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Traffic Policy
Preliminary Communication
Accepted: Nov. 27, 2007
Approved: May 13, 2008

STRATEGIC FRAMEWORK OF AIR TRAFFIC DEVELOPMENT

ABSTRACT

The paper elaborates the past development of air traffic in Europe from the aspect of its economic benefits and ecological lack of sustainability of conventional technology. The main guidelines of the strategic development are related to the implementation of the global ecological standard and actual reformation processes of the air traffic management system postulated by ATM 2000+ Strategy and the "Single European Sky" standard. The paper studies the wider aspects of integrated traffic development at the regional level and the factors influencing further development of the European air traffic.

KEY WORDS

air traffic, strategic planning, air traffic management, external costs, safety management, ecological management

1. AIR TRAFFIC DEVELOPMENT DETERMINANTS IN EUROPE

Recognizing the principles of sustainability, the projection of air traffic development needs to evaluate both the social and economic benefits of the aviation industry, and the external costs caused by air traffic. The economic benefits of aviation industry are doubtless. However, regarding its growth air traffic is the most progressive source of greenhouse gases that cause the global climate change with an estimated share of 3.5 percent.

The issue of negative dimension of air traffic, articulated through the costs of environmental pollution and congestion has become topical because of the traffic growth projection at a rate of 6 percent in the period from 2004 to 2008. In a recent study on external costs of traffic in the West European countries[1], the external traffic costs have been evaluated in the amount of about 10 percent of the gross domestic product with 14 percent accounted for by air traffic.

The planned system of measures of technical, operative and economic nature in the context of the implementation of Kyoto protocol provisions and the strategic documents of the European Union should contribute on the one hand to the reduction of the growth in traffic demand and negative impact of air traffic, whereas on the other hand it should ensure further economic growth.

1.1 Economic benefits of air traffic

The period since 1960 has seen air traffic growth at an annual rate of 11 percent for goods transport, and 9 percent for passenger transport, which is 2.4 times more than the average growth of the gross domestic product. The forecasts confirm further growing trend of air traffic at an annual rate of about 6 percent.

Following an unstable phase caused by escalation of terrorism in the US, Iraqi crisis and SARS syndrome in the Asia-Pacific region, the year 2004 saw a significant growth of the commercial aviation transport performance – 15 percent in passenger and 13 percent in cargo transport, as well as an increase in the load factor to 74 percent.[2]

The year 2007 saw a more moderate increase of 7.3 percent in passenger traffic and 4 percent in cargo

Table 1 - Growth indicators in international scheduled air traffic

2007 / 2006	Revenue Passenger Kilometres RPK %	Available Seat Kilometres ASK %	Passenger Load Factor PLF %	Freight Tonne Kilometres FTK %	Available Tonne Kilometres ATK %
Industry	7.3	6.3	77.3	4.0	5.1

Source: IATA Monthly MIS Traffic Statistics, 2007

traffic with further increase in the load factor to 77.3 percent (Table 1).

In 2005 more than 2 billion passengers were transported in air traffic, which is approximately a quarter of the world population, and almost 38 million tonnes of goods. The realised transport performance amounted to about 488 billion tonne kilometres[3].

At the end of 2005 the world commercial fleet had more than 22 thousand aircraft, out of which 18.2 thousand were jet and about 3.8 thousand were turbo-prop aircraft.

According to IATA forecasts, the trend of further growth has been marked by an average annual rate of 5.1 percent in passenger and 4.8 percent in goods transport (Table 2).

Table 2 - Traffic growth forecast

Forecast	Passenger traffic		Cargo traffic	
	2007	2007-2011	2007	2007-2011
Africa	6.7%	5.6%	5.0%	4.6%
Asia-Pacific	6.4%	5.9%	4.9%	5.4%
Europe	5.7%	5.0%	4.4%	4.3%
Middle East	8.5%	6.8%	5.9%	5.0%
N. America	4.1%	4.2%	3.7%	3.9%
S. America	4.7%	4.4%	5.0%	4.2%
Industry	5.8%	5.1%	4.6%	4.8%

Source: IATA Passenger and Cargo Forecasts, 2007

For the area of Europe, in the period from 2004 to 2023 Boeing plans an average annual traffic growth rate of 4.8 percent. The forecasts also say that the average economic development in the world in that same period will be 3 percent annually, passenger transport will increase by 5.2 percent on the average annually, and goods transport 6.2 percent on the average annually.[4]

For the period 2004-2023, Airbus predicts the traffic growth expressed in RPK of 5.3 percent on the average annually, i. e. 5.9 percent expressed in goods tonnes kilometres[5].

An evolution is also expected regarding increase in the average flight distance, increase in block speed, average PLF, and average annual aircraft load factor. According to the Airbus forecast the average growth rate in passenger traffic in Europe will be 5.2 percent in the period until the year 2023.

Aircraft industry realizes economic performance, measurable by the size of 4.5 percent of the world gross domestic product and ensures at the world level 28 million workplaces. More than 40 percent of the world trade (regarding value) is realized by air transport[6].

These indicators confirm the influence of air traffic on the total economic growth, and especially the correlation with tourist industry. The correlation of the economic performance of air traffic and the economic and tourist flows of a certain region, except from the direct financial indicators of business success is reflected in the indirect and induced impacts related to the air transport performance[7].

The World Tourist Organization (WTO) estimates that the share of tourist flows by air will increase in relation to other transport branches from 38 percent in 1995 to 42 percent in 2010[8]. At the same time regional redistribution of tourist flows in favour of Asia and Pacific is forecast, with a somewhat reduced share of Europe that will continue to be the dominant region as a tourist destination (Figure 1).

About 45 percent of passengers in air traffic belong to the tourist category, and more than 50 percent of the transport performance in passenger air traffic is realized for tourist purposes. The more recent estimates of the share of air traffic in the total tourist traffic range between 20 and 26 percent (2000)[9].

In the evaluation of the current condition on the market and the projection of further development, the category of unfavourable factors refers to the oil price and progressive introduction of "security" fees. Strict legislative on the protection of the passengers' rights in the European Union, with sanction provisions for

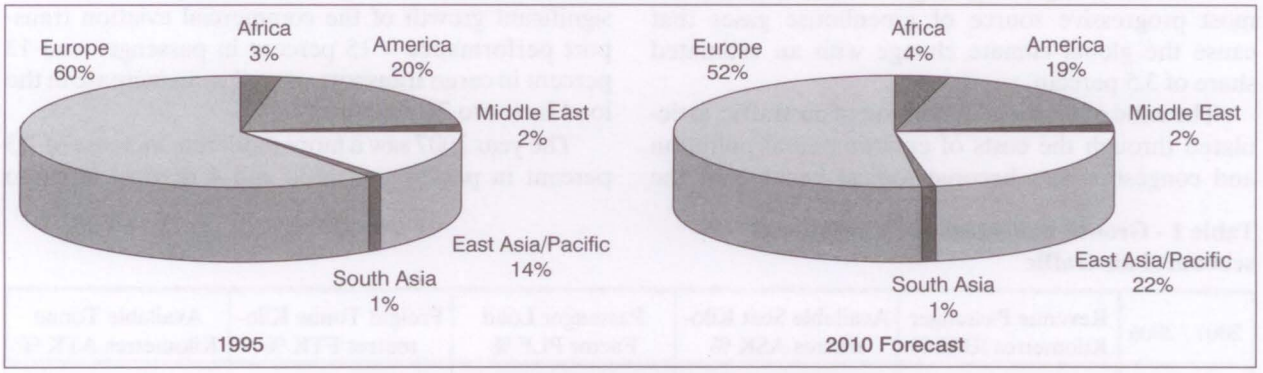

Figure 1 - Distribution of world tourist flows

Source: WTO

the companies in case of operative disturbances caused by airport and ATM saturation represent the additional pressure on the operation and development policy of the air carriers.

The last five years have marked an average annual growth of low-cost carriers at a rate of 38 percent, and measured in the number of carried passengers these companies cover 20 percent of total European market. The low-cost carriers are estimated to have in 2010 thirty-three percent and by 2015 even forty-one percent of the European market[10].

Expressed in the number of IFR operations, the low cost carriers traffic in Europe has a share of about 18 percent in the total traffic (Figure 2).

Air traffic in the European Union showed the most impressive growth of all the transport modes in the last twenty years at a rate of 7.4 percent, and the traffic at airports of 15 countries of the European Union has multiplied five times since 1970.

The European aviation industry encompasses more than 130 airlines, a network of 450 international airports and more than 60 air traffic control service providers.

In overcoming big economic crises at the beginning of the 1990s, the processes of restructuring and deregulation of the European market have nevertheless enabled successful operation of air carriers. The problems that subsequently came up were related to the saturation of the airport operative and overload of the air traffic control system. The conventional flight control in fragmentary airspace cannot accompany the progressive growth trend of air traffic, additionally increased by opening of the market of transition countries.

Therefore, the ATM regionalization initiatives have been actualized – from CEATS[11] Agreement to the new SEE FABA[12] approach of functional space zoning of South-eastern Europe, entailed by the extension of a "Single European Sky" and to the area of South-eastern Europe.

In the transposition context of the unique aviation regulative of the European Union, i. e. acquis in the air traffic area, the ECAA[13] Agreement has been signed between the countries of South-eastern Europe and the European Commission.

1.2 External costs of air traffic

Aviation is economically an extremely subsidized transport activity. The direct and indirect financial support to air traffic in the European Union refers to both abolition of tax duties and to non-internalized external costs of air traffic. The simplified calculation model of external costs of air traffic, due to pollution, saturation, injuries, may be based on the share of air traffic of 14 percent in total external costs of the European Union traffic, that have been estimated by the value of 10 percent gross domestic product[14].

This problem is an extremely sensitive one from the aspect of the competitiveness of the transport branches and complementary traffic development regarding implementation of strategic goals of the common transport policy of the European Union, mainly the mechanism of direct transport infrastructure charging and (sector) internalization of external costs of traffic.

Sixteen main international airports in the European Union have recorded delays longer than 15 minutes on 30 percent of flights and consequently extra fuel consumption of six percent of the total annual consumption. More than 350 thousand flying hours are lost annually due to the delays caused by air traffic control (ATM) and inadequate routing[15].

The statistics for the year 2004 brings the data on average delays in departure of 10 minutes, which is an

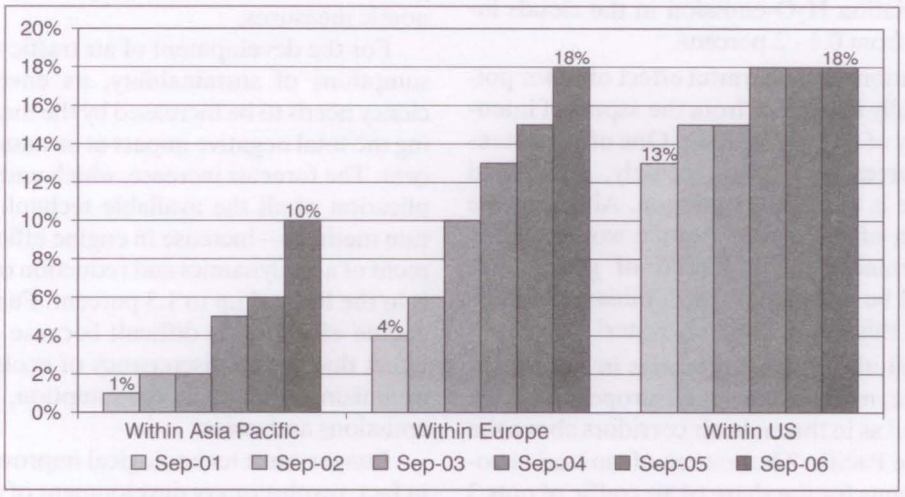

Figure 2 - Share of low-cost carrier traffic in the total traffic (IFR operations)

Source: OAG Global Travel and Transport Information Company, Press Releases 2006.

annual increase of 7.5 percent and delay greater than 15 minutes on 17.7 percent of flights[16].

Furthermore, air traffic is the most progressively growing world source of greenhouse gases that cause climate changes. The fleet of jet aircraft of world commercial aviation emits annually about 750 million tonnes of harmful gases into the earth atmosphere out of which 600 million tonnes of carbon dioxide[17]. According to the EU Commission, the world fleet of subsonic aircraft consumes about 130-160 million tonnes of fuel annually[18]. The world aviation accounts for about 3 percent in the total consumption of fossil fuels, i. e. about 12 percent of consumption in the traffic sector.

The share of air traffic in total anthropogenic emissions of harmful gases, although of relatively small level of 2 to 3 percent for CO_2 and NOx, due to constant growth in air traffic can greatly affect in the future the weakening of the ozone layer and the climate changes. The most significant pollution, namely, occurs at the cruising altitudes in the region of the tropopause and lower layers of the stratosphere, where aircraft appear as the only anthropogenic polluters. Apart from the direct influence on the greenhouse effect, which is at those altitudes ten times greater than in the tropospheric layer, the pollution of water vapour conditioned by air traffic has additional climatic action due to the formation of the so-called condensation trails that facilitate the formation of high, icy cirrus clouds.

At poles, where the troposphere boundary layer is at the altitude of 8-9 km, the aircraft cruise always in the stratospheric layer, with water vapour pollution being twice as harmful: on the one hand, this is reflected in the formation of polar stratospheric clouds that affect the degradation of ozone, and on the other hand, in the accumulation of cirrus clouds that enhance the greenhouse effect[19]. The sources estimate the share of aviation H_2O-emission in the clouds increase ranging from 0.4 - 2 percent.

The elaboration of the harmful effect of water pollution is especially important from the aspect of intensifying the study of alternative fuels. One of the potential energy sources in aviation, namely, researched more and more is the liquid hydrogen. Although the implementation of this energy source would almost completely eliminate the pollution of greenhouse gases, it should be noted that the dominant combustion product of this fuel is precisely water!

Aviation pollution is most intensive in the Northern Hemisphere, mainly above the European and US continent as well as in the main air corridors above the Atlantic and the Pacific. The volume of emitted nitrogen-oxide accounts for the share of air traffic of only 3 percent, but this quantity is at cruising altitudes of the same order of value as the natural pollution of this gas from the stratosphere into the troposphere. There is significant increase in NO_x-concentrations at middle geographic latitudes of the Northern Hemisphere, where the share of air traffic in the total NO_x-emission of the upper troposphere has been quantified with 40 percent.

1.3 Optimisation of environmental effects of air traffic

Regarding evaluation of the sustainably acceptable concepts of further traffic development, The Organization of Economic Cooperation and Development (OECD) defined in 2001 four relevant criteria:

- Regeneration – usage of renewable resources without exceeding the long-term term of their natural regeneration.
- Substitution – limiting the use of the unrenewable resources to the level that may be matched by the renewable resources.
- Assimilation – emissions into the environment have to be within the limits of assimilation capacities.
- Preventing irreversibility – prevention of irreparable harmful anthropogenic effects on the eco system.

Air traffic does not satisfy any of the mentioned criteria. The criteria of regeneration and substitution have not been met since air traffic is maximally dependent on fossil fuel. The criterion of assimilation has not been met from the aspect of the progressive growth rate of the harmful impact indicator of air traffic on the environment, so that consequently, the fourth criterion could not be met since the climate change is a constant and irreparable phenomenon.

The methodology of preventing negative impact of air traffic on the environment means synchronized implementation of the technological, operative and economic measures.

For the development of air traffic to satisfy the assumptions of sustainability, its environmental efficiency needs to be increased by the measures of reducing the total negative impact at an annual rate of 5 percent. The forecast increase, which understands the application of all the available technological optimization methods – increase in engine efficiency, improvement of aerodynamics and reduction of design weights is in the limit of up to 1.3 percent. Further increase in engine efficiency is difficult because of the trade-off effect due to the discrepancy of ecological effects of optimizing the fuel consumption, nitrogen-oxide emissions and noise.

Longer-term technological improvements refer to, in fact, revolutionary development of alternative fuels and configuration of non-conventional aircraft. New aircraft configurations, e.g. BWB (blend wing body)

configuration, the so-called flying wing can contribute to the reduction of consumption by 10 to 20 percent.

The implementation of bio-fuel can reduce the emission of carbon-dioxide to zero. However, water vapour and nitrogen oxide remain as the primary combustion products and they account for two thirds of the harmful aircraft pollution into the atmosphere. The potential alternative fuel is liquid hydrogen. Liquid hydrogen fuelled aircraft prototype called Cryoplane is an Airbus A310 version with modified, heightened fuselage for the accommodation of special larger volume tanks. Although the production of greenhouse gases is eliminated, this alternative fuel also generates water vapour as the dominant product of combustion.

The volume of fuel consumption directly correlates with the volume of environmental pollution. Although in the last thirty years the efficiency of aviation fuel per passenger kilometre (consumption efficiency) has been doubled by increasing the load factor and improving the aircraft aerodynamics and mainly the aircraft engine technology, the technological advances are expected to yield 20 percent improvement by the year 2015 and 40 to 50 percent of long-term improvement in the efficiency of fuel consumption in relation to the today's technology.

The concept of sustainable development for future generations of aircraft engines dictates the implementation of new requirements by 2010 regarding:[20]

- reduction of fuel consumption by about 20 percent,
- reduction of direct operative costs by about 3 percent,
- reduction of noise level by 10 dB,
- reduction of NO_x emissions 85 percent.

Recognizing the achievements of the international community, articulated by adopting the UN Framework Convention on Climate Change[21] and Kyoto Protocol from 1997, as well as IPCC report findings[22] from 1999, special emphasis on the prevention of the growth and reduction in harmful impact of air traffic on the environment is actually oriented to the optimization of exploitation processes and ecological management of the air traffic operative. The latter refers to the implementation of an efficient system of environment protection management in air traffic operative. The basis of the ecological approach in the operators' business policy is contained in EMAS[23] standards and international ISO 14001 standard.

In 2001, based on CAEP[24] recommendations "Chapter 4" standards for certification of new aircraft and re-certification "Chapter 3" categories of aircraft in exploitation with full implementation since 2006 were adopted.

At its assembly in 2001 the International Civil Aviation Organization also brought a special resolution[25], suggesting a balanced approach to aircraft noise management at airports, as an international framework to comply with the ecological standards. There are four elements of balanced approach to the regulation of aircraft noise:

- reduction of noise at the source,
- operative restrictions for aircraft at the limit of meeting "Chapter 3" standards,
- space planning and airport management,
- operative procedures of reducing noise.

The existing operative procedures require the aircraft to follow fixed routes, especially in approach, which results to a concentration of aircraft and their harmful impact.

Long-term, with aim of substantial reduction of negative environmental impact the optimization of take-off and approach-landing procedures is expected, optimization of routes, optimization of flight profiles – altitude and speed (Figure 3), network optimization and fleet composition.

The first two options can increase the consumption efficiency by 10 percent, but, apart from the technical interventions they are conditioned also by organizational and political actions. From the company's view, the optimization of the flight profile understands environmental balancing of the fuel costs and the operative costs related to the flying time.

The potential of the reduction in the influence of air traffic on the climate change lies in the network planning between the two extreme cases – fully connected network (point-to-point) and hub&spoke network. According to a Dutch pilot-study, the latter network planning generates 20 percent larger aviation emission.

At the European Civil Aviation Conference the ATM Strategy 2000+[26] was adopted with the aim of creating the Single European Sky, which plans the development and implementation of new communication, navigation and control systems supported by satellite technology, that should allow free navigation and "gate-to-gate" concept, greater throughput capacity and optimization of airspace capacities by the year 2015. Within this context the ATM regionalization is predicted, i. e. unification of several national air traffic management systems in the upper airspace, which should contribute to the reduction in the number of decision makers at the national levels and complying with the guidelines of integration in the technological and conceptual-management sense.

Regarding ATM improvement, a reduction of total harmful emissions of 6 to 12 percent is expected as well as additional 2-6 percent of reduction due to improved operative procedures. The forecasts of air traffic growth and consequent harmful environmental impact (increase of 300 percent in 2025 compared to 1992) are not in line with sustainable development. In

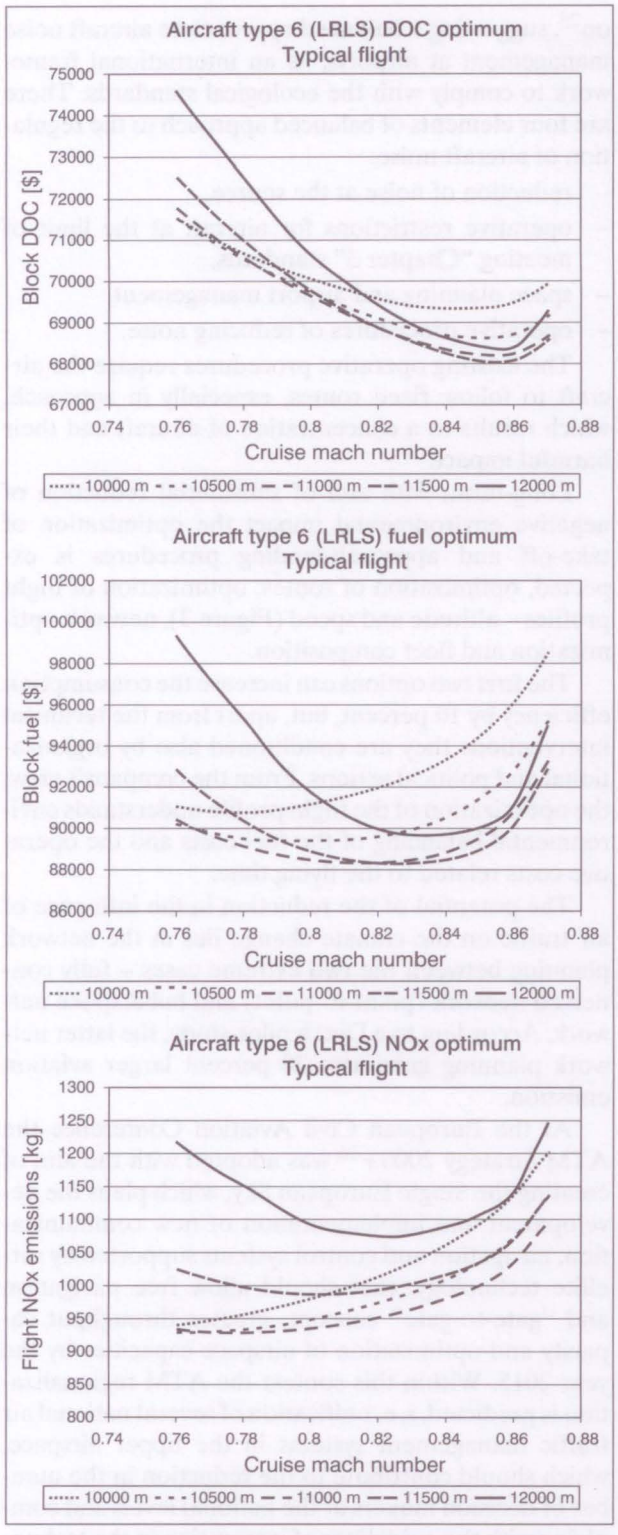

Figure 3 - Operative optimum of long-haul aircraft flight profiles (6,000km; PLF 75%)

Source: P. Peeters: Duurzame luchtvaart. Een verkenning opgesteld voor NOVEM. Ede, Peeters advies 56.

order to reduce the negative effects of air traffic the bringing and implementation of a package of economic measures and regulative instruments of financial and fiscal policy are planned.

Taking into consideration the air traffic growing trend and its harmful impact on the climate changes, apart from technical and operative measures, also the instruments of financial and fiscal policy are available, that have no direct influence on the reduction of the volume of harmful emissions, but such reduction can result from their implementation. The economic measures correlate maximally with the assumptions of the White Paper on the European transport policy of the European Union and the White Paper on fair payment for traffic infrastructure[27].

Cancellation of financial support results from the measures of the European air traffic market liberalization, and would mean direct contribution to environmental protection regarding cancellation of state subsidies to the traffic branch, which is the largest pollutant per unit of transport efficiency (passenger kilometre). The tax discount for aircraft tickets and kerosene is an exception in the normal financial practice. The beneficiary status of air traffic operative is not fair regarding competitiveness of the traffic branches. Therefore, the abolition of tax benefits for air traffic is a potentially important measure regarding demand shift to other transport modes, primarily railway (modal shift), including the reduction of air traffic growth and its harmful environmental impact. The introduction of aviation environmental fees is also an adequate financial measure with the aim of internalizing external costs of air traffic. The suggested fee of 0.20 dollars per litre of fuel would reduce the increase of aircraft emission by 30 percent.

2. STRATEGIC ELEMENTS OF ORGANIZING EUROPEAN AIR TRAFFIC

The analysis of air traffic management in the European space needs to recognize the general diversities of two groups of respective countries, the developed countries of the European Union and the countries in the process of political and economic transition.

The actual problems of air traffic refer to the congestion of international air routes of the Euro-zone and the impossibility of conventional air traffic control systems in following the future traffic increase. The operative implications are reflected in the delays of flight operations with negative connotations for international operators (increase in exploitation costs), in airport saturation and the impossibility in increasing the airport capacities, and indirectly also in ecological and safety aspect of air traffic exploitation.

With the disintegration of the former Soviet Union, Czechoslovakia, Yugoslavia, at the beginning of the 1990s, air traffic control in the European airspace was divided in more than 65 national systems.

The impossibility of a more efficient air traffic management in Europe, under the conditions of the traffic growth at annual rate of 5-6 percent, results from different technical and technological air traffic control systems and different institutional management concepts at national levels.

The adopted development plans of the European air traffic at the global and regional level within the coverage of intergovernmental organizations ICAO[28], ECAC[29] with the respective JAA[30] and EUROCONTROL[31], are oriented to several relevant aspects:

- development and introduction of advanced communication, navigation, and control (radar) systems,
- harmonization of technical and technological standards,
- separation of regulatory and operative function (regulators and providers),
- implementation of unique safety regulations including the implementation control mechanisms,
- optimization of air traffic management.

The European air traffic management program EATMP[32] is an expansion and a logical follow-up of the EATCHIP[33] program from the 1990s, which defines the development guidelines of integrated European air traffic management until 2015, implementation instruments according to ATM strategy after 2000, and projects portfolio under the responsibility of EUROCONTROL, as well as the development dynamics.

The development concept of the European ATM system is fully complementary with the ICAO transiton plan of the CNS/ATM system[34] implementation, i. e. former FANS concept[35].

In the context of wider traffic approach, i. e. adopted development program of the Trans-European traffic network (TEN-T) under the responsibility of UN-ECE[36] and EU-EC[37] and the European Union Common Transport Policy[38] and in the air traffic segment the development emphasis is on the recognition of environmental aspects, efficiency, management of traffic flows supported by the use of intelligent transport systems, interoperability of traffic modules and mainly the safety aspects of exploitation. In this sense EUROCONTROL as support to ECAC participates in the EGNOS[39], ECARDA[40] and TEN[41] programs.

With the aim of establishing a Single European Sky the European Commission founded a group (High-level Group) to study the reforms of ATM systems in Europe.

In solving the problems of fragmentary characteristic of the European space regarding regulation and control of air traffic the EC-group faced three essential barriers in the realization of the "Single European Sky" concept:

- the issue of commercialization / privatization of ATS providers,
- the issue of a unique regulator,
- the issue of harmonizing civil and military users.

The safety regulations regime in the European Union for ECAC members was delegated to the responsibility of the new European Aviation Safety Agency EASA, and in principle is based on taking over the JAR[42] system and its upgrade.

Since JAA and subsequently EASA regulation domains actually do not cover the air traffic management, the question is raised about the efficiency of the future regulator.

On the other hand, apart from the activity of harmonization of CNS/ATM national systems and implementation of ATM Strategy 2000+ through the portfolio of EATM related projects, EUROCONTROL took over the task of standardizing the safety aspects of the air traffic management. The implementation of ESARR[43] package at national levels should insure in the future the uniqueness of the ATM safety management.

The Air Navigation Service Providers (ANSP) are obliged to adopt the safety ESARR regulations, standardized as a package of combined requirements for improving the reporting system, monitoring of significant changes in work operations, incorporation of standardized safety procedures into the safety manual, and evaluation of safety changes at the organizational and infrastructural level.

The adopted ESARR – package includes:

- ESARR 1 – National safety oversight in ATM;
- ESARR 2 – Reporting and assessment of safety occurrences in ATM;
- ESARR 3 – Implementing SMS by ATM service providers;
- ESARR 4 – Risk assessment and mitigation in ATM system;
- ESARR 5 – ATM service's personnel;
- ESARR 6 – Software in ATM systems;

The expected controversial issues in realizing the "Single European Sky" concept refer to the status of EUROCONTROL with the double function of service provider and regulator, and analogue to the establishment of a single unique regulator for all the segments of the air traffic system. Therefore, as part of reformation processes of the European air traffic management system, the European Commission has initiated also a project of shifting the regulative function for the ATM sector from the responsibility of EUROCONTROL to the responsibility of EASA.

The foundations of the strategic organization of the European air traffic refer to the implementation of innovative technological, operative and economic measures of the traffic policy in the realization of the

European Commission program entitled "Single European Sky" - SES. The main objectives of the program include: restructuring of the European airspace for better throughput capacity of air traffic, creation of additional capacities, and increase in the total ATM efficiency.

The development program of the Single European Sky SESAR[44] is oriented to the establishment and development of the air traffic management, and channelling of the development projects of the European Commission and EUROCONTROL. The main objective is the establishment of a harmonized network of the European air traffic management until the year 2020 that will operatively support the forecast air traffic growth with high safety standards.

As part of the development program, the regulatory and legislative framework of the Single European Sky initiative will be completed, in order to facilitate the implementation of the technical, operative, and organizational innovations with the aim of increasing the European air traffic safety.

The development initiative assumes the reduction in the fragmentarity of the European air traffic management system through synchronization and integration of the implementation plans and actions in two phases – from research and technical implementation to operative implementation of the program.

The program implementation will be supported by the organizational and regulatory concepts, as well as the introduction of advanced technologies with the aim of increasing safety. In the period from 2005 to 2012, the research will focus on the establishment of interoperable integration, support and upgrade of the ATM/CNS systems and components. The interoperability in the SES system will be implemented progressively, depending on the dynamics of the SESAR "outputs", and full operation is expected by the year 2020.

The determined guidelines for the realization of the Single European Sky programme include:

- reducing the fragmentary characteristic of the European aviation market;
- reducing of unnecessary costs through system reorganization;
- increase of compatibility and interoperability of ATM systems;
- improvement and enhancement of the total safety;
- promotion of technological innovations on ground and aircraft systems;
- increase in the airspace capacity;
- simplification of the regulatory framework.

The implementation of the development program of establishing the Single European Sky is supported by adequate European Commission regulations:

- The framework of regulatory measures[45] establishes a harmonized institutionalized and regulatory model for SES requiring the member countries to create National Supervisory bodies - NSA, independent from service providers, that act in the committees of the Single European Sky;
- Service provision regulation[46] sets the standards of safety, quality and security. The regulations enables the operation of independent supervisory bodies that require shift of ESARRs to the principle of social right, representing the navigation service providers certification mechanism ANSP in the sense of following the requirements of the European Commission for transparency and clear scheme of the air traffic control system;
- Regulations related to airspace[47] determines the development requirements of transition functional airspace blocks - FAB, that ensure optimal access to the operative restructuring of the airspace, and also give incentive to the harmonization of the airspace division methodologies;
- The interoperability regulation[48] refers to the achievement of interoperability of the European ATM network. The regulations defines the basic conditions, new operative concepts and technologies. The document entitled Declaration on agreement contains the implementation rules, standards and specifications that are in compliance with the manufacturers.

The issue of ATM reform in Europe has not been sufficiently delegated to the responsibility of the national regulators, primarily because the complex of the standards has been brought at the level of the professional association EUROCONTROL, rather than at the level of an international regulator. The national regulators are not obliged and have no responsibility of implementation.

On the other hand, in the air traffic deregulation process in Europe with the aim of commercializing the service providers, the national ATM systems have been transformed in the majority of transition countries from the government authorities to autonomous commercial companies owned by the state. As successors, these companies have taken over the infrastructural and human resources with the primary function of commercial management on the open market, whereas the regulatory function of the ATM system has remained under the jurisdiction of the national regulator. Following the non-obligatory legislation and the transfer of the qualified staff into the air traffic control operative, the national regulators cannot adequately follow the development needs of the ATM system due to the shortage of the qualified administrative staff, i. e. insufficient administrative capacities.

In the assumptions of the model of the future European air traffic management, the expanded cooperation with the national regulators in ECAC countries, EU non-members, as well as stakeholders unions is of

extreme importance. The adopted model, namely, will consequently refer to the wider European area, mainly the transition countries that tend towards integration into the European Union, with the adoption of EU solutions being not only the question of the political will, but also of objective possibilities regarding legal, financial, and human resources. In this sense, from the aspect of associate transition countries, the planning of the instruments of financial and technical support in the European ATM reform is suggested.

3. CONCLUSION

Modelling of the strategic development of air traffic is subject to influences of external and internal factors – from global trends of ecological standardization, dynamics of tourist development, reformation changes in the European context of air traffic development to the restriction at the local level in the sense of insufficient administrative capacities for the necessary re-structuring of the air traffic sector.

Positive development aspects are reflected in the trend of air traffic growth at the European level at an annual rate of 5-6%. In the majority of transition countries the air traffic growth rate is greater than the European average. The medium air traffic forecast in Europe for the 2007-2013 period is at the annual rate of 3.4 percent.[49]

The unfavourable development aspects are manifested in the evaluation of the external costs of air traffic with a share of 14% (without the congestion costs) in total external traffic costs. Because of the harmful impact on the environment, at the global level[50] and at the level of the European Union[51] strict measures of reducing fuel consumption are being introduced, and these will be reflected also on the air traffic growth control.

Reformation processes of the air traffic management system in Europe are directed to the integration of the European airspace by means of comprehensive dynamic harmonization programmes. The strategic development programmes of the European airspace, from the safety aspect, refer to the solving of the problem of fragmentary airspace by means of ATM regionalization with the aim of effective increase of airspace capacity, following the forecast traffic growth, and increase in the air traffic efficiency. From the economic side, the development programmes refer to the liberalization of the aviation market of the enlarged Europe.

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SAŽETAK

STRATEGIJSKI OKVIR RAZVOJA ZRAČNOG PROMETA

U radu se elaborira dosadašnji razvoj zračnog prometa u Europi s aspekta njegovih ekonomskih beneficija i ekološke neodrživosti konvencionalne tehnologije. Glavne odrednice strategijskog razvoja vezane su za implementaciju globalne ekološke normative te aktualne reformacijske procese sustava upravljanja zračnim prometom postulirane ATM 2000+ strategijom i normativom «jedinstvenog europskog neba». U radu se konotiraju širi aspekti integriranog prometnog razvoja na regionalnoj razini te čimbenici utjecaja na daljnji razvoj europskog zračnog prometa.

KLJUČNE RIJEČI

zračni promet, strategijsko planiranje, upravljanje zračnim prometom, eksterni troškovi, sigurnosni menadžment, ekološki menadžment

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We are very sad to report that as this issue was being printed our distinguished colleague, professor at the Faculty of Transport and Traffic Sciences, co-author of this paper, and above all, our dearest friend, Prof. Borivoj Galović, Ph.D. passed away suddenly and will be greatly missed by all of us.

Mario Anžek, Ph.D.
Editor-in-Chief

In Memory of Boris!

You were not just someone,
you were the unique one,
the one who was always able to find the right word,
who was always there to give support,
and knew how to entice a smile,
to share love, and be my dearest, dearest friend!

Sanja Steiner, Ph.D.