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# REFRAMING AIR NAVIGATION SERVICES: A MODERN SERVICE DELIVERY MODEL

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**Abstract**

*The increasing digitalisation and growing complexity of air traffic management require a reassessment of traditional approaches to air navigation service provision. Emerging service delivery models move away from nationally isolated structures towards data-centric, network-enabled solutions. This paper examines these new models through the lens of airspace architecture principles and analyses the evolving roles Air Navigation Service Providers (ANSPs), in particular their transformation into Air Traffic Service Providers (ATSPs) and ATM Data Service Providers (ADSPs). The proposed models promote a functional separation between operational Air Traffic Services (ATS) and ATM Data Services. This separation improves interoperability, scalability, and regulatory transparency, while maintaining safety and enhancing flight efficiency, cost effectiveness, and environmental performance. The transformation also supports the implementation of SESAR and Common Project objectives, especially those related to trajectory-based operations, system-wide information management, and cross-border service integration. Finally, the separation of ATSP and ADSP roles has the potential to improve overall network performance, and enable market-based provision of data services, provided that strong governance arrangements, data quality assurance mechanisms, and effective regulatory oversight are in place.*

**Keywords**

*Air Navigation Services, Air Traffic Service Providers, ATM Data Service Providers, Regulation (EU) 2024/2803 Single European Sky – SES2+*

## 1. Introduction

The emerging vision for Air Navigation Service Providers (ANSPs), in the context of Air Traffic Data Providers (ADSPs), represents a fundamental shift in how air navigation services are organised and delivered.

Rather than relying on geographically bound systems, this vision promotes the transformation of ANSPs into, or their close cooperation with, ATM Data Service Providers. This shift enables service-oriented and virtual architectures that support dynamic cross-border operations and more flexible capacity sharing.

European Union (2024) suggests that the new service delivery model builds on the concept of ATM Data Service Providers, where ATM Data Services – also referred to as "Air Traffic Data Services" or "ADS" — encompass services consisting of the collection, aggregation and integration of operational data from surveillance, meteorological and aeronautical information service providers, network functions, and other relevant data-generating entities. These data are then processed and made available for Air Traffic Control and Air Traffic Management purposes.

Within this framework, an ANSP may operate solely as an Air Traffic Service Provider or combine Air Traffic Services and ATM Data Services within a single organisation, subject to full compliance with applicable regulatory requirements. These include

- certification under Commission Implementing Regulation (EU) 2017/373;
- compliance with emerging ATM Data Service Provider requirements, including those under the forthcoming Common Project 2 regulation (expected to be submitted to the European Commission before summer 2026);
- assurance of fair and non-discriminatory data access; effective oversight by the National Supervisory Authority through audits;
- maintenance of safety as the overriding objective; and compliance with SWIM and cybersecurity standards.

## 2. Airspace Architecture – Based Service Delivery Models

Service delivery models describe alternative approaches to organising Air Navigation Services, ranging from nationally independent provision to highly integrated or Union-wide arrangements. These models include vertically integrated structures, functionally separated configurations, and cooperative or alliance-based approaches (SESAR, 2019).

At the level of individual Air Navigation Service Providers (ANSPs), several service delivery models can be distinguished.

In the **integrated service delivery model**, an ANSP provides both Air Traffic Services (ATS) and ATM Data Services within a single organisation, reflecting a traditional vertically integrated structure.

In contrast, the **independent service delivery model** separates operational Air Traffic Services from data provision, with the ANSP acting solely as an Air Traffic Service Provider (ATSP) and relying on external ATM Data Services.

The **specialised service delivery model** further develops this functional separation by assigning specific ATM data services — such as SWIM, surveillance, or meteorological services — to dedicated ATM Data Service Providers (ADSPs), rather than offering a comprehensive service portfolio.

The **alliance service delivery model** extends this concept through shared data service platforms, whereby dedicated ADSPs deliver ATM Data Services to multiple ATSPs.

Beyond individual organisational arrangements, a Union-wide service delivery model envisions Air Navigation Services being provided at the EU level. This model is based on a common data layer accessible to all European ANSPs, capacity-on-demand mechanisms that support cross-border service provision, and service-oriented architectures that enable dynamic resource sharing across the network (SESAR, 2019).

Finally, the three-layer model addresses the transformation of the ATM system as a whole rather than individual Area Control Centres. It conceptualises service delivery across three interconnected layers — business, services, and infrastructure — providing a structured framework for system-wide evolution (SESAR, 2019).

### *2.1. Decision framework*

Several service delivery models can facilitate the transformation of ANSPs into ADSPs; however, the three-layer model and the independent or specialised service delivery models are the most directly applicable. In particular, the specialised service delivery model, when supported by the three-layer model, provides the most robust architectural foundation for this transformation. The independent and integrated service delivery models offer pragmatic pathways for transitioning ANSPs, while the alliance service delivery model is better suited as a complementary mechanism rather than a primary framework for transformation.

### *2.2. Emerging opportunities*

In this emerging framework, the primary service delivery models, as illustrated in Figures 1 and 2, remain under active research. Although the regulatory framework is still being developed, pilot implementations are already underway. Airspace within each State is organised into one or more Flight Information Regions (FIRs), each managed by a dedicated Area Control Centre (ACC). ACCs are further subdivided into adjacent Airspace Sectors (AS) or sector groups, with controllers typically trained and certified for a limited subset of sectors within an ACC. Each ACC relies on a tightly integrated Flight Data Processing (FDP) system that provides the Controller Working Position (CWP) with processed local flight information, weather, surveillance, and aeronautical data to support traffic planning, separation, conflict detection, and safety net operations. These FDP systems generally operate with a limited level of automation. Concurrently, the European Commission and the European Union Aviation Safety Agency (EASA) are developing the regulatory framework for ADSP certification, laying the foundation for broader implementation.

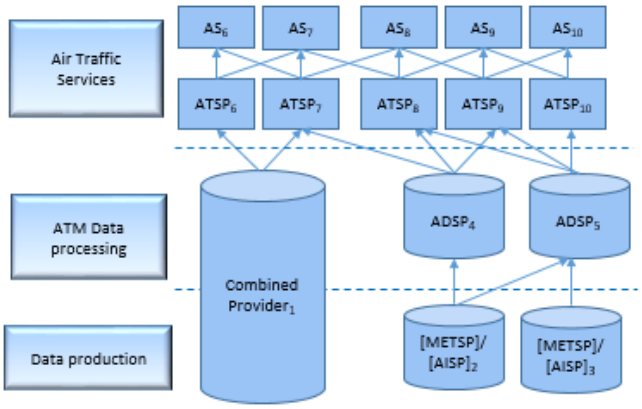


*Figure 1. Specialised Service Delivery Model (Source: SESAR, 2019)*

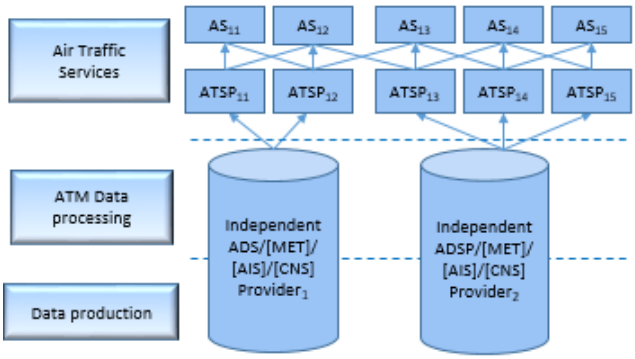


*Figure 2. Independent / Integrated Service Delivery Model (Source: SESAR, 2019)*

*Note 1: AS – Airspace Sector; ATSP – Air Traffic Service Provider; ADS – ATM Data Service; ADSP – ATM Data Service Provider; AIS – Aeronautical Information Services; AISP – Aeronautical Service Provider; CNS – Communication, Navigation and Surveillance; MET – Meteorology; METSP – Meteorological Service Provider.*

## 3. Alternative Perspectives on the Models

As part of our research, we examined the models with a focus on the transformation of ANSPs into ATSPs and ADSPs, considering several key dimensions, suggested by the European Union (2021).

- Operationally, airspace is optimised based on traffic flows rather than national boundaries. In terms of operations and technology, Trajectory-Based Operations (TBO) serve as the

core concept, supported by progressively enhanced automation for Air Traffic Controllers (ATCOs).

- The framework dimension emphasises flexible allocation of ATCO resources and seamless cross-border service provision.
- From a regulatory perspective, certification frameworks for new service providers are being developed alongside a performance-based approach.
- Finally, the models are designed to be scalable, flexible, and resilient, incorporating fall-back capabilities and redundancy to ensure operational continuity.

## 4. Expected timeline

The key transition years are determined by regulatory, operational, and technological readiness, with anticipated research outputs illustrated in Figure 3:

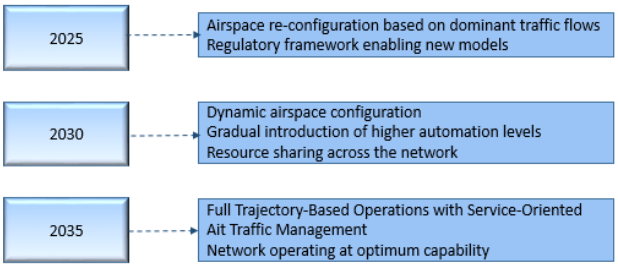


*Figure 3. Milestones based on Airspace Architecture Study (Source: Authors based on SESAR, 2019)*

### *4.1. Implementation weaknesses*

Several challenges have been identified in the transition from traditional ANSPs to ATSPs and ADSPs (Commission Implementing Regulation (EU) 2017/373, 2017 and CP1 Regulation, 2021):

- Unclear Certification Framework — The introduction of future ADSPs poses significant risks if certification and licensing issues are not adequately addressed.
- Lack of Established Procedures — No standardised processes currently exist for certifying Data Service Providers independently from traditional ANSPs.
- Evolving Standards — Technical and operational standards remain under development and are not yet fully mature.
- Unclear Liability — In the event of an accident involving multiple providers, responsibilities and liability chains are insufficiently defined.
- Data Integrity and Availability — Ensuring data quality, consistency, and cybersecurity is critical for safety.
- Need for New Methodologies — Future ATM systems require novel tools, performance indicators, and analytical approaches.
- Cybersecurity Risks — Increased data sharing introduces vulnerabilities, necessitating robust backup and failover mechanisms.
- Organisational and Operational Challenges — Transitional risks arise from operating between legacy and new systems.
- Trust and Sovereignty Concerns — Cross-border data services raise issues of confidence and regulatory compliance.
- Limited Market Maturity — The scope of ADSP service delivery remains undefined; only maximum potential service boundaries are currently identified.

### *4.2. Pathways for Transformation*

The future direction of the transformation from Air Navigation Service Providers (ANSPs) to ATS Providers (ATSPs) and Air Traffic Data Service Providers (ADSPs) is a shift toward data-centric, network-enabled, and service-oriented aviation systems, while improving flight efficiency and reducing environmental impact, maintaining safety the overriding priority (SESAR, 2019 and European Union, 2021).

It is enabled through functional separation between operational ATC services and ATM Data Services, allowing scalable and cross-border data provision.

## 5. Transition Options for Small ANSPs

Under applicable legislative and regulatory frameworks, any separation of an ANSP into an ATSP and ADSP requires thorough analysis and validation of processes and procedures. This ensures that service quality, accuracy, reliability, and compliance are maintained throughout the transition. Currently, these steps are under investigation within a research framework. Following legislative amendments, the separation process must be reassessed as necessary to allow the ANSP to operate under market conditions while delivering safe and reliable services.

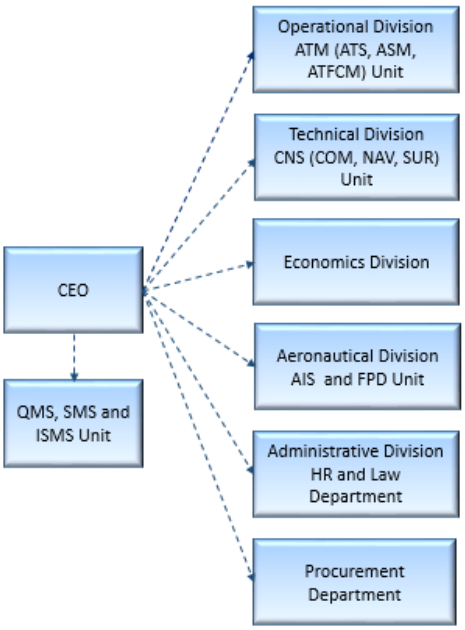


*Figure 4. Simplified organisational structure for small ANSP, illustrative overview (Source: Authors)*

*Note 2: CEO – Chief Executive Officer; QMS – Quality Management System; SMS – Safety Management System; ISMS – Information Security and Cybersecurity Management System; ATS – Air Traffic Services; ATM – Air Traffic Management; ASM – Airspace Management; ATFCM – Air Traffic Flow and Capacity Management; CNS – Communication (COM), Navigation (NAV) and Surveillance (SUR); AIS – Aeronautical Information Service; FPD – Flight Procedure Design; HR – Human Resources.*

## 6. Conclusion

The transformation of an Air Navigation Service Provider (ANSP) into separate Air Traffic Service Provider (ATSP) and ATM Data Service Provider (ADSP) roles represents a necessary and logical step in the evolution of air traffic management, driven by increasing digitalisation, network integration, and performance-based regulation. This separation establishes a clear distinction between operational service delivery and data-centric support functions, enhancing transparency, scalability, and regulatory oversight while maintaining safety as the paramount objective.

Analysis suggests that such a functional separation can improve interoperability, enable cross-border and network-level services, and align ANSP activities with SESAR and Common Project objectives. The feasibility and effectiveness of this transformation, however, rely on rigorous process validation, robust governance structures, and an adaptive regulatory framework that safeguards data quality, neutrality, and resilience.

Overall, the transition toward combined or distinct ATSP and ADSP roles is a key enabler for a data-centric, performance-driven, and future-ready air traffic management system.

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