



BUDAPEST
ATM
NETWORK
FORUM

Connecting ideas and regions
for a more cooperative
Single European Sky

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The ATM Networker

INSIGHTS FROM THE BUDAPEST
ATM NETWORK FORUM (BANF)

KEY THEMES DISCUSSED



Prioritising the
Network interest



The operational
aspect



Inter-regional
synergies



Financing the
infrastructure
transition



Governing the
execution of the
Network Functions



EDITORIAL

As the CEO of HungaroControl and host of the first Budapest ATM Network Forum (BANF), I am pleased to introduce to you the first edition of the ATM Networker, which highlights the main takeaways and messages of the Forum. Indeed, the Forum placed the interest of the Network at the core of a seamlessly and efficiently operating Single European Sky. The Forum, in particular, discussed and managed to create a common understanding of the operational, the financing, and the governance challenges of such a network-centric approach, and succeeded in creating a commitment to addressing these challenges in a cooperative and forward-looking manner. It furthermore became clear that such an approach cannot be limited to the EU and must reach out to and include other regional networks, in particular, in South-West Asia. Finally, focusing on the network interest, also means co-operating with our airspace user partners in the interest of European mobility and the travelling public.

Therefore, it only seemed sensible to institutionalize the BANF spirit in a from now on annual conference focusing on the increasingly important role which the Network will undoubtedly serve as the basic structure of the Single European Sky and as part of the global aviation network.

Ferenc Turi
CEO, Hungarocontrol



LOOKING AHEAD

BANF confirmed the shared commitment to place the Network at the heart of European ATM. Enhanced intra- and inter-regional co-operation, strong leadership, clear priorities and a robust legal framework will be essential to deliver the benefits of the Single European Sky within and beyond its boundaries.

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Summary

As the moderator of the Budapest ATM Network Forum, I have taken the liberty to summarize my personal takeaways in five separate topics, which roughly follow the structure of the Forum, namely (1) the prioritization of the “network interest”, (2) the importance of the operational perspective, (3) the key role of interregional synergies, (4) the question of how to finance the infrastructure transition, and, most importantly, (5) the problem of governing the evolving network functions. For each of these topics, I will highlight what seem to me to be the most relevant points that were made, the main questions that were raised and/or the main challenges that remain to be addressed.

Prioritizing the “network interest”

Obviously, the “network interest” was the very focus of the Budapest ATM Forum. But what is the network interest exactly? One can get at this question either from the “network’s” or from the “interest’s” perspectives. It is tempting to try to start out by defining the network, but this will lead us inevitably to an abstract and theoretical discussion, such as, for example, the complex relationships between the “whole” and its “parts” or the “nodes” and the “links”. Also, I am afraid that it will be difficult to derive the network interest from there.

Instead, I would like to propose a more pragmatic approach, which, I have the impression, was also shared by the participants, namely that the network is rather an “ecosystem” composed of actors, most of them operation actors (e.g., airlines, airports, ANSPs, including military actors), but some also being coordinating and supporting actors. Up to a certain point, all these actors do have an interest in the network’s proper functioning, but, by definition, most of them lack the network perspective (the “big picture”), not to mention the fact that they all pursue their specific, yet legitimate interests. It appeared clearly during the Forum that the main challenge is therefore to make all these actors understand and recognize that the network is benefiting them (to a certain extent) and that they, therefore, should also have an interest in making the network function, if not to actively contribute to it. Also, it is important to acknowledge that the network interest is also in the public interest.

The importance of the operational perspective

As goes the saying: “the proof of the pudding is in the eating”. And so is it also in ATM: “the proof of the network is in its operations”. Here, the main question, it seems to me, is how to balance efficiency and resilience, both against the backdrop of growing demand, environmental challenges, and the need for capacity. Indeed, the more saturated the network is, the more it operates at its limits and the more it will be vulnerable to shocks of all kinds (demand, war, weather, financing, etc.).

Everybody seems to agree that, even when it comes to operations, a network perspective is always better than a purely local or national perspective, be it for system efficiency and resilience. Not to forget the fact, it was argued, that both efficiency and resilience have simultaneously a human and a technological dimension. While on the human side efficiency and resilience are about ATCO availability and collaboration between the stakeholders involved (cross-border collaborations, airspace user-ANSP collaborations, interregional cooperations and cooperative decision-making processes), on the technological side they are about standardization, interoperability, and integration.

Furthermore, it was also made clear that current operational efficiency and resilience are the result of past policy orientations, technological choices, and financial decisions, among others, whereas, on the other hand, today’s orientations, choices, and decisions, will mechanically determine operational efficiency and resilience in the future. It appeared clearly from the discussions that, in this matter, different actors have different time horizons. ANSPs, for example, clearly have a more long-term view than airlines. Airlines, on the other hand, may have a more systemic view than ANSPs. It is therefore important that the different actors understand and take into account their respective time and system horizons as well as each other’s perspectives.

The key role of interregional synergies

A network, like any system, necessarily has boundaries. Ideally, these boundaries should be defined from an operational efficiency and resilience perspective. But then, everyone agreed that one has to be pragmatic and accept the fact that ATM network/system boundaries are, and will in the foreseeable future remain politically defined. Still, no network or system operates in isolation; it is always connected to other networks and regions, and some of these interconnections can be chokepoints, especially in terms of the network's resilience. This is particularly the case, as was convincingly shown during the Forum, where the European and the West Asian networks interconnect.

It is therefore imperative to actively manage this and other chokepoints and to inter-connect and even inter-operate the relevant networks, again at both the human and technological levels. It will also be important to institutionalize this interconnection and corresponding cooperation across networks.

The question of how to finance the infrastructure transition

As said, the network has a strong technological dimension, and this even more so, as digitalization is becoming ever more present and ever more pervasive. Among others, digitalization entails a new service delivery model with data as a new pan-European “infrastructure”, as defined in the 2019 Airspace Architecture Study (AAS). This requires new investments in addition to and above of the investments necessary for the modernization of ATM technologies.

It seems to me that the most important challenge here is conceptual, namely how to conceive the new pan-European mainly data “infrastructure”: is it a (new) infrastructure in its own right, a shared resource analogous to an infrastructure, or simply a service. It will be important to clarify and, at some point, to decide, as this has implications not only on the financing of this “infrastructure” (e.g., public funds versus airspace user fees), but also on its future governance.

In any case, reaching the technological target model outlined by the AAS, or more generally the “modernization of the network”, raises the question and challenge of how to finance the transition. This is, among others, the question of the most appropriate regulatory tool, especially the tools that incentivize both long-term investments over short-term efficiency, as well as regulatory tools that incentivize technological integration – including the integration of digitalization into ATM technology development –, as opposed to cementing technological (and system/network) fragmentation.

The problem of governing the evolving network functions

All four above considerations (and challenges) will have to come together in the (future) governance of the network (and its inter-connections). While the current thinking and discussions are focused on the Network Functions Implementing Regulation (NFIR), one may question whether the NFIR will be sufficiently comprehensive in order to be able to address the challenges ahead. In particular, I am not alone in wondering whether one should not more clearly distinguish between the process of phasing out the existing basically unsatisfactory governance (too many actors, requiring too much coordination, convoluted decision-making, no clear leadership, etc.) on the one hand, and the facilitation of the emergence of a new, more assertive network governance target model with clear leadership, unambiguous roles, responsibilities attributed to the respective stakeholders, and enforceable accountability rules.

Matthias Finger

Regional Cooperation and the Case for SOCEA

One of the clearest lessons from the Budapest ATM Network Forum from my perspective is that efficiency can no longer be viewed as being limited to Europe's internal boundaries. Traffic growth, geopolitical volatility, and the constant risks of disruption are tying Europe's network more closely to flows from the East - Central Asia, the Middle East, and Asia. In practice, this means that the network's performance depends not just on what happens at its core, but on how well its interfaces are managed.

For Türkiye, this isn't theory, it is a daily reality. Positioned on the South-Eastern axis of the European network, Türkiye is a vital gateway between Europe and Asia. When traffic flows are steady, this position ensures continuity. But when disruptions occur, Türkiye becomes the frontline; absorbing volatility, handling sudden re-routing, and protecting the network from fragmentation.

Therefore, inter-regional cooperation is no longer a "nice to have." It's an operational necessity. Europe's ATM network needs strong central coordination, shared tools, and common situational awareness. But it also needs capable actors at its strategic edges, the places where traffic shifts first appear and where continuity must often be defended in real time.

SOCEA was created with this logic in mind. It isn't meant to replace or compete with Europe's existing structures. Instead, it complements them by bringing together operational players across a wider geography, especially at the Europe - Asia interface. Its strength lies in practical coordination, trust-building, and operational dialogue, the kind of alignment that makes resilience possible.

If we want the network to be truly resilient, regional platforms like SOCEA should be embraced as extensions of the broader system. They connect Europe more effectively to the realities of traffic flows in the East, improve information exchange, and build trust before disruptions occur.

Ultimately, if we are serious about protecting the network's interest, we must also take seriously the perspectives of those who carry heavy operational responsibilities at its edges. The network's interests extend beyond the centre to its interfaces as well.

Dr. Cengiz Paşaoğlu
Deputy Director General, DHMI

Europe's ATC capacity: time to act

European airspace is running out of controllers. More and more delays and disruptions are driven by ATC staffing shortages, and this is set to worsen. In the coming years, a significant share of experienced ATCOs will retire, while traffic continues to grow across the network.

This is not a surprise. Airlines publish their schedules well in advance, demand trends are well understood, and traffic forecasts have consistently pointed in one direction: up. Ryanair alone is expected to grow from 200 to 300 million passengers within a decade.

Yet ATC capacity has not kept pace. The consequences are already visible: structural delays and recurrent congestion. This is not a temporary imbalance; it is a structural mismatch between demand that is planned years ahead and capacity that is still managed reactively. We are not facing unexpected shock. We are facing a predictable (continued) capacity failure.

Recruitment pipelines remain insufficient and, in some cases, disconnected from actual traffic needs. This mismatch is compounded by the fragmentation of European systems and procedures: training can take 12 months in one jurisdiction and 60 months in another for essentially the same role. This cannot be explained by operational necessity; it simply reflects lack of standardisation and harmonisation. The result is simple: Europe under-delivers capacity while demand increases. Without urgent corrective action, this gap will widen.

There are, however, very positive examples. HungaroControl, for instance, has delivered tangible improvements. But critical parts of the network continue to face persistent shortages.

The path forward is clear. Capacity must be planned and delivered against demand. Training must be accelerated and better aligned across the network, while preserving safety – nothing more than what operators have already done for decades.

The phase of diagnosing the problem is over. We know what needs to be done. Some ANSPs across the network already deliver strong performance, showing that it is possible to plan and recruit effectively. The priority must now be to mirror these best practices and align all ANSPs with the standards set by the best performers. It is now time to act.

Giovanni Zucchetta
EU Public Affairs Lead, Ryanair

The role of innovation in ATM transformation

I was delighted to participate in the Budapest ATM Forum alongside other stakeholders to discuss the evolution of the European air traffic management network. One thing that came through clearly in the discussion is that we are operating in a context where short-term operational priorities and the long-term transformation of the system need to be considered in parallel. There is, understandably, a strong focus on day-to-day performance, capacity and resilience in network management. At the same time, it is important to maintain a clear line of sight on longer-term system evolution, including future capacity needs, technology renewal and the progressive reduction of technical debt.

As air traffic continues to grow and the operating environment becomes increasingly complex, the challenge is to address immediate pressures and at the same time ensure that the decisions taken today do not constrain the options available tomorrow. This requires a shared understanding of where the network is heading and a collective commitment to investing in the capabilities that will be needed in the years ahead. And this is where innovation in SESAR plays a key role. It is not a separate track, but an integral part of how the system evolves, ensuring that today's decisions and deployments contribute positively to the long-term development of the network.

Through collaborative development and deployment, SESAR helps bridge the gap between operational needs and strategic objectives. It provides a framework to bring much needed innovation to market in Europe that will enhance performance in the longer term (10 years +) while providing opportunities for early movers to transform in the shorter to medium term (within the next 10 years).

Running the network of today and building the system of tomorrow are closely linked, but they are not the same tasks, and at times different perspectives are required. They require different decision-making horizons, while remaining aligned within a coherent overall framework. The discussions in Budapest reinforced the importance of maintaining this balance.

Alain Siebert
Chief Technology and Strategy, SESAR 3 Joint Undertaking

Ownership With(out) Accountability: Why We All Must Step Up for the Pan European Network

The Single European Sky was built on a foundational premise, namely that the pan-European airspace should be a seamless continuum, functioning as a unified network, not a mosaic of national territories stitched together by bilateral agreements and enabled by a central coordination function. Yet decades into this initiative, a persistent gap remains — not in regulation or technology, but in a shared ownership attitude. National or individual thinking still very much prevails, and optimisation efforts continue to address primarily local or individual requirements, treating the pan European network as someone else’s responsibility. This must change if we want to raise the performance of the network and support the competitiveness of the European aviation and the free movement of people and goods.

Member States have resisted efforts to significantly strengthen the network-oriented approach to ATM, and the SES framework has accommodated this by distributing responsibility between national structures and a Network Manager at pan European level. EUROCONTROL, as Network Manager, coordinates flow management, scarce resources, and airspace design, whereas national providers control national air traffic service delivery. EASA sets the regulatory standards. The European Commission drives performance targets. The airline market is largely liberalised and operates under strong competition principles. Airports are critical infrastructures enabling the airline sector to respond to growing demand. In this ecosystem, no single actor holds all the levers — which is precisely why every actor must commit and be accountable to the Network-oriented approach.

The problem is that distributed governance only works when each node takes genuine ownership of collective outcomes that they co-author and co-own. This was also recognised in the last update of the Single European Sky framework which introduced new network functions, highlighting that improvements in performance can only be delivered if everyone acts together through these functions, prioritising the network interest.

Delays cascading across the network, inefficient routing perpetuated by national airspace boundaries, challenges with airport operations, network coordination complexities, flight plan adherence challenges, slow deployment of technological solutions and slow modernisation of infrastructure mostly have roots in individual decisions — made at or deferred to either national or individual stakeholder levels. However, local decisions have network impact.

True ownership means more than compliance. It means to “think network”. It also means all network stakeholders actively contribute to network-level planning and to adhering to it, to volunteering capacity during peak periods, to implementing cross-border solutions without waiting for mandates, to harmonising technological and infrastructure evolution, and to holding themselves accountable to network performance metrics with the same rigour they apply to national/individual ones. It finally means scrutinising how individual performance and decisions affect the wider network.

The governance architecture of the Single European Sky distributes responsibilities because political reality demands it. But distributed responsibilities without distributed accountability is a recipe for collective underperformance. If we are all essential building blocks of the pan European ATM network, we must behave as equal owners of that network — not tenants paying minimum rent. The network’s performance is only as strong as the weakest link willing to take responsibility for it.

Predrag Vranjkovic
Head of Strategy, Engagement and Institutional Relations, Eurocontrol

Stop celebrating fragmentation!

De-fragmentation has been one of the main drivers behind the creation of the Single European Sky (SES). Numerous publications estimate the cost of fragmentation at between 880M€ and 3 billion€ per year. These costs stem primarily from infrastructure inefficiencies (Eurocontrol 2006),^[1] including the lack of common systems and piecemeal procurement driven by national and local specifications per Air Traffic Control Unit. Various regulations and institutions under the SES policy initiative target de-fragmentation, notably the performance scheme, the charging regulation, the SESAR deployment funds, and Network Management. Yet critical reviews consistently show that fragmentation has not decreased despite these efforts and to the contrary cements fragmentation.

At the Budapest ATM Network Forum, several speakers called for greater efforts by all actors to overcome fragmentation. The overall tone felt more like a celebration of fragmentation than a genuine effort to address it.

The Network Manager's (NM) role should be strengthened with greater competency over airspace organisation, infrastructure investment, and coherence between Performance Plans and the Network Operations Plan (NOP). The proposed European ATM Network infrastructure deployment function (Art. 37.2 NFIR) is a key initiative to close the gap left by uncoordinated infrastructure rollout –The future NFIR must give the NM sufficient tools to unblock deployment bottlenecks without overriding state authority on procurement and contracting.

The current performance scheme and charging regulation has itself become a driver of fragmentation: as it has pushed ANSPs to cut investment, entrench existing airspace and route structures, report capacity figures not always aligned with reality, and measure environmental impact through route efficiency rather than actual trajectory efficiency.

The SESAR Deployment Funds have paradoxically also increased fragmentation by financing local or national deployments that do not necessarily reduce it at the network level.

Thus, we should stop celebrating fragmentation and start to defragment the European Air Traffic management system.

Marc Baumgartner
SESAR/EASA coordinator, IFATCA

[1] <https://www.eurocontrol.int/sites/default/files/2019-06/impact-fragmentation-european-atm-cns-2006.pdf>

A step change in technology calls for a new cost recovery regime

A broad consensus exists that the future of air navigation service provision, along with the availability of the necessary capacity for controlling a growing volume of air traffic in a safe manner, should be based on new technologies and a new system of cooperation. Digitalization, the New Service Delivery Model, a Service-Oriented Architecture, AI-supported solutions, and disruptive technologies are just a few of the concepts often mentioned nowadays. While technology experts predominantly discuss these topics with a certain excitement, financial experts are more concerned, as these concepts entail serious financial consequences. The two most interesting relevant topics of the ongoing policy discussions are risk allocation within the general context of the financial framework and incentive schemes.

The existing financial framework, i.e., the performance scheme, differentiates between two cost recovery regimes: one, where ANSPs bear practically all the cost risks, within the context of operational expenditures. The second cost recovery regime concerns “cost exempt” categories, among others for capital expenditures, where a quasi-full cost recovery regime is in place, where ANSPs do not bear any cost risk. Under these two schemes, it does matter whether a deviation from the performance plan concerns OPEX or CAPEX.

The classification of cost items is basically an accounting (thus not technological) issue. However – if the two regimes remain – the importance of the accounting treatment will increase significantly when moving towards a more service-oriented architecture, where a significantly increased OPEX share is anticipated. Or maybe not. The envisioned new technologies and the cooperative approaches they necessitate will probably result in atypical risk sharing agreements. Experience suggests that the IFRS classification of these new contracts remains uncertain. In any case, care should be taken to ensure that decisions are driven by technological and operational considerations rather than by accounting treatment, particularly where different accounting outcomes entail different risk-sharing consequences.

Another topic pertains to the incentives embedded in the performance scheme. As for CAPEX, the current rules focus on the difference between the planned and the actual costs. This current scheme cannot be considered appropriate as it is essentially incentivizing the spending of money up to the level of what was planned. There are no direct targets and consequently no incentives for deploying technology, namely there are no direct incentives for investing into technological solutions. The only consequence under the current incentive scheme is financial: ANSPs must repay the money they have already received from airspace users for the committed execution of their investment plans. Paradoxically, this also applies even when a project is delivered as planned but at a lower cost.

Thus, my recommendations are the following: first, the way risks are distributed among stakeholders shall not be an accounting issue. Rather, risk distribution has to be part of a homogenous regime for cost recovery. Second, the incentive scheme should reward the delivery of technological capabilities, and not the mere spending of resources. Finally, cost-efficiency targets should be set considering also the foreseen significant increase in investment-related costs (should they be OPEX or CAPEX), and ANSPs shall not be forced into a trade-off between cost containment and technological evolution. In my view, while the step change in technology might lead to short-term cost increases, airspace users are probably willing to invest if the appropriate returns are foreseen. In other words, they may prefer ANSPs not to return the funds they have been given for investments, rather to deliver a return on their investments.

Kálmán Seregélyes
CFO, Hungarocontrol

Clear governance arrangements: a pre-requisite for a robust Network

The European ATM Network is becoming perhaps the most important pillar of the Single European Sky and an increasingly important component of the global aviation system. With the evolution of the Network concept, the Network Functions have evolved to include aspects such as the shaping and management of airspace structures, capacity management, and infrastructure development. The governance of these functions is a fundamental, yet unresolved problem, the solution to which may determine how efficiently the Network will be operated and developed in the coming years or decades.

Under EU law, through the governance arrangements for the Network Functions, a wide range of actors – both public and private – have been conferred the responsibility to operate and develop the Network. These governance arrangements may be perceived as the institutional framework of the Network that governs behaviour, interactions and how the public interest may be pursued. Today, several aspects of how the Network should be governed are still unclear. The Forum has helped to identify and, to some extent, address some of the existing uncertainties.

Although there was broad agreement that the Cooperative Decision-Making (CDM) process cannot deliver legally binding decisions, there were opinions that the Network Operations Plan (NOP) nevertheless has binding effects. Also, there was general agreement that the roles and responsibilities in the governance of the Network remain insufficiently defined, especially with respect to the responsibilities of the Member States and the legal nature of the decisions reached in the decision-making process (CDM) within the context of the execution of the Network Functions.

Legal uncertainty, the absence of strong leadership and clear accountability were highlighted as significant weaknesses of the system. It remains unclear to what extent the execution of the Network Functions involves an exercise of public powers, to what extent private entities are involved in the execution of public powers, and how some degree of stakeholder accountability could be introduced into the system.

While the CDM process originated as an operational and coordinative mechanism, the SES regulatory framework has given it a new purpose and has significantly broadened its scope. However, key aspects like the exact scope of the decision-making authority, the responsibilities of the decision-makers and the legal nature of the decisions have not been clearly defined. Despite having a legal basis, the CDM process operates within an underdeveloped legal framework and has gradually evolved into an opaque decision-making structure. Still, this is the institutional framework for the execution of the Network Functions today, with potential implications for long-term planning, infrastructure development and investment, airspace design, incentive schemes, and the implementation of corrective and remedial measures by individual stakeholders. Under such circumstances, the governance of the Network Functions lacks the robustness, clarity and leadership necessary for the effective and efficient functioning of the system.

In my view, the clarification of the governance and institutional framework of the Network Functions is of fundamental importance, as the elimination of uncertainties could reduce the tensions in the system between the different stakeholders and provide a firm foundation for building the trust necessary for a truly cooperative approach. The problem is complex of course, since network governance is closely connected to airspace sovereignty, the division of competences between the EU and the Member States, the exercise of public powers, and the protection of particular interests (both public and private).

Answering a few basic questions may lay a good foundation for designing a robust and efficient system of governance:

1. What is the exact scope of each Network Function?
2. Does the execution of the Network Functions involve an exercise of public authority through a public function?
3. Is the decision-making involved in the execution of the Network Functions (CDM) a purely coordinative process or does it involve an exercise of public authority?
4. In case it does, who may exercise powers of a public authority and how can those powers be exercised?
5. Does the adoption of remedial and corrective measures involve the exercise of public authority or is it a purely coordinative process without legal consequences?
6. Should the accountability to be established in the system be based on the decisions of a public authority, voluntary commitments or simply transparency and peer pressure?

It is of course difficult to answer these questions through the analysis of the provisions of the SES 2+ Regulation, as its wording leaves significant space for interpretation. Furthermore, the NFIR can neither narrow nor broaden the scope of the SES 2+ Regulation. So, what could be the solution for addressing uncertainties?

In my view, a straightforward approach is necessary. The European Commission is well-placed to propose answers for the fundamental questions identified above and to establish a consensus with the Member States with respect to the interpretation of the SES 2+ Regulation. Then, the NFIR may be drafted accordingly. Answering the questions above should serve as a basis for establishing a firm foundation for creating the legal certainty and developing the trust necessary for a truly cooperative system. Establishing a strong leadership role, some form of stakeholder accountability, and a leaner, more transparent system of governance will of course require further efforts in developing innovative solutions.

Iván László Arnold
Director Single Sky, Hungarocontrol