Network Manager
nominated by
the European Commission

EUROCONTROL

Network Manager Annual Report 2017

June 2018

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

2017 was an important year in the evolution of the Network Manager. The traffic sustained the biggest annual increase in a decade (+4.4% compared to 2016) registering another all-time record for en-route traffic. On Friday, 30 June, there were 35,937 flights, over a thousand more than the busiest day in 2016. On average, an aircraft departed from within or entered the European Network every 2.4 seconds during that day.

This increase, whilst very much welcome from the perspective of economic growth and further enhancing European and global connectivity, has been a challenge for the ATM industry to meet and has required significant performance improvements throughout 2017. At the beginning of the year, the Network Management Board (NMB) was proactive and held an ad hoc NMB meeting solely dedicated to reviewing the network results in 2016 and the lessons learned, and applying these and other recommendations to help improve the outlook for network performance for 2017. As a result and despite the record traffic increase, the en-route ATFM delays for 2017 were 2% above 2016, from 0.86 min/flt to 0.88 min/flt.

Whilst en-route weather contributed to the delay (+30% more than 2016, +96% more than 2015) this was still considerably above the 2017 delay target of 0.5 min/flt. As the NMB Chair, I have been impressed by the amount of effort that has been exerted by many to minimise these delays, however looking forward all of us across the aviation community need to work together to prevent this trend from continuing.

During 2017 the NMB was extremely active in overseeing the work of the Network Manager, offering challenge when required and working together with the Director Network Management and his team to address some significant strategic issues; such as strike impact mitigation and recommending best practices to mitigate the likelihood and consequence of air navigation strikes; the adoption of a definition of the European Network; reviewing the progress of the implementation of the increased managerial autonomy to Director NM and of the actions from the validated NM action plan. These are all important subjects, which will help shape the future environment we will operate in and the NMB's longer term strategic vision in support of the network.

Looking further ahead, it is obvious that traffic forecasts for 2018 and beyond are showing an upward trend with differing rates of growth across European States. Whether this is as a result of economic growth, tourism demand or changes in route choice due to restricted airspace, these challenges all have the potential to impact the performance of the European ATM network. In my capacity as the NMB Chairman I will do my best to ensure full support of the NMB to the NM in rising to the challenge.

Finally I would like to thank my colleagues on the NMB, Joe and his management team and all the NM staff for their hard work and dedication in 2017 supporting the European ATM network, and in anticipation of continuing in these efforts to meet the challenges of future.

MESSAGE FROM THE DIRECTOR NETWORK MANAGEMENT, JOE SULTANA - EXECUTIVE SUMMARY

On a Sunday afternoon in July 2017, for the first time ever, the Network Manager handled one million flights in a month across the European network, which ranges from Ireland to Armenia and from Morocco to Finland. The traffic sustained the biggest annual increase in a decade (+4.4% compared to 2016), registering another all-time record for en-route traffic and on several occasions there were more than 35,000 flights in a single day.

Despite this record traffic increase, the en-route ATFM delays registered only a slight increase of 2% over the ones in 2016, from 0.86 min/flt to 0.88 min/flt. Which, however, remained above the target of 0.5 min/flt. Significant increase of more than 30% was accumulated due to en-route weather, combined with increased delays of 12% due to capacity/staffing. In total the network experienced fewer delays due to disruptions and events.

NM applied significant efforts to reduce delays. As a result, in 2017 the actions by the Network Manager Operations Centre ensured delay savings amounting to 0.14 min/flt, or 14% of the annual en-route delay, thus exceeding the NM objective to reduce ATFM delays by 10%. NM was able to set up delay mitigation plans tackling various issues and restrictions, bringing delays down.

NM identified a number of critical areas and together with its partners – ANSPs, agreed an action plan with additional measures to be taken by Belgium, Cyprus, Czech Republic, Maastricht UAC, France (Brest ACC), Germany (Karlsruhe and Langen ACCs), Greece (Athens and Macedonia ACCs), Poland and Portugal. Eighteen ACCs had delays higher than the forecast, while 30 experienced delays though remaining below the forecast. ACCs Athens, Makedonia, Lisbon, Skopje and Zagreb, implemented particular measures and improved performance above expectations, also accommodating traffic growth above 9%. Other ACCs (Marseille, Nicosia, Karlsruhe) did not deliver the performance as declared in the Network Operations Plans, due to staffing and rostering issues.

Performance in Environment-Flight efficiency area showed significant and now sustainable improvement, while still needing efforts to achieve the targets. Key to this improvement is the continuous implementation of Free Route Airspace in the European airspace. The programme has achieved reduced fuel consumption and emissions, improved flight efficiency, while also absorbing inefficiencies caused by crises (e.g. in Ukraine, Middle East and East Mediterranean) and capacity gaps due to industrial action. Within a revised framework, NM support to airlines to improve flight planning delivered savings of more than 77,000 nautical miles in 2017.

A revision of the regulatory framework governing the Network Manager started by the European Commission deliberating at the Single Sky Committee, the pending amendments of the NM Regulation and the Performance and Charging Regulations. The updates to the NM Regulation built upon the experience gathered so far and proposed improvements inter alia in the scope of the NM functions and tasks, adjusted processes for the Network Operations Plan (NOP), pan-European dimension and participation of third countries, cooperative decision-making and network crisis management.

An increased autonomy for the Director Network Management became effective as of 1 November 2017. Building on the already established internal processes, this milestone allows the Network Manager to continue being a key player in the SES landscape, within the EUROCONTROL institutional set up, by providing additional, administrative and strategic tools and flexibility.

With a view of the approaching applicability date for the mandatory certification of the Network Manager, the preparation for the application to EASA was initiated. It is planned to apply for certification to EASA by the end of 2018, aiming at receiving the certificate in time for the appointment as Network Manager for the Reporting Periods 3 and 4 over ten years.

With a forward look to 2018, and the millionth flight milestone in mind, the Network Manager is more than ever committed to the importance of the pan-European network approach for managing our busy skies. Significant investments will be made to ensure the timely delivery of operational and technical solutions, thus adding value to the efforts of our operational and institutional partners for improved performance in the SES. EUROCONTROL as Network Manager will continue to work closely with all players across Europe and beyond to help over a billion passengers a year get to their destination as efficiently as possible.

TABLE OF CONTENTS

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 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 2017.

NM management autonomy

Following the independent review of the NM performed in 2016, EUROCONTROL put together an Action Plan to answer to the report's recommendations as requested by the EC. This plan has been validated by the European Commission and progress of its implementation has been regularly monitored at the meetings of the Network Management Board (NMB).

One of the main changes resulting from this process was granting greater management autonomy to the Director NM. This was achieved in 2017: following the Provisional Council (PC) approval, the delegation decision granting the Director Network Management increased managerial autonomy to carry out, on behalf of EUROCONTROL, the Network Functions as established by European Union regulations was signed and became effective 1 November 2017. It constitutes an important milestone for the Network Manager and EUROCONTROL Agency, whereby one of its core businesses, namely the execution of the network functions, has been equipped with those institutional, administrative and strategic tools that will allow the Network Manager to continue being a key institutional player in the SES landscape.

NM regulatory framework evolution

The 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 was published. It has specific requirements for NM as a provider, including its certification. NM has initiated a project to deliver all necessary justifications, documents and procedures demonstrating to European Aviation Safety Agency (EASA) the compliance of the different services associated to the network functions.

EC is leading the on ongoing work on amendments to the NM regulation. Discussions at the level of the Single Sky Committee (SSC) as well as in a dedicated workshop in November 2017 focused on a number of possible improvements, inter alia the scope of the network functions, NM tasks, adjusted processes for the NOP, alignment with the conclusions of the NM Review, pan-European dimension and participation of third countries, and network crisis management.

NM also provided inputs in the context of the evolutions of the Performance Scheme Regulation through the dedicated written consultation and the workshop organised by the EC to this effect. In accordance with the requirements stipulated in the European legislation, NM also provided inputs on the revision of the Pilot Common Project (PCP) and the definition of the second Common Project. Other inputs related to legislation having a relation to the network functions were provided as required.

The NM has been ISO 9001 recertified for the period 2017-2020.

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.

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

A range of **Business Initiatives** were progressed during 2017 to improve the business delivery of NM functions and services to stakeholders.

- Generic and office IT activities, formerly part of the NM technical services division and performed for other Agency directorates, were transferred to the new Central IT unit at corporate level as of 1 October 2017;
- 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;
- The introduction of the CAM ensured that the support costs allocated to NM are transparent. As a result the indirect cost allocated to NM was reduced;
- 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;
- Reduction of NM systems development and operating costs through the gradual implementation of n-CONECT.

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/medium term to perform NM functions. The HR Review Panel supports the Director to recruit in line with the business needs and priorities. HR applied the succession planning in the preparation for the NM Directorate reorganisation.

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 is up on the agenda. A solution to mitigate it is now technically ready for implementation (addition of a separate NM system entry/exit node at Maastricht Upper Area Control Centre). NM initially postponed the delivery to the first half of 2018 for budgetary reasons but now the project is part of a full review of the NM system outage (3 April 2018) that will affect several areas of operational practice.

The 'Cyber Security' covers the risk for partial or complete unavailability of NM services due to a cyber-attack. NM identified risk mitigations for it and implementation is underway. In that respect, the NM managed security service project was approved by the NMB and will be gradually put into operations as from 2018. Additional external expertise has been contracted to review NM Cyber protection status.

The NM budget risk for 2017 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) is a body established to adopt measures related to the governance of the network functions and to monitor their performance. Discussions on amendments to the NM regulation initiated in the course of 2017 considered also a possible evolution of the NMB role.

The NMB held regular meetings in April, July and November 2017. On 27 January 2017 an ad-hoc NMB meeting was dedicated to reviewing the network results in 2016 and the projected network performance for 2017. On 1 June 2017 the NMB held an ad-hoc meeting in response to the EC request for the NMB to analyse eight Centralised Services from the operational and technical perspective. In 2017 the NMB has been reviewing the progress of the implementation of the increased managerial autonomy to Director NM and of the actions from the validated NM action plan. In addition, the NMB approved a number of key strategic deliverables including: the NM Work Programme, the Annual Report, Network Operations Plan, and network definition. The NMB reviewed the implementation of the Network Strategy Plan and network and NM performance throughout 2017, and endorsed the 2018 budget.

In line with the NMB role, a number of key strategic issues were discussed by NMB in 2017. NMB established an ad-hoc Strike Impact Mitigation Task Force to recommend best practice to mitigate the likelihood and consequence of air navigation strikes in follow-up to the EC Communication on Aviation: Open and Connected Europe, issued in June 2017. The Task Force presented its conclusions to the NMB in November 2017 and proposed a number of recommendations, inter alia: establishment of a Strike Impact Mitigation Best Practice Repository; the need for ongoing actions to encourage implementation of best practices in order to minimise the strike impact; invited the NM to provide systematic and regular reporting of all strike events to the NMB at least yearly.

The definition of the network was another topic for which NMB established an ad-hoc NMB Task Force; the Task Force proposed a network definition that was adopted in November 2017.

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, airports and sustainability, notably n-Conect. It endorsed the work of the NDOP Network Delay Optimisation working group and the application of the concept in summer 2018 to provide more options for regional planning. NDOP reported its conclusions and recommendations to the NMB.

The NDOP structure includes mechanisms for the direct involvement of ANSPs, military partners, airspace users and airports. Its three meetings in 2017 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.

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.

Stakeholder Cooperation

A total of 247 participants from 39 different countries attended the NM User Forum held on the 25-26 January 2017 in Brussels. The main debate focused on how the NM and its stakeholders will improve the performance in 2017. A number of specific sessions were held on topics like advanced ATFM techniques, predictability and 4D trajectories, relationship between an airport operations centre, airspace users and ATFM actors as well as various technical enablers like B2B functions supporting operations.

The Network Cooperative Decision Making (CDM) processes were discussed and amended as required.

The European Aviation Safety Agency (EASA) conducted two NM oversight audits (March and November 2017) of compliance to requirements applicable to NM. To date, EASA has not identified any significant non-compliance (i.e. level I finding) with applicable requirements or organisational procedures/manuals in their continued oversight programme. In 2017, EASA issued five "Letters of Acceptance" for the deployment of two key NM releases, a new safety baseline, infrastructure updates and the new n-CONECT changes. In total over fifteen 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 2017 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 NMB conditionally endorsed the 2017 budget in November 2016. Condition was fulfilled when on 1-2 December 2016 the EUROCONTROL Provisional Council confirmed that the Agency will apply the annual process for the return of unspent credits for the NM budget. The Single Sky Committee (SSC) gave its positive opinion on the 2017 NM budget during SSC/63 on 13-14 December 2016.
The approved NM budget for 2017 is 199,134K€.

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.

[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.

2.3 INVESTMENT, EXPENDITURE AND REVENUES

The investment plan of NM is largely aimed at replacing obsolete infrastructure. The approved investment credits were 3.6M€, of which 2.7M€ were executed and consisted mainly in replacement of legacy IT infrastructure and installation of entry nodes.

The approved NM budget for 2017 is below the cost efficiency target included in the NM performance plan. The approved NM Cost Base for 2017 is 199,134K€, which is lower than foreseen in the NPP (218,126K€). This is the result of savings and cost reductions made in the previous years. Hence, NM is meeting the cost efficiency target for 2017 by staying within its approved budget.

The cost per service unit was 1.25 euro, 17 cents lower than 2016, a 12% reduction over 2016 and 18% over 2015.

The table below shows the budgetary outturn, cost base and contributions compared with the plan. The Remuneration outturn exceeded the plan because of an unplanned salary increase. During the budget execution in 2017, NM took mitigation measures to limit the budget expenditure to the approved budget.

Revenues were as planned with a slightly lower as expected revenue from ad-hoc sales of services (e.g. safety or airport capacity work under UPP, tokens).

COSTBASE/CONTRIBUTIONS 2017 (in M€)

EXPENDITURE	BUDGET	OUTTURN	UNSPENT	OUTTURN
STAFF REMUNERATION	90.8	94.4	- 3.7	104.0%
OPERATION EXPENDITURE	43.8	40.0	3.7	91.5%
DEPRECIATION	1.9	0.4	1.5	22.2%
COST OF CAPITAL	0.2	0.0	0.2	11.8%
INDIRECT COST	32.0	31.6	0.4	98.8%
ALLOCATION OF PAST	35.1	35.6	- 0.5	101.3%
TOTAL EXPENDITURE	**203.8**	**202.1**	**1.7**	**99.2%**

RECEIPTS	BUDGET	OUTTURN	UNSPENT	OUTTURN
STAFF CONTRIBUTIONS (e.g accident insurance, special levy)	- 1.1	- 1.1	0.0	101.8%
SALES OF SERVICES	- 0.9	- 0.7	- 0.2	77.0%
COMPREHENSIVE AGREEMENT STATES	- 2.7	- 2.7	0.0	100.0%
TOTAL REVENUE	**- 4.7**	**- 4.5**	**- 0.2**	**96.0%**

TOTAL COSTBASE	**199.1**	**197.6**	**1.5**	**99.2%**
INTERNAL TAX	- 26.0	- 27.5	1.5	105.8%
TOTAL CONTRIBUTIONS	**173.2**	**170.1**	**3.0**	**98.3%**

3. NM'S ACHIEVEMENTS IN 2017

The performance targets and objectives are captured in the **Network Performance Plan** (NPP). Throughout 2017 NM addressed network operational performance issues in safety, capacity, or flight efficiency. Full 2017 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 record increase in traffic, notably in already congested areas, put additional pressure on the network. In this context NM worked with its partners to optimise network capacity so that the increase in traffic does not translate in a jump in ATFM delays. External factors such as airspace restrictions and volatile geo-political situations continued to create disruptions in the network. Traffic patterns also changed due to differences in route charges, further contributing to higher traffic levels in already overloaded airspaces.

The traffic sustained the biggest annual increase in a decade (+4.4% compared to 2016) registering another all-time record for en-route traffic.

Despite the record traffic increase, the en-route ATFM delays had only a slight increase of 2% over 2016, from 0.86 min/flt to 0.88 min/flt, which is nevertheless above the target of 0.5 min/flt. The en-route weather registered another significant increase (+30% more than 2016, +96% over 2015) followed by an increase of 12% for capacity/staffing delays. The network had less disruptions and events related delays.

There was above the average traffic increase on the south-west axis (summer increase +7.6%) which impacted the ability of some centres to provide the adequate ATC capacity. Staffing issues in Cyprus combined with a strong recovery of the traffic in the Eastern states caused an increase in delays on the south-east axis.

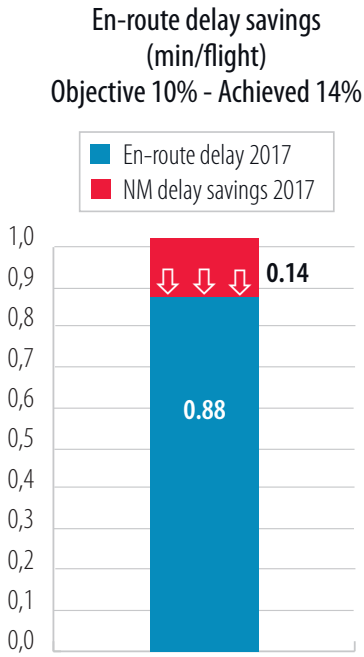
More details in Chapter 4 section Operations Planning.

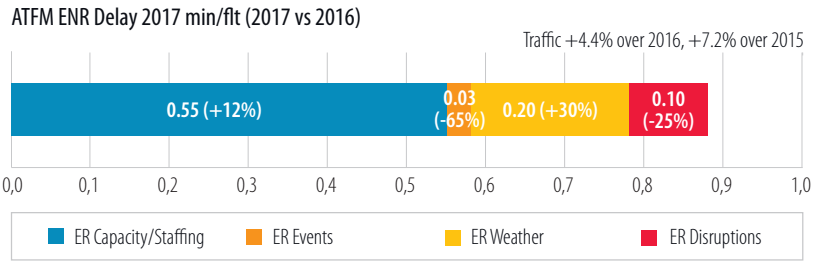
NM's contribution to delay savings

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's efforts to reduce delays increased in 2017 in proportion to the overall en-route delay increase. Delay savings were calculated conservatively, only taking into account accepted Re-routings Proposals (RRPs) and NMOC direct action (i.e. Force CTO/CTOT and Override Slot).

In 2017, en-route delay savings exceeded 1,500,000 minutes from direct actions in NMOC (1,300,000 min) and RRPs proposed and followed by airlines (200,000 min), equivalent to 0.14 min/flt – without this, the delay in 2017 would have been 1.02 min/flt. This equates to 14% of the annual network en-route delay, meeting the 10% objective.





6 NM now limits delays saving RRPs for flights captured in scenarios to RRPs sent within 3 hours of EOBT

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).

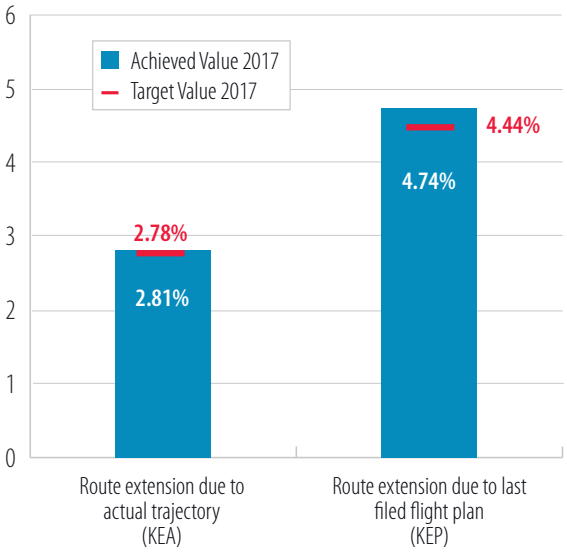
The flight plan indicator KEP showed the best results since monitoring began, the result for SES area in 2017 being 4.74%, a reduction of 0.18pp over 2016. It is however still above the target of 4.44%. The KEP for NM area showed similar good results, reaching 4.62% in 2017. These were the lowest levels ever recorded for KEP.

The actual trajectory indicator KEA showed also good results in 2017. The SES value of 2.81% was slightly above the target of 2.78% while the KEA for the entire NM area was 2.77% meeting the target.

Key to this significant improvement in the FE indicators is the implementation of Free Route Airspace (FRA) projects, which now cover the majority of European airspace. This has notably reduced fuel consumption and emissions, and improved flight efficiency. The programme is also helping to absorb inefficiencies caused by crises in Ukraine, the Middle East, and south Mediterranean, as well as capacity shortfalls due to strikes. The impact of strikes amounted to over 800,000 nautical miles while the Ukraine crisis amounted to over 2.5 million nautical miles lost in 2017.

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 support given to airlines to improve their flight planning was discussed in 2017 within the framework of NM Airline Operations Group. The group re-routing tool (GRRT) will continue to provide better opportunity not only for refiling shorter and more efficient routes but also to allow airlines to identify possible inefficiencies in their flight planning system. The Re-Routing Proposals (RRPs) for flight efficiency will be provided to the airlines that opt-in for this service. As a result in the second half of 2017, while the number of RRPs sent reduced, their



acceptance rate increased two fold. At the same time, the Network Manager produced Guidance Material for the Computer Flight Plan Service Providers to support further improvements of the flight planning systems.

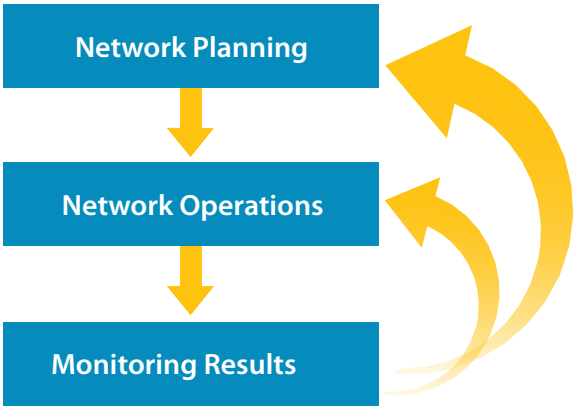
Within the revised framework, the NM combined GRRT and RRP mechanism delivered savings of more than 77,000 nautical miles in 2017. While the proposals made exceeded the 5% objective of the NM flight efficiency savings, due to low acceptance rate the confirmed route changes matching the proposals were much lower than the objective.

Full coverage of the Network Performance is addressed in the Network Operations Report 2017[5].

[5] To be published at http://www.eurocontrol.int/articles/network-operations-monitoring-and-reporting

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.

NM proposed to NMB in January 2017 a set of **network initiatives** to improve the performance and address ways of meeting network performance targets relating to capacity and flight efficiency in 2017 and beyond. The main initiatives progressed during 2017 are in the areas of:

- Address ways to cope with high traffic growth through regional strategic cooperation between ACCs and NM. This was tackled by the network delay optimisation process which provided its outcome to the NDOP; the application of the concept is foreseen in the summer 2018 to improve network collaboration;
- network CDM processes for application of routing scenarios;
- Monitoring of the sector opening schemes for planning and operations purposes provided a better view of where the operational issues are, allowing for a more effective planning of the operations in the next NOP update;
- Better provision of information on sector opening schemes for planning and operations purposes and full transposition of the NOP into operational plans;
- NM worked with airspace users, flight plan service providers (CFSP) to enable them to take full advantage of the flight efficiency opportunities in the European network, including opportunities provided by the implementation of free route; the formal cooperation with CFSPs will be enhanced in 2018; guidelines on technical requirements for CFSPs were also developed;
- Actions for the short and medium/long term were proposed to NMB to address the ATCO shortages;
- In the medium/long term change the European way of delivering capacity through new network concepts, including improved cross border arrangements for critical traffic flows.

Monitoring and reporting

NM presented regular, timely and accurate reports on the overall performance of the network to NDOP and NMB throughout 2017.

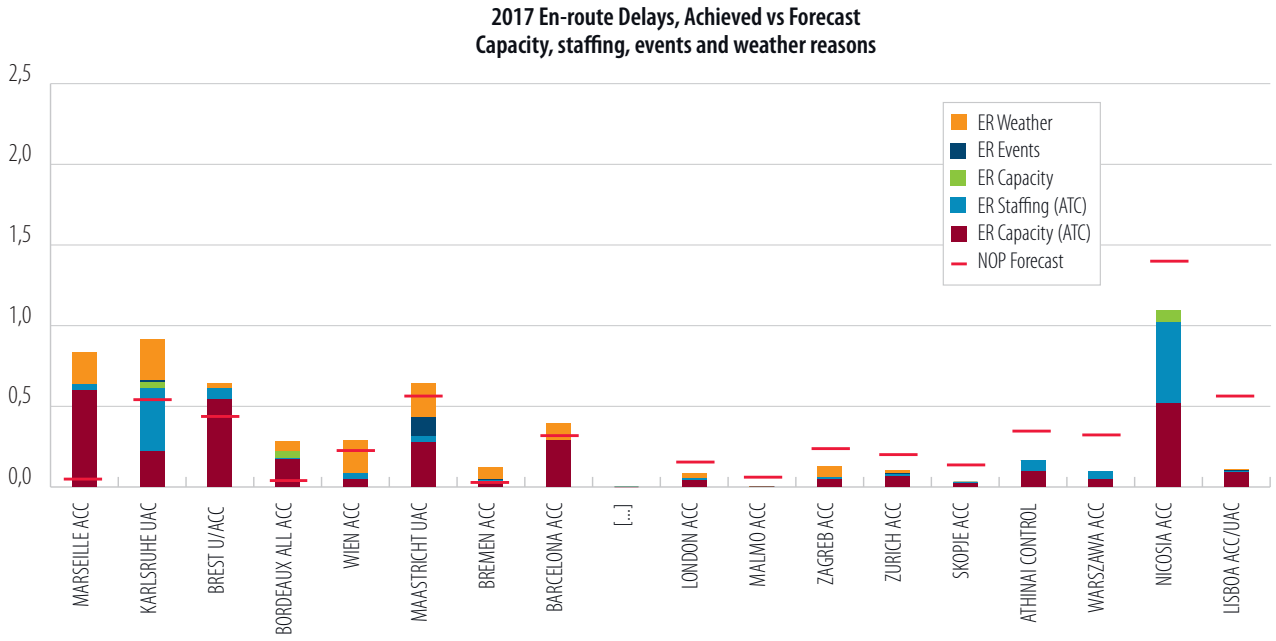
NM also published regular Network Operations and ATFM Compliance reports to stakeholders. The update and validation of the NM interactive reporting tool took place during 2017, which will become operational in 2018. The new tool will provide a better service to NM stakeholders both in the presentation 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. The internal NM Performance Steering Committee identified several performance issues; those with a significant network impact triggered corrective actions (e.g. Flight Efficiency proposals to the airlines, Zurich airport action plans).

In 2017 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 will be used to plan the number 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 highlighted where NM should use its pro-active stance and 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 2017-2019/21 in July 2017.

NM produced traffic forecasts in February and September 2017 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 who gave further input.

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 Belgium, Cyprus, Czech Republic, Maastricht UAC, France (Brest ACC), Germany (Karlsruhe and Langen ACCs), Greece (Athens and Makedonia ACCs), Poland, and Portugal.

Network traffic increased by 4.4% in 2017, which was between February 2017 baseline and high forecast (3.2% and 4.6% respectively, measured as daily average increase over 2016). The en-route ATFM delay in 2017 was 0.88 min/flt (all reasons included), which was above the NOP's annual delay forecast of 0.73 min/flt (including industrial action and technical disruption). Staff, capacity, events and weather delays amounted to 0.78 min/flt, which is more than forecast. The difference to the 0.88 min/flt was mainly due to disruptions, i.e. ATC strikes, ATC equipment failure and other disruptions, which accounted for 0.1 min/flt and higher en-route weather delays which accounted for 0.2 minutes per flight (0.1 minutes/flight higher than in the forecast).

Eighteen ACCs had higher delays than forecast (only capacity, staffing, events and weather reasons). 30 ACCs recorded fewer delays than forecast. The main differences are in the chart above.

A number of ACCs which had been identified in the Network Operations Plan (NOP) as having capacity shortcomings for the summer season implemented measures and performed better than expected. These include Athens, Makedonia, Lisbon, Skopje and Zagreb ACCs – all with traffic growth above 9%.

Marseille ACC en-route delays were well above the planned NOP delay forecast. The general roster was built to focus on demand peaks in the morning leaving fewer sectors in the evenings. The situation was worsened by the increase in SW axis traffic and a decrease in the number of ATCOs, especially in the East sectors.

Nicosia had a traffic growth of 12%, bringing additional complexity in some sectors. In addition, non-slot adherence of flights from nearby airports strongly impacted traffic predictability and regular military activity interfered

significantly with ATC provision. Nevertheless, and despite the slight capacity increase, the ACC did not deliver the maximum number of sectors declared in the NOP during many of the peak summer periods.

Karlsruhe did not comply with the capacity plans agreed in the NOP but the UAC duly fore-warned NM on its staffing issues for the summer. Brest and Bordeaux have performed better than 2016 with increased number of sectors opened (including first-rotation) but still have periods with insufficient capacity in the face of high demand (e.g. Saturdays). Maastricht, despite the flexible sector schemes, was operating at full capacity in 2017 and at times was not able to cope with the high geographically imbalanced demand.

In 2017 the effective capacity indicator increased by 4% over the whole European ATM network, when compared to 2016.

Major ATM changes

NM prepared a transition plan for major projects as part of the NOP and continuously updated the plan during 2017.

There were a number of system implementations in 2017, notably the new voice communications system in Maastricht UAC, finalisation of the ERATO system in Bordeaux, stripless system in London ACC/TMA. There was no big network impact from these events.

Events accounted for 0.03 min/flt, a reduction of 65% over 2016.

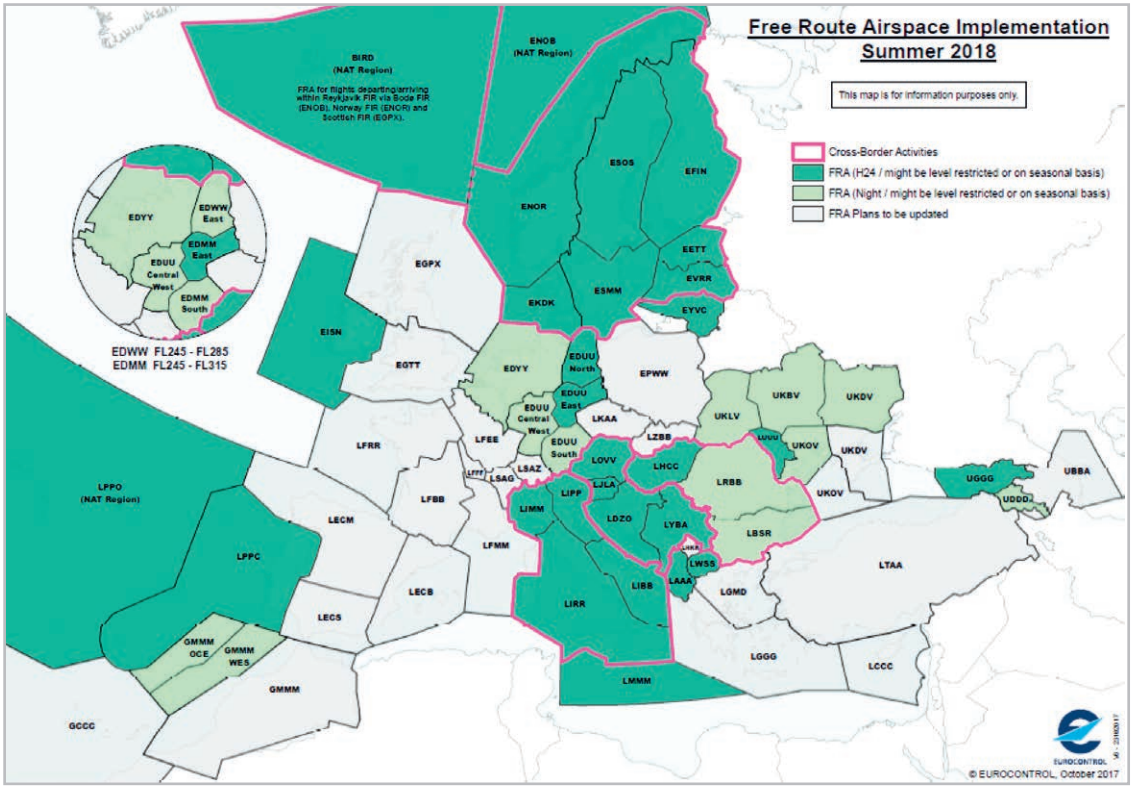
Functional Airspace Blocks

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 the ERNIP at its meeting in July 2017.

NM's European Route Network Design function worked intensively in close cooperation with States and ANSPs to ensure that the European airspace can accommodate



additional capacity needs. Over 200 airspace improvement packages were developed and implemented in the 12 months prior to summer 2017. This helped ensure that the airspace design performance indicator achieved its objective. Free route airspace (FRA) was fully or partially implemented in 51 ACCs in Europe by the end of 2017. 26 ACCs achieved the full 24hrs FRA implementation. Cross-border FRA was implemented in 2017 by countries in the 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 the CDM processes and its mature network operations' flow management procedures.

The NMOC internal reorganisation was completed in 2016: the new roles and functions were fully operational in 2017, focusing on the management of the network drivers, i.e. the performance objectives on safety, capacity, flight efficiency and cost-effectiveness.

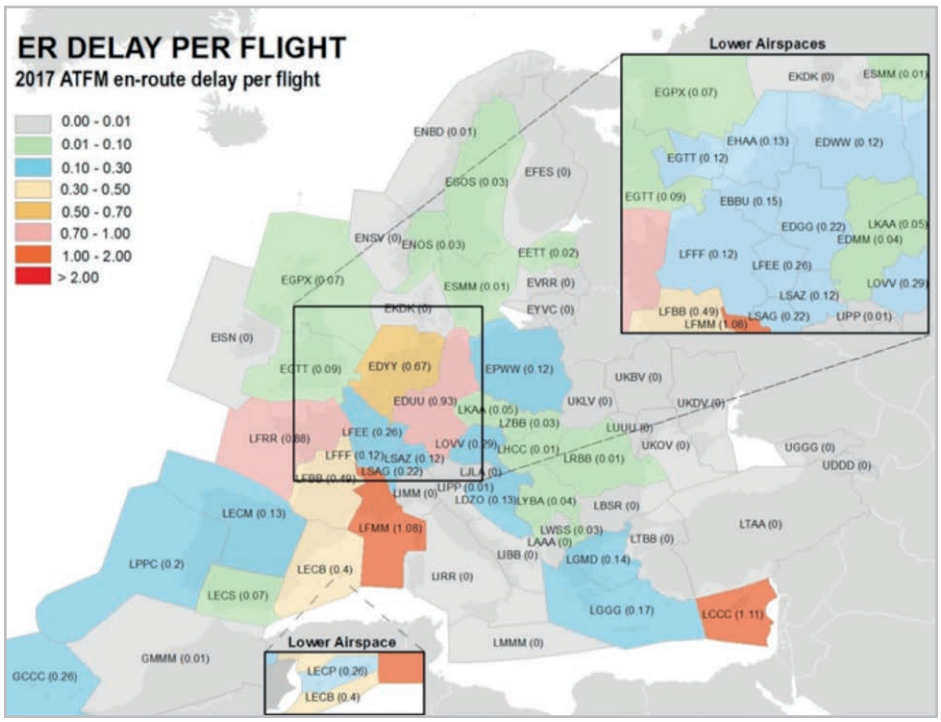
The new reorganisation allowed NMOC staff to obtain cross validation among the three operational domains (Airspace Data, Flow Management and Flight Planning). The first six cross validated staff (FM/FP) were deployed in NMOC before summer 2017, giving a significant contribution to the ATFM delay savings.

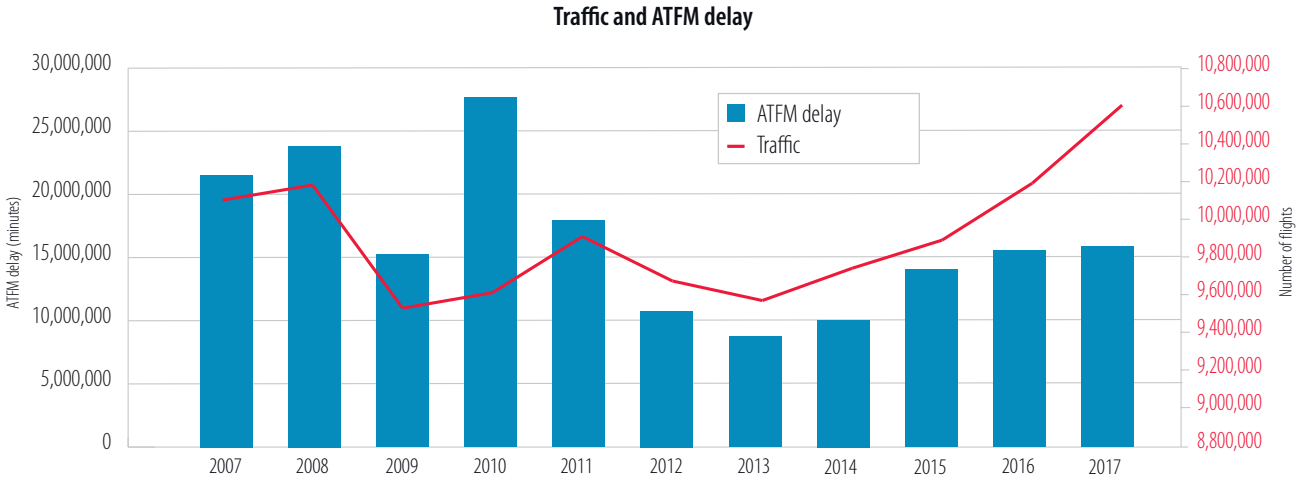
The NMOC staff delivers the ATFM delay savings by their actions in tactical operations. This led to a reduction of 1,520,000 minutes of en-route delays, above the 10% of the en-route delay for 2017, so achieving the NPP objective. The equivalent for airport ATFM delays was 620,000 minutes, representing 8.6% of total airport ATFM delays.

Weather was the main reason of ATFM delays in 2017, en-route and airport combined. Recommendations on best practices and procedures were applied within NMOC but, as it was the case in 2016, collaborative strategies across the network were not properly followed by ANSPs, as they are still reluctant to anticipate the decision on activating ATFM regulations, despite the accuracy of weather forecasts for specific weather events.

NM's strategy is to foster collaboration between the airport authorities and ANSP, with NM acting as moderator, suggesting network collaboration, anticipation, mitigation processes and procedures. A new Weather Forum will be organised in May 2018 to establish clear principles on weather Network dimension.

The map below presents the full results of the en-route ATFM delays (min/flt) for all the ACCs within the NM area (represented by the ICAO four letter code).





The main cause in 2017 for en-route ATFM delay was capacity and staffing. The significant traffic increase and staffing issues caused continuous delays for Karlsruhe, Marseille, Brest, Bordeaux, Maastricht and Nicosia ACCs. Weekends remain an issue as a lower demand triggers delays higher than weekdays, due to traffic pattern and ATCOs unavailability.

During 2017 the network was able to absorb the significant traffic increase and lack of capacity and staffing issues thanks to a positive collaboration between NM, ANSPs, and airspace users. This enabled NM to set up efficient delay mitigation plans to counter for the various restrictions, non-homogeneous route charges, staffing and social issues.

As a result the overall ATFM delay increase in 2017 is insignificant compared to the traffic increase versus the previous years.

Airports

Airport Collaborative Decision Making (A-CDM) facilitates the integration of major airports into the network and delivers more accurate departure information. During 2017 Palma de Mallorca, Stockholm-Arlanda, Hamburg, and Lyon Saint Exupery airports fully implemented A-CDM making 26 airports in total, covering 33.7% of the departures in the NM area.

Tenerife, Malaga and Gran Canaria - Las Palmas airports connected to NM as ATC Advanced Tower airports, making 19 airports in total, covering 8.7% of departures in the NM area. NM is now being provided with Departure Planning Information (DPI) messages for 42.4% of departures in the NM area.

After the trial in 2016, NM implemented in 2017 the airport function within the NMOC which provided tactical support to capacity constrained airports or hot-spot airports, notably the Greek islands airports. This proved very beneficial for all operational stakeholders with tangible results in delay reduction at those airports. Close 'on the day' cooperation with Hellenic Air Navigation Service Provider, Slot Coordinator and Airline Operators allowed for better utilisation of capacity. Arrival delays at the Greek islands airports during the summer season were kept under control, despite a 5.5% increase in traffic.

The European scheme for re-categorising wake turbulence separation (RECAT-EU) was implemented in July 2017 at Leipzig-Halle Airport / Munich Approach for specific category of aircraft.

The Enhanced Information Exchange, which enables data sharing on anticipated capacity impact of airport events with NMOC during the ATFM pre-tactical phase of operations, was used by 35 airports in 2017. The information is shared with the airports and airline operators that subscribed to the service. In parallel the focus on the Airport Corner was to enhance the quality of strategic airports information.

The exchange of complementary data between the Airport Operations Plan (AOP) and NOP via System Wide Information Management (SWIM) is an essential element for the ongoing integration of airports and the network. A first AOP-NOP Integration project was started with Paris Charles de Gaulle airport, Frankfurt airport and London Heathrow airport to implement the data exchange via NM B2B services.

Special Events

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

Industrial Action

The French industrial action in March, September, October and November contributed to most of the industrial action delays in 2017, which represented 8.5% of total en-route delay in 2017. There were 710,000 minutes of direct en-route delays plus 84,000 minutes of indirect delays in the neighbouring ACCs due to on-loaded traffic. Flights planning to avoid affected areas added 800,000 nautical miles to their trajectories. An estimated 4,600 flights were cancelled during the strike days.

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

- Coordination with all adjacent ACCs in coming up with mitigating actions: re-routeing proposals; the use of oceanic routes; enhanced levels of staffing; extra traffic accepted by neighbouring ACCs;
- Disabling restrictions and coordinating with military stakeholders in neighbouring states to make off-load routes available;
- Arranging special routes with North African states; including Algeria/Tunisia in the flight plan distribution area to help ANSPs and airlines.

NM proposed best practice measures to reduce the volatility during the strike days.

A number of recommendations were approved by NMB at the end of 2017 addressing the strike impact mitigation work carried out by the specialised NMB task force. NM will adapt its operational procedure and mitigations measures if need be to address these recommendations.

Network Crisis Management

The European Aviation Crisis Coordination Cell (EACCC) held three meetings in 2017: March, June and September. 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 2017 edition of the EACCC workshop took place at EUROCONTROL premises in Brussels on 14 June 2017. More than 45 participants attended, most of them aviation crisis management State Focal Points from 23 States, European Commission, EU Computer Emergency Response Team (EU-CERT), EU Agency for Network and Information Security (ENISA) and members of the EACCC. The workshop focussed on two main topics: the developing role of the State Focal Points; and cyber-security including the forthcoming EACCC Exercise.

Disruptions and crises

The EACCC was not activated in 2017 although a number of disruptions impacted the European network, which 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 1 and 2 of February 2017 the EACCC organised the crisis management exercise 'Power17'. This exercise simulated a network crisis resulting from a large scale power outage in several European countries and the management of the response to the related crisis in cooperation with the Member States and aviation stakeholders concerned. Participant feedback showed that the exercise helped understanding and increased awareness on how to deal with a crisis whose cause is outside of the aviation domain and whose impacts are much wider than aviation. In particular this exercise scenario identified the telecommunication aspects that have to be worked out at the level of the various stakeholders.

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 adapt their route structure to facilitate smooth traffic flows impacted by the disruptions at the interface with Iran and Iraq and the associated continued adaptations performed in Bulgaria, Romania, Hungary, Slovakia and Poland.

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 21 and 21.5 were implemented in 2017 including changes related to the evolution of existing business services, but also to the introduction of new business services and new technologies.

The NM system provides improved information from DPI messages to the airspace users.

A number of changes were designed to improve the usage of ATFM scenario, notably their management via B2B (simulate scenario from a repository, query and apply scenario from a repository). The horizontal rerouting options were improved to consider, inter alia, for specific RAD information, and conditional rerouting constraints.

SESAR trial exercises were supported by the development of arrival planning information B2B in the NM operational system by integrating flight arrival information into several subsystems.

The Flight Plan and Flight Data Evolution strategic project was also supported by a number of improvements, notably improved restriction model and ATFM processes through use of enhanced flight plan data.

The flight efficiency area saw several developments: support to FRA implementation, generation of automatic RRPs for subscribing airlines, clear indications which RRPs are sent to take advantage of conditional route (CDR) openings in the European airspace.

Several developments took place for NM B2B service: Flight plan message filing and distribution in Flight Information Exchange Model (FIXM) format via B2B; extend the targeted users of B2B web services to FMPs by making the Flight Data message a complete alternative to the older technology of flight data distribution. The information flow was enhanced by aligning the Central Airspace and Capacity Database (CACD) model to allow seamless data download from the EAD and European ATM Information Management Service (EAIMS).

The process that is looking at improving the ATFM delay in a regulation is now applied every minute while it was applied at a five minutes interval before.

The governance of the n-CONECT Project was ensured by the associated Strategic Project Steering Group under the supervision of NDOP and NMB. During 2017, in addition to the required technical developments, the most significant operational developments were related to the RAD@n-CONECT, TCF Code Allocation List and Initial/Dynamic Network Plan. Work has been initiated on airspace and flow applications with extensive external consultation expected in 2018. Existing working arrangements will be used for RAD, airspace and TCF developments. For flow developments, NDOP has agreed with the creation of a dedicated user group. Due to further evolutions of the graphical layout based on new framework technologies, NM currently estimates a delay of 6-9 months of the originally planned delivery schedule.

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 the NM network safety domain is the identification of the operational safety hazards at network level and the assessment of the associated safety risk. In 2017 workshops were held with a number of ANSPs to confirm the current safety priorities (the "top 5" risk priorities) and to explore the possibility of new ones. 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.

While the top 5 remained unchanged, NM released two Operational Safety Studies for the new risk priorities identified in 2016: "Sudden, high energy runway conflict" and "ACAS RA not followed" (ACAS RA is the Airborne Collision Avoidance System Resolution Advisory).

NM provided support to its stakeholder 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. In addition the newly designed Safety Tools course (including RAT) attracted many participants to the two courses held during the year. On a wider scale the web version of the Toolkit for ATM Occurrence Investigation (TOKAI) continued to be deployed in 2017 to improve the overall collection, analysis of and lesson learning from ATM safety data.

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

The Just Culture achievements during 2017 include:

- Signing of a Just Culture MoU with the European Railway Agency (ERA);
- Two just culture 'expert' courses run in association with International Federation of Air Traffic Controllers' Associations (IFATCA) and European Cockpit Association (ECA) that aims to produce a pool of + 84 aviation 'experts' who can interface with national judiciary;
- Four regional roadshows/workshops were held to 'show and sell' the Just Culture Model Policy and 'expert' course;
- Deployment of the Just Culture 'ironman' questionnaire to be used to gauge the implementation of Just Culture at organisation (ANSP) and national (Civil Aviation Authorities and judicial) level. Agreed requirements for a new Just Culture portal to be hosted on SKYbrary.

NM continued to improve the JC as part of its internal SMS covering all staff, including those working in NM's operational areas.

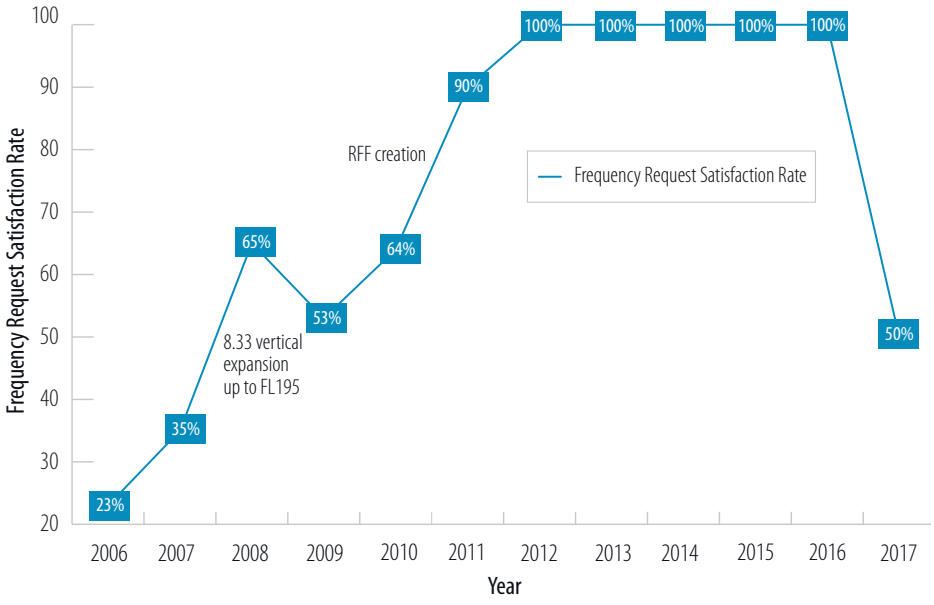
The "Experience Sharing to Enhance SMS (ES2)" programme covered a range of SMS related topics: best practice in NM safety management tools, human factors and system safety thinking, and just culture and judiciary system. In addition to these ES2 events, the bi-annual ANSP CEO Safety Conference was attended by 28 CEOs (a record) and many more safety directors and managers. It covered a variety of topics in particular the ground-breaking panels on Performance and Cybersecurity. The Conference issued a cyber security briefing describing five measures that organisations can take to improve their cyber security.

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 Radio Frequency Function is mandated by the European Commission and described in the Annex II of the NM regulation. After five exceptional years of satisfying all requests for new aeronautical voice frequencies in Europe, this year will see again unsatisfied requests. Frequencies could not be found in 2017 for new sectors in Austria, Germany, the Czech Republic and Poland. The satisfaction rate for the frequency congested European areas has dropped to 50%.



This low satisfaction rate confirms the NM assessment of the past years. Despite improvements introduced by the RFF, limited spectrum gain provided by the too few 8.33 kHz conversions by some States was quickly consumed by the continuous requests for new frequency assignments.

The RFF has been working to mitigate the impact of this shortage of frequencies. It is expected to find frequencies for the more urgent requests in 2018, however only the creation of more voice channels, by extending the use of 8.33 kHz channel spacing, will satisfy all future frequency demand. In the short term, the development of the new SAFIRE v6 will enable the optimisation of the use of the limited available spectrum.

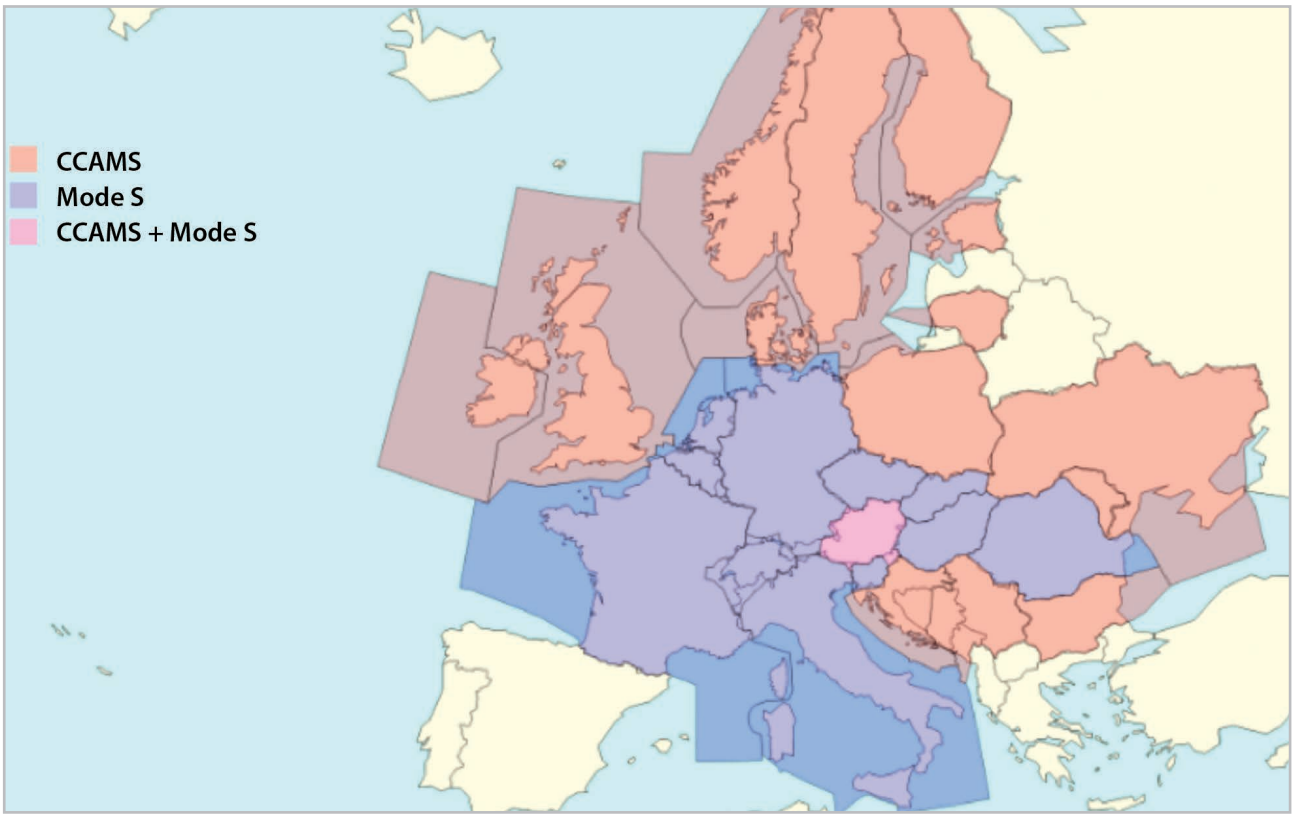
In 2017 the NM RFF, following a request of the EC, also performed an assessment of the initial 8.33 kHz conversion plans of the European States to support their completion as well as a preliminary assessment of the network impact of local measures granting exemption notified by Member States. With due regard to the potential impact of such measures and the identified gap between planning and deployment of 8.33 kHz VCS, the Network Manager supported the European Commission in raising awareness of Member States during Single Sky Committee meetings in 2017 and in the organisation of a dedicated workshop which took place on 27 October 2017. The Member States' plans for local measures granting exemption for frequency assignments were completed at the end of 2017 and the NM RFF has started their assessment in order to determine their impact on the network and if they will deliver enough benefits to fully accommodate the frequencies demand for the coming years.

In 2017, the Radio Frequency Function also supported the analysis and resolution of radio interferences reported by National Frequency Managers.

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 function 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 2017, sixteen States had CCAMS namely: Austria, Bulgaria, Croatia, Denmark, Estonia, Finland, Ireland, Lithuania, Moldova, Montenegro, Poland, Norway, Serbia, Sweden, Ukraine and the United Kingdom. CCAMS also benefits non-CCAMS States as it reduces the number of code changes due to crossing different participating areas.

The map above presents the CCAMS and Mode S implementation in Europe at the end of 2017.

Approximately 54.7% of the daily flights receive an SSR code from CCAMS. Monitoring tools detected and operational users reported in total 50 cases of wrong codes assigned by CCAMS. 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 2017. Approximately 12.43% of the daily flights used the conspicuity code A1000, an increase of 7% over 2016.

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 2017. 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.

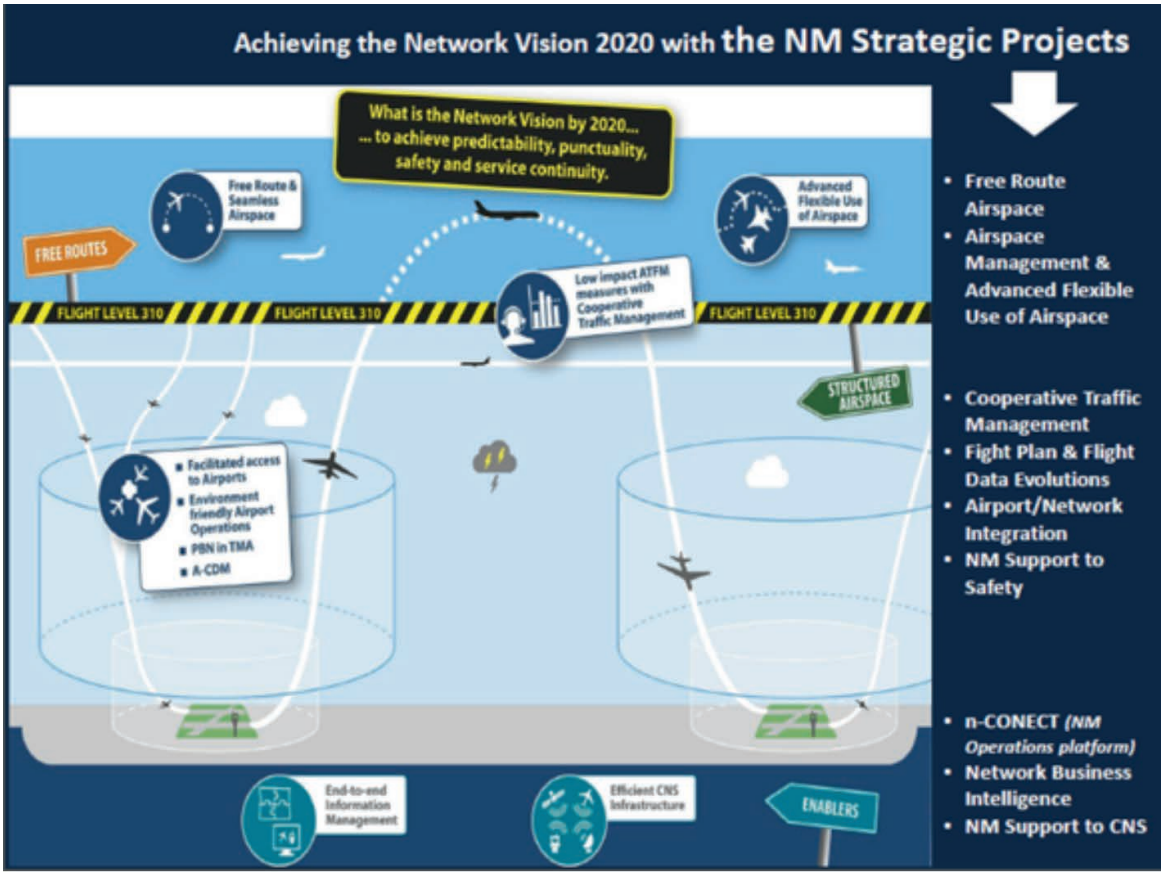
In RP2, the NSP is implemented through two types of action:

- developments coordinated via NM's Strategic Projects, when significant technological improvements are required;
- action taking place in the Network Functions' context, 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 2017**, which is a companion document to this report.

The major achievements from NSP implementation in 2017 are summarised in the respective paragraphs of chapter 4 and include:

- The evolution of the service architecture SOA/ Network Eco-System (NES) platform and the migration of the human-machine interfaces (HMI) to the new platform;
- The deployment of Free Route Airspace – the main driver for airspace defragmentation – was progressing very well. A total of 26 ACCs achieved the full 24hrs FRA implementation. There are increasing trends for ACCs to conduct cross border operations and to lower the base level of FRA to the maximum extent possible. By the end of 2017, 51 ACCs have either fully or partially implemented Free Route Airspace operations;
- The optimisation of flight efficiency through improved flight planning, NM developed a "NM Flight Planning Requirements – Guidelines" document allowing alignment of CFSP systems and algorithms with NM flight plan processing and associated environment data. The document is expected to be fully approved by all operational stakeholders during the first trimester of 2018;



- Four more airports implemented A-CDM and connected to the network increasing the total number of full A-CDM airports to 26. In conjunction with the "Advanced Tower" implementations 42% of European traffic is covered by Departure Planning Information (DPI) shared with the network;
- "Just Culture" in European ATM was promoted and enhanced. Four regional roadshows/workshops, one in Spain, one in Luxembourg and a 'double-header' in Latvia, were held to 'show and sell' the Just Culture Model Policy and 'expert' course. A new "Just Culture" portal will be hosted on SKYbrary;
- Two major NM system releases were implemented. NM Releases 21 and 21.5 delivering a number of new or updated key functionalities. Amongst others the number of B2B services as well as the amount of operational stakeholders using them was significantly increased. The operational benefits of this approach have been reported on several occasions. In particular the first B2B flight services based on Flight Information Exchange Model v4, and new services in support of scenario management were implemented. The Full airspace use plan (AUP) template has been implemented (except for information about standard instrument departure/ standard instrument arrival routes closure). The Dynamic Network Plan editor was deployed into operations as planned on the n-CONECT platform;
- The user driven prioritisation process (UDPP)/slot swapping tool was operationally implemented. Further evolutions have been implemented to better accommodate FRA implementations.

Contribution to the SESAR Deployment

NM 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: in the review of the Pilot Common Project (PCP), in the update of the Deployment Programme (DP-2018) and in the development of the proposal for the next Common Project (CP2).

INEA/CEF funded projects

In June 2017 Innovation and Networks Executive Agency (INEA) announced the Implementation Projects approved for funding under Connecting Europe Facility (CEF) Call 2016. Five out of the six proposed NM IPs were approved. Three of them are multi-stakeholder projects. NM also submitted five Implementation Projects proposals under CEF Call 2017. Four of them are multi-stakeholder projects. All IPs submitted by NM for INEA/CEF funding are within the NM Work Programme and Budget agreed by NMB.

Contribution to the SESAR Research and Validation activities

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

- NM communicated its vision of Network Management Functions at 2020 horizon and beyond;
- NM has contributed to the development and the review of the Operational Service and Environment Description (OSED) of several projects in relation with Optimised Network Services, 4D Trajectory Management and integration Airport Operations to the Network Management;
- NM has been involved in the validation exercises starting in 2017 on some of these topics.

Concerning the Very Large Scale projects (VLD's) 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). Finally NM provided its initial ideas concerning the 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, the 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.

Shape the NM organisation

Management autonomy

NM being a SES body, its governance requirements, as established by the EC regulation 677/2011, will be suitably applied within the context of the EUROCONTROL Organisation. This has been swiftly implemented in November 2017 and already has a positive impact on the NM contribution to the delivery of the network functions. The NM autonomy will be further consolidated in 2018.

Network Manager Certification Project

The necessary compliance matrices demonstrating NM compliance to the different applicable regulations as required by Commission implementing regulation EU 2017/373 have been prepared and NM intends to distribute the NM Service Provider certification application form to EASA during the first quarter of 2018. The EASA review and audit activities are expected in 2018 for a period of approximately one year, with an expectation of a delivery of certificate by mid-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.

Shape the future network

Network Strategy Plan

Given that the current NSP is valid until the end of 2019, work has started to develop the next version covering the next decade. It is expected that this will allow NM to initiate the required coordination on an updated version of the NSP just after the nomination decision.

The **concept of flow management** has seen its evolution from the ATFM in the 1990s to ATFCM in the years 2000s to the concept of network management in the 2010s. The NM intends to propose further evolution of the concept through the NM strategic Collaborative Traffic Management (CTM) project.

NM can see significant improvements in capacity if airspace organisation and sectorisation are designed without the constraints of national borders and in function of the traffic flows. Such an airspace optimisation would complement the technological emphasis of the ATM Master Plan and give European ATM the tools to meet the challenges of the next decade.

Transform the technical systems

Future Architecture Study

A review of the NM systems architecture is ongoing and a future architecture of NM technical systems will be ready for consultation in 2018. It will be the basis to rebuild the NM systems in accordance with the latest technical evolutions and ensure that the NM systems continue to be fit for purpose for the next decades.

Strategic Project, n-CONECT

The n-CONECT strategic project will continue to develop. Following the initial implementations in 2017, several milestones are foreseen in 2018 for the continuation of implementation of the Airspace and Airspace Utilisation Rules, Availability applications for operations at NMOC and other Network Operation Portal services migration. These will be done in a completely newly designed graphical framework expected to be put in operation in 2018. The first mature draft of the roadmap for the delivery of the new ATFCM interfaces will be also finalised with the external stakeholders by the end of 2018 and will consider current and new functionalities in relation to the Cooperative Traffic Management strategic project.

Embrace partnerships

SESAR 2020 programme

In the context of the S2020 wave 1 industrial research programme, NM will further contribute to the development and the validation of less mature concepts and evolutions affecting NM remits and expected evolutions to NM roles and responsibilities, about topics like Advanced Demand Capacity Balancing and Airspace Management, 4D Trajectory Management, and optimisation to Free Routing deployment. In the context of S2020 wave 2 scope of work NM will provide its final proposal and its suggestions for prioritisation.

In parallel, NM will continue contributing to SESAR 2020 transversal activities covering the integration of new concepts developed by Industrial Research projects and to the Master Plan Maintenance for evolutions more specifically affecting the Network Function. In particular in 2018 NM will contribute to the ATM Master Plan update campaign.

GLOSSARY

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
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
DPI	Departure Planning Information
EACCC	European Aviation Crisis Coordination Cell
EAD	European AIS Database
EASA	European Aviation Safety Agency
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 Organization
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

Approved by NMB on 3 July 2018