SMALL AIRCRAFT TRANSPORT AS A NEW COMPONENT OF THE EUROPEAN AIR TRANSPORT SYSTEM

A vision of the European Transport System

Different scenarios can be envisaged for the future European Transport System depending on many factors (social needs, economy, fossil oil price and availability, environmental concerns, climate change, political choices and stability). A possible visionary European Transport System should be based on an environmentally sustainable, cost efficient, safe, seamless and co-modal passenger friendly system aiming to ensure mobility and cohesion for the European citizens while enabling economic growth.

"*More people and greater economic affluence mean more mobility and more transport. Some studies suggest that the number of cars in the world will increase from around 700 million today to more than 3 billion in 2050, creating serious sustainability problems unless there is a transition towards lower and zero-emission vehicles and a different concept of mobility is introduced in an environmentally friendly way.*"

Communication from the European Commission. A sustainable future for transport: towards an integrated, technology-led and user friendly system. Brussels, 17 June 2009. [1]

One future element of such an advanced transport system will be **transportation using small aircraft and small/regional airports**. This new transport mode will enable fast travel in areas of Europe where high speed trains or traditional airline connections are unavailable and will alleviate road congestion problems in a customer - and environmentally friendly way.

"general and business aviation complements regular air transport performed by commercial airlines and thus provides specific social and economic benefits such as increasing the mobility of citizens, the productivity of businesses and regional cohesion".

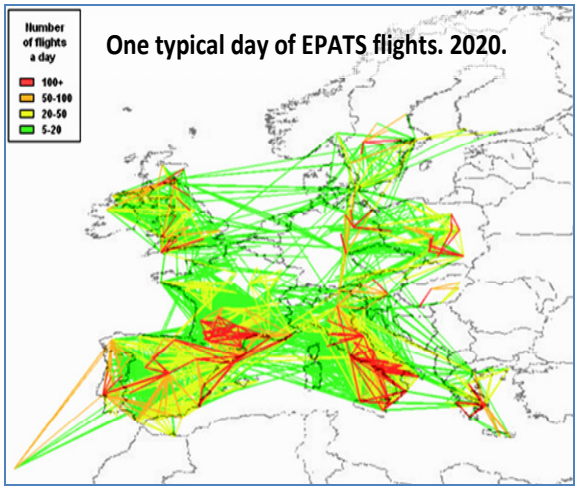
European Parliament Resolution of 3 Feb 2009 on an Agenda for Sustainable Future in General and Business Aviation. [2]

What is the Small Aircraft Transport System (SATS)?

SATS aims at the segment of the transport market that is not served by scheduled air transport or high speed trains, which today results in a substantial need for road travel for short to medium distances, to answer the specific needs of. business and other users

The small aircraft transport mode can **fill a gap,** which exists between **Surface Transport** and regular mass **Air Transport.**

The challenge is to create a new mode of transport by wider use of small aircraft using local and regional airports, enabling access to more communities in less time.



EUROCONTROL, D3.1 EPATS ATM, 2008 [3]

The main idea is to shift a part of medium/long distance passenger car trips to small aircraft to improve the efficiency of passenger transport, relieve the congestion on roads and thus reduce the environmental impact. Taking into account the travel cost and the value of time saved by air travel, SATS will offer an attractive alternative to travel by car for distances greater than 200 kilometers.

The Small Aircraft Transport responds to trends in society that are serious challenges for transport system i.e. spending less time in travel and creating better conditions for traveling, while meeting the following conditions:

- Use less energy,
- Increase safety and security,
- Reduce pollution,
- Reduce costs,
- Exploit more efficiently the existing infrastructure,
- Deploy intelligent transport system to achieve efficiency and easy way of reservation service.

The Small Aircraft Transport System will use small 4 to 19 seater aircraft, single pilot crew and automated control & guidance, flying IFR operations, with propulsion systems that are tailored to the missions, using the network of regional airports, supported by appropriate ATM-ATC systems and an ICT infrastructure (Information and Communication Technology) to provide an easy reservation system and per-seat on-demand air travel and enable more effective operational and administrative procedures. [3] [4] [13] [14] [20]

Accessibility

The FP6 project EPATS-STUDY (European Personal Air Transportation System - Study) showed that the currently available airport infrastructure (2570 airports and airfields in Europe) is sufficient to provide easy access to all European communities. About 60% of the European population is living within a distance of 20 kilometers from the nearest regional airport, whilst for 95% of the European population the nearest regional airport is within a distance of less than 40 kilometers. The existing airport infrastructure will be sufficient (SATS will use satellite CNS and satellite based landing aids).

Affordability

Calculations show that small aircraft transportation is cost effective compared to road traffic over distances greater than 200 kilometers. Using modern mass-produced small aircraft based on advanced technology and an intelligent transport business model, SATS will be affordable, and once full maturity is reached, costs will be similar or less than car travel. [4] [14] [15]

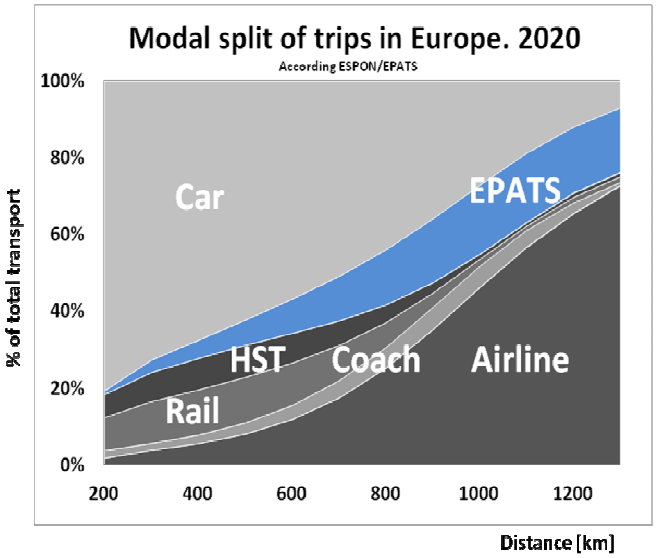
Impact on the environment

The environment remains the main policy area where further improvements are necessary. The impact of different modes of transport on environment is usually assessed by costs externalities measurements. Many research was made to compare road and air transport. In all cases, the impact of air transport on the environment is much more friendly than in the case of road transport; it concerns noise pollution, local air pollution, traffic congestion, crash and others [13]. According to European Environmental Agency Road transport — the largest share of both passenger and freight mobility volumes — is also the largest contributor to total external costs. Road transport modes also have relatively higher average costs per passenger-kilometer and tonne-kilometre than other modes [21].
As fuel consumption per pas.km is lower for aircraft, than the emission of harmful gases and particles per passenger kilometer are less than in cars. Implementation of the Clean Sky will also benefit SATS. [2] [15] [1].

In relation to 1 pas.km road transport needs many times more land than the air transport [16]. Given the use of existing airports SATS implementation does not require new land.
The noise level of SATS aircraft is already regulated. It is expected that current noise levels can be lowered significantly in future thanks to new technologies and procedures.
Although small piston aircraft use mainly 100LL aviation fuel now, there is a need to replace Avgas by more friendly to environment, such as unleaded, or biofuel.

The market potential of SATS

EPATS-STUDY showed that small aircraft transportation is beneficial for business travel in Europe, especially in southern France, Spain, Portugal and Italy, as well as in Eastern Europe [8], adding a new relevant market towards the current business aviation market which is currently more mature between London and Milano.



The EPATS project showed that **7% (96 billon pas.km) of the future car travel** (by means of affordable operating costs) **in 2020 could be shifted to SATS.** This would require **a fleet of 89 000 small aircraft** (4 to 19 seats), and generate up to **43 million flights per year** [3] [4] [10] [11].

The project participants expect that further studies will address interregional mobility in the EU, to better identify passenger flows, to better estimate the future demand for small aircraft transportation.

Business aspect

The business cases are generated by straight forward choices, but have complex operational characteristics. Operational characteristics and elements of the business cases include:

- **Totally on-demand:** the passenger is free to choose the final airport destination and the flight time. He always flies without other non-related passengers.
- **Semi on-demand:** the passenger is bounded in his departure and destination airport choice, but is able to choose its own flight time.
- **Per seat on-demand (net-centric case):** the passenger is free to decide his final departure and destination airport; other non-related passengers may accompany the original passenger to the same destination. Consequentially the passenger can choose a flight time interval for departure, whereas the operator decides the ultimate intermediate departure time of all passengers. The higher the interval the lower the charter price.

Aircraft fleet: passengers are free to choose different aircraft type according to their demands.

The SATS should operate in the frame of centralised Information and Communication Technology system. ICT solutions will be developed to support better management and integration of transport flows. The structure of the SATS network, planning and service management are aimed at reducing empty flights legs, increasing fleet effectiveness and fuel efficiency, to minimize transportation costs [4], [13], [14].

Safety

Using professional pilots for small transport aircraft operating both under Parts 91 and 135 of the FAR or EU PART OPS, SATS will have a far lower accident rate than road transport. The challenge to SATS is to reach safety levels similar to those of current commercial air transport (Part 121 or EU OPS air carriers). Improved small aircraft will be based on new technologies that facilitates pilot situation awareness and flying in poor weather which will help to reach the projected safety levels. Additionally the small aircraft will be supported by new training systems [7].

Aircraft pilot issues

Using small aircraft means that the pilot costs will have to be shared by a lower number of passengers so, it is crucial to reduce the crew to one pilot, replacing the second by automatic system. SATS will be characterized by efficient pilot management, maximising the pilot availability and skills, complying with the rules addressing flight time limitations and required rest periods.

The technology roadmap

The 7th FP SAT-Roadmap CSA project will set out a technology roadmap projecting the necessary research activities for the implementation and maintenance of SATS in Europe. Technology challenges which will receive extra attention are the aircraft and propulsion efficiency, all weather operations, single pilot operations, noise and emission reduction, safety and security, cabin comfort as well as net-centric IT systems to support different business models. SATS development should be linked to SESAR ensuring compatibility with the SWIM environment of SESAR. Additionally the roadmap will also address future regulation necessary to fulfil the pre-defined set of requirements.

The following topics will be addressed:

1. **High Level System Requirements.** This relates to Airports – ATM/ATC – Net-Centric Acquisition & Transport Management Centre – SATS Aircraft Family – Service – Environment.
2. **The Business Model**. To develop the most affordable and suitable business model for SATS.
3. **Advanced ICT.** To develop Information and Communication Technologies for the SATS network with the purpose of the system to work on the basis of SESAR's System Wide Information Management (SWIM), integrating SATS aircraft into high volume airspace operations. Eventually Airports can operate with virtual control towers.
4. **Resistance for weather minimums.** To develop methods and means to assure reliable and safe flight operations during defined weather conditions and perform landings at minimally equipped landing facilities.
5. **Single-pilot ability**. To develop means to safely replace the second pilot using fail safe systems and more automation (using the results of the Sofia, P-Plane and others projects).
6. **Efficient Systems and Propulsion for Small Aircraft** through dedicated R&TD.
7. **Small-Size Aircraft**. Dedicated R&D on new types of aircraft that should constitute the mainstay of SATS (based on CESAR, Clean Sky, SESAR, EPATS and others)
8. **Friendly Legal Environment.** Review and update of EASA regulation to assure the development of economical reliable and safe SATS, to provide differentiation of regulations affecting different categories of undertakings and airspace users.
9. **Passenger Comfort,** and others.

Near term actions.

The resolution by the European Parliament from February 3rd 2009, emphasized the relevance of SATS and the importance of supporting the existing, competitive capabilities which will enable SATS and encouraged the development of innovative aircraft in the European Member States.

It is highly appropriate that policy makers and stakeholders recognize the potential of this new mode of transport and support appropriate actions to develop such a system to its full potential.

SAT-Roadmap Consortium
Contact:
Krzysztof Piwek
Instytut Lotnictwa (Institute of Aviation), al. Krakowska 110/114, 02-256 Warsaw, Poland
khp@ilot.edu.pl

Legal notice: SAT-Rdmp support action is co-funded under the EU's Seventh Framework Programme. The views expressed in this publication are the sole responsibility of the authors and do not necessarily reflect the views of the European Commission.

References:

1. Communication from the European Commission. A sustainable future for transport: towards an integrated, technology-led and user friendly system. European Commission 2009
2. European Parliament Resolution of 3 Feb 2009 on an Agenda for Sustainable Future in General and Business Aviation. European Parliament 2009.
3. D3.1 EPATS ATM General requirements & related issues to be solved. EPATS Consortium -EUROCONTROL 2008
4. D5.2 EPATS Roadmap. EPATS Consortium 2008.
5. System Transportu Małymi Samolotami (STMS) w Polsce. R2.1 Analiza porównawcza parametrów transportowych i oddziaływania na otoczenie pojazdów lądowych i statków powietrznych . (Small Air Transport System in Poland. Transport and environmental performances of car and small aircraft comparison). Instytut Lotnictwa 2009.
6. STMS. UR2.1.1 Analiza porównawcza czasu i kosztów podróży służbowej samochodem i samolotem osobowym – Przykład obliczeń. Instiute of Aviation 2009.
7. EPATS D1.1 Report on European Business & Personal Aviation Database and Findings. Chapter 4 Total and fatal accidents rate by aircraft type and Operators. EPATS Consortium 2007.
8. EPATS T1.2 Airports and Facilities Data Base. EPATS Consortium 2007.
9. ESPON European Spatial Planning Observation Network , www.espon.eu
10. EPATS D2.1 Potential transfer of passenger demand to personal aviation by 2020. EPATS Consortium 2008.
11. EPATS T2.2.1 Synthesis of the EPATS estimation method and results. EPATS Consortium 2008.
12. EPATS T5.3 Small Aircraft Requirements & Potential Demand. EPATS Consortium 2008.
13. Koncepcja funkcjonowania Systemu Transportu Małymi Samolotami w Polsce (The concept of SATS functionning In Poland). Institute of Aviation 2009.
14. Intelligent Personalized Air Transportation System A. Baron – IPATS . Transactions of the Institute of Aviation Scientific Quarterly 3/2010.
15. EPATS D4.2 Operating Costs Analysis Report. EPATS Consortium 2008.
16. Air Transport Efficiency and its Measures. Transactions of the Institute of Aviation Scientific Quarterly 3/2010.
17. Annual Energy Outlook 2006 with Projection to 2030.
18. Analiza ekologii systemu transportu małymi samolotami (STMS). Etap 1. Karol Ekert. (SATS Ecological analysis). Institute of Aviation 2009.
19. Evaluation of the air transport efficiency definitions and their impact on the European Personal Air Transportation System development. Jozsef Rohacs. Transactions of the Institute of Aviation Scientific Quarterly 3/2010.
20. The Challenge of mobility in Europe. A. Baron, M. Mączka, K. Piwek. Transactions of the Institute of Aviation Scientific Quarterly 3/2010.
21. European Environment Agency - TERM 2002 25 EU — External costs of transport