

THE UNIQUE EUROPEAN AIR SPACE

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ABSTRACT

The evolution of air traffic, particularly within the European Union, underscores the importance of international cooperation, regulatory frameworks like the Single European Aviation Area and Open Skies, and the increasing focus on user satisfaction, especially for passengers rather than cargo. Modern management practices emphasise the need to prioritise service users, or passengers, by implementing responsive feedback systems and mechanisms that enhance their experience, despite historical challenges such as lengthy and inflexible processes. To align with contemporary business and technological advancements, these mechanisms must be optimised and rapidly integrated into air traffic management, ensuring that passenger satisfaction becomes a core element of the industry's growth and development strategy.

1.0 PLANNING SETTINGS

I Theoretical basis of the work

The dynamic evolution of international air traffic, primarily focused on passenger transport, necessitates a comprehensive analysis to optimise efficiency and preempt congestion, especially within the framework of European agreements like the Single European Sky and open skies policies. By examining detailed operational data and scientific literature, this work aims to identify critical bottlenecks and prioritise segments of air traffic that require targeted improvements, such as airspace management, route planning, and scheduling. The overarching goal is to develop strategic solutions that address potential problems, enhance the structure of aviation operations, and elevate user satisfaction through proactive auxiliary treatments, ultimately supporting the sustainable growth of the aviation industry and its regulatory frameworks.

II Methodology for scientific paper work

The paper discusses the development and implementation of a model to enhance air traffic management (ATM) optimisation, aligned with the ATM strategy 2000+ completed in 2003, emphasising security and protection. Although Bosnia and Herzegovina (BiH) is a member of the Single European Sky (SES) but not the European Union (EU), this status allows for a more flexible and expedited adoption of air navigation optimization methodologies, enabling BiH to advance its ATM systems concurrently with its EU accession measures, thereby potentially accelerating improvements in safety, efficiency, and security within its air traffic infrastructure.

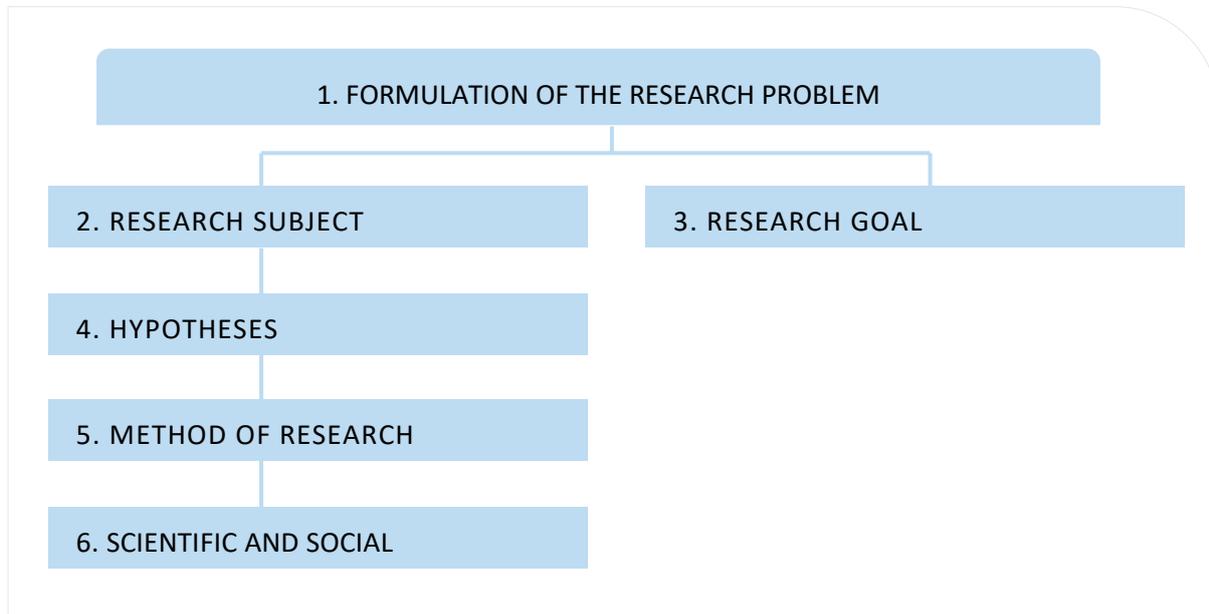


Figure 1, Outline of a scientific idea

1.1 Research objectives

The primary aim of this research is to develop a comprehensive European air traffic management system that guarantees an efficient, safe, and rapid flow of air traffic through adaptable and proportionate services tailored to diverse user needs, while adhering to stringent security standards, ensuring global compatibility, ecological sustainability, and consistent operational principles to effectively meet growing and evolving demand.

-  1) The goals should be set so that they find optimization solutions.
-  2) When setting each goal, you should take care of its connection and compatibility with other goals
-  3) Every set goal must be measurable, so that its execution can be monitored.
-  4) Goals must be challenging in order to be motivating.
-  5) Clear, consistent, measurable and challenging goals should be achievable in practice, because only achievable goals make sense.

Figure 2, Setting the purpose and goal of the work¹

¹ <https://www.boundless.com/management/textbooks/boundless-management-textbook/introduction-to-management-1/core-requirements-of-successful-managers-19/the-importance-of-performance-targets-125-3922/>

Optimizing air traffic flow management is essential for ensuring safety, efficiency, and sustainability in the highly complex, international air traffic system that involves technical systems, procedures, operators, and national regulations. By harmonizing international standards and best practices, the goal is to streamline processes, reduce delays, and enhance coordination across borders, ultimately supporting the social objective of improved air traffic operations. Achieving this requires continuous collaboration among global stakeholders to adapt to evolving technological advancements and operational challenges, ensuring a safe and efficient global airspace.

1.2 Method of research

Scientific research employs diverse methodologies such as analysis, synthesis, statistical, and causal comparative methods, each serving distinct purposes in systematic inquiry. The analysis method involves deconstructing complex concepts into simpler parts to understand their structure, while synthesis combines simpler judgments into more complex ones, building comprehensive knowledge from specific to general. The statistical method allows for the quantification and identification of patterns and regularities in phenomena, though it faces limitations in capturing the qualitative aspects of individual cases. The causal comparative method helps explore relationships within their natural context, focusing on causal links between variables. Together, these methods form a toolkit for rigorous, objective investigation across various scientific disciplines, enabling researchers to derive meaningful insights and theories.

1.3 Scientific and social justification of research – structure

This research focuses on optimizing air traffic services within European airspace, emphasizing the scientific and social justifications for such efforts. Scientifically, it highlights the importance of robust research methods and methodologies to analyze phenomena and solve problems related to air traffic management, aiming to enhance efficiency and safety. Socially, the study underscores the potential benefits of improved air navigation, such as preventing disruptions and increasing operational effectiveness, ultimately contributing to a more reliable and efficient transport system. Recognizing the complexity of long-term development, the research considers the multifaceted criteria, harmonization of interests, and sustainable investments necessary to support the ongoing evolution of the European air traffic system.²

² <http://www.merriam-webster.com/dictionary/optimization>

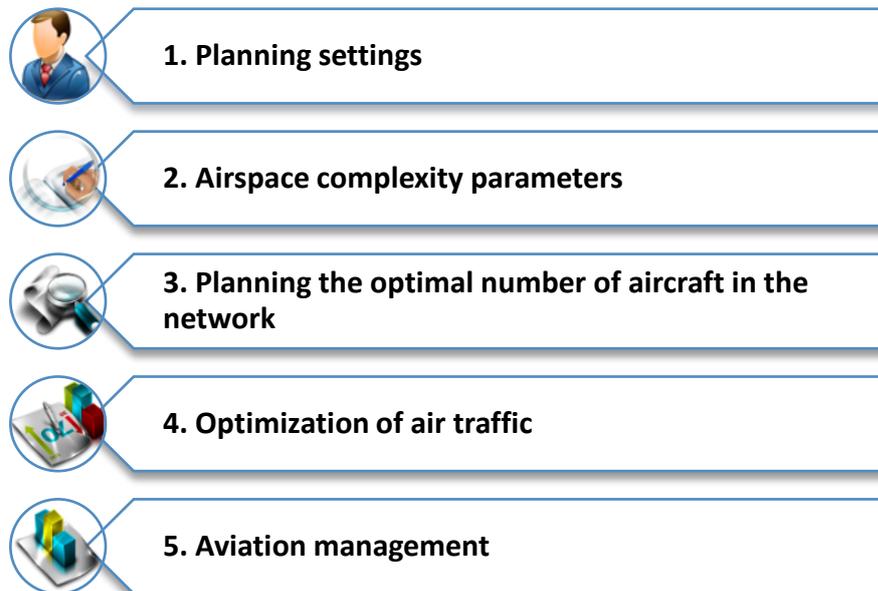


Figure 3, Structure of work

Through an introduction to the research problem, goals, literature review, and work organization; followed by an analysis of airspace complexity and traffic development, weighing social, economic, and external costs; then focusing on modeling the optimal number of aircraft through regionalization and mathematical approaches; next reviewing multidimensional air traffic optimization models; and finally, applying an aviation management concept with selected models to enhance service user determination. The research employs diverse methods—descriptive, comparative, statistical, analytical, and synthetic—to systematically analyze, compare, and synthesize knowledge from various scientific disciplines, aiming to address the core issue of service optimization within the technical, technological, and organizational framework of airspace integration, particularly within the Eurosook airspace.³

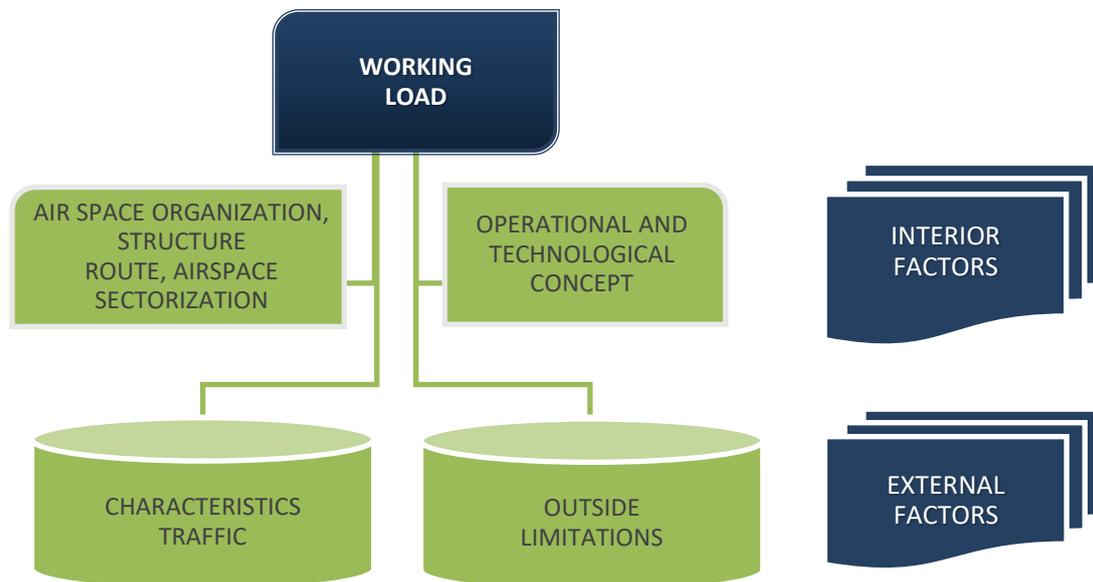
2.0 AIRSPACE COMPLEXITY PARAMETERS

The complexity of air traffic is best assessed through numerical validation of air traffic controllers' workload, considering various factors that influence this workload, including traffic volume, aircraft types, environmental conditions, and operational procedures. These sub-chapters likely explore these factors in detail, identifying how each contributes to overall complexity and how they can be managed or mitigated to ensure safety and efficiency in air traffic control operations.⁴

2.1 Factors Complexities

³ Šefkija Čekić: „Osnovi metodologije i tehnologije izrade znanstvenog stručnog dijela“ Fakultet za saobraćaj i komunikacije, Sarajevo, 1999.

⁴ <https://www.boundless.com/management/textbooks/boundless-management-textbook/introduction-to-management-1/core-requirements-of-successful-managers-19/the-importance-of-performance-targets-125-3922/>



Graph 1, Distribution of complexity factors influencing the workload of the controller⁵

The passage highlights that internal factors—such as airspace organization, route structure, sector configurations, and operational procedures—are controllable elements that can enhance air traffic management efficiency by reducing complexity and workload. Conversely, external factors, including traffic characteristics like concentration and interaction types, as well as external restrictions such as military activities, regional control center interactions, and specific events, are external influences that impact controller workload but are less controllable. These external factors are fundamental to the model's basis, as they directly affect the operational environment and the challenges faced by controllers.⁶

2.1.1 Characteristics of Air Traffic

Traffic density significantly influences airspace complexity by affecting aircraft distribution, with higher density increasing the potential for conflicts and controller workload, especially when aircraft are closely spaced in time and space. Uniform dispersion typically reduces conflict risk, but increased volume or concentration raises operational challenges, particularly when external factors like traffic demand and restricted military zones limit available airspace, thereby intensifying the need for precise management and coordination to ensure safety and efficiency.

Potential indicators for evaluating traffic density are:

- I. unadjusted density;
- II. custom density;

⁵ <http://www.internationalairportreview.com/5697/airport-news/eurocontrol-issues-its-atm-cost-effectiveness-benchmarking-report-for-2009/>

⁶ <http://www.eurocontrol.int/publications/atm-cost-effectiveness-ace-2014-benchmarking-report-2015-2019>

- III. concentration within specific time intervals;
- IV. spatial and temporal density;
- V. sector overflight time;
- VI. number of conflicts.

Possible indicators for measuring traffic complexity include the frequency of climbs and descents, which directly impact the spatial demands and potential conflict points, the density of aircraft within a given airspace, the variability in aircraft speeds and trajectories during vertical movements, and the degree of coordination required between neighboring control centers, especially in regions with closely situated main airports. Additionally, factors such as the volume of traffic during peak hours and the presence of congested or constrained airspace can further influence the overall complexity, necessitating more sophisticated traffic management strategies, as:

- a) demand for flight level changes,
- b) changes in flight levels,
- c) the number of airports in the vicinity,
- d) number of conflicts.

The described situation highlights the complexity of air traffic flow management, emphasizing that while simplified models assume uniform, linear movement of aircraft, real-world traffic involves intricate interactions primarily driven by crossing flows and intersecting points, which are influenced by traffic demand and internal route structures, leading to delays and increased conflict risks. Key indicators of this complexity include the number of conflicts, intersection points, and the behavior of cross-flows, which can delay traffic in neighboring sectors, while traffic mix—characterized by varying aircraft speeds, climb and descent profiles—further complicates controller tasks by requiring different separation standards and making conflict detection more challenging. Although VFR (Visual Flight Rules) data is less central in complexity assessments, the IFR (Instrument Flight Rules) to VFR flight ratio can serve as an additional indicator, reflecting the diversity of aircraft performance and the associated operational challenges in airspace management.

The ratio of aircraft powered by turbojet and turboprop engines offers a straightforward glimpse into the diversity of aircraft speeds in a specific airspace, reflecting the performance differences between these propulsion systems, especially at lower altitudes. While this ratio may not be highly informative for detailed assessments of operational complexity, it effectively illustrates the spectrum of aircraft capabilities, with turbojet-powered aircraft becoming more prevalent at higher flight levels due to turboprops' limited ceiling, thus highlighting how aircraft performance characteristics influence their operational distribution across different flight altitudes.⁷

2.1.2 Structure of the Airspace

The proposed indicators likely include measures such as sector workload and capacity, operational costs, route complexity and flexibility, and the degree of military influence on route

⁷<https://books.google.ba/booksid=UZR7jk650iMC&pg=PP2&dq=air+traffic+characteristics&hl=en&sa=X&ved=0ahUKEwiQ4rih3PbPAhVL1SwKHdsEClIQ6AEIMTAA#v=onepage&q=air%20traffic%20characteristics&f=false>

structure and sector configuration, which collectively help evaluate the efficiency and safety of airspace management. The proposed indicators are:

- a) number of routes within the airspace volume,
- b) the number of cross and joint points within the volume of space,
- c) flow direction – one-way/two-way.⁸

2.1.3 External Limitations

Military flying significantly impacts Croatian airspace capacity, complexity, and controller workload, especially due to numerous military zones such as those in Slavonia, south of Zagreb, and along the Adriatic, with the NATO zone being particularly influential. The implementation of flexible use of airspace (FUA) aims to mitigate these challenges through agreements and coordinated decisions. Additional factors like military exercises, adverse weather, and unforeseen events further increase complexity, compounded by seasonal variations in IFR traffic that demand resource optimization. Ultimately, airspace capacity constraints necessitate regulatory measures to manage excess traffic, emphasizing the importance of effective military-civilian coordination and adaptive airspace management strategies.⁹

2.2 Cognitive Complexity

Cognitive complexity in air traffic control measures the mental effort required to safely manage and separate aircraft, often quantified by the time spent on tasks within a specific period, typically one hour. As air traffic increases, models have been developed to assess controller workload based on data such as those in table 8, where the total load is expressed in recorded minutes per hour. The load threshold is set at 50% when the hourly load reaches 30 minutes, indicating a moderate workload, while overload occurs when it exceeds 70%, or approximately 42 minutes, emphasizing the importance of managing cognitive demands to maintain safety and efficiency, particularly for the executive controller role.

<i>Load threshold [%]</i>	<i>Load description</i>	<i>Recorded working hours within 1h [min]</i>
70 i više	Overload	42 +
54-69	High	32-41
30-53	Midle	18-31
18-29	Low	11-17
0-17	Vary low	0-10

Table 1, Air traffic controller workload threshold values and descriptions¹⁰

⁸ https://en.wikipedia.org/wiki/Airspace_class

⁹ <http://www.eurocontrol.int/articles/flexible-use-airspace>

¹⁰ <http://www.bhansa.gov.ba/upravljanje-zra%C4%8Dnim-saobra%C4%87ajem/kontrola-zra%C4%8Dnog-prometa>

The described workload model for regional air traffic controllers integrates three core tasks: routine load, which involves monitoring aircraft presence and communication; approval tasks, such as granting climb or descent clearances; and conflict resolution during concurrent aircraft operations in shared airspace segments. By quantifying each task's duration and frequency within specific time intervals, the model provides a comprehensive assessment of controller workload, crucial for ensuring safety, optimizing staffing, and managing airspace complexity in Europe, especially during high-demand periods or complex traffic scenarios involving overlapping routes and flight levels. The equation can be written as follows:

$$WL = t_{ac} \cdot O_{ac} + t_{cnf} \cdot O_{cnf} + t_{cl} \cdot O_{ci}$$

where:

O_{ac} , O_{cnf} te O_{ci} - the number of occurrences of routine tasks, climbing/descending tasks and resolving conflicts in a time interval (most often 1h);

t_{ac} , t_{cnf} te t_{ci} – the duration of routine tasks, climbing/descending tasks and resolving conflicts.¹¹

The Macroscopic Controller Workload Model (MWM) used within EUROCONTROL's COCA framework, based on the RAMS Plus software and the COLA simulator, assesses air traffic complexity and controller workload by analyzing sector-specific data, including flight and interaction complexities. Flight complexity considers aircraft numbers, types, and traffic patterns during peak hours, while interaction complexity evaluates conflicts, route interactions, and separation standards. By collecting detailed data on task durations across different complexity levels and weighting these by sector parameters, the model effectively links sector complexity to controller workload, enabling accurate simulations and capacity assessments without significant deviations from software-based results.

The SAAM software package offers a capacity planning (CAPAN-like) function for workload analysis, although this feature is still under development. Despite this, it effectively categorizes the controller's work tasks into six well-defined and detailed categories, facilitating comprehensive workload assessment and management.¹²

- flight data management – receiving comics (flight plans) upon the arrival of the aircraft in the sector of jurisdiction and their de-registration,¹³
- coordination – receiving the estimated time and flight level of the aircraft from the competent neighboring regional control center or sector within the center; transmission of the estimated time and flight level of the aircraft to the neighboring center or sector; receiving and transmitting the time and flight level of the aircraft to sectors with which it borders vertically,¹⁴

¹¹ http://www.eurocontrol.int/sites/default/files/library/019_Airspace_Complexity_and_HAZOP.pdf

¹² <http://www.icao.int/safety/pbn/Pages/default.aspx>

¹³ https://en.wikipedia.org/wiki/Flight_planning

¹⁴ <https://aerospace.honeywell.com/en/services/aerospace-services/air-traffic-control-coordination>

- conflict detection – detection of potential conflicts before the aircraft enters the sector (standard detection); additional detection of potential conflicts between aircraft already present in the sector; detection of potential conflicts from aircraft that change vertically or vertically separated sectors in the configuration;¹⁵
- radio-telephone communication - includes all tasks related to performing radio-telephone communication with aircraft (first contact, transponder code change, climb and descent instructions, etc.), which significantly increases the complexity.¹⁶
- radar surveillance and interventions - tasks that are closely related to conflicts and are different with regard to the distance between aircraft, where it is necessary to detect conflicts in order to prevent them from occurring; radar surveillance is defined at about 20 NM, and radar intervention at a distance of about 10 NM, where additional separation intervention needs to be applied.¹⁷
- surrender via radar - also closely related to conflicts, and implies the involvement of several sectors in a conflict and the surrender of aircraft in a conflict between sectors.¹⁸

2.3 Airspace Complexity Indicators

The concept of airspace complexity extends beyond just air traffic, encompassing broader factors that influence the intricacy of managing airspace, with the ACE Working Group establishing key indicators such as adjusted density (AD), vertical (VDIF), horizontal (HDIF), and speed (SDIF) complexity to quantify these challenges, primarily focusing on en route traffic under regional control. Despite these metrics, the lack of a comprehensive analysis model limits the ability to incorporate internal route structure factors, which are crucial for understanding traffic flow patterns, though the division of airspace into a network of cells offers a partial approximation by mitigating the influence of route configurations. This nuanced understanding underscores the multifaceted nature of airspace complexity, emphasizing that traffic volume is only one aspect amid broader structural and operational considerations.¹⁹

2.3.1 Operational Concept of Air Traffic Management

The traditional ATM system faces sustainability challenges due to its inability to meet the rising demands for capacity, safety, efficiency, and cost-effectiveness amid increasing air traffic post-2020; in response, the European ATM 2000+ strategy aims to fundamentally redesign air traffic management by emphasizing automation and leveraging advanced technology, thereby ensuring the system's adaptability, safety, and efficiency to accommodate forecasted traffic growth.²⁰

2.3.2 ATM Strategy 2000+

The "ATM 2000+" strategy, approved in 2000 and completed in 2003, aimed to enhance European air traffic management by ensuring safety, efficiency, and environmental

¹⁵ [http://www.skybrary.aero/index.php/Medium_Term_Conflict_Detection_\(MTCD\)](http://www.skybrary.aero/index.php/Medium_Term_Conflict_Detection_(MTCD))

¹⁶ <https://en.wikipedia.org/wiki/Radiotelephone>

¹⁷ https://en.wikipedia.org/wiki/Secondary_surveillance_radar

¹⁸ <http://aviation.stackexchange.com/questions/23381/how-can-a-military-combat-pilot-indicate-surrender>

¹⁹ www.researchgate.net/publication/3977808_Air_traffic_complexity_indicators_ATC_sectors_classification

²⁰ [www.icao.int/Meetings/anconf12/Document%20Archive/9854_cons_en\[1\].pdf](http://www.icao.int/Meetings/anconf12/Document%20Archive/9854_cons_en[1].pdf)

sustainability through a coordinated, integrated approach. It focused on developing a complex network of interconnected systems—covering ground and aviation components—that optimize capacity, improve navigation operability through programs like EATMP, and meet diverse user and security requirements. This strategy emphasized the importance of adaptable services that are globally compatible and capable of managing the entire flight process, from departure to arrival, ensuring a seamless, safe, and efficient flow of air traffic across the European airspace. The scope of the ground ATM system will be to ensure the overall efficiency of the system and the organization of traffic in a way to optimize capacity, while the aviation part of the system will take over the function of separating the aircraft and arriving "at the right place at the right time".



Figure 4, Main objectives of the ATM strategy 2000+²¹

The ICAO Convention assigns each country responsibility for organizing and managing navigation services within its territory, which poses challenges in Europe due to the continent's numerous small sovereign states, making individual management of navigation services complex and inefficient. To address this, European countries have established collaborative frameworks like Eurocontrol and the Single European Sky initiative, which aim to coordinate air traffic management across borders, standardize procedures, and optimize the use of airspace, thereby enhancing safety, efficiency, and capacity despite the fragmentation of sovereignty.²²

2.3.3 Acceptance of ATM Security Regulations (ESARR)

²¹ www.eurocontrol.int/sites/default/files/content/documents/official-documents/pc/commission-act/cn-decisions-95-en.pdf

²² [www.icao.int/Meetings/anconf12/Document%20Archive/9854_cons_en\[1\].pdf](http://www.icao.int/Meetings/anconf12/Document%20Archive/9854_cons_en[1].pdf)

EUROCONTROL established the Security Commission as an independent body to provide advice and to ensure a permanent high level of security in the ATM system in the ECAC countries.

Over the last few years, EUROCONTROL has approved six Safety Regulatory Requirements that lay a broader basis for the safety regulation of ATM systems. Approved ESARRs that are mandatory for EUROCONTROL members are:

- 1) ESARR 1 – National ATM Security Regulatory Framework, 2002.
- 2) ESARR 2 – Reporting and assessment of extraordinary events in ATM, 2000.
- 3) ESARR 3 – Use of SMS by ATM service providers, 2000.
- 4) ESARR 4 – Risk assessments and mitigation in the ATM system, 2001.
- 5) ESARR 5 – ATM staff, 2002.
- 6) ESARR 6 – Program support for the ATM system, 2003.

The provisions of each ESARR enter into force within the third year from the date of publication.²³

2.4 Air Traffic Flow Management

ATFM (Air Traffic Flow Management) is a crucial function designed to ensure the safe, efficient, and timely flow of air traffic by maximizing air traffic control capacity and aligning traffic volumes with available capacities of air traffic service providers. It involves planning, coordination, and implementation of strategic, pre-tactical, and tactical measures to prevent overloads and optimize system capacities within the European Air Traffic Management Network (EATMN), while minimizing negative impacts on airspace users. These measures are carefully timed and tailored to balance safety, efficiency, and operational flexibility, ultimately supporting a smooth and reliable air traffic system.

The implementing rules must support the operational decisions of air navigation service providers, airport operators and airspace users, and must refer to the following rules:

flight planning; use of available airspace capacities in all phases of the flight, including the slot, and use of general air traffic routes, including:

- creation of a unique publication for the route and traffic orientation,
- options for diverting general air traffic from congested areas, i
- priority rules regarding airspace access for general air traffic, especially during periods of congestion and crisis situations.

The Air Traffic Flow Management Ordinance establishes requirements for air traffic flow management in order to optimize available EATMP capacities and improve ATFM processes.

The Ordinance applies to the following participants involved in ATFM processes, or representatives acting on their behalf:

²³ www.skybrary.aero/index.php/ESARRs

- ❖ aircraft operators;
- ❖ air traffic control operational service units including ATS reporting offices and airport control services;
- ❖ aviation information services;
- ❖ entities involved in airspace management;
- ❖ administrative bodies of the airport;
- ❖ central unit for ATFM;
- ❖ local units for ATFM;
- ❖ slot coordinators of coordinated airports.²⁴

2.5 Management of Air Traffic Flow and Airspace Capacity

The ATFCM is divided into four main phases:

1. Strategic phase: classifies data on long-term flight requirements according to air traffic capacities.
2. Pre-tactical phase: balances the next day's flights with available air traffic capacity.
3. Tactical phase: manages current flights in accordance with existing air traffic capacities and develops corrective measures in order to successfully resolve emerging situations and crises.
4. Post operative analysis: analyzes the day of operation

ATFCM has become an important part of ATM due to the utilization of the full capacity of the air traffic system without the risk of reducing safety. In the future, ATC capacity management will be as important as traffic flow management.²⁵

3.0 AVIATION MANAGEMENT

3.1 Benchmarking in Airline Company Positioning on the Market

Benchmarking, fundamentally involves comparing processes and outcomes to identify causes of superior performance, serving as a guide for continuous improvement rather than a strategic plan itself. It encompasses internal and external types—such as competitive, industrial, and generic—and is widely used in the aviation industry to enhance strategic planning, product and process comparison, and goal setting. Leading airlines leverage benchmarking to gain a competitive edge, exemplified by initiatives like the AEA's monthly service quality indicators. Effective benchmarking is an ongoing, systematic effort integrated across all company functions, emphasizing repeated practice and continuous enhancement to institutionalize excellence.

²⁴ https://en.wikipedia.org/wiki/Air_traffic_flow_management

²⁵ <http://www.eurocontrol.int/articles/air-traffic-flow-and-capacity-management>

BEST PRACTISE →

- DEFINING ACTIVITIES
- RANKING OF CRITICAL FACTORS
- DEFINING OPTIMAL PRACTICE
- CHECK THE BENCHMARKING INFORMATION
- ACTION PLAN

In benchmarking Croatia Airlines' marketing strategy, it's essential to analyze both external factors—such as consumer preferences, market competition, and environmental conditions—and internal factors through tools like SWOT analysis to identify strengths, weaknesses, opportunities, and threats. Despite Croatia Airlines' poor positioning in passenger or tonne kilometers when these are numerator-based indicators, it performs better in yield metrics based on the denominator, indicating areas of potential competitive advantage. Incorporating Harrington's five-stage benchmarking process, which emphasizes analyzing external and internal factors, can help identify strategic improvements. The comparative data on Airbus aircraft utilization across 55 airlines provides a valuable operational benchmark, revealing how Croatia Airlines' aircraft productivity compares and highlighting opportunities to optimize fleet deployment in line with broader marketing and operational goals.



Figure 5, Benchmarking in positioning²⁶

A solid level of aircraft and fuel productivity is evident, but also a large disparity in labor productivity.²⁷

²⁶ <https://edukalife.blogspot.ba/2015/10/benchmarking-market-positioning.html>

²⁷ <http://study.com/academy/lesson/what-is-benchmarking-definition-types-process-examples.html>

3.2 Elaboration of the Process and Regionalization of the European Air Traffic System with Reference to the MAASTRICHT and CEATS Projects of Regional Centers

MAASTRICHT UACC, located in Maastricht, Netherlands, is a pivotal European air traffic control center responsible for managing air traffic over Belgium, Luxembourg, the Netherlands, and northwestern Germany, and is the second largest in Europe after London due to its strategic proximity to major airports like London, Paris, Frankfurt, and Amsterdam. Since 1972, it has safely overseen approximately 25 million flights in one of Europe's most congested airspaces, becoming a leader in navigation services and a key player in the integration and consolidation of European airspace, enhancing security, increasing throughput, and reducing flight costs through operational efficiency and border management. Its role, along with projects like CEATS, underscores its importance in maintaining Europe's complex air traffic network.

CEATS is a project to establish a traffic control center in the upper airspace for Central Europe with headquarters in Vienna. 8 countries participate in the project: Croatia, Bosnia and Herzegovina, Austria, the Czech Republic, Slovakia, Hungary, Slovenia and Northern Italy. The main goals of the project are:

- a. Maintaining and increasing the level of security;
- b. Increasing the capacity of the air traffic control system;
- c. Improved economy of flight operations.

The air traffic control center in the upper airspace CUAC was supposed to start operating in 2007. but it was extended for 2010.²⁸

3.2.1 MAASTRICHT UACC

Since its establishment in 1972, EUROCONTROL's Maastricht UACC has become the second largest air traffic control center in Europe, managing the dense upper airspace over Belgium, Luxembourg, the Netherlands, and parts of Germany, controlling over 1.2 million flights in 2000 alone. It handles aircraft during cruise, climb, and dive phases at altitudes above 24,500 ft, working closely with military authorities to ensure safety and efficiency amid rapidly increasing traffic—doubling every 15 years—while achieving significant improvements such as an 80% reduction in delays and a 24% decrease in air traffic costs between 1990 and 2005, exemplifying its vital role in managing Europe's expanding airspace demand.

EUROCONTROL has implemented advanced tools like the MADAP automatic data processing system and RAPNET data distribution network to enhance the safety and efficiency of air traffic flow, particularly within the Maastricht UACC, which serves as a model for broader European initiatives such as the CEATS project, demonstrating a coordinated institutional and technical approach to managing increasing flight volumes effectively and cost-efficiently.²⁹

3.2.2 Central European Air Traffic Services - CEATS

²⁸ <https://www.eurocontrol.int/articles/projects>

²⁹ <https://www.eurocontrol.int/muac>

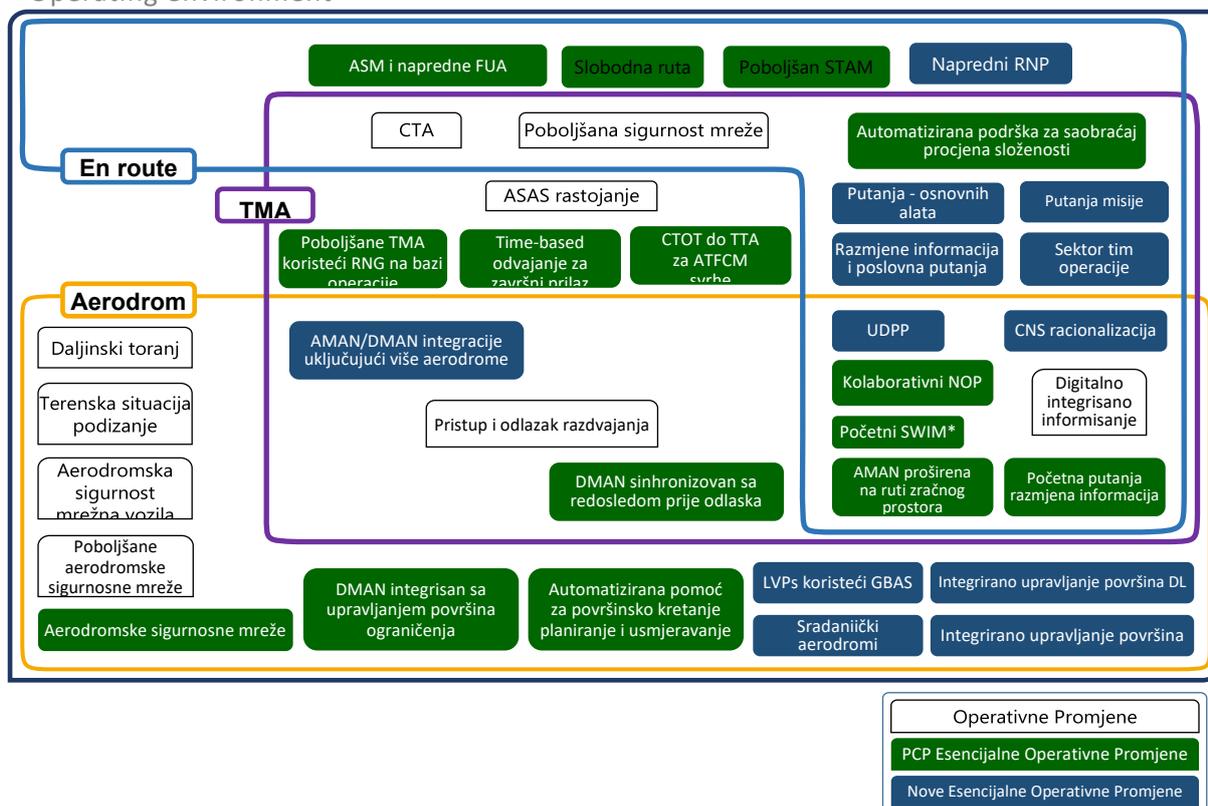
The Central European air traffic control project aims to enhance safety, efficiency, and expeditious flow of air traffic across Austria, Bosnia and Herzegovina, Croatia, the Czech Republic, Slovakia, Hungary, Italy, and Slovenia, with full EUROCONTROL compatibility and participation in the EATMS system. Approved by EUROCONTROL on June 6, 1997, the project involves establishing the CEATS UACC upper airspace, with a contractual agreement signed by participating countries beginning in June 1997, although Bosnia and Herzegovina signed later in October 2001, reflecting ongoing collaboration to unify and modernize regional air traffic management.

The most important strategic goals of the project can be listed as:

- Maintain and if possible increase the level of security in the CEATS region;
- Increase in airspace capacity;
- Improve the economy of flight operations;
- Support the access of military users to the airspace.

The CEATS project aims to establish a unified airspace management system modeled after the successful Maastricht UACC, emphasizing a "single CEATS sky" to eliminate national border limitations and optimize air traffic flow through harmonized procedures and capacity enhancements. Following a 2001 ministerial meeting, the goal was to implement the initial CEATS UACC by October 2007, with full operation targeted by 2010, designating Vienna as the operational hub and engaging EUROCONTROL to review project costs while advancing ratification of the CEATS contract.

Operating environment



Graph 2, Operating environment

SOURCE: ATM Master plan II³⁰

According to the CEATS random program, the transition to the full operation of the CEATS UACC will proceed gradually, and three main stages have been identified in the transition process.

- 1999 the EUROCONTROL commission determined the locations for the CEATS UACC center and its units
- The unit for strategic planning and development of the CSPDU, located in Prague, launched on November 1, 1999.
- Center for research, development and simulation CRDS, located in Budapest, launched on July 1, 2001.
- CTC training center, located in Forli (Italy), launched in 2004.
- Center for air traffic control in the upper airspace CUAC located in Vienna, will be launched in the period from 2007-2010.³¹

3.2.3 Unit for Strategic Planning and Development CSPDU

The CSPDU, based in Prague, plays a crucial role in the CEATS project by overseeing the development and implementation of the UACC infrastructure, ensuring alignment with strategic objectives from ATM 200+, ICAO CNS-ATM, and FATMP, with a focus on enhancing safety, reducing costs, increasing capacity, minimizing environmental impact, and ensuring operational uniformity. Its responsibilities include shaping institutional, economic, and management structures, operational and technical planning, designing the air traffic control system, fostering cooperation across airspace levels, and providing expert support to related programs within EATMP, all aimed at achieving a modern, efficient, and safe European air traffic management system.

The CSPDU is responsible for overseeing the comprehensive strategic planning and management of the CEATS project, ensuring it is embedded within an institutional and economic framework to secure financial support, establish an effective management structure, and optimize airspace management. This includes managing activities related to the development and implementation of the CEATS UACC, coordinating planning, design, development, and operational deployment of air traffic control services. Additionally, CSPDU must ensure the timely execution of the CEATS program in alignment with financial constraints, strategic goals outlined in the CEATS strategic plan, and principles fostering the creation of a unified European air transport system, including collaboration with the EATMP program.³²

³⁰ <http://atm2003.eurocontrol.fr/past-seminars/5th-seminar-budapest-hungary-june-2003/speeches/g-kerkhofs.ppt/view>

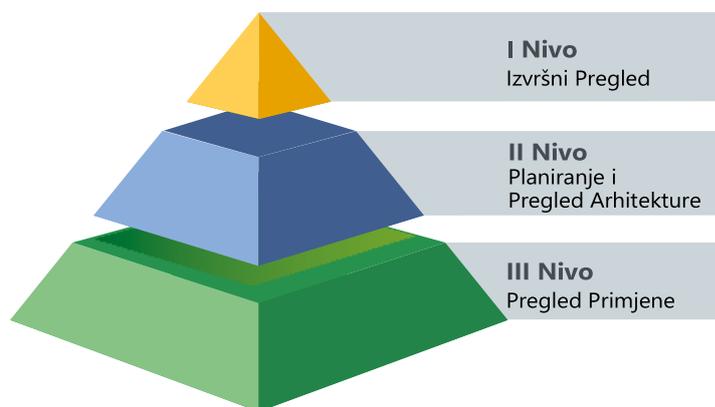
³¹ <http://atm2003.eurocontrol.fr/past-seminars/5th-seminar-budapest-hungary-june-2003/speeches/g-kerkhofs.ppt/view>

³² <https://books.google.ba/books>

[id=bVOaAAAAQBAJ&pg=PA253&lpg=PA253&dq=CSPDU+Unit+for+Strategic+Planning+and+Development&source=books](https://books.google.ba/books?id=bVOaAAAAQBAJ&pg=PA253&lpg=PA253&dq=CSPDU+Unit+for+Strategic+Planning+and+Development&source=books)

3.3 Etiological Overview and Projection of the Implementation of the Single European Sky Project

The Single European Sky project, initiated to unify and optimize European upper airspace management, has been a longstanding vision since EUROCONTROL's founding in 1960, reflecting the enduring need among European nations for a coordinated and efficient air traffic system; despite partial implementation in earlier decades, the concept continues to be vital today, aiming to enhance safety, reduce delays, and improve environmental sustainability across the continent.



Graph 3, Three levels of the European ATM Master Plan³³

EUROCONTROL predicts that air traffic will double by 2020. The current systems, with ongoing improvements, should be sufficient to handle this amount of traffic until the middle of the next decade, but after that, radical measures will need to be taken to reduce air traffic congestion.³⁴

3.3.1 One Market, One Currency, One Sky

The European Union's move to establish a single market in 1985 exemplifies the potential for borderless cooperation, yet challenges remain in air traffic management (ATM) due to fragmented work habits, limited airway routes rooted in national borders, and legislative disparities among member states. Despite efforts to modernize and improve ATM, costs are still high, partly because current systems do not fully leverage the shortest routes over water or land. The Single European Sky initiative aims to address these issues by harmonizing regulations and streamlining operations across countries, facilitating the implementation of the ATM 200+ strategy to meet future air traffic demands more efficiently. However, achieving these goals requires overcoming significant legislative and operational hurdles to create a truly integrated and cost-effective European airspace.³⁵

rce=bl&ots=IhOjLbaRs&sig=sbYgKYWbOfJP1A0Dq9Qbhf16UxQ&hl=en&sa=X&ved=0ahUKEwj56rGln_jPAhWPD RoKHZD8CtkQ6AEIGzAB#v=onepage&q=CSPDU%20Unit%20for%20Strategic%20Planning%20and%20Development&f=false

³³ http://www1.atmb.net.cn/CD_web/UploadFile/2013092718150954.pdf

³⁴ http://www1.atmb.net.cn/CD_web/UploadFile/2013092718150954.pdf

³⁵ http://www1.atmb.net.cn/CD_web/UploadFile/2013092718150954.pdf

3.3.2 EUROCONTROL and the Single European Sky Project

EUROCONTROL, established in 1960 and revised in 1997, is a pivotal European organization dedicated to ensuring safe, efficient, and environmentally sustainable air navigation across 37 member states, encompassing both civil and military sectors. Its core activities span from gate-to-gate operations, airspace flow management, controller training, and the deployment of innovative safety technologies, to establishing equitable billing procedures for air navigation services. By developing coordinated short-, medium-, and long-term strategies involving national institutions, airports, and industry stakeholders, EUROCONTROL aims to address the anticipated increase in air traffic, enhance safety standards, reduce operational costs, and minimize environmental impact, making it a cornerstone in Europe's efforts to modernize and optimize its air traffic management system.

The single European sky project adopted by the European Commission has plans characterized by the following goals:

- Restructuring of European airspace for the purpose of better air traffic flow.
- Creation of additional capacities.
- Increasing the overall efficiency of the ATM.

The package of laws within the ATM2000* strategy, adopted by the European Commission, covers the necessary regulatory elements, which should be developed in order to create a purposeful European air traffic management. These are:

- A. Legal frameworks for the creation of a single European sky
- B. Payment for the use of navigation services
- C. Organization and use of airspace
- D. Mutual cooperation of the ATM 2000* strategy system.

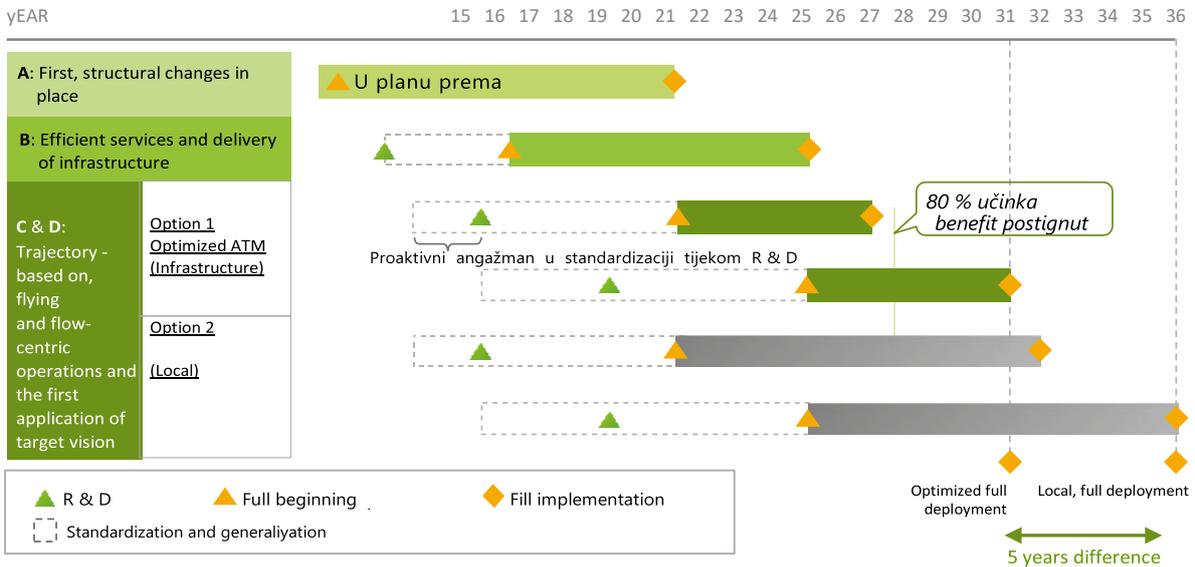
In October 2002, the European company's approach to Eurocontrol reflected a strategic alignment with the broader European integration efforts for the single European sky initiative, emphasizing cooperation, expertise sharing, and regulatory adaptation to enhance air traffic management capacity. The European Commission recognized Eurocontrol's vital role in implementing flexible airspace use, uniform billing, and improved information systems, aiming to develop an efficient, high-capacity air traffic system capable of supporting future growth. The subsequent 2003 Memorandum of Cooperation further strengthened this partnership, focusing on project implementation, R&D, global navigation systems like Galileo, data management, and international collaboration, underscoring Europe's long-term commitment to transforming its airspace management into a more integrated, efficient, and sustainable system.³⁶

3.3.3 SESAR Single European Sky Research Program

The development phase of the management of the single European sky project will last from 2008. until 2013

³⁶ http://www1.atmb.net.cn/CD_web/UploadFile/2013092718150954.pdf

The goals of introducing SESAR by 2035.



¹ Representing the start of deployment of the solution in all operating environments, deployment may begin earlier for, for example, airspace users and some ANSPs.
² Not all solutions are distributed everywhere, e.g. only 50% of planned aircraft equipped, military aircraft take longer to implement.

Graph 4, Objectives of SESAR introduction³⁷

The European ATM Master Plan aims to modernize and streamline air traffic management across Europe by fostering collaboration among industry, international organizations, and regulatory bodies, with EUROCONTROL playing a central coordination role. The development and validation of innovative technologies from 2014 to 2020 will address the challenges posed by increasing air traffic, fragmentation of European airspace, and aging navigation systems, ensuring greater integration, efficiency, and safety. The success of these initiatives relies heavily on transparent, independent development activities and effective cooperation among stakeholders, ultimately supporting the future of a more connected and congestion-resilient European airspace.

ATM Master Plan – II

SESAR - Key Characteristics

	Essential Operational Changes			Key R & D activity
	Prije-SESAR	PCP	Novo	
 <p>Optimized ATM network services</p>	<ul style="list-style-type: none"> •ATFM slot exchange •Civil/military airspace and aeronautical data coordination •Basic network operations planning •STAM 	<ul style="list-style-type: none"> •ASM i A-FUA •Automatizirana podrška za procjenu složenosti prometa •Collaborative NOP •CTOT to TTA for ATFCM purposes •Enhanced STAM •Free route 	<ul style="list-style-type: none"> •UDPP 	<ul style="list-style-type: none"> • Management of dynamic airspace configurations • Integrated local DCB processes • Network prediction and performance • Collaborative network management functions • Mission trajectory driven processes • AU processes for trajectory definition • AU trajectory execution from FOC perspective • AU fleet prioritisation and preferences

³⁷ https://en.wikipedia.org/wiki/Single_European_Sky_ATM_Research



Advanced air traffic services

<ul style="list-style-type: none"> • Basic AMAN • Introduction of PRNAV • Provision of ATSA- AIRB 	<ul style="list-style-type: none"> • AMAN extended to en-route airspace • Enhanced TMA using RNP-based operations • Free route 	<ul style="list-style-type: none"> • Advanced RNP • AMAN/DMAN integration including multiple airports • Trajectory-based tools • Sector team operations 	<ul style="list-style-type: none"> • Flight- and flow-centric ATC • Collaborative control • Improved performance in the provision of separation • Advanced separation management • IFR RPAS integration • Dynamic and enhanced routes and airspace • Enhanced rotorcraft and GA operations in the TMA • Ad hoc delegation of separation to flight deck • Enhanced airborne collision avoidance for commercial air transport normal operations - ACAS Xa • Use of arrival and departure management Information for traffic optimisation within the TMA • Generic (non-geographical) controller validations
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High-performance airport operations

<ul style="list-style-type: none"> • Initial airport CDM • A-SMGCS L1 and L2 • Crosswind reduced separations for arrivals • Operations in LVC 	<ul style="list-style-type: none"> • TBS for final approach • Automated assistance to controller for surface movement planning and routing • Airport safety nets • DMAN synchronised with pre-departure sequencing • DMAN integrating surface management constraints • Airport operations plan 	<ul style="list-style-type: none"> • LVPs using GBAS • Collaborative airport • Integrated surface management • Integrated surface management datalink 	<ul style="list-style-type: none"> • Wake turbulence separations optimisation • Enhanced arrival procedures • Independent rotorcraft operations at the airport • Traffic optimisation on single and multiple runway airports • Traffic alerts for pilots for airport operations • Enhanced airport safety nets for controllers • Surface operations by RPAS • Enhanced collaborative airport performance management
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Provision of aviation infrastructure

<ul style="list-style-type: none"> • IP network • B2B services • Information reference and exchange models • A/G datalink • ADS-B, WAM • GNSS, GBAS, SBAS 	<ul style="list-style-type: none"> • Common Infrastructure Components: SWIM registry, PKI • SWIM technical infrastructure and profiles • Aeronautical information exchange • Meteorological information exchange • Cooperative network information exchange • Flight information exchange • Initial trajectory information sharing (4D) 	<ul style="list-style-type: none"> • CNS rationalisation • Information sharing and business trajectory • Mission trajectory 	<ul style="list-style-type: none"> • Integration of trajectory management processes in planning and execution • Performance-based trajectory prediction • Enhanced mission trajectory • Management and sharing of data used in trajectory (AIM, meteo) • Workstation, service interface definition and virtual centre concept • SWIM TI purple profile for A/G advisory information sharing • Airborne D&A systems supporting integrated RPAS operations • FCI terrestrial datalink • Future satellite communications datalink • GA/RC specific CNS systems • GBAS • Multi-constellation/multi-frequency GNSS • Alternative position, navigation and timing
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Graph 5, SESAR - Key Characteristics³⁸

Source: ATM Master Plan – II

The SESAR program represents a groundbreaking collaborative effort to modernize European air traffic management by uniting civil and military stakeholders, industry, operators, and legislators to develop a comprehensive Master Plan. Spanning three phases from 2005 to 2020, its primary aim is to eliminate fragmentation in ATM, integrate diverse plans and resources, and create a synchronized, efficient system that meets the needs of all parties involved. With around 30 organizations and numerous investors contributing expertise, SESAR serves as a

³⁸ <http://www.sesarju.eu/solutions>

vital initiative to enhance European aviation safety, capacity, and environmental sustainability through innovative technological and operational solutions.³⁹

SESAR 2035 action ambitions (categorized by KPA)

Key performance areas	SES High-Level Goals vs. 2005	Key performance indicator	SESAR ambitions vs.	
			Absolute savings	relative savings
Profitability: ANS productivity	Reduce ATM costs per service unit by 50% or more	<ul style="list-style-type: none"> • Gate-to-gate managed ANS price per flight • Determine the unit cost for en-route ANS* 	EUR 290-380	30-40%
Operational efficiency	-	<ul style="list-style-type: none"> • Fuel consumption per year (ton/year) • Weather year by year (min/year) • Departure delay (min/dep) 	4-8 min 0.25 - 0.5 toni	3-6 % 5-10 %
Capacity	Enabling a 3-fold increase in ATM capacity	<ul style="list-style-type: none"> • En-route management of air traffic delays* • Primary and reactionary delays all causes • Additional flights to congested airports (millions) <ul style="list-style-type: none"> • Network throughput additional flights (millions) 	1-3min 0.2-0.4 (milioni) 7.6-9.5 (milioni) <small>Dodatni letovi, ne uštede</small>	10-30 % 5-10 80-100
Environment	Enable a 10% reduction in the environmental footprint	<ul style="list-style-type: none"> • CO2 emission (ton/flight) • Horizontal flight efficiency (actual path)* • Vertical efficiency • Taxi-out phase 	0.79 -1.6 toni	5-10 %
Safety	Safety improvement by a factor of 3-4	<ul style="list-style-type: none"> • Accidents with ATM contribution 	No increase in accidents	Poboljšanje za faktor 3-4
Security	-	<ul style="list-style-type: none"> • ATM-related security incidents resulting from traffic disruptions 	No increase in accidents	

Metrics are monetary values in billion Euro terms

* Targeted by the Performance for Performance scheme

1 Additional flights that can be accommodated at congested airports, representing 5-10% of flights at congested airports (~ 31% of 14.4 (million) flights in 2035).

Graph 6, SESAR 2035 action ambitions⁴⁰

3.3.4 SESIS Single European Sky Implementation Support

The SESIS project by EUROCONTROL aims to streamline and support the certification process for National Competent Authorities (NSAs) and Navigation Service Providers (ANSPs) by providing comprehensive guidance materials. These resources are designed to ensure that all parties adhere to the necessary regulatory and safety standards, facilitating efficient and compliant certification procedures. By standardizing the process, SESIS enhances safety, consistency, and transparency across European air navigation services, ultimately contributing to safer and more reliable air traffic management.

The ANSP certification guide consists of three parts:

- a) Providers of aviation communication and navigation services, and system monitoring,
- b) Provider of aeronautical information,

³⁹ https://en.wikipedia.org/wiki/Single_European_Sky_ATM_Research

⁴⁰ <http://www.sesarju.eu/node/2567>

c) Provider of meteorological information.

3.3.5 Portfolio of Projects in the Jurisdiction EUROCONTROLA

The EUROCONTROL initiatives within the EATMP program aim to enhance European air traffic safety, capacity, and environmental sustainability through various projects such as the 8.33 kHz frequency expansion to address spectrum demand, the development of the aviation information service and the European aeronautical information database for harmonized flight data, the implementation of the ADS automatic surveillance system, and the reduction of vertical separation with RVSM to increase airspace capacity. Additional efforts include adopting the WGS84 geodetic system, improving air traffic statistics and forecasting through STATFOR, optimizing airport operations for safety and efficiency, and aligning operational improvements via the ECIP and LICP plans, collectively contributing to a more efficient, safe, and environmentally conscious European air traffic management system.⁴¹

Resources



Graph 7, Path from validity of goals to benefits⁴²

3.3.6 Airport management solution

⁴¹ <http://www.eurocontrol.int/dossiers/single-european-sky>

⁴² <http://www.eurocontrol.int/dossiers/single-european-sky>

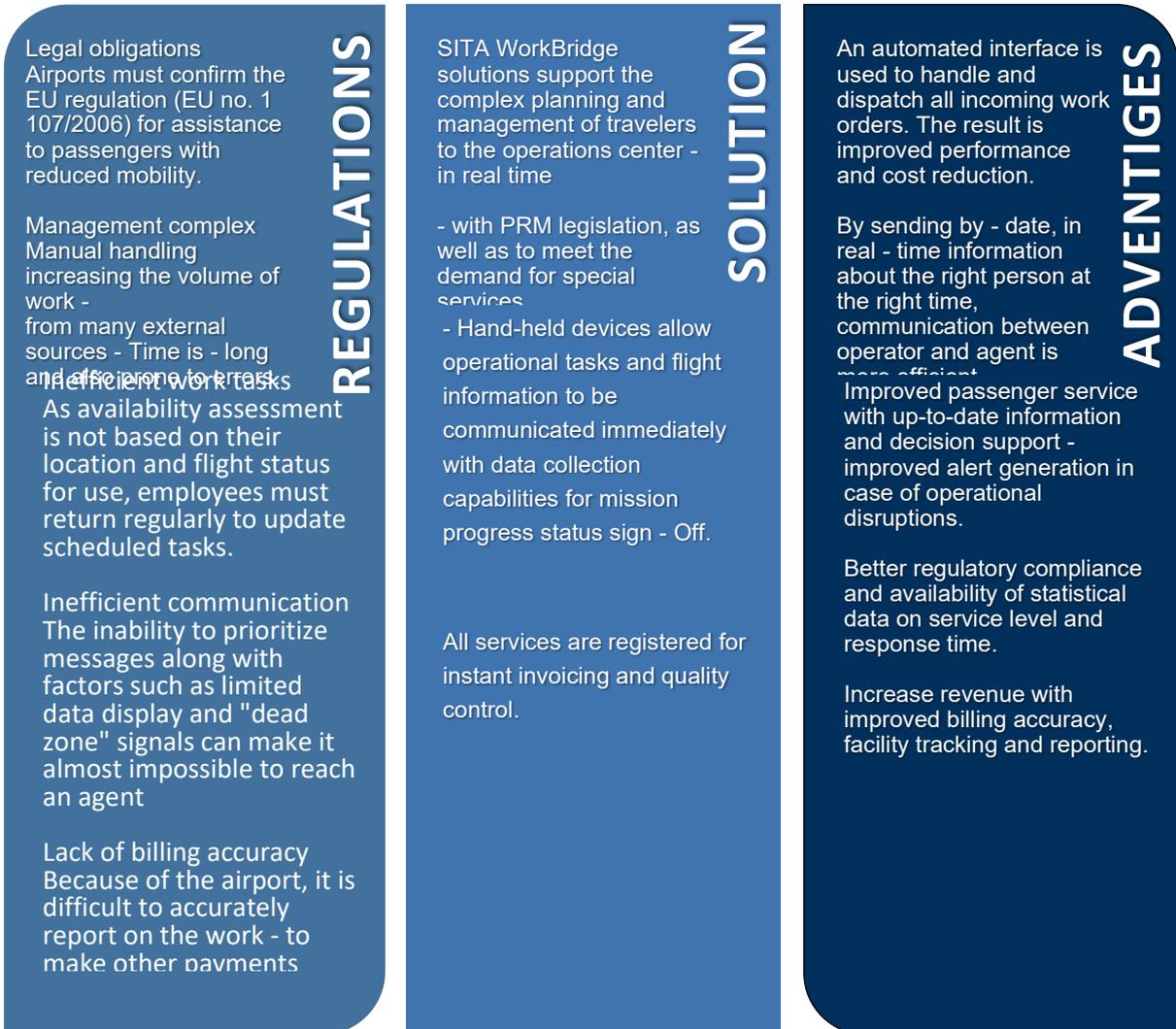


Figure 6, PRM and special support services⁴³

1. Automated work order solution

⁴³ <https://www.sita.aero/solutions-and-services/solutions/airport-management>

Interprets PRM service requests between various and disparate sources - including standard messages, telex parsing, web services, web-based solutions, direct entries, etc.

2. Generation of automated tasks

Based on the rules and parameters, the system automatically generates the appropriate sequences of tasks and necessary routes to provide the requested service. This includes planning the optimal number of aircraft - to - air transport through the terminal, the Schengen zone, the use of different means of transport, etc.

3. Integrated real-time flight information

It enables alerts, instant rescheduling and work distribution, thus increasing productivity.

4. Optimized scheduling and shipping;

Based on staffing, skills, availability, location, flight information, etc., the system will automatically assign tasks to agents/drivers at both terminals and side ramps. Distribution is done in a way that maximizes the use and efficiency of the workforce.

5. Mobile handheld devices

Instant communication and information about the flight and work tasks, with the ability to collect data on the status of the progress of the mission sign - off - achieving deployment in accordance with the status of the entire operation.

6. Reporting and collection of exports

Dynamic functional report - building functionality ensures both operational and financial business intelligence. Registration of services upon completion ensures precise and timely export billing.

→ Case studies

PRM solutions are supported by many of the world's airports, including two of the busiest International Airport Paris CDG and Hong Kong. Direct feeds to the airport flight information system ensure the time to pick up and take passengers, with hundreds of mobile devices to work directly communicate relevant information to agents. Critical data is recorded for quality assurance and billing.

4.0 OPTIMIZATION OF AVIATION TRAFFIC

4.1 Legal Frameworks - International regulations in aviation

The development of international civil aviation law is marked by key treaties and protocols, starting with the Warsaw Convention of 1929, which established the airline ticket as a fundamental travel document and laid the groundwork for civil aviation regulation. The Chicago Convention of 1944 further advanced aviation law by establishing the "five freedoms" of the air and affirming national sovereignty over airspace, enabling the development of duty-

free zones. The Geneva Convention of 1948 set rules for airline conduct during incidents, emphasizing airline responsibility toward passengers and cargo. The Hague Protocol of 1955 amended the Warsaw Convention, clarifying airline liability for checked baggage and security issues, while the Paris Agreement of 1956 regulated non-linear and charter flights, easing restrictions for humanitarian, small, and irregular flights.⁴⁴

4.2 International aviation organizations

International sources of aviation law are deeply intertwined with the activities of various global and regional organizations, primarily ICAO, which operates under the Chicago Convention and fulfills administrative, legislative, and judicial functions to promote the safe, harmonious, and rapid development of civil aviation worldwide. Complementing ICAO, organizations like IATA, founded in 1945 and representing over 270 airlines, focus on legal competition and price regulation among carriers, while professional bodies such as the International Organization of Pilots and Controllers address specific professional interests. Regional entities like the Association of European Airlines (AEA), established in 1952 by major Western European airlines, further support aviation development and cooperation within their respective regions, collectively shaping the legal framework and standards governing international civil aviation through resolutions, recommendations, and acts that member states and airlines adhere to.

4.2.1 Agreement on the establishment of the Common European Aviation Area

The European Common Aviation Area (ECAA) aims to create a unified aviation market based on free market access, equal competition, and shared safety, security, and environmental standards among EU member states and partner countries, with all parties committed to implementing measures to uphold these objectives. It ensures unrestricted company establishment, cooperation on aviation security, and mutual assistance in incident response, including efforts to prevent illegal acts like hijacking. Additionally, the agreement promotes cooperation in air traffic management through initiatives like the Single European Sky, emphasizing safety and efficiency improvements, and mandates the implementation of relevant legal frameworks, organizational restructuring, and ratification of international conventions such as the Montreal Convention during the transition period, with observer participation in EUROCONTROL activities.

4.2.2 Agreement on air transport

The provided text outlines the legal framework governing air transport contracts, distinguishing between passenger and goods transportation, with emphasis on international and domestic distinctions. In passenger transport, the airline commits to carry passengers and baggage from departure to destination at agreed times, while passengers owe the fare; the carrier is responsible for the carriage, and the passenger's rights and obligations depend on the specific contract. For goods, regulated by the 2011 Act, the airline undertakes to transport items via air, with the shipper responsible for accurate data in the air waybill, which formalizes the contract upon signing. Payment is tied to the goods transported to the final destination, and the carrier

⁴⁴ [https://hr.wikipedia.org/wiki/Pari%C5%A1ki_ugovor_\(1951.\)](https://hr.wikipedia.org/wiki/Pari%C5%A1ki_ugovor_(1951.))

has rights to safeguard undelivered goods if the consignee defaults, including holding the items or storing them securely, with obligations to inform involved parties.

4.2.3 National administrations, directorates or agencies

European Union agencies or directorates serve as national supervisory bodies in air navigation, responsible for issuing qualification certificates to service providers, ensuring ongoing compliance with operational standards, and regulating service provision through regulations and administrative acts. They also issue public documents, maintain comprehensive records, conduct inspections of aviation entities, and participate in international aviation organizations, collaborating with foreign authorities to promote safety, efficiency, and interoperability in air navigation services across member states. Their organization mainly includes parts such as:

→ Department for air traffic management (ATM – Air Traffic Management),

→ Department of communication, navigation and surveillance systems and devices CNS (Communication Navigation Surveillance).

The national administration participates in the drafting of by-laws in the field of air traffic management and airports and supervises their implementation within the framework of the organization for air traffic control.

The civil aviation directorate or agency is responsible for ensuring aircraft airworthiness, issuing licenses and authorizations, and maintaining the aircraft registry, including registering all categories of aircraft. It also issues the Certificate of Competence for Public Air Transport (AOC) and collaborates with the European Commission to implement the European Common Aviation Area (ECAA) Agreement, particularly in air traffic management through programs like ISIS, with national air navigation authorities serving as the National Supervisory Authority (NSA).

5.0 CONCLUSION

Effective airline positioning relies on comprehensive benchmarking and strategic planning, considering factors such as flight schedules, tariffs, revenue management, and distribution channels, all within a highly competitive global market. Understanding the dynamic nature of these elements enables airlines to adapt swiftly to changing circumstances, ensuring sustained market relevance and growth. Developing a detailed business plan is essential, as it articulates the company's ambitions, outlines opportunities, and provides a framework for aligning operational activities with strategic goals, supported by thorough analysis of various business models to optimize decision-making and foster long-term success.

The research highlights the lack of a definitive concept for creating business plans, particularly in the air traffic sector, which remains underexplored compared to other industries, offering a foundational model for future studies and practical applications. It underscores the critical issue of European airspace fragmentation, necessitating coordinated reforms involving manufacturers, airlines, air traffic control, international bodies, and regulatory authorities to develop a unified, efficient "single European sky" (SES). To meet rising passenger demands for quality, punctuality, affordability, and environmental safety, the paper advocates for

technological modernization, regulatory adjustments, and regionalization of air traffic management, emphasizing airspace control and sustainable development as vital components for optimizing aviation operations within a comprehensive, integrated European ATM system.

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