.

Collaborative Traffic Management (CTM) supported the SESAR trial exercises by the development of integrated flight arrival information into the network operation portal, the adaptation of NM traffic demand trajectories with received arrival information and enhancement of ATFCM arrival measures with local ANSP/Airport priorities and targets.

Several improvements were implemented for the ASM function, notably the change that allows the airspace management cells to publish airspace user plan (AUP) information via B2B during the pre-tactical phase whenever feasible, and make it available on the network operation portal.

The ATFM scenario management process continued to improve by including traffic volume description and suggested alternative re-routings in the published scenario, as well as the calculation of re-routings and impacted airspaces as part of the Group Rerouting Tool (GRRT) functionality.

NM implemented changes for a more efficient network impact assessment in all phases of the operation: results of the simulation and related assessment are stored in the measure operation log, which is available to stakeholders via B2B and B2C. Overall more data generated by the assessment will be available via B2B. The NM B2B service also expanded by including the legacy flight messages updates.

NM aligned the Central Airspace and Capacity Database (CACD) airspace model to allow seamless ICAO type data downloads from the EAD and European ATM Information Management Service (EAIMS).

To give flow management position more flexibility for tuning traffic counts, certain elements directly linked to flow management were moved onto the Traffic Volume (so called skip-in/skip-out).

The Flight Activation Monitoring (FAM) has now more stringent requirements that triggers the suspension of a flight that is not reported as airborne. This change will improve network predictability and reinforce the compliance of flights with route and airspace availability.

The flight efficiency area saw several developments in support to FRA implementation and Flight Plan and Flight Data Evolution. The alternative route generator also improved, notably its vertical dimension, which will benefit the RRP tool. These changes will also improve operational usability and user experience of the re-routing tool.

Other changes were implemented in the area of flight planning, airspace data, improvement of the effectiveness of e-Helpdesk service.

The governance of the n-CONECT Project was ensured by the associated Strategic Project Steering Group under the supervision of NDOP and NMB. Several workshops took place in 2018 for coordination with stakeholders and to report on the operational progress: validation workshops on airspace and RAD user interface, RAD acceptance, and B2B. An expert group will be created under the working arrangements of ODSG. As a side effect of the NM outage, n-CONECT active development was stalled due to the actions foreseen in the Vulnerability Action Plan. Objectives of NM implementation in 2018 had to be reduced, n-CONECT delivering only TCO, Transponder Code Function (TCF) Code Allocation List, and Dynamic Network Plan (DNP) using the new graphical framework.

### Future Architecture Study (FUTARS)

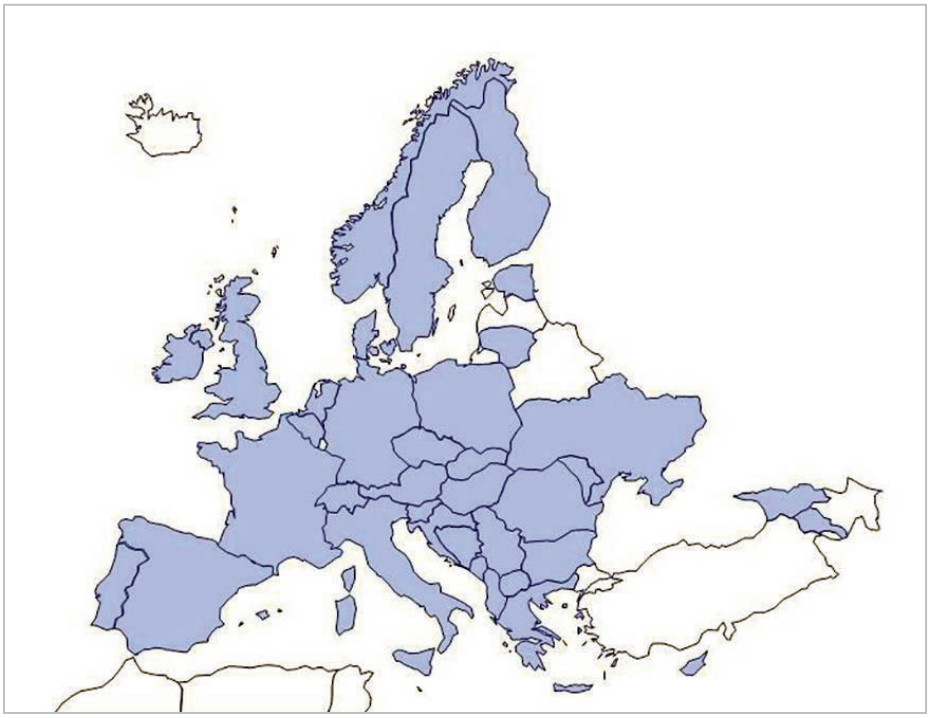
NM is now engaging in a phase of modernisation of NM systems, aiming to make a major digital transformation while making the network technical systems less complex and more efficient. This will allow the transformation of the business processes through the use of today's digital technologies capabilities, among them cloud technologies, big data and machine learning, which will take NM to an entirely different level of effectiveness.

The first deliverable presented to NMB at the end of 2018 was the Executive Summary. It summarises the target architecture and the roadmap. It also presents several examples of user requirements with the benefits that this new architecture would bring to different stakeholders. The consultation of the FUTARS deliverables will start in 2019.

# 5. NETWORK SAFETY

NM has a safety approach to network operations built around a harmonised ATM network safety management system (SMS) and ensuring a 'just culture' within the ATM network. NM and stakeholders have developed and deployed SMS best practices, operational safety improvement tools and methods, and learning and sharing of safety knowledge across the network. They have also promoted 'just culture' as a key enabler for improving European aviation safety.

One of the main activities of NM in the network safety domain is the identification of the operational safety hazards at network level and the assessment of the associated safety risk. The 'Top 5' process identifies those operational hazards that have network-wide commonality and require network-wide consolidation of knowledge by all actors because of the low probabilities of occurrence, spread of the knowledge and sensitivity of the detailed information needed.



*2018 NM Top 5 SAFMAP study - Geographical representativeness*

During 2018 a large-scale exercise was undertaken with ANSPs (see map above) to re-prioritise the operational network risks. Based on the conclusions of the incident data analysis, the prioritisation was:

- the top 5 safety priorities: Blind spot, Airborne Collision Avoidance System Resolution Advisory (ACAS RA) not followed, Flight without a transponder or with a dysfunctional one, Sudden, high energy runway conflict and Controller detection of potential runway conflict and,
- to monitor the risk associated with: Airspace infringement, Restricted airspace infringement, Inadequate ATC coordination, inadequate separation in class D airspace, events that could have been prevented by stop bars, events where Vehicle participated in the incident, Traffic synchronisation/entry procedures, and low level go around.

NM provided support to its stakeholders in the context of Performance regulation and RP2 safety KPIs and safety targets. The web version of the NM Risk Assessment Tool (RAT) supports the severity assessment of ATM safety occurrences. The RAT tool is part of a wider suite of tools called TOKAI - the Tool-kit for ATM occurrence investigation, which helps ANSPs manage the entire safety occurrence investigation process: notification, investigation, storage, analysis and reporting, including in compliance with EU Regulation 376/2014 on reporting occurrences in civil aviation and with the Performance regulation.
TOKAI is a one-stop-shop for complying with these regulations and the development is steered by users. TOKAI offers full flexibility to more than 60 ANSPs, as they can use local variations like, for example, the reporting templates.

SKYbrary is a web-based electronic repository of safety knowledge related to ATM and aviation safety that allows risk identification based on gathering, sharing and learning from safety knowledge acquired by aviation organisations. It continued to thrive in 2018 with more than 4.5 million visits. New material was continually added and included, like operational risks categories, including NM 'Top 5' risks, continued integration of safety deliverables, video tutorials and bookshelf resources. The new 'SKYclips' programme aims to deliver animations covering a wide range of operational aviation safety topics.

Just Culture (JC) enables improved reporting and lesson learning, which are important for improving safety – it is also a safety KPI in the Performance regulation.

The Just Culture achievements during 2018 include:

- Adoption of a new Just Culture Model Policy for prosecution for aviation and railways;
- Two just culture 'expert' courses run in association with International Federation of Air Traffic Controllers' Associations (IFATCA) and European Cockpit Association (ECA) that aim to produce a pool of aviation 'experts' who can interface with national judiciary. At the end of 2018 a total of 227 experts (amongst which 59 ATCOs, 41 pilots, 90 judiciary and 37 observes/organisers/moderators) have successfully undertook the Prosecutor Expert Course;
- Two just culture "expert" courses run in association with ERA (European Union Agency for Railway) to adopt the same approach as in aviation for railways;
- Four regional roadshows or workshops were held to 'show and sell' the Just Culture Model Policy and the 'expert' course (Riga, Prague, Tallinn, Trier);
- Annual Just Culture Conference "Continuing to learn from each other" brought together 155 experts from judiciary, aviation, railway, maritime and health care;
- Deployment of the Just Culture climate questionnaire to gauge the implementation of Just Culture at organisation (ANSP) and national (Civil Aviation Authorities and judicial) level in conjunction with SMS Standard of Excellence;
- NM continued to improve the just culture as part of its internal SMS covering all staff, including those working in NM's operational areas.

The "Experience Sharing to Enhance SMS (ES2)" programme covered a range of SMS related topics: best practice in NM safety management tools, human factors and system safety thinking, and just culture and judiciary system. ES2 2018 events covered topics such as: safety culture, fatigue management and performance roster, automation, digitalisation and cyber – new challenges for human factors in complex organisations - when machine world meets the human world in air traffic management.

# 6. SCARCE RESOURCES

The Radio Frequency Function (RFF) and Transponder Code Function (TCF) were established in 2012. The NMB approved the CDM arrangements that govern both functions.

## Radio Frequency Function

The implementation of 8.33 kHz below FL195 has again enabled NM to satisfy all requests for new aeronautical voice frequencies in Europe in 2018.

Even though only around 70% of the 8.33 kHz conversions planned for 2018 were completed before January 2019, these conversions provided spectrum capacity enabling the National Frequency Managers together with RFF to satisfy all the 2018 frequency requests. This high request satisfaction rate confirms the NM assessment of the benefits of the deployment of 8.33 kHz radios below FL195.

The NM Radio Frequency Function (RFF) has launched activities to maximise the benefit from the 8.33 kHz conversions in order to ensure they enable the satisfaction of all frequency requests for many years to come. This will be achieved via the development of new software tools supporting enhanced frequency management procedures agreed by the Radio Frequency Function group (RAFT) and, when applicable, applied in the whole ICAO EUR region via the cooperation with the ICAO EUR Frequency Management Group.

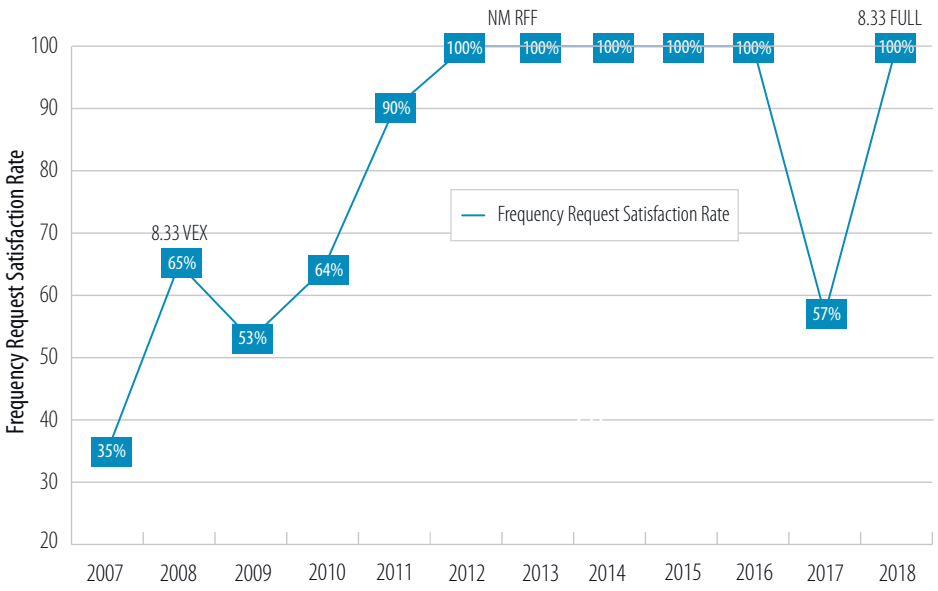
In 2018, the Radio Frequency Function also provided support to the National Frequency Managers by coordinating monitoring activities, analysing and contributing to the resolution of reported radio interferences and by performing local studies to satisfy complex frequency requests.

## Transponder Code Function

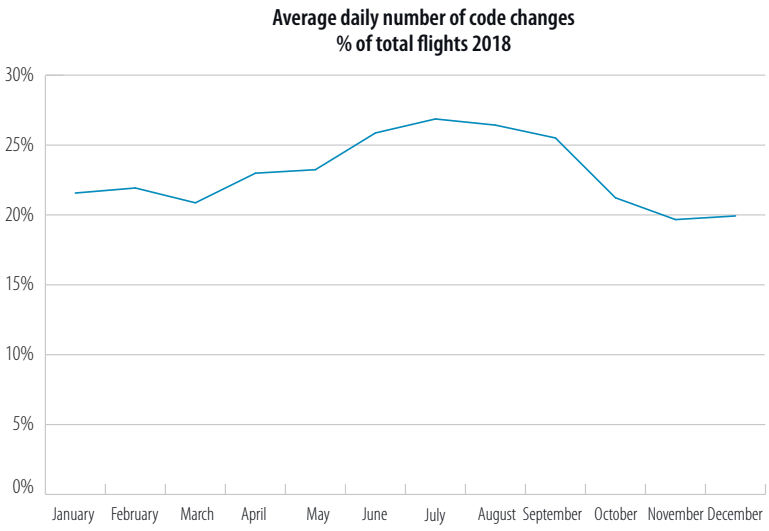
Transponder code usage in Europe has improved through the introduction or extension of multiple technologies. There were enough transponder codes available to users to avoid allocating wrong or conflicting codes.

One of the main enablers for TCF is the Centralised Code Assignment and Management System (CCAMS), a pan-European solution to overcome the current and future shortages of the SSR codes used by Air Traffic Control for radar services. CCAMS provides a unique SSR code to each flight operating in the countries using the service.

By the end of 2018 seventeen States implemented CCAMS namely: Austria, Bulgaria, Croatia, Denmark, Estonia, Finland, Ireland, Lithuania, Moldova, Montenegro, Poland, Portugal, Norway, Serbia, Sweden, Ukraine and the United Kingdom.




*8.33 VEX - the Vertical EXpansion down to FL195 from FL245 and*
*8.33 FULL - the 8.33 kHz implementation in all the airspace of EU States plus Norway and Switzerland*




CCAMS also benefits non-CCAMS States as it reduces the number of code changes due to crossing different participating areas (see the graph; these figures are based on the current radar data provision to NM that have the SSR code included).

Approximately 59.3% of the daily flights receive an SSR code from CCAMS.

No cases of wrong codes assigned by CCAMS were detected by the monitoring tools or reported by the operational users. On average 29 code conflicts were detected daily for the NM area.

Another technology that contributed to the optimisation of the code usage was the Mode S radar technology that supported the capability to use the downlinked aircraft identification, which continued to progress in 2018. Approximately 13.65% of the daily flights used the conspicuity code A1000.

In coordination with the ICAO Paris Office, the Code Allocation List (CAL) for the complete ICAO EUR Region was produced and published in preparation for the summer season 2018. No cases of shortfalls (e.g. code shortages) in code allocations to States were reported.

# 7. NETWORK STRATEGY PLAN

The Network Strategy Plan (NSP) defines the guiding principles for network operation and its medium to long-term perspective. It forms part of the Single European Sky planning process and aims at driving ATM operational improvements from a network perspective and in a structured way. The Network Strategy Plan for the RP2 of the performance scheme (2015-2019) was approved through the Commission Decision C (2014) of 22 July 2014.

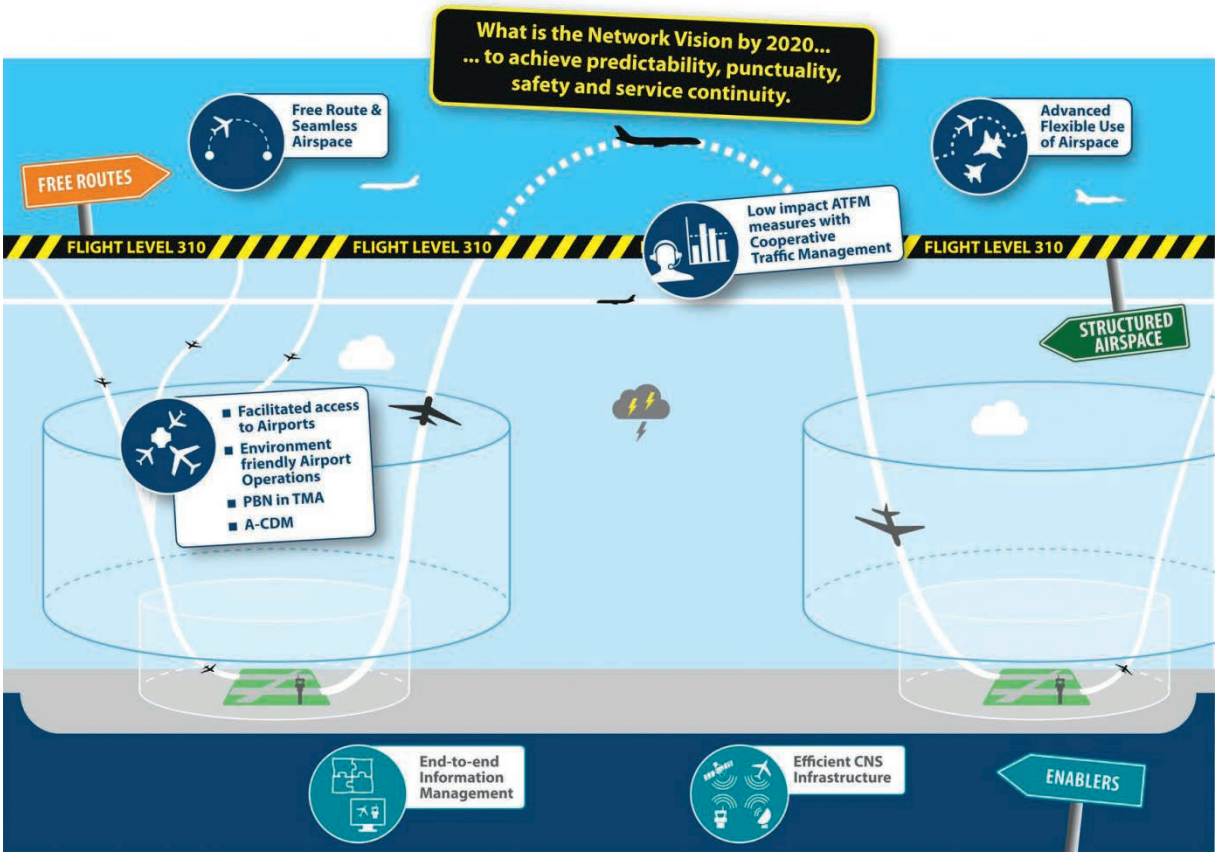
In RP2, the NSP is implemented through two types of action:

- developments coordinated via NM's Strategic Projects, when significant technological improvements are required;
- action taking place in the context of network functions, addressing performance flaws and operational improvements through these functions.

The monitoring of the NSP execution is reported as part of the NM Annual Report process. A full report on the progress of the NSP milestones is part of the **Report on the Implementation of the NPP and NSP 2018**, which is a companion document to this report.

The major achievements from NSP implementation in 2018 are summarised in the respective paragraphs of chapter 4 and the report mentioned above and include:

- Progress on the development of the service architecture SOA platform, especially in the area of service management, supervision, deployment support;
- Continuation of the development of a new airspace data management application, as well as the RAD management application for both internal and external users;
- The deployment of Free Route Airspace – the main driver for improvements in flight efficiency and airspace defragmentation – continued in 2018 resulted in either partial or full implementation at 54 ACCs across Europe. There are increasing trends for ACCs to conduct cross border operations and to lower the base level of FRA to the maximum extent possible as it was the case for countries in northern Europe, southeast, and central southeast Europe;
- Further steps were made in 2018 to support the airspace users: the opportunity tool provides more flexibility by enabling airspace users to have more customised parameters to reflect their operational



needs; support to the CFSPSs on flight planning matters to align CFSP systems and algorithms with NM flight plan processing and associated environment data;
- Important implementation steps were made towards more dynamic system supported ATFCM Measure coordination, the operational use of Target Times, and FF-ICE trajectory planning;
- Two airports implemented A-CDM and four airport implemented Advanced Tower in 2018 and connected to the network increasing. the total number of full A-CDM airports to 26. In conjunction with the "Advanced Tower" implementations 43.7% of European traffic is covered by Departure Planning Information (DPI) shared with the network;
- During 2018 a large-scale exercise was undertaken with ANSPs to re-prioritise the operational safety hazards at network level and the assessment of the associated safety risk. The top 5 safety priorities were confirmed and the risk associated with a number of areas will be monitored;
- "Just Culture" in European ATM was promoted and enhanced through expert courses, regional roadshows/workshops, Just Culture Conference;
- The implementation of 8.33 kHz below FL195 has again enabled NM to satisfy all requests for new aeronautical voice frequencies in Europe in 2018;
- The NM Strategic Project addressing the Sustainable Network CNS Infrastructure progressed significantly, in partnership with the CNS Team: 8.33 deployment, voice over IP deployment, sustainability, surveillance modernisation, GNSS infra management support, and terrestrial navigation optimisation.

## Contribution to the SESAR Deployment

NNM continued throughout the year contributing to the SESAR Deployment in line with the relevant regulations and the "Cooperative Arrangements" (CA) signed between NM and the SESAR Deployment Manager (SDM). In particular, NM contributed to:

- update of the Deployment Programme (DP-2018);
- provision of prefilled SDM monitoring templates with the data collected via NM cooperative arrangements;
- coordination related to the SDM monitoring exercise;
- assessment of performance contribution for finalised and on-going projects;
- drafting the ADS-B implementation plan and associated Cost benefit Analysis.

## INEA/CEF funded projects

In July 2018 Innovation and Networks Executive Agency (INEA) announced the Implementation Projects approved for funding under Connecting Europe Facility (CEF) Call 2017. Five projects proposed by NM were approved. Three of them are multi-stakeholder projects. The execution of CEF2015 and CEF2016 is carried out as planned. The initial preparatory steps have been undertaken in relation with CEF2017 projects.

## Contribution to the SESAR Research and Validation activities

NM provided support to the SESAR 2020 wave 1 Industrial Research programme:

- Contributions to ATM Master Plan update campaign (mainly as operational stakeholders);
- NM has contributed to the development and the review of the Operational Service and Environment Description (OSED) of several projects in relation to Optimised Network Services, FRA, 4D Trajectory Management and integration Airport Operations to the Network Management;
- NM has been involved in the validation exercises on these topics;
- Support to SESAR 2020 transversal activities.

Concerning the Very Large Scale projects (VLDs), NM is leading the "Network Collaborative Management" project (PJ24). This work constitutes the pre-deployment activities supporting NM Strategic project CTM. NM has also actively contributed to VLD "Arrival Management extended to en-route airspace" (PJ25). NM contributed to the prioritisation of SESAR 2020 wave 2 scope of work.

# 8. CHALLENGES FOR THE FUTURE

In order to continue contributing to the performance of the European Network in a seamless and effective manner, NM has initiated a number of activities from an operational and technical perspective, in expectation of its re-designation as Network Manager over the Reference Periods beyond 2019.

## Planning the network operation

NM, together with operational stakeholders, responded to the severe capacity constraints that are going to affect the network operation in 2019 and 2020. To this effect a EUROCONTROL Network Manager Action Plan has been defined to mitigate operational performance in 2019 and 2020. The action plan contains the network measures to be implemented in preparation for the summer 2019 and beyond. It includes:

- Enhanced NM/ANSPs Network Measures for summer 2019 (eNM/S19)
- Preparation of NOP 2019-2024, including specific sector opening schemes and rostering (2019 emphasis).
- Network CDM Process for management of en-route weather (2019).
- Harmonization of Flexible Use of Airspace (FUA) application and enhanced FUA procedures (2019).
- Network CDM process to optimise ATFM regulations (2019).
- Addressing structural airspace bottlenecks (2019/2020).
- ANSPs to work with social partners to avoid strikes or to provide improved notification to airlines and NM (2019).

## Shape the NM organisation

### Network Manager Certification Project

The NM certification process was officially started in 2018. EASA will conduct on-site audit activities during the first half of 2019. It is expected to complete the certification by Q3 2019.

### Resource management

In the near future, a number of key members of staff will be retiring. Work will go on to define the sourcing strategy to ensure that NM continues to be staffed with competent resources with network expertise from various parts of the network. NM has developed a staffing plan that ensures that all recruitments are prioritised so that the staff numbers are as closely aligned as possible to the plan and it allows improvements of staff knowledge, skills and capabilities.

## Shape the future network

### Network Strategy Plan and Network Performance Plan

NM will update its strategic and performance plans for the next reference periods. This will capture the network vision and the strategic objective as well as the performance targets that will drive the NM and network developments in the years to come in full compliance with the SES requirements. To this effect, the existing Network Operational Concept of Operations will be further updated to capture the latest operational and technological evolutions, in accordance with the European ATM Master Plan.

### Airspace Future Architecture Study

NM will be actively involved in the next steps related to the evolutions of the Airspace Architecture Study in its areas of competence and in the evaluation of the expected future operational performance.

## Transform the technical systems

### Future Architecture Study (FUTARS)

The "Executive Summary" document is the first FUTARS deliverables. A workshop in the first half of 2019 will kick-off the stakeholder consultation. The final deliverables will include the NM Target Architecture and the Roadmap.

### Strategic Project, n-CONECT

The n-CONECT strategic project will continue to develop. Several developments are foreseen in 2019 for the continuation of implementation of the Airspace and Airspace Utilisation Rules (RAD), Availability applications for operations at NMOC and other Network Operation Portal services migration. These will be done in a completely newly designed graphical framework. The project will aim at migrating existing interfaces while making some improvements mainly in the CTM area. It is expected that the project closes in 2021 and the new evolutions will be taken into consideration in the FUTARS project.

## Embrace partnerships

### SESAR 2020 programme

In the context of the S2020 wave 1 and wave 2 industrial research programme, NM will continue to contribute to the development and the validation of concepts and evolutions affecting NM remits and expected evolutions to NM roles and responsibilities. This will include topics like Advanced Demand Capacity Balancing, Airspace Management including Dynamic Airspace Configuration, 4D Trajectory Management including the flight planning aspects, and optimisation to Free Routing deployment. In the context of S2020 wave 2 scope of work, NM indicated the priorities and expected contribution.

### Operational stakeholders

NM will continue to support its stakeholders for the operational and technical deployments and business plan implementation, to satisfy their operational requirements while achieving the overall network performance.

# GLOSSARY

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|---|---|
| **NM regulation** | Commission Regulation (EU) 677/2011 of 07 July 2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions |
| **Amended NM regulation** | Commission Implementing Regulation (EU) No 970/2014 of 12 September 2014 amending Regulation (EU) No 677/2011 laying down detailed rules for the implementation of air traffic management (ATM) network functions |
| **ATFM regulation** | Commission Regulation (EU) No 255/2010 of 25 March 2010 laying down common rules on air traffic flow management |
| **Performance regulation** | Commission Regulation (EU) No 390/2013 of 3 May 2013 laying down a performance scheme for air navigation services and network functions |
| **Common requirements and Oversight regulation** | Commission Implementing Regulation (EU) No 2017/373 of 1 March 2017 laying down common requirements for providers of air traffic management/air navigation services and other air traffic management network functions and their oversight, repealing Regulation (EC) No 482/2008, Implementing Regulations (EU) No 1034/2011, (EU) No 1035/2011 and (EU) 2016/1377 and amending Regulation (EU) No 677/201 |
| **Common Projects regulation** | Commission Implementing Regulation (EU) 409/2013 of 3 May 2013 on the definition of common projects, the establishment of governance and the identification of incentives supporting the implementation of the European Air Traffic Management Master Plan |
| **Pilot Common Project (PCP) regulation** | Commission Implementing Regulation (EU) 716/2014 of 27 June 2014 on the establishment of the Pilot Common Project supporting the implementation of the European Air Traffic Management Master Plan |
| **ACC** | Area Control Centre |
| **A-CDM** | Airport Collaborative Decision Making |
| **AIM** | Aeronautical Information Management |
| **ANSP** | Air Navigation Service Provider |
| **AOP** | Airport Operations Plan |
| **ATC** | Air Traffic Control |
| **ATCO** | Air Traffic Controller |
| **ATFM** | Air Traffic Flow Management |
| **ATM** | Air Traffic Management |
| **B2B** | Business-to-Business |
| **CAM** | Cost Allocation Methodology |
| **CCAMS** | Centralised Code Assignment and Management System |
| **CDM** | Cooperative Decision Making |
| **CFSP** | Computerised Flight plan Service Provider |
| **CNS** | Communication, Navigation & Surveillance |
| **CTM** | Collaborative Traffic Management |
| **DPI** | Departure Planning Information |
| **EACCC** | European Aviation Crisis Coordination Cell |
| **EAD** | European AIS Database |
| **EASA** | European Aviation Safety Agency |

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|---|---|
| **EC** | European Commission |
| **ERNIP** | European Route Network Improvement Plan |
| **EUROCONTROL** | European Organisation for the Safety of Air Navigation |
| **EU** | European Union |
| **FAB** | Functional Airspace Blocks |
| **FE** | Flight Efficiency |
| **FMP** | Flow Management Position |
| **FRA** | Free-Route Airspace |
| **ICAO** | International Civil Aviation Organisation |
| **IFPS** | Integrated Initial Flight Plan Processing System |
| **KEA** | The average horizontal en route flight efficiency of the actual trajectory |
| **KEP** | The average horizontal en route flight efficiency of the last filed flight plan trajectory |
| **KPI** | Key Performance Indicator |
| **n-CONECT** | Network-Common Enhanced Collaborative ATM |
| **NDOP** | Network Directors of Operations Forum |
| **NETOPS** | Network Operations Team |
| **NM** | Network Manager |
| **NMB** | Network Management Board |
| **NMOC** | Network Manager Operations Centre |
| **NPP** | Network Manager Performance Plan for RP2 |
| **NOP** | Network Operations Plan |
| **NSP** | Network Strategy Plan |
| **RAD** | Route Availability Document |
| **RFF** | Radio Frequency Function |
| **RP2** | Reference Period 2 (2015-2019) |
| **RRP** | Re-Route Proposal |
| **SAFIRE** | Spectrum and Frequencies Information Resource |
| **SDM** | SESAR Deployment Manager |
| **SES** | Single European Sky |
| **SESAR** | Single European Sky ATM Research |
| **SMS** | Safety Management System |
| **SSC** | Single Sky Committee |
| **SSR** | Secondary Surveillance Radar |
| **SWIM** | System-Wide Information Management |
| **TCF** | Transponder Code Function |
| **TMA** | Terminal Control Area |
| **UAC** | Upper Area Control Centre |

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