MINUTES

Small Air Transport – Roadmap (SAT-Rdmp), CSA-SA, FP7 Project,

What:	**MINUTES of the Panel Discussion "Three Pivotal Questions" held on workshop "Common Vision for Small Aircraft Transport Mode", organized in the framework of SAT-Rdmp Project**
Who:	Moderator: **Krzysztof PIWEK (ILOT)** Panelists: **Adriaan de GRAAFF (Ad Cuenta)** **Stefaan GHIJS (Aeolus)** **Tony HENLEY (THL)** **Marcello AMATO (CIRA)** **Jaroslav RŮŽIČKA (Evektor, EGAMA)** **Zbigniew MĄCZKA (Polish Civil Aviation Office)** **Jozsef ROHACS (BUTE)** **Pablo PEREZ-ILLANA (EC)**
When:	**28 Sept 2011**
Where:	**Regione Campania – Brussels Office, Avenue De Cortenbergh 60,**
Why:	**Discuss with representatives of the SAT Community, EC, Regulators, Manufactures, Operators about the elements of the SAT Vision in order to build up a "Common" shared view of the future Small Aircraft Transport System as a component of the European Integrated Transport.**

1. Surroundings.

Small Aircraft Transport has gained researchers attention. US has answered the crisis in GA with published GARA (General Aviation Revitalization Act) in 1994 and they executed AGATE (Advanced General Aviation Transport Experiment), and SATS (Small Air Transportation System) Programs up to first years of XXI century. Students in the whole world learn to fly on Cessnas (even older than students fathers), very successful Cirrus is also recognized in the whole world. Also Eclipse was precursor of new class – Very Light Jet Aircraft. As a result they have revitalized US GA industry.

In Europe, first SRA (Strategic Research Agenda) concentrated on areas necessary to European airliners and also manufactures of big passenger aircraft (even biggest in the world). Specific Small aircraft R&TD topics were absent in the Framework Program.

The EU Extension in 2004 brought into the picture of European aviation new stakeholders from NMSs; Czech, Poland, Romania and others in Central and Eastern part of Europe). The NMSs industry had produced commuters (L410, An28), agriculture and fire fighting aircrafts, small helicopters, small primary trainers and gliders and all hardware necessary to these products. The EU Extension gave new challenges for New Member States economies but this was connected also with the loss of their traditional eastern market.

In traditional EU MS small aircraft, business aircraft, and helicopters manufacturer are present and are interested improving their world market positioning (e.g counteracting the USA GA hegemony) with and possibly to develop a new transport mode, complementing the traditional commercial air transport mode, based on smaller aircraft/rotorcraft.

The problem has raised and European Parliament answered by publishing on 3rd Feb 2009 the "Agenda for sustainable future in general and business aviation". Addendum to SRA has reflected some interest to small aircraft aviation. Idea that small aircraft industry can bring additional value for Europe was consequently matured. In FP6 CESAR (Cost-Effective Small Aircraft) Project has started and also EPATS (European Personal Air Transportation System). Project "Out of the Box" included personal transport as a promising idea also in long term perspective. In FP7 the project Personal Plane (PPlane) is studying one approach adopting small aircraft as personal transport.

The results of these projects were promising, and EC decided to launch a new support action in FP7 "Assessing and further developing the role of small aircraft in the air transport system"; this resulted into the support action "**Small Air Transport – Roadmap" (SAT-Rdmp)**. Furthermore, the topic "Integrated approach to efficient propulsion and related aircraft systems for small-size aircraft" was also launched in IV Call of FP7 and the Level 2 project "Efficient Systems and Propulsion for Small Aircraft" (**ESPOSA**) with a consortium of 39 Partners was funded.

In the SAT Rdmap support action a Common Vision and a Roadmap are being developed.
In order to have an appropriate consultation of the European General Aviation Community two workshop have been set up: SAT Common Vision Workshop and SAT Roadmap Workshop.

On September 28th the Common Vision Workshop was held. As a preparation to this workshop a discussion paper "Common Vision on the Development of a Small Aircraft Transportation System (SATS)" was elaborated, and sent to representatives of the SAT Community, EC, Regulators, Operators etc. The Discussion Paper is presenting also three Pivotal Questions to be debated at the Workshop.

Taking into account the discussion during the workshop and the written answers a "SAT System Common Vision" is being developed.

2. Goals of Workshop and Panel Discussion - Why workshop and Panel discussion?

Goals of Workshop „Common Vision for Small Aircraft Transport Mode", (held 28th September 2011 in Brussels, at Regione Campania – Brussels Office, Avenue De Cortenbergh 60), are:

- Small Aircraft Transport (SAT) mode: a new modality for the Future ATS responding to 2020 challenges (medium term) and looking towards 2050 horizon (longer term),
- Start-up Discussion on: Enabling Technologies, Enabling Conditions, Priorities,
- Can be expressed as the "who", the "what" and the "why" of your endeavour and the "when" is the medium/long term future.

Goals of Workshop's Panel Discussion are:

Discuss with representatives of the SAT Community, EC, Regulators, Operators about the elements of the SAT Vision in order to build up a "Common" shared view of the future, and answer on Three Pivotal Questions:

1. **Do you agree with the following statement: "A Small Aircraft Transport System, based on small-size aircraft, operating on commercial scheduled or non-scheduled flights from standard airports and small airfield network, should be accepted as a component of the European (Air) Transport System"?**
2. **Do you agree with the formulated goal: "The main goal of Small Aircraft Transportation System is to provide fast passenger transport service for European business travel, the need of passengers along city pairs with low intensity traffic (also in central Europe), as well as the needs of remotes regions with underdeveloped transport infrastructure thus enabling door-to-door travel between EU regions/city pairs at a flying distance of around 4 hours?**
3. **Do you agree that these goals might be met by 2020 using mostly currently existing aircraft, infrastructure and available ICT?**

Parallel Sessions and Panel discussion was prepared by SAT Consortium preparing and distributing before the workshop the paper: "Common Vision on the Development of a Small Aircraft Transportation System (SATS), Paper for Discussion".

This Paper was sent to European General Aviation Community, to European Commission DG Research and DG Move, to experts preparing new Strategic Research and innovation Agenda, and also to personalities outside EU – from Russia, Canada, Turkey, US.

Furthermore, SAT-Rdmap Project Coordinator specifically asked Mr Bruce Holmes (President of US programs AGATE and SATS) for presentation his point of view.

3. Summary of obtained written answers:

Response to SAT Consortium's paper "Common Vision on the Development of a Small Aircraft Transportation System (SATS), Paper for Discussion" was significant. Here is summary of obtained written answers:

Adriaan de GRAAFF (Strategic Research Agenda - SRA-1,-2, SRIA – co-author; EPATS, SAT-Rdmp Partner). Mr de Graaff carefully analysed strategy and tactics of Small Aircraft Transport. SAT will affect not quite friendly reception by big airports, big industries, SESAR, environmental lobbies. Only governments and regions may support SAT. Therefore it is necessary to take a smart approach in our discussion papers.
See attachment No1

Jaroslav RŮŽIČKA (President of Evektor, Vice-president EGAMA). Mr Ruzicka agreed that small-size aircraft in future will be accepted as a component of European Air Transport System. Also positively answered the second question. The third question (about introduction the SAT System using today's aircraft, infrastructure and ICT) is not possible to be executed with existing in Europe certification philosophy, and also with today's (not developed in many years) technologies in small aircraft industry. Biggest problem of Europe is overregulation!
See attachment No2 and No3 (recollection after workshop).

Alfred BARON ("Father" of EPATS). Mr. Baron presented very wide comments to Common Vision Paper. He proposed SATS goal as follows: „The main goal of Small Aircraft Transportation System is to provide high-speed passenger transport to European Regions serving city-pairs with low-intensity traffic (below 10K pas./year for each route and more than 10K pas./year generated by region), travelled by cars so far, and without close prospects for the introduction of high-speed train or scheduled airlines, mainly providing services on the routes on which travel time from door to door using available mode of transport is greater than 4 hours for business trips and 8 hours for private travel". Answers for 3PQ are generally positive with precisely consideration about each structure of SATS.
See attachment No4 (Comments) and No11 (Updated Common Vision Document).

Bruce HOLMES (President of AGATE and SATS; very Important Person in American GA) gave excellent deep comments based on his best in the world experience in Small Air Transportation System.
Mr Holmes has highlighted common main SAT/ODM (Small Aircraft Transport/On-Demand Mobility) strategies in US and EU:

- most of the demand for personal air mobility will likely be substitution for road travel;
- the smaller communities become more isolated without support of the personal air system;
- smaller airports and ATM need more attention in NextGen (the same situation in EU with SESAR);
- metrics for SAT in EU coincided with U.S. (Environmentally friendly, Affordable, Safe, Interconnected, Accessible, Predictable, Dependable, Comfortable) + in U.S. Quality of Service measured by doorstep-to-destination speed (75 mph for trips of 400 miles in length up to about 125 mph at 1000 miles);
- Social and economic benefits for communities with better connections;
- Special feature for new aircraft design that best satisfy network optimization considerations (for network-based on-demand, either per-seat, or per-aircraft), with bio and electric propulsion, short trip distances (today 170nm for propeller aircraft, 250nm small jets), and also with greater autonomy and remote operational possibilities;
- There is significant risk involved for industry in undertaking the design and development of new aircraft for the on-demand air carrier services. Governments could support mitigation of

technical and regulatory risks through public-private partnerships that target pre-competitive technology development. The investment required of a new manufacturer to develop, certify, manufacture and support a new aircraft design of the size envisioned for the on-demand markets is in the range of $1 Billion USD.

- More Automation and Autonomy - approaches to the vehicle autonomy as operated from ground-based command centers can benefit significantly from current UAS operational lessons and will still require significant R&D to advance the most promising of the concepts into commercial services; Automation in the airspace management of SAT/ODM aircraft will benefit from advancements contemplated in trajectory-based operations (TBO) for airspace.
- Collaboration between US and EU in General Aviation Area is strongly needed (first common regulatory considerations).

Mr Bruce Holmes answers for 3PQ are precisely pointed:

- for First Q the answer to this question could be “Yes,” if the environmental and airspace capacity impacts can be demonstrated by analysis to be neutral or better;
- for Second Q the answer could be different in the EU (the previous operational experience for on-demand air carriers in the U.S. indicates that the average flying distance for the eastern portion of the country is around 1.0-1.5 hours)
- for Third Q answer will sound positively “if”: - if airport and airspace infrastructure can be deployed for all airport and related airspace (i.e., ADS-B, RNP, SWIM, data comm); if fares for close to current a aircraft (e.g., Eclipse 500, Cirrus, et.al.) will be about $1.25 to $2.00 USD per seat mile; however, for the industry to move from serving the business markets toward the larger leisure markets, these fares need to be in the range of $.50 per seat mile – thus requiring a new generation of aircraft and utilization rates.

See attachment No5 (Notes on Common Vision Paper)

Frans van SCHAIK (representative NLR, Netherland, with Airport/Environmental Expertise).
Mr. van Schaik presented letter with items (16) necessary to consideration – among others some more important are:

- ATM capacity needs more attention – SESAR is not able to provide to ATM extra 50-100 thousands personal aircraft in Europe
- Major go/not go for PATS – the noise level at existing airports shall not increase.
- Impression that stimulation governmental actions in favour of SATS is its main success driver. It has to be explained how agree with free market subsidizing this mode of transport.

See attachment No6

Roland GURALY (Research Director Slot Consulting Ltd., Hungary, CEARES, CargoMap Project Coordinator). Mr. Guraly agreed with main idea approach in Small Air Transport. However he emphasized necessity to consider problems as well as all weather operations (reliable treatment of runway in harsh conditions, pilot weather forecasting support, firefighter service, de-ice service), also security issues can make the airfield-side investment considerable.
Apart from that, Mr Guraly agreed with the statements of the document, and welcomed the idea and declared contribution to the promotion of the project.
See attachment No7

Pierre-Marie BASSET (System Control and Flight Dynamics Department, Simulation and Flight Testing Unit, ONERA). Mr. Basset has sent serious analysis considered that rotorcraft should be important part of the SATS. Rotorcraft configurations should not be excluded "a priori" (this a priori may come from the "airplane culture" of the authors for which rotorcraft are considered as more costly, more noisy than an airplane). Indeed they are very well suited for the purposes of SATS.
Rotorcraft can be part of the SATS during first phase (until 2020) where they can (already now) provide door-to-door transportation and exactly in the scope needed in terms of range ~400km and travel time (~4hours). By doing so they can reduce the travel time and limit the change of transport

mode nearly replacing the connection {small airplane + ground transportation (taxi or bus)}. By doing so they can compensate their assumed higher DOC.
Also during the second phase (after 2020) rotorcraft concepts must be considered for SATS, knowing that new rotorcraft configurations and techno will be developed for: extending their flight envelop in terms of speed, range (e.g. see Sikorsky's X2, Eurocopter's X3, etc.) and lift capability (see Joint Heavy Lift System studies already few years ago in the USA), reducing their environmental impact (energy efficiency, air pollution, noise).
So, Mr. Basset's answers about the three pivotal questions are:
1- YES, but add "on small-size aircraft (airplanes and rotorcraft) ... from standard airports-heliports and small airfield-helipads network"
2- YES, but why only for business travel ? SATS will be also beneficial to private interest travel (for example allowing increased distances between working and living places) and to leisure-tourism EU developments.
3- YES if we start soon !
See attachment No8

Tony HENLEY (Strategic Research Agenda - SRA-1,-2, SRA – co-author; ATM – SESAR expertise, SAT-Rdmp Partner). Mr Henley has pointed very carefully comments to Common Vision Paper page by page. Some of them are:

- Have a significant impact on the viability of the concept. What is missing is (Near) all weather operation - without this the concept is dead
- CS-23 are ok, but I believe that for the more sophisticated aircraft CS-23 part 4 applies, which is very demanding in term of systems integrity.
- Avionics. HUD with EVS /SVS could be affordable for such small a/c/ small airport operations supported by augmented GNSS; critical additional avionics - a new Flight Control System to manage weather (gust alleviation) and pilot support including envelop protection with a simply high integrity back up mode in case of failure,
- The local transport organiser is a good concept which we should expand on.

Mr Henley answers for 3PQ are precisely pointed:

- for First Q the answer to this question could be "Yes," but..... we should define clearly what we mean by the different approaches, on demand taxi, semi scheduled , scheduled, etc., as the viability will be different for each depending on the environment.
- for Second Q the answer could be Yes.. But note that this question includes 3 different operational models which will have different business cases
    - Business travel (in the economic banana - implying on demand taxi?)
    - City pairs with low intensity traffic (outside the banana - implying Semi schedule?)
    - Regions with under developed transport infrastructure implying low capacity scheduled?)

  He suggested to delete the word 'Remote', what is important is the transport infrastructure rather than the geography or economic capacity. Remote, low income rural areas will generate little demand.
- for Third Q answer will sound positively "if": - if some service can be established in that time frame it will be very difficult to maintain the necessary future investment or the regulatory and ATM environments necessary to support the long term expansion. This is not to suggest that new aircraft, systems and infrastructure will not be required to grow the opportunity, just than if there is no viable commercial operation within 9 or 10 years the concept will die.

See attachment No9.

4. The Panel Discuss held on workshop

Workshop Common Vision has foreseen Panel Discussion on Small Aircraft Transport Mode. Moderator Krzysztof PIWEK (SAT-Rdmp Project Coordinator) invited Personalities from different areas of General Aviation Community. Thanks to friendly answer, in the Discuss Panel took part representatives of the EC, Regulators, Operators, Manufactures, Research, Academia, and independent experts.

Here they are (according successive presentation order):

- **Adriaan de GRAAFF** (AdCuenta - Independent expert, co-author SRA's, EPATS, SAT-Rdmp Partner),
- **Stefaan GHIJS** (Fly Aeolus – small aircraft operator, SAT-Rdmp Partner),
- **Tony HENLEY** (THL – ATM – SESAR expertise, co-author SRA's, SAT-Rdmp Partner),
- **Marcello AMATO** (CIRA - ACARE expertise, co-author SRA's, SAT-Rdmp Partner),
- **Jaroslav RŮŽIČKA** (Evektor, EGAMA Vice-President),
- **Zbigniew MĄCZKA** (Polish Civil Aviation Office Vice-President),
- **Jozsef ROHACS** (BUTE – Professor with PATS expertise, SAT-Rdmp Partner),
- **Pablo PEREZ-ILLANA** (EC DG Research – Project Officer of SAT-Rdmp Project),

Adriaan de GRAAFF has presented his observations from workshop discuss. Mobility of European Citizens using air transport has doubled every 15 years. The air traffic concentrated on big hubs (70% traffic at 15 hubs when total number Europe's airports/airfields is about 2500) and current capacity of the airports cannot accommodate additional traffic. Road traffic (236 million car in EU-27) is also increasing. Trains are focused on areas within the main European economic centres (cost of one km High Speed Rail is 40 million Euro). Remote areas in Europe still have a bad transport infrastructure. Travellers want fast door-to-door seamless connections.
From this reasons **answer for Q1** (Small Aircraft Transport System as a component of European (Air) Transport System) will **sound positively** if we manage to prove (not in a wishful thinking way) real figures of market demand for SATS. Also it is real necessity to work on positive society reception for this new transport mode.
Answering for Q2 (SATS goal formulating) Mr de Graaff has proposed following definition:
The main goal of the small aircraft transportation system is to provide fast and seamless transport service which will serve: the need for low-intensity intercity routes which has been dependent so far on road transport; regions out of the central European "economic banana" with less developed infrastructures to stimulate the economic development; the needs of business people to travel door to door. SATS transport should provide low cost travel, either as a scheduled service or as air taxi operations. Cost should be comparable to travelling by car.
Answer for Q3 (SATS with existing aircraft infrastructure and IT). Current technology is **not sufficient** for meeting SATS goals. It is necessary effort for research and technology development.
They are: Novel aircraft technologies (single piloting, cockpit equipment supporting SESAR requirements, better noise and emissions characteristics - green propulsion, gust alleviation - ride quality, resistance for weather hazards); Network centric booking system (instant access via IT, SATS transportation management centre, on the spot flight planning); Infrastructure adaptation (airports, ATM - TMA and en-route operation mixing SATS and traditional flights,) and others.

Stefaan GHIJS represent Fly Aelous Operator's Company. They now offer affordable, on-demand, reliable, door-to-door private flights. Aelous is example of air taxi activities and it will be developed in accordance with SAT-Rdmp findings as Aelous is Partner in SAT-Rdmp project. For these reasons his **answers for Q1, Q2, Q3 are positive**.
Mr Ghijs attached important comments via email after Workshop – see attachment 10.
Goals should be refined using SMART (specific, measurable, attainable, realistic and timely) structure. SATS shouldn't be limited to only the underdeveloped or lack of infrastructure and low intensity traffic, but are also congested developed infrastructure (traffic jams, congested airports) and the convenience factor. Mr Ghijs does NOT envision a public system of on-demand or personal air transport in the current EU steered by one IT system. What he does believe is that on-demand an personal travel should become cheaper in order to improve mobility in Europe. He agrees with the set-up for IT system improving the on-demand business from an operational point of view, but not from a commercial point of view. Operators are not very keen to decrease their entrepreneurial dependency in obligated partnership. In an on-demand system customers do not want interdependency of other customers.
Main factors for operational success are:

- **all weather** aircraft landing systems to land at airports without ILS facilities,
- **single pilot** operations,
- **low aircraft DOCs**,
- low **maintenance** requirements,
- operational optimizers minimizing **empty legs**,
- additionally **IT** should help in automatic (flight)planning and reservations decreasing indirect and overhead costs.

Mr Ghijs agrees with the comments of Bruce Holmes. Nonetheless two major differences need to be spotted: one - the population density in the US is totally different then the EU therefore generating different drivers for on-demand transport, second - the acceptance for on-demand transport is far higher in the US than the EU.

Tony HENLEY answers for 3PQ are precisely pointed: for **Q1** the answer could be **"Yes, but..."** we should define clearly what we mean by the different approaches, on demand taxi, semi scheduled, scheduled, etc., as the viability will be different for each depending on the environment.
For **Q2** the answer could be **"Yes".** But note that this question includes 3 different operational models which will have different business cases: Business travel (in the economic banana - implying on demand taxi?); City pairs with low intensity traffic (outside the banana - implying Semi schedule?); Regions with under developed transport infrastructure implying low capacity scheduled?). Suggest delete the word 'Remote' , what is important is the transport infrastructure rather than the geography or economic capacity. Remote, low income rural areas will generate little demand.
For **Q3** answer will sound **positively "if":** - if some service can be established in that time frame it will be very difficult to maintain the necessary future investment or the regulatory and ATM environments necessary to support the long term expansion. This is not to suggest that new aircraft, systems and infrastructure will not be required to grow the opportunity, just that if there is no viable commercial operation within 9 or 10 years, the concept will die.

Marcello AMATO has very good record of animation of activities in European Research Area. He take part in ACARE, and ARG activities also he is main author of Italy Strategy of Aviation Research. Mr Amato is responsible for organizing this Common Vision Workshop.
Answering **positively on 3PQ** Mr Amato commented that it is strange that this type transport is not exploited yet, because infrastructure is enough for start, and market capacity also is there. This what we need is social acceptance of SATS in short term. Then will be a wider base for development of the the system.

Jaroslav RŮŽIČKA highly appreciate the initiative to move European General Aviation forward and it was his pleasure to participate in the workshop. has considered that this is the only way how to help our segment of industry.
Mr. Růžička answers for 3 Pivotal Questions are:
Q1. – yes
Q2. – yes
Q3. – not
Answers for Question 1 and 2 must be yes – The scope of Evektor's business clearly define its position. It claims that all of us – which are active on GA has the same opinion. On Question 3, he only mentioned that it is not possible to build SATS on existing fleet of airplanes, especially existing certification philosophy and existing power plants. What it meant? Just see dynamic development UL/LSA category – This categories was not recently overregulated. Result is – reliable, environmentally friendly airplanes with car comparable prices, fuel consumption/kmpax same or similar as car's... We cannot wait with new design until 2020.... What we use in aviation? Engines which design is mostly 40-50 years old, similar equipment. how big progress was made in car engines and equipment... This is the way...
Unfortunately, time is hard and we have just limited power to improve conditions for any kind of airplanes smaller than airliner...There will be always difference between researches point of view (let's say academic) and his (industrial). The industry must make a living on result of their work – so they feel very clearly market reactions, impact of regulations, environmental requirements etc, etc...
Some EU Member States have been concentrated to make Airbus real competitor for Boeing during last 30 years. They succeed. But where is EU General Aviation? Who is in Germany? Grob and Extra.. Italy – just Piaggio... France – Socata, 80% working for Airbus... GB? Etc, etc...
Just see situation in Poland clearly – so strong aircraft industry before, so many independent, real Polish projects. And what is research connection to own Polish industry now? Why so many Polish owners own planes registered in Czech Republic? Poland is wide country, flat, there is not very good road network. Why light airplane operations is not really supported? And the same in Europe… Example? Mr. Alois Peterle from Slovenia mentioned during EGAMA dinner. He planned to fly from Ljubljana to Brussels. He prepared it for several days but had to land in Antwerpen finally.. Not possible reach Brussels. Europe is overregulated and all GA regulation (training, operations, maintenance, production, certification) are closer and closer to airliners.
Simply last 20-30 EU totally didn't pay attention about GA, wide youth pilot training doesn't exist, less and less young people enter aviation education any kind...
Mr. Ruzicka is sure that SAT project is right – but who will finally use it? There is big difference between US and EU. Not needed to describe – just visit one time Oshkosh Air Show. EU is not able to compete with US in Aviation without big change of aviation spirit.
Biggest problem of Europe is overregulation... And he is happy for any voice which make any noise here that GA in Europe is still existing and has also right to be alive.

Zbigniew MĄCZKA has pointed that Small Aircraft Transport Mode should be accepted by market, citizens, lawmakers, politicians and even industry. But it is clear that this social feeling for such kind of transport is difficult to change. Mr Mączka agree in this matter with Mr de Graaff, and Mr Ruzicka.
But main goal for Small Aircraft Transport Mode is to fly (no matter private, air taxi, corporate) almost door-to-door and **answer for Q1** (Small Aircraft Transport System as a component of European (Air) Transport System) sounds **yes**.
The question Q2 (SATS goal formulating) is understandable because the definition on which we are deliberating should be established. Mr Mączka noted that it isn't important whether flight time will last 4 hours or 4,5 but it is important that SATS will serve remote, underdeveloped areas, who lack good transport infrastructure. The only tool for improving this situation is providing for this areas friendly conditions for investors – important are transport connections.
Mr Mączka **positively answers for Q2** but he propose consider to wider definition and change word "underdeveloped" for "not served routes" for example.

Future for small aircraft is needs the technology change and probably direction is to go to the automated systems supporting to take operating decisions. Mr Mączka stated his personal opinion answering **Q3** (possibility of SATS with existing aircraft infrastructure and IT) is like this: With optimal use existing technology without discussing any other thresholds with stakeholders, politicians, society etc. – theoretically it is possible to create system (**"Low Cost Air Taxi"**) similar to SATS. But to be realistic - now - with existing situation on the legal infrastructure, with current society understanding **it is not possible** to create such system today.

Jozsef ROHACS. Hungarian government has invested a lot of money (25 million Euro per 5 years) because they want to improve research and find area in which Hungarians could succeed. This very promising area could be this kind system of small aircraft transportation, especially in the regions which lack transport infrastructure. Prof. Rohacs has recommended necessary outlook of what is going in US and how NASA has developed Small Aircraft Transportation System. Prof. Rohacs is confident that SATS could really to open new businesses, new technologies and new way of development of small aircraft used by GA (General Aviation). But what is today's status? Small Aircraft used by GA was designed 30-40 years ago - old solutions (high operational cost), old engines (significant environmental footprint).
This is very challenging situation – if we could cut operational costs, increase safety, if we manage to increase society acceptation as a new field of business, and as new field of transportation system – then we will be leading in this area, and this will be future. To do that we should develop this system; we have to define some indicators, thresholds, optimized trajectory, optimized system. It is necessary to consider cost – which is very important for common citizens. We should think about system greening otherwise society will contest airplanes, air transportation systems. To have system in real we should possess society acceptance for this kind of idea.
Prof. Rohacs considered above facts **has answered all the Three Pivotal Question "Yes".** However, he noted that we should accelerate a little more the activity because for the last 5 years we have only talked.
In the discussion Adriaan de Graaff mentioned that beside NASA programs, very potential industrial danger is going up from China. They have tomorrow in space, they have big programs on helicopters and small airplanes, they are fast, faster than we in Europe, and they do it. Mr. De Graaff's feeling is, if we are not be active enough - Chinese will cover all the market (Cirrus has just been sold to them too) and we will have only one choice – Chinese product.
Prof. Rohacs agreed with this observation and concluded that one solution for us is to stop talking and start acting.

Pablo PEREZ-ILLANA. As representative of the DG R&I at the European Commission, Mr. Perez-Illana firstly clarified that his intervention addresses R&T aspects – as this is the realm of SAT-rdmp initiative. Although no representatives from EC-DG MOVE, EASA and SESAR were finally able to participate at this workshop, he was convinced that both EASA and SESAR have specific initiatives for the benefit of the small aircraft community and offered himself to facilitate the connection of SAT-rdmp with those initiatives*.
*POST-WS note: EASA-led initiative EGAST (www.easa.eu.int/essi/**egast**/); SESAR Lot 4 (consortium AT-one, consortium MAGNITUDE).

Answer for Q1 (**Do you agree with the following statement: "A Small Aircraft Transport System, based on small-size aircraft, operating on commercial scheduled or non-scheduled flights from standard airports and small airfield network, should be accepted as a component of the European (Air) Transport System"?**)
Yes, and as a matter of fact the European Commission's Framework Programme has funded and is co-funding several specific R&T projects for the benefit of the small aircraft community, ranging from pioneering projects on PATS such as PPlane, MyCopter, 4D-Control, ... to more downstream like FP7 SAFAR (Avionics) and large integrated projects such as FP6 CESAR and the recently approved

FP7 ESPOSA (Engine/systems) – in addition to other actions such as FP6 EPATS and FP7 SAT-Rdmp itself including this workshop
These projects should be instrumental in demonstrating the feasibility of a SATS to contribute towards the Smart Green & Integrated Mobility challenges spelled out in the different European AAT Visions (Vision2020, FlightPath2050) and European policy references (e.g. Transport White Paper, STTP, Innovation Union /Horizon2020).

Answer for Q2 (**Do you agree with the formulated goal: "The main goal of Small Aircraft Transportation System is to provide fast passenger transport service for European business travel, the need of passengers along city pairs with low intensity traffic (also in central Europe), as well as the needs of remotes regions with underdeveloped transport infrastructure thus enabling door-to-door travel between EU regions/city pairs at a flying distance of around 4 hours?**)
Mr. Perez-Illana underlines that the 4 hour door-to-door goal is certainly aligned with the FlightPath2050 vision. He questions whether the wording "business" is the right choice – in relation to social acceptance for this new mode of transport. As other participants, he also suggests further clarification regarding the word "remote". On this respect, he suggests SAT-rdmp also to connect with the FP7 action support action FUSETRA.

Answer for **Q3** (**Do you agree that these goals might be met by 2020 using mostly currently existing aircraft, infrastructure and available ICT?)**
Beyond the key role of non-research aspects (such as regulation, certification, ATM, pilot availability and training, …), Mr. Perez-Illana assumes that a degree of innovation in aircraft & infrastructure can help achieve the goals. Results from EC-funded projects can contribute, even if very challenging for 2020. The upcoming EU programme Horizon2020 (H2020) can be instrumental, as embracing not only R&T but also innovation for earlier uptake of results into products and services. What "scale & scope" in H2020 for aviation at large, and for small aircraft in particular, are questions to be decided by the EU Member States next year.
The European SATS stakeholders can be influential: Firstly, convincing their Member States that aviation research at large is of paramount importance (not only for the States with large aircraft manufacturers). Secondly, participating pro-actively in the working groups of ACARE to translate the FlightPath2050 goals into a Strategic Research & Innovation Agenda. This agenda will be influential in the structure and implementation of the aviation programme in H2020. European SATS stakeholder can ensure then that their views are taken into account, and that some technology (and budget) synergies (rather than competition) can be established with other aviation segments initiatives – e.g. larger aircraft technology demonstration, UAS or inter-modality for instance. Additional enablers can be better coordination of national initiatives in Member States – as well as targeted international cooperation, which the EU can certainly support.

5. Summary of the Panel Discuss held on workshop

Workshop "Common Vision for Small Aircraft Transport Mode", gathered not all General Aviation Community, but a satisfactory representative (attendants from 11 countries, representing Manufactures, Operators, Regulators, Academia, Research, ACARE, EC). Also, response for discussion paper with Three Pivotal Questions "Common Vision on the Development of a Small Aircraft Transportation System (SATS)" was significant. Of course building "Common" shared view of the future Small Aircraft Transport System as a component of the European Integrated Transport is very long process, not for one meeting. But results of the workshop discussion, also from Panel Discussion, as well as mail response, are extremely useful to recognize directions of concentration activity in project executing and dissemination.

Answers for Q1 (Small Aircraft Transport System as a component of European Air Transport System). The importance of SATS as a new air transport mode was generally accepted by all Panellists. A very important challenge is – social acceptance. It will be reached when this system will be Environmentally Friendly and with Cost, Quality & Competitiveness Challenges as a determining factors, and with Safety and Predictability of Operations as important factors.
Rotorcraft should be considered as element to be included in this Vision.
The Business model to be adopted is an essential element for the success of a SAT System. It has to be affordable and reliable. A pilot phase testing some different business models should be set up in the short term (within 2020); this would allow to build up a success story, to increase trust in the approach, to support public acceptance and increase political leverage.

Answer for Q2 (SATS goal formulating). Panellist have discussed a common SATS goal definition. It was generally agreed that SAT System should not be considered to serve only "remote regions, and underdeveloped regions".

Two proposition of goal description are in consideration:

1. According to some panellists: The main goal of the small aircraft transportation system is to provide fast and seamless transport service which will serve: the need for low-intensity intercity routes which has been dependent so far on road transport; regions out of the central European "economic banana" with less developed infrastructures to stimulate the economic development; the needs of business people to travel door to door. SATS transport should provide low cost travel, either as a scheduled service or as air taxi operations. Cost should be comparable to travelling by car.
2. According to Alfred Baron: The main goal of Small Aircraft Transportation System is to provide high-speed passenger transport to European Regions serving city-pairs with low-intensity traffic (below 10K pas./year for each route and more than 10K pas./year generated by region), travelled by cars so far, and without near term perspectives for the introduction of high-speed train or scheduled airlines; mainly providing services on the routes on which travel time from door to door using available other modes of transport is greater than 4 hours.

Both are good. First one is better for marketing purposes, second one is more specific and should be used in modelling demand calculations and simulations.

Answer for Q3 (possibility of SATS implementation with existing aircraft infrastructure and IT).
Mr. Ruzicka has pointed that General Aviation products have not technologically advanced too much in many years: "What do we use in aviation? Engines and avionics whose design is mostly 40-50 years old. Looking to car engines and equipment and impressive innovation was achieved and end users are acquainted to technology changes in every new car they buy! There is a strong dependency on USA engine manufacturers that is not allowing innovative airframe design.

Furthermore, Europe is overregulated and all GA regulation (training, operations, maintenance, production, certification) are closer and closer to airliners....“; this is creating difficulties in terms of products innovation and costs.

Mr. Mączka has another doubt: “with existing situation on the legal infrastructure, with current society perception it is not possible to create such system today”.

A different view was also brought forward by another Panellist: “the R&TD and rulemaking activities needed to introduce the SAT System in 2020 and to ensure public acceptance should be accelerated because competition from others strong key players is going to come soon (China).

Rotorcraft have already the technology and on board equipment to be adopted in SAT System ensuring a door to door transport. In order to achieve Public Acceptance some action is still needed; noise perception, cost, and safety perception. Infrastructure requirements for rotorcraft are low. An appropriate business models should be defined and tested.

Proposition of “Common Vision” up-dating after workshop see on attachment 11.

Main conclusion from Panel Discussion:

The Small Aircraft Transport System should be part of the European Integrated Transport System; this is a challenging objective but in Europe there is the knowledge and market potential to achieve it.
Currently the enabling conditions are in a poor status. European manufacturer are suffering from this situation.

There is a social need for mobility and specifically some regions and city-pairs would increase their access to transport by a SAT system; anyhow, proper dissemination and political leverage is needed to improve awareness of sustainability and social benefit of a SAT system.

The Business model to be adopted is an essential element for the success of a SAT System. It has to be affordable and reliable.

A pilot phase testing some different business models should be set up in the short term; this would allow building up a success story, to increase trust in the approach, to support public acceptance and political leverage.

The Vision and the Roadmap should also look to medium (2035) and long term (2050).
There is an agreement that SAT System might become a small scale platform to demonstrate the European Integrated Transport functionality.

It is worth reminding the European goal, as declared in Flightpath 2050 and EC relevant documents, to create a European Integrated Transport System which has to be safe, green and seamless - with one of goals “90% of travellers within Europe are able to complete their journey, door-to-door within 4 hours. Passengers and freight are able to transfer seamlessly between transport modes to reach the final destination smoothly, predictably and on-time”.

SAT-Rdmp Project is compliant with Fligfhtpath 2050 challenges.

Attachments

Attachment No 1 “Adriaan de Graaff Comments, 2 Sept 2011”
Attachment No 2 “Jaroslav Ruzicka Comments, 19 Sept 2011”
Attachment No 3 “Jaroslav Ruzicka Comments, 12 Oct 2011”
Attachment No 4 “Alfred Baron Comments, 26 Sept 2011”
Attachment No 5 “Bruce Holmes Comments, 26 Sept 2011”
Attachment No 6 “Frans van Schaik Comments, 26 Sept 2011”
Attachment No 7 “Roland Guraly Comments, 26 Sept 2011”
Attachment No 8 “Pierre-Marie Basset Comments, 27 Sept 2011”
Attachment No 9 “Tony Henley Comments, 30 Sept 2011”
Attachment No 10 “Stefaan Ghijs, 6 Dec 2011”
Attachment No 11 “Common Vision – v1”

Attachment No 1 "Adriaan de Graaff Comments, 2 Sept 2011"

SAT Common Vision – Paper for Discussion
110902-Adriaan de Graaff-Comments

Dear friends, in addition to my email last night i would like to stress that we carefully need to define our strategy and tactics. Asking for money from the Commission at this point of time can be counterproductive. Why? look at the stakeholders:

Airlines do not like the PATS concept as it may take away business class passengers
Big airports want to give their slots to large aircraft as these produce customers for shops and parking lots
Big industries are not interested as it consumes money they need for big aircraft development and profitable projects. Airbus, Thales and RR will not support it
SESAR does not like PATS as it will complicate its concept of operations that s fully based on scheduled flights
Environmental lobby groups will argue that it will create more emissions and noise (we have seen the reaction to the EPATS report from Germany: whilst the German car industry is developing more powerful and bigger cars, the green lobby is against small aircraft)
Passengers have no combined lobby club to defend their interest

So we are fighting an uphill battle.

Regards Ad

Attachment No 2 "Jaroslav Ruzicka Comments, 19 Sept 2011"

Email from Jaroslav Ruzicka 19 IX 2011
Dear Krzysztof,
I am very pleased by your email, asking if I can be "Panelist" during the coming Common Vision workshop next week. And I am sorry that I answer with little bit delay – I was out from the office and need discuss with my team.
My answers for 3 Pivotal Questions are:
1. – yes
2. – yes
3. – not
My answers for Question 1 and 2 must be yes – The scope of Evektor's business clearly define my position. I think that all of us – which are active on GA has the same opinion on Question 3, I only think that it is not possible to build SATS on existing fleet of airplanes, especially existing certification philosophy and existing power plants. What I mean? Just see dynamic development UL/LSA category – This categories was not recently overregulated. Result is – reliable, environmentally friendly airplanes with car comparable prices, fuel consumption/kmpax same or similar as car... We cannot wait with new design until 2020.... What we use in aviation? Engines which design is mostly 40-50 years old, similar equipment. how big progress was made in car engines and equipment... This is the way...
Looking forward to meet you next week
Jaroslav

Attachment No 3 "Jaroslav Ruzicka Comments, 12 Oct 2011"

Common Vision – Three Pivotal Questions
Jaroslav RŮŽIČKA – Comments 11Y10.12

Dear Krzysztof,

I highly appreciate your initiative to move European General Aviation forward and it was my pleasure to participate on your workshop.
I think that this is the only way how to help our segment of industry.
Unfortunately, time is hard and we have just limited power how to improve conditions for any kind of airplanes smaller than airliner...
There will be always difference between your point of view (let's say academic) and my (industrial). We must survive from result of our work – so we feel very clearly market reactions, impact of regulations, environmental requirements etc, etc...

EU have been concentrated to make Airbus real competitor for Boeing during last 30 years. They succeed. But Where is EU General Aviation? Who is in Germany? Grob and Extra.. Italy – just Piaggio... France –Socata, 80% working for Airbus... GB? Etc, etc... Just see situation in Poland clearly – so strong aircraft industry before, so many independent, real Polish projects. And what is your connection to own Polish industry now? And sure – you know better than me why so many PL UL owners own planes registered under OK. Poland is wide country, flat, there is not very good road network. Why light airplanes operations is not really supported?

Just one segment of industry boomed during last 20 years – UL/LSA planes, but only in countries where regulations are maintained by enthusiasts (CZ, D, maybe I)... As MEP Mr. Alois Peterle from Slovenia mentioned during EGAMA dinner. He planned to fly from Ljubljana to Brussels. He prepared it for several days but had to land in Antwerpen finally.. Not possible reach Brussels. Europe is overregulated and all GA regulation (training, operations, maintenance, production, certification) are closer and closer to airliners.

Simply last 20-30 EU totally didn't pay attention about GA, wide youth pilot training doesn't exist, less and less young people enter aviation education any kind...
What I am afraid SAT project is right – but who will finally use it? There is big difference between US and EU. Not needed to describe – just visit one time Oshkosh Air Show. EU is not able to compete with US in Aviation without big change of aviation spirit.

Biggest problem of Europe is overregulation... And I am happy for any voice which make any noise here that GA in Europe is still existing and has also right to be alive.

Best regards!

Jaroslav

Attachment No 4 "Alfred Baron Comments, 26 Sept 2011"

ALFRED BARON

COMMENTS

TO : COMMON VISION ON THE DEVELOPMENT OF A SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)

AND ANSWERS TO THREE PIVOTAL QUESTIONS

COMMENTS

Ad: Small Aircraft Transportation System (SATS) main goals

***"The Goal** of Small Aircraft Transportation System is to provide fast passenger transport service for European business travel, the need of passengers along city pairs with low-intensity traffic (also in central Europe), as well as the needs of remotes regions with underdeveloped transport infrastructure thus enabling door-to-door travel between EU regions/city pairs at a flying distance of around 4 hours"*

This means, that the maximum distance between the regions served by SATS is limited by time of flight (4h) and speed of the aircraft – this means that the network connections are limited by aircraft performances. Meanwhile, the network connection should result from the transportation needs, and the aircraft mission requirements should be adapted to them. Hence, the correct statement should be: …thus enabling door-to-door travel between EU regions/cities in less than 4 hours.

Inserting the first the need to provide fast passenger transport service for European business travel affect the hierarchy of objectives. According to the concept described in the Vision the first objective of SATS is to meet the transport needs of remote areas to ensure sustainable development of all Europeans regions. This is to meet the needs of business travel generated in these regions, but also the needs of commuting, lifestyle travelling, repositioning and others.

The second objective: "enabling door-to-door travel between EU regions/city pairs in less than 4 hours " aims to enable each business trips in the EU area in one day. There is a growing need to perform long-distance inter-city travel within 1 day. In most cases meet this need occurs when the travel time from door to door between cities does not exceed 4 hours. Much of intercity distance is below 300 km, and these cities are served by passenger cars, train or coach in less than 4 h. The remainder of intercity connections is in the range from 300 to 2500 km. Just a little part of those door to door connections (these of high density traffic) can be realized by fast trains or air lines in less than 4 hours. The remainder part such opportunities has not. This is precisely the area of intercity connectivity, which is intended to be serviced by SATS, and therefore, it is why the travel time, for the longest network segment operated by the plane, cannot be greater than 4 h.

I suggest the following goal formulation:

The Main Goal of Small Aircraft Transportation System is to provide high-speed passenger transport service for remotes underdeveloped regions and city pairs with low traffic intensity connections and to enabling door-to-door travel between EU regions/city pairs in less than 4h

Ad: Three Pivotal Questions

The 1 question: " Do You agree… that SAT System ... should be accepted as a component of the European Air Transport System ? " is meaningless. *Whatever has been authorized in Europe to perform transportation flights is a component of the European Air Transport System.*

ANSWERS
Answering the question if the designated objective can be achieved by using the existing aircrafts, infrastructure and available IT technologies depends on the way of interpretation of this objective. If we focus on providing fast means of transport for business travel, the answer will depend on the degree of meeting this need we consider. If we consider satisfying only the elites (less than a per mille of the business population) then the answer is yes, because the elites are already using the business flights and aero-taxi services and are able to travel to each city in Europe and back to origin within one day.
However if we consider a wider range of business population, including the business conducted in remote areas then the answer will depend on how we understand the 'wider range' statement (is it 1%, 20%, 50% of population or so?) and how we predict this develop-ment in time, what is our knowledge of aviation and it's traffic management and what kind of requirements we set for air transport. The answer will also depend on from what point of view, we evaluate the objectives: technical, ecological, economical and social points of view.

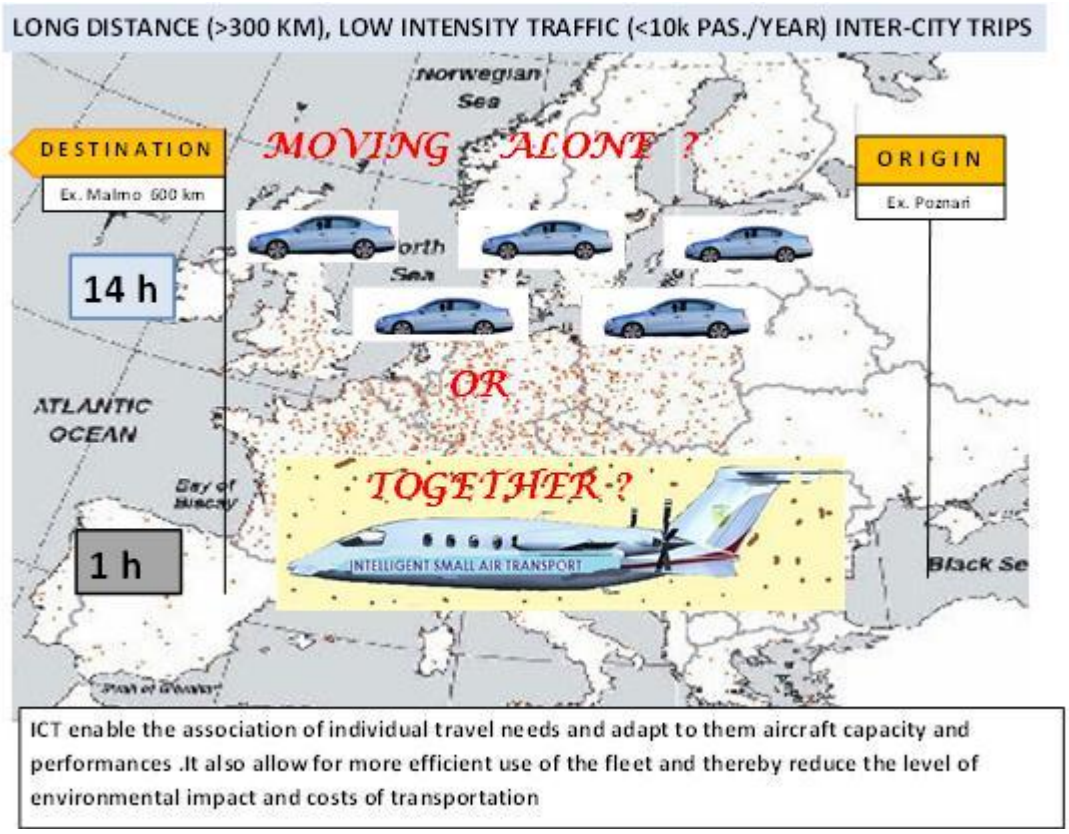
Considering particularly each of every 3 components of SAT system we can state:

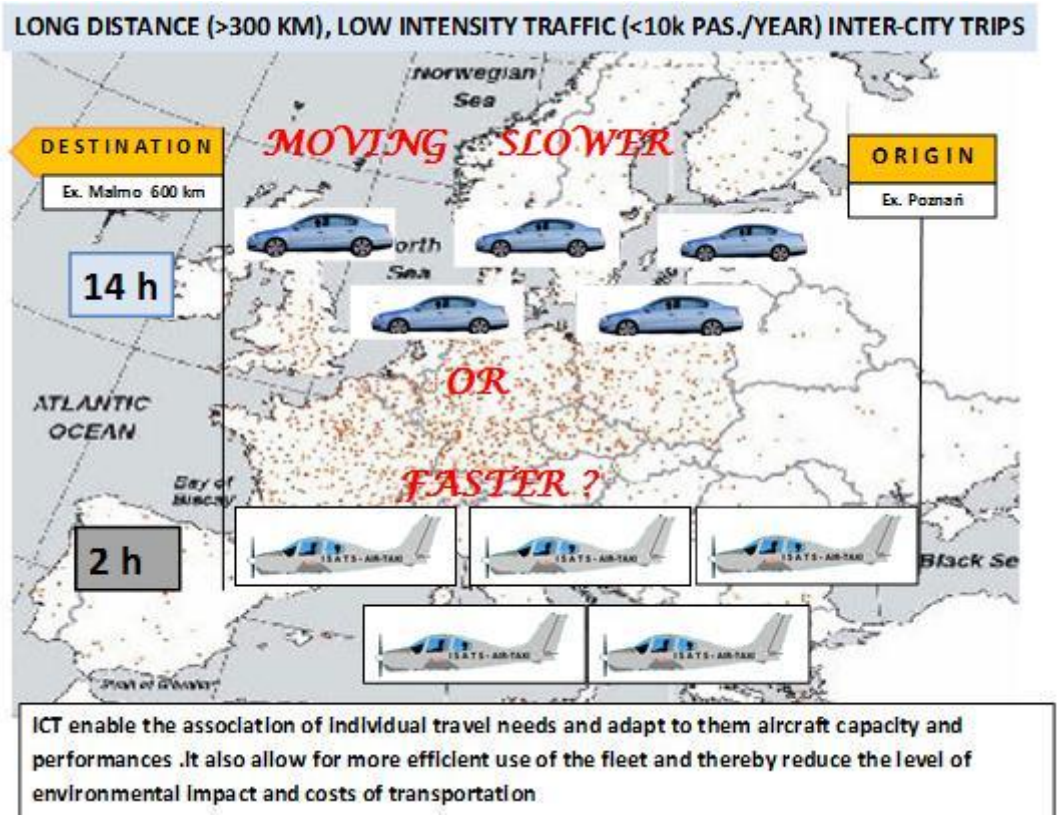
Aircraft
In the first part of SATS development phase (until 2020) existing business-purposed aircrafts are meeting the technical (mission requirements), ecological (energy consumption, gas and sound emission) and social (security) requirements. But they do not satisfy the economical requirements – production and operational costs Reducing those costs and further decrease of the impact on environment should be the basis to formulate the research and development objectives of those aircrafts in upcoming years.

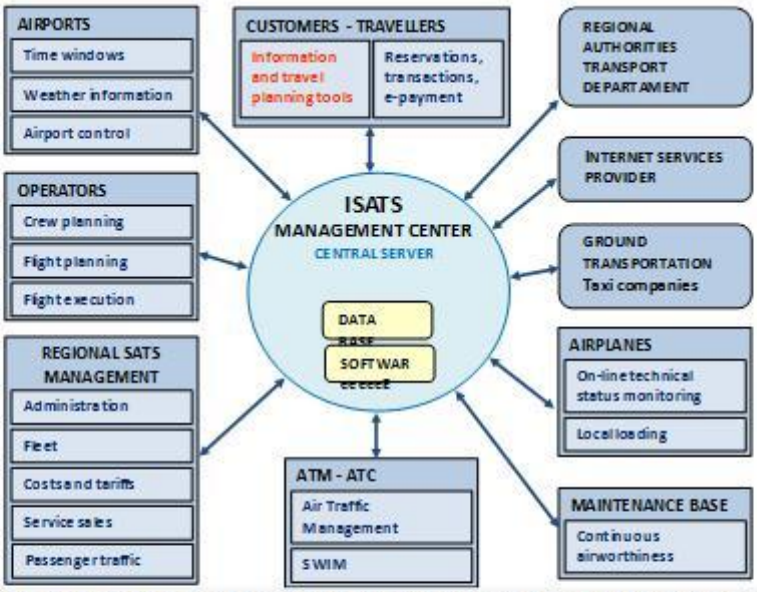
Infrastructure
The existing airports and flight management systems allow significant increase in air traffic, particularly in remote regions. Realizing the existing plans of airports' modernization and the SESAR program will enable further development of the SATS program after 2020.

Information & Communication Technologies – ICT
The condition to achieve the defined goals is to add a specialized and centralized information and communication system to SATS infrastructure. This system will allow to introduce interactive communication between service providers and their customers thus reducing the number of indirect agents and improving the quality of information and service, developing mission effectiveness of aircraft (increasing annual flight hours and load factor , reducing repositioning flights to 5%), better coordination of flight operations and ground services etc.
Adding this system to SATS infrastructure creates an environment for the Intelligent Small Air Transport System (ISATS). Creating ISATS is the basis to significant reduction of the costs of SAT services. Increasing annual flight number to the level of 1200 – 1500 hours and decreasing repositioning flights to 5%, while using an appropriate business model, would allow to reduce the cost of passenger-kilometers, in relation to the current aero-taxi services, by several dozen percent which would lead to significant increase of demand for these services. Considering the existing ICT technologies and available IT centers, after defining the system guidelines and input data being the result of assumed business models, developing and implementing specialized and centralized information and communication system to SATS could be executed within few years time.

SATS Concept in Pictures







The answers to the above questions will provide Information and travel planning tools included in reservation system, which is subsystem of the ISATS net-centric management system,.
Based on input provided by the customer (itinerary, time, individual value of time, preferences, etc.) and the data included in the dynamic database, the model allows you to select the optimum means of transportation for any proposed reservation
ICT enable the association of individual travel needs and adapt to them aircraft capacity and performances .It also allow for more efficient use of the fleet and thereby reduce the level of environmental impact and costs of transportation

Attachment No 5 "Bruce Holmes Comments, 26 Sept 2011"

110926 Notes on Common Vision Paper

Bruce J. Holmes
NextGen AeroSciences, LLC
Williamsburg, VA USA

The following points of strategy for SAT in the EU are in common with the "On-Demand Mobility" concept in the U.S.:

- **Substitution for road travel:** As in the U.S., highway modes in the EU are increasingly congested, with little prospect that more roads will be built to accommodate more car travel. Most of the demand for personal air mobility will likely be substitution for road travel, according to studies in the U.S. The benefits include the prospect for reduced emissions and energy consumption, in comparison with highway travel.

- **Small community air service:** In both the EU and U.S., scheduled air carrier service is in decline in smaller markets. These markets are too thin, or small, to support daily scheduled service; these markets can, however, support on-demand air carrier services, as has been demonstrated in certain industrial innovations in such services in the U.S. and in Europe. This decline in scheduled service is an expected result of airline industry responses to economic forces, include fuel costs. The result over the recent decade in the U.S. is that a decline of more than 40% in passenger-miles for airline trips less than 250 miles and of more than 15% for trips between 251 and 500 miles[1]. The consequence is that smaller communities become more isolated from the economic mainstream and opportunities to contribute to innovation, with coincidental losses in quality of life.

- **RTD activities for smaller airports:** Current NextGen implementation programs in the U.S. focus on the largest of airports and related airspace and airline users; this is a similar situation to that in the EU with SESAR. The implementation of ADS-B, data communications systems, airborne access to SWIM, and other NextGen technologies has not included the General Aviation community in the U.S. The result is that the pace of implementation and the realization of benefits are somewhat delayed compared to a situation in which the small aircraft community were more fully engaged. For example, projects could be implemented today that demonstrate the positive business case for applications of ADS-B OUT and IN, data communication systems, airborne access to SWIM, and remote tower functions that eliminate procedural separation at non-towered airports.

- **Metrics:** The proposed metrics for SAT in Europe coincide directly with those of value in the U.S., including:
  - Environmentally friendly
  - Affordable
  - Safe
  - Interconnected
  - Accessible
  - Predictable
  - Dependable
  - Comfortable

  In the U.S., we would emphasize one more metric: Quality of Service, as measured by doorstep-to-destination speed or time (which is also referenced in the SAT papers). In the U.S., an average door-to-door speed for airline travel ranges between 75 mph for trips of 400 miles in length up to about 125 mph at 1000 miles. These figures are the result of origin-to-destination distance divided by all

[1] Air Transport Association, Washington, DC

of the time required to move through each mode involved in the total trip. It is possible to travel at twice these average speeds in the personal air mobility mode, at total mission costs that are competitive with highway or certain scheduled air carrier prices, in certain markets that are poorly served by airlines.

- **Social and economic benefits:** The degree to which communities in a nation or between nations are connected drives economic performance as well as the capacities for innovation in products and services. The small aircraft transport concept fills a void created by the emerging challenges and constraints in highway and scheduled air service modes.

- **Aircraft design:** Based on experience over the past ten years in the U.S. on-demand air carrier industry, the average segment length for small jets is about 250 nm and for small propeller-driven aircraft is about 170 nm. For each, the average segment duration is about one hour. This means that aircraft designs that satisfy economic and performance metrics based on these experiences should be considered for future aircraft development. Studies should be conducted of the performance requirements that best satisfy network optimization considerations for network-based on-demand (either per-seat, or per-aircraft) operational benefits. These design requirements should consider both alternative fuels (bio-derived Diesel for example) and electric propulsion. Based on current rates of progress in both of these fields, the opportunities to introduce new aircraft into on-demand fleet operations appears plausible as early as about 2020, for earliest adopters. Aircraft that are designed for greater autonomy and remote operational support pose new challenges to certification. Early engagement of the regulators is essential.

- **Industrial engagement:** There is significant risk involved for industry in undertaking the design and development of aircraft for the on-demand air carrier services. The performance and economics of such aircraft may not optimally suit the historical market for general aviation manufacturers of owner-flown personal aircraft. Therefore, governments could support mitigation of technical and regulatory risks through public-private partnerships that target pre-competitive technology development. The investment required of a new manufacturer to develop, certify, manufacture and support a new aircraft design of the size envisioned for the on-demand markets is in the range of $1 Billion (USD). This is approximately the expenditure experienced lately for new startups in aircraft OEM production. Existing corporations can bring a new aircraft to market for substantially less due to existing manufacturing and product support infrastructures. However, the nature of the new markets and design requirements for on-demand aircraft may dissuade most extant OEMs from taking on the risks attendant to these new markets.

- **Automation and Autonomy:** The concepts associated with more autonomy in aircraft and more automation in airspace management under both the US NextGen and EU SESAR programs hold significant promise in enabling advancements in future (post 2020) small transportation aircraft for the SAT/On-Demand Mobility concepts. Approaches to the vehicle autonomy as operated from ground-based command centers can benefit significantly from current UAS operational lessons and will still require significant R&D to advance the most promising of the concepts into commercial services. Automation in the airspace management of SAT/ODM aircraft will benefit from advancements contemplated in trajectory-based operations (TBO) for airspace. R&D involving government, industry, and regulators to mitigate risks is an essential ingredient for progress in these areas.

- **Regulatory considerations:** The regulatory community for General Aviation aircraft in the U.S. is highly interested in supporting the advancements considered in both the EU and the U.S. on-demand mobility studies. Collaboration between the EU and US in technology advancement for SAT/On-Demand Mobility would logically include the regulators on both sides.

The Three Pivotal Questions:

1. **Do you agree with the following statement: "A Small Aircraft Transport System, based on small-size aircraft, operating on commercial scheduled or nonscheduled flights from standard airports and small airfield network, should be accepted as a component of the European (Air) Transport System"?**

A: In the U.S., the answer to this question could be "Yes," if the environmental and airspace capacity impacts can be demonstrated by analysis to be neutral or better.

2. **Do you agree with the formulated goal: "The main goal of Small Aircraft Transportation System is to provide fast passenger transport service for European business travel, the need of passengers along city pairs with low intensity traffic (also in central Europe), as well as the needs of remotes regions with underdeveloped transport infrastructure thus enabling door-to-door travel between EU regions/city pairs at a flying distance of around 4 hours?**

A: The previous operational experience for on-demand air carriers in the U.S. indicates that the average flying distance for the eastern portion of the country is around 1.0-1.5 hours. The distribution of flying segments around this average has a deviation of about plus one hour and minus .25 hour. The answer could be different in the EU, however, modeling studies should be conducted that can determine these figures.

3. **Do you agree that this goal might be met by 2020 using mostly currently existing aircraft, infrastructure and available ICT?**

A: Business case evidence in the U.S. supports the premise that if the airport and airspace infrastructure can be deployed to all airports and related airspace (i.e., ADS-B, RNP, SWIM, data comm), then operators can put reliable services into operation with business cases that close using current aircraft (e.g., Eclipse 500, Cirrus, et.al.). This premise is based on fares of about $1.25 to $2.00 USD per seat mile. However, for the industry to move from serving the business markets towards the larger leisure markets, these fares need to be in the range of $.50 per seat mile – thus requiring a new generation of aircraft and utilization rates.

###END###

Attachment No 6 "Frans van Schaik Comments, 26 Sept 2011"

Three Pivotal Questions
Frans van Schaik

26 Sept 2011

Dear all,

First of all, I will attend both the PMC and the Worksop in Brussels, so you can react on my notes during these days.

I have spent some time reading the Common Vision document and would react as follows:

1. Please put a time horizon in the title of this Common Vision: like "up to the year 2030".
2. In some paragraphs it is not clear where the statements come from; please add more references
3. ATM deserves more attention. Page 5 could state that SESAR is not able to provide ATS to 50.000 or 100.00 extra personal aircraft in Europe, but there are more places in the vision, like chapter 3b to expose the ATM problems
4. Is known what the effect will be of new web-based communications? I would expect that the web meetings, web based conferences, web based telecom would lower the need for travelling.
5. The noise level at existing airports shall not increase. This might become a major go/no-go item for PATS. We shall put more emphasis on it.
6. We are up to now talking about aircraft with 4 up to 19 seats; chapter 4a signals a "gap to fill" for aircraft with 19 to 40 pax. No problem for me, but (1) we shall be very clear what we are talking about, (2) please give more references and (3) indicate the consequences for e.g. certification (costs).
7. Chapter 3e contains a message to stimulate governmental actions in favour of SATS. This gives me the impression that such is needed for the success of PATS. It could be explained as if we already know that any PA is not profitable.
8. Same remark for with 3f and the Public Service Obligations. In a free market, tariffs will be known.
9. How do we cope in the business case with airports that subsidize air transport (related to 3f)?
10. Please add references to chapter 3g
11. Do we need some statements (actions) to increase the believe of Banking people? We need money for our investments.
12. Chapter 4: how do we estimate the effect of web-based communications, making travelling not needed?
13. Chapter 4: should we emphasise more on the effects of fuel price? I assume this to be the most important cost.
14. Should we emphasize more on the effect of mass production of PA? Think about 10.000 aircraft per type or even more.
15. Chapter 4b, add ATM, Safety, Training and Safety Management to the list:
    - How to provide Air Traffic Services to 10.000 or 100.000 more European Personal Aircraft?
    - How to fly those PA safely?
    - How to train and check 10.000 extra PA pilots?
    - How to introduce and maintain a safety management System for those numbers?
16. Question 3: It will really evoke reactions, if we don't need new aircraft!

Se you tomorrow,

With kind regards,

Frans van Schaik

Attachment No 7 "Roland Guraly Comments, 26 Sept 2011"

RE: Common Vision Discuss Paper - Workshop for Small Aircraft Transport Mode, Brussels, 28th Sept 2011
2011-09-26

Dear Mr. Dziugieł,

Thank you for asking my opinion about the issue. After consulting with my colleagues, I must admit that it looks quite deliberate. We only have some minor comments, see below.

The SATS vision is quite right divisioning the feasibility around three aspects: Aircraft, Airports and Airspace/ATM. Regarding the aircraft part, I agree with the statements of the material, adding that the onboard avionics of the state-of-the-art small aircraft evolved so fast in the last few years that the gap between the situational awareness of the pilots of an airliner and a small airplane is rapidly vanishing. This is good news for all-weather operations safety.
Moreover, time will soon come when satellite-aided onboard systems completely outrule such ground-based equipment as ILS, VOR and DME, connecting each-and-every strip of concrete equipped with some runway lights to the rest of the world. As the paper indicates, this allows small airports to get into the business with a relatively small investment.
From the avionics side, it is right. However, I fear, there is more in the box. For example, all-weather operations may require

- the proper and reliable treatment of runway surface in harsh met conditions,
- weather reporting and forecasting service,
- firefighter service defined by the traffic,
- de-icing service available,

Another tricky question can be the security issue. Security control provided by small airfields is usually far from the service operating at public airports. We all hope that SATS makes traffic volume increase on these places, so they will most likely have to provide the equivalent level of security to eliminate a new threat towards the public. This, along with the constraints related to the proper all-weather-operations can make the airfield-side investment considerable.
Apart from that, I agree with the statements of the document, and welcome the idea. Please let me know whether we can contribute to the promotion of the project. Among my Colleagues are airport and ATM experts, as well as aircraft-engineers experienced in small aircraft design, so the topic fits well into our field of work. I would appreciate if you kept us informed in the future.

Unfortunately I cannot participate at the workshop on Wednesday.

Best regards,

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web: www.slotconsulting.hu

Attachment No 8 "Pierre-Marie Basset Comments, 27 Sept 2011"

Three Pivotal Questions

Pierre-Marie BASSET

27th Sept 2011

Dear European partners,

After receiving on the 23rd of September the document :
Common Vision for Small Aircraft Transport Systems (SATS)
I give you my feedback as a research engineer for Rotorcraft R&D for 20 years.
That is my personal view but I am sure that many of my colleagues not only at ONERA would share it.

The paper is very comprehensive addressing nearly exhaustively all aspects expected regarding SATS.
BUT to my great surprise, there is absolutely not mention about helicopters or any rotorcraft concepts.
Even in the part "4.b - Future needs and new technologies (after 2020)", there is a paragraph about "Innovative concepts and configurations", but with only the general very short mention "New configurations may be introduced".

I believe that:
Rotorcraft configurations should not be excluded "a priori",
(this a priori may come from the "airplane culture" of the authors for which rotorcraft are considered as more costly, more noisy than an airplane).
Indeed they are very well suited for the purposes of SATS !

Rotorcraft can be part of the SATS:
a) during the first phase (until 2020):
thanks to their Vertical TakeOff and Landing (VTOL) capabilities, they can (already now) provide door-to-door transportation nearly everywhere (with low investment in ground infrastructure in places where there are not yet heliport available) and exactly in the scope needed in terms of range ~400km and travel time (~4hours). By doing so they can reduce the travel time and limit the change of transport mode nearly replacing the connection {small airplane + ground transportation (taxi or bus)}. By doing so they can compensate their assumed higher DOC.

Already in this first period, the acoustic impact is reduced thanks to much progress in the rotorcraft design (e.g. see Blue edge techno) and also thanks to adapted flight path approaches reducing the noise footprint. Helicopters can land on top of buildings or other helipads where the detrimental impact is reduced and very close if not in the city centres.

b) During the second phase (after 2020):

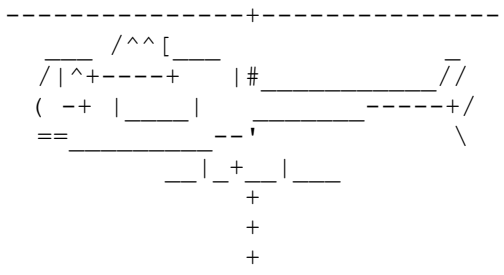
Rotorcraft concepts must be considered for SATS,
knowing that new rotorcraft configurations and techno will be developed for :
extending their flight envelop in terms of speed, range (e.g. see Sikorsky's X2, Eurocopter's X3, etc.) and lift capability (see Joint Heavy Lift System studies already few years ago in the USA),
reducing their environmental impact (energy efficiency, air pollution, noise).

SO, about the three pivotal questions at the end of the report:
1- YES, but add "on small-size aircraft (airplanes and rotorcraft) ... from standard airports-heliports and small airfield-helipads newtwork"
2- YES, but why only for business travel ? SATS will be also beneficial to private interest travel (for example allowing increased distances between working and living places) and to leisure-tourism EU developments.
3- YES if we start soon !

Hoping my remark will be well received and understood.
Knowing that I am not working for a rotorcraft builder, there is no underlying intention, but a sincere point of view.

Sincerely yours,

Pierre-Marie BASSET



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Attachment No 9 "Tony Henley Comments, 30 Sept 2011"

Tony HENLEY - answers for 3PQ

30 Sept 2011

Questions not address

- Fuel use per passenger mile – today - What is necessary to compete with cars
- Acceptable weather minima specifically the number of days per year when flight not possible will depend on the aircraft and the infrastructure and can be improved with technology

f page 9

o Per-seat on demand (aircraft sharing).
o Aero-taxi service.
o Seat reservation on a scheduled flight
o Transport services information system, including a tool for choice of best available transport to carry out the travel planned by customer.

There are too many options for the pricing model –

The local transport organiser is a good concept which we should expand on

Annual flight hours over 1000 hours.
o Load factor 0,75 or more.
o Allocation of airplane bases adapted to serviced network and lowering idle flights of 5%

Need more justification of why an IT system will improve these.

Page 10

Mission requirements include the following main airplane characteristics:
o number of passenger seats,
o cruise speed,
o operative range,
o takeoff and landing distance,
o typical flight profile,
o propulsion,
o avionics,
o economic and operational parameters.

Add altitude of cruise and weather minima to this list

Page 11

Specifically, it should be expected that a category should emerge to fill a gap between 19 seater commuter and 40 seater regional aircraft.

Only true if based on a scheduled service – 40 seats seem too many ,19 is a lot given the current alternative transport options

Of the list of issue on pages 11 and 12 it is likely that only

- **Flight management:**
- **Flight safety:**
- **Comfort:**

And to some extent

Airplane control

Have a significant impact on the viability of the concept. What is missing is (Near) **all weather operation** - without this the concept is dead

Appendix - 2 SMALL AIRCRAFT TRANSPORTATION SYSTEM MISSION REQUIREMENTS

Altitude implies mostly class G airspace (other than for jets)
Weather is a problem at these altitudes
CS23 a Ok but I believe that for the more sophisticated aircraft CS23 part 4 applies which is very demanding in term of systems integrity.

LIST OF SATS AVIONICS. (*on the basis of „D4.1 EPATS aircraft missions specification")*

Weather is a key issue especially with the small aircraft
ILS will not be available at small airfield therefore no value consider GPS (GNSS) plus WASS (EGNOS) and Local Area augmentation for precision landing guidance to the pliot

HUD with EVS /SVS could be affordable for such small a/c/ small airport operations supported by augmented GNSS

Critical additional avionics - a new Flight Control System to manage weather(gust alleviation) and pilot support including envelop protection with a simply high integrity back up mode in case of failure

1. Do you agree with the following statement: "A Small Aircraft Transport System, based on small-size aircraft, operating on commercial scheduled or non-scheduled flights (more likely to be successful if it could run only as Scheduled or semi scheduled service) from standard airports and small airfield network, should be accepted as a component of the European (Air) Transport System"?

Yes, but..... we should define clearly what we mean by the different approaches , on demand taxi, semi schedules , scheduled, etc., as the viability will be different for each depending on the environment. See below

2. Do you agree with the formulated goal: "The main goal of Small Aircraft Transportation System is to System is to provide fast (and reliable and affordable) passenger transport service for European European business travel, the need of passengers along city pairs with low intensity traffic (also in (also in central Europe), as well as the needs of remotes regions with underdeveloped transport

transport infrastructure thus enabling door-to-door travel between EU regions/city pairs at a pairs at a flying distance of around 4 hours?

Yes .. But note that this question includes 3 different operational models which will have different business cases

- **Business travel (in the economic banana- implying on demand taxi?)**
- **City pairs with low intensity traffic (outside the banana - implying Semi schedule?)**
- **Regions with under developed transport infrastructure (implying low capacity scheduled?)**

Suggest delete the word 'Remote' , what is important is the transport infrastuture rather than the geography or economic capacity. Remote, low income rural areas will generate little demand

3. Do you agree that this goals might be met by 2020 using mostly currently existing aircraft, infrastructure and available ICT?.

Yes and more importantly if some service can be established in that time frame it will be very difficult to maintain the necessary future investment or the regulatory and ATM environments necessary to support the long term expansion. This is not to suggest that new aircraft, systems and infrastructure will not be required to grow the opportunity, just than if there is no viable commercial operation within 9 or 10 years the concept will die.

Attachment No 10 "Stefaan Ghijs, 6 Dec 2011"

Common Vision – Three Pivotal Questions
Stefaan GHIJS – Comments 11Y12.06

Dear Krzystof,

Hereby my comments and remarks of a very good start of the vision document.
The detailed comments are in the document. Underneath some general comments.

- I do think the goals are not very clear and should be made objective (SMART).
- I do NOT envision a public system of on-demand or personal air transport in the current EU steered by one IT system. What I do believe is that on-demand an personal travel should become cheaper in order to improve mobility in Europe.
  Decreasing the price majorly (goal still to be set in the document) for personal flying (and increasing safety and the easiness to fly) will set-out a boost on the demand for of on-demand personal air transport, therefore setting out a necessity for a controlled air transport environment for safe free flight (including ATM, regulations, airports, air space etc.).
- The driver for on-demand personal travel is not only the underdeveloped or lack of infrastructure and low intensity traffic, but are also congested developed infrastructure (traffic jams, congested airports) and the convenience factor.
- I do agree with the set-up for IT system improving the on-demand business from an operational point of view, but not from a commercial point of view. Gathering demand by IT systems, to increase the load factor will always eventually become a scheduled service. Additionally operators are not very keen to decrease their entrepreneurial dependency in obligated partnerships, steered by demand gathering IT systems with other operators because of quality reasons. Additionally chances that more than one customer needs to join another customer on the same moment to the same place on-demand is low. In an on-demand system customers do not want interdependency of other customers.
- Looking at an on-demand system an intermodal match should be made (ref. Lufthansa en business jet services, providing a differentiated product to high end customers).
- Main factors for operational success are all weather aircraft landing systems to land at airports without ILS facilities, single pilot operations, low aircraft DOCs with low maintenance requirements and operational optimizers minimizing empty legs. Additionally IT should help in automatic (flight)planning and reservations decreasing indirect and overhead costs.
- I agree with the comments of Bruce. Nonetheless two major differences need to be spotted: 1. The population density in the US is totally different then the EU therefore generating different drivers for on-demand transport, the acceptance for on-demand transport is far higher in the US than the EU. The average travel time distribution for the EU needs to be made.

Cheers,
Stefaan

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Attachment No 11 " Common Vision-v1-Baron"

COMMON VISION

ON THE DEVELOPMENT OF

A SMALL AIRCRAFT TRANSPORTATION SYSTEM (SATS)

Version v1,

1 Small Aircraft Transportation System (SATS) concept

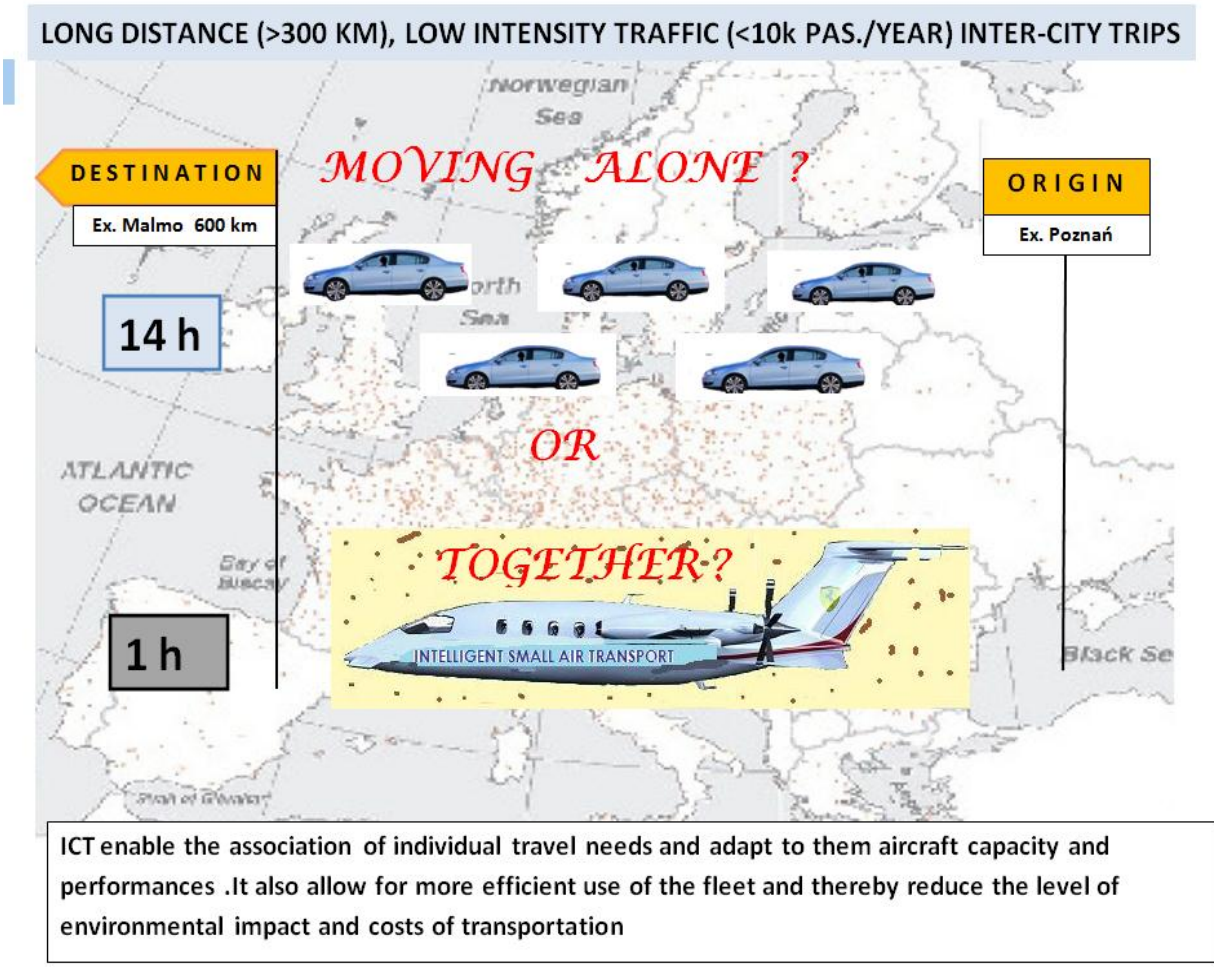
The air transport system in Europe has been constantly adapted to new demand and requirements.

In the 1960ties, economy class was introduced in airline operations which made air travel more affordable. The introduction of Low Cost Carriers was another step change. It allows leisure travel to further develop. The HUB and spoke airport system allowed access to those destinations where direct routing for large (intercontinental) aircraft was not economic.

The air transport system in Europe currently accommodates about 10 million flight movements to 450 airports. 150 scheduled airlines transport some 750 million passengers in Europe per year. Today about 30% of air travel is related to business travel and 70% to leisure. Thanks to economic growth, air travel demand increased by more than 4% per year. This resulted in mass transport. As a consequence the airport systems is getting more and more overloaded. New security rules are in place that are time consuming for the passenger.

It is expected that a next step change in the development of the air transport system will be more personalized air transport. This form of transport will use relative small airplanes, dense network of small airports and new Information & Communication Technologies to provide quick services. In principle different types of operation to satisfy the needs of those requiring more personalized transport can be foreseen. It will complement existing travel modes and will be a substitute for road travel on highly congested roads in Europe for distances above 300 KM.

Picture below shows an example of such beneficial substitution:



ICT enable the association of individual travel needs and adapt to them aircraft capacity and performances .It also allow for more efficient use of the fleet and thereby reduce the level of environmental impact and costs of transportation

Existing mass transport systems – (high-speed) rail and airlines - serve intercity connections where passenger flows are thick and load factors are high (in aviation the load factor is nearly 80%). As a result cost-effectiveness is ensured. On connections where such passenger volumes are not achievable, mainly road transport modes are used (cars and busses).

In Europe a large scale high speed train network is being developed which involves the support by the European Commission. These high speed trains are seen as an attractive substitute for car travel and regional air traffic. Large sums of money are needed to establish the infrastructures (cost about € 40 million per KM of track).

The EU development strategy is mainly focussed on regions generating the biggest passenger traffic flows. Time now to implement a balanced policy of regional development and support solutions to the efforts.

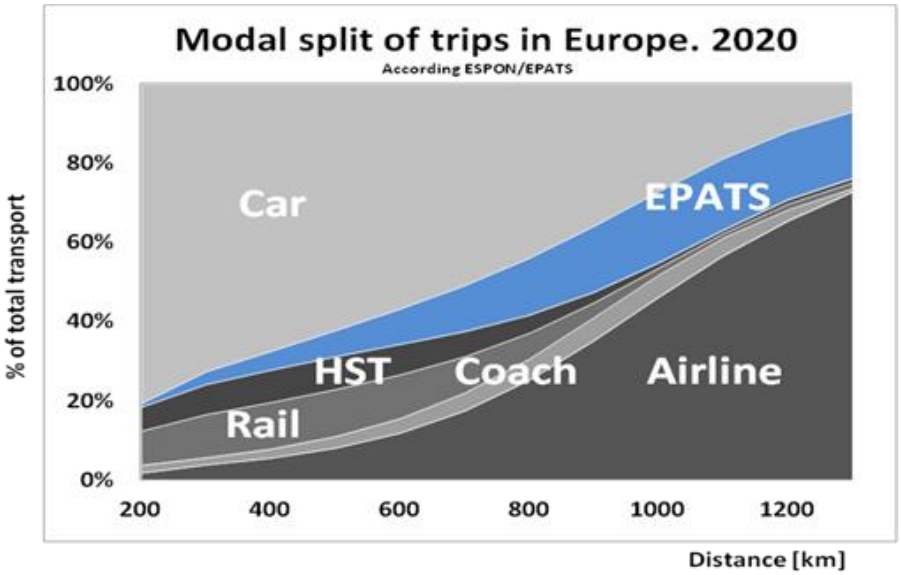


Fig 2. Modal split of trips in Europe. 2020. According to ESPON/EPATS

The EPATS study took into account that there are 2500 airports and aerodromes in Europe that can be used Small Aircraft Transport operations. These airports are very near to regional towns. They make door to door travel possible in the shortest possible time. The maximum radius of action of a car trip is between 250 and 400 km per day, depending on road infrastructure. Even with a dense road network, distance that can be travelled by car during one day allowing a return trip does not exceed 400KM or 4 hours. A longer trip by car takes too much time. Apart from the cost of travel, these longer trips involve cost of accommodation. And there is the value of time: long car trips mean ineffective hours for business travellers which involve high opportunity cost. Peripheral regions in Europe lack access to mass transport means and rely heavily on road transport.

This hinders their economic development even more. It also adds to road congestion in Europe and its negative effects on the environment. Although airport facilities are available in those regions, the traffic flows do not allow regular airline operations using bigger aircraft. The SATS system could serve these regions as well and help to develop these into stronger economic centres. In order to implement a balanced growth strategy it is important providing transport accessibility for cities and areas devoid of efficient and fast transport; this can only be realised through more intensive use of airspace and capabilities of air transport with an eco-sustainable approach.

The SATS approach will add a new modality within air transport and complement international and regional transport. .

The system is based on small aircraft, 4 to 19 seats, operating in an integrated and intelligent transport management system.

Thus it is advised that the Small Aircraft Transportation System development and implementation might be included in the EU mobility strategy and transport network development.

The High Level Group on Aviation Research chaired by the European Commission published its „Flightpath 2050 Europe's Vision for Aviation" in March this year.

It advocates tailored travel services that are seamless and cost/time efficient.

The SATS system can contribute to this goal.

Research and development

So far, the research and technology development activities (R&TD) for civil transport aircraft has been focused on larger aircraft along high-intensity and long range routes. To some extent this is logical as the industrial profit margins on large aircraft is much larger than for small aircraft.

Substantial profits adopting SAT system are only possible if small aircraft are intensively used and produced in large series. Only large markets will attract the interest of the manufacturing industry.

The same holds true for RTD focusing on airports and new Air Traffic Management systems. Currently, the actions are focused on large airports and SESAR is essentially concerned with scheduled airline operations using large aircraft.

If a new SAT system has to be developed, RTD actives need also to focus on the development of related systems and its major components.

SATS approach will add a new modality within air transport and complement international and regional air transport.

SATS cannot be developed overnight.

Therefore urgent action is needed today to prepare for the future.

In „Flightpath 2050 Europe's Vision for Aviation":

"European citizens are able to make informed mobility choices and have affordable access to one another, taking into account: economy, speed, and tailored level of service.

Travellers can use continuous, secure and robust high-speed communications for added-value applications. ***90% of travellers within Europe are able to complete their journey, door-to-door within 4 hours.***

Passengers and freight are able to transfer seamlessly between transport modes to reach the final destination smoothly, predictably and on-time."

In „Beyond Vision 2020 (Towards 2050)":

"Business air transport is also what symbolically drives social demand. ***Personalized*** *air transport that is clean - the key element is pollution; air before noise - could be a driver for future aviation.*

In a multipolar world, such a model could envisage the position of the air transport sector (particularly in the EU) within a world that has the means to offer itself air transportation with lower standards. Potential policies aiming to regionalize leisure could create specific niches for ***personalized*** *air transport solutions. The social image of future air transport could therefore be articulated around both big mass transport and* ***light personal transport****."*

*"****The people-oriented system****: Today's traveller is sometimes treated not as an individual but as part of a herd. The experience of air travel often includes the invasion of privacy by security measures, discomfort during long transits, lengthy waiting times, inadequate information, and uncomfortable conditions - both on the ground and in the air."*

"In Europe, expectations of future travelers include: ***Personalized*** *travel, with individual tailoring of the travelling experience".*

2. Small Aircraft Transportation System (SATS) main goals

The main goal of Small Aircraft Transportation System is to provide high-speed passenger transport to European Regions serving city-pairs with low-intensity traffic (below 10K pas./year for each route and more than 10K pas./year generated by region), traveled by cars so far, and without close prospects for the introduction of high-speed train or scheduled airlines, mainly providing services on the routes on which travel time from door to door using available mode of transport is greater than 4 hours for business trips and 8 hours for private travel

The System must be **environmentally friendly, affordable, safe and secure, interconnected, accessible, predictable, dependable and comfortable**.

- The system has to be **environmentally friendly.** SAT system should not should not raise the noise level at which people are exposed . Noise contours should stay within the airport boundaries and with a low societal impact. The system should also enable a reduction of emitted greenhouse gasses compared to other means of travel.
- The system has to be **affordable.** Cost of travel will be comparable with other means of fast transport.
- The system has to be **safe** not only by meeting appropriate EU aviation rules and regulations, but it should also be perceived as safe by the users. The operational system has to be **secure** as well.
- The system has to be **interconnected** so that it will be part of a multi modal seamless transport system.
- The system has to be **accessible** thanks to the high density of existing airports and the short distances between these airports and the final destination.
- The system will offer a high level of **predictability**. The system needs to operate on time during 24 hours, seven days a week. Only in specific circumstances (extreme weather, volcanic ash) where safety might be compromised, the system may shut down.
- The system needs to be **dependable**, so that the passenger will be assured of flights that meet his or her time schedule.
- The system needs to be **comfortable** and client centred. Aircraft will offer the same comfort as cars. The reservation system will make use of social media to book flights.

Studies conducted in the EPATS project showed that these goals are achievable, but

meeting them will depend on many actors: EU, member states, regions, cities, as well as the industry, social partners and citizens. Hence, a clear vision of development needs and broad awareness of the social benefits resulting from implementation of SATS is crucial for future developments.

A clear vision for the development of this new air transport mode needs to be developed and accepted in the public and private domains based on the awareness of the social and economic benefits resulting from the implementation of SATS.

3. Vision on system development.

a. Mobility and demand

Vision of SATS development is closely connected to prediction of interregional (intercity) passenger traffic in Europe. The choice of transport mode depends on many factors, but mainly on distance, time and cost of travel and on value of time spend in travel.

Planning a new transport investment it is necessary to have a full knowledge on the needs it has to meet and tasks it has to fulfil. Data base and models of European transport network based on population mobility research will serve this purpose. Such models and data were developed in the framework of many European projects, among others: DATELINE, TREMOVE I TRANSTOOLS.

Especially important for planning the SATS system is knowledge about those intercity connections which, with existing transport modes, cannot be accomplished with a one day return trip.

These routes will constitute the bulk of SATS connections, the basis for calculating demand and setting mission requirements for aircraft. Door-to-door travel time on any interregional connection of up to 4 hours, is one of the main SATS requirements.

Preliminary analyses so far, in EPATS project, that was based on mobility requirements indicate that substituting business trips above 300 km from cars to small aircraft, would require a fleet of 89.000 small 4 to 19 seat aircraft: both propeller driven aircraft and jets. These projects show that in terms of safety, cost, time and energy efficiency as well as environmental impact, small aircraft transport is more advantageous than road transport.

b. Airspace and air traffic management.

Introducing large quantity of small IFR aircraft into the European airspace requires an adaptation of the ATM system in Europe. These small aircraft will make use of modern satellite based CNS systems and will be connected to the new SWIM network. They will use new GNSS based systems to navigate, separate, take-off and land. Therefore only small low cost changes will be needed at regional airport infrastructures. These costs are affordable for local governments interested in their development.

c. Airport network.

In Europe there are 2126 airports and aerodromes, 1336 of which have concrete runways and 737 are already equipped with ILS systems. In most cities with more than 100.000 citizens there are airports available with concrete runways in the proximity.

These airports are not exploited up to their potential. There is a need is to inform both central and local governments about the SATS service potential and benefits. Hence, a broad information action and setting up contacts and collaboration is needed to introduce the system.

It is reasonable to take action for: “Initiating stocktaking of all existing and planned airport and landing facilities in the EU Member States and Strategic Plan of European Airport Modernization”. An European program - similar to the US “National Plan of integrated Airports Systems” (NPIAS) and “Airport Improvement Program” (AIP) - should be defined and implemented. The new Airport Package proposal by the European Commission (DG Move) should also include the development of these regional airports.

d. Small aircraft market

The market of small aircraft for passenger transport meeting FAA Part 91 requirements for non-commercial transport (private and corporate) and FAA Part 135 for commercial transport (charters, aero-taxi, commuters) include the same range of aircraft as business aircraft market. The fleet of these aircraft comprises pistons, turboprops and jets, 4 to 19 seaters. Number of these aircraft in EU is roughly 5000, of which there are 2294 jets and 1148 turboprops. Most of these aircraft are American built. The most commonly types used in EU are:

- Jets: Citation 525 (7 seats), Citation Mustang (5 seats)
- Turboprops: Beechcraft King Air 200 (14 seats), Piaggio P180 (7 seats)
- Pistons: PA-31 (5 seats)

Currently, aircraft with highest annual production numbers and mostly purchased in recent years are:

- Jets (meeting affordability criterion): Eclipse (161), Phenom 100 (100), Citation Mustang (73)
- Turboprops: Cessna Grand Caravan (87), Beechcraft King Air (90), Socata TBM 850 (38), Pilatus PC-12 (79)
- Pistons: Cirrus (264), Diamond (129), Piper (135)

In the class of business aircraft these aircraft now represent the highest technical level.

The annual world production of business class aircraft in 2010 was 2015 airplanes, which is made up by 889 pistons, 363 turboprops and 763 jets. EU share was about 18%, while US share was 66%. It is worth to remind to be aware of potential production capabilities that in the US in 1976 annual production reached 17000 units, while in Poland Mielec manufacturing plant produced 660 AN-2 in 1972. Currently manufactured business aircraft, as new CNS are developed and propulsion modernized, will be periodically retrofitted, which will enable their adaptation to new regulation requirements.

Designing new aircraft types should be based on mission requirements resulting from intercity mobility research, transport models (e.g. TRANSPOOLS) and SATS operation model.

New aircraft designs to be introduced after year 2020 should take into account relevant results of SESAR, Clean-Sky, ESPOSA projects and should be based on regulations requirements in force on the day the design process is started. Mission requirements for designs carried out in the framework of EU projects should include socio-economic requirements and be supplemented by operational cost limits approved by the European Commission.

Increasing demand for air transport services induced by introduction of SATS will create the need for dynamical increase of small aircraft fleet size; currently existing aircraft types deliveries will increase and new aircraft types will be designed and introduced into market.

e. Organization and operation of the system

SATS is a personal passenger transport system meant to provide public service. Local and central government should supervise the system, and are responsible for sustainable transport and regions development. SAT System development should be an element of the European development strategy for transport modalities and infrastructures, in particular air transport. The basis for creating SATS in a region is a transport development plan, based on intercity mobility needs and transport models, coordinated and consistent with national and EU programs.

Organizational SATS structure comprises local, regional, national and EU organizations and entities, acting autonomously, but related through common regulations, infrastructure system elements and operating in a common central management system based on Intelligent Transport System technologies – see "Appendix 1 - System Architecture scheme" which must be treated as an initial concept to study the development of the business model. Aircraft operators should be concentrated in corporations which sign agreements with organizer to provide transport services. Transport organizer might be public, private-public or private entity, and should sign an agreement with governments.

Common maintenance base will be created and continuous airworthiness planning coordinated. (topic to study in the business model).

The current White paper on transport by the European Commission does not yet fully recognises the potential of the SATS system. It is felt the potential impact of SATS on future transport system should be more clearly recognized.

f. Service range and tariffs.

SATS services should provide passenger door-to-door transport on any route in the network at a convenient time for passengers and include:

- Per-seat on demand
- Per aircraft on demand (aircraft charter)
- Aero-taxi service. (one way aircraft on demand)
- Seat reservation on a scheduled flight

- Transport services information system, including a tool for choice of best available transport to carry out the travel planned by customer.

During reservation the system should allow to organize transport to and from the airport as part of the service and as part of a single transaction. Appropriate agreements should be signed with taxi companies, which should be included in the IT system.

Service tariffs should be published and updated on the SATS webpage. Tariffs should be set centrally, (we assume the most of routes will operate as PSO routes (Public Service Obligation for remote regions) according to Regulation (EEC) No 1008/2008 which define a system of public service obligations (but finally it should be the subject of studies in the framework of business model) based on model of Dynamic SATS Yield Management, which maximizing yield of the system (in limited scope) will take into account a variety of services and customers, time windows, regularity of service use, purchase of service pack, etc.

g. Intelligent Small Air Transportation System

Meeting the condition of SATS affordability requires creating Intelligent Small Air Transportation System. Affordability can be achieved, provided that the price of services will be affordable for a wide number of people, i.e. total cost of travel will be comparable to that of a personal car. Nowadays, cost of transport using business airplanes and air taxi service prices are far higher. It is mainly a result of high indirect costs, which are several times higher than direct operating cost. This is caused by: too few annual flight hours, low load factor, high cost of idle flights, high customer handling cost and high DOC resulting from small fleet size.

Analyses show that there is the possibility to significantly reduce these costs to a level close to affordability for a significant part of the population. To achieve this goal, the following conditions must be met:

- Annual flight hours over 1000 hours.
- Load factor 0,75 or more.
- Allocation of airplane bases adapted to serviced network and lowering idle flights of 5%.
- Introduction of full and automatic internet customer handling.
- Interactive connection between customer needs and service provider capabilities.
- Centralized customer services management.
- Common aircraft maintenance bases.

Above requirements are possible to achieve using advanced management techniques and various ICT thus creating Intelligent Transportation System.

Definition and introduction of such ITS requires the involvement of many institutions and specialists from different disciplines and its evaluation requires extensive investigations.

Implementation and verification of ISATS operations may take place in several regions of UE countries, chosen on the base of mobility research and transport models.

These regions would play the role of forerunners in creating SATS in Europe and would start a new impulse in European personal transport strategy.

4. Vision on Small Transport Airplanes development

A “Vision” on SATS should be agreed for two time frames:

- **Current and near term social needs and mostly existing technologies (until 2020),**
- **Future needs and new technologies (after 2020).**

Development of small airplanes is driven by demand for fast transport services. A measure of the demand is the number of passengers which are willing to choose air transport as optimal transport mode for travelling between regions.

The choice depends mainly on time and travel cost, passenger wealth and their assessment of time value. Cost and time of air transport depend on airplanes parameters and business model used. Setting the parameters and model is the scope of transport market analyses. In passenger transport such analysis are mainly done by airlines which, under agreement with manufacturers, set mission requirements for new aircraft types and order them.

In case of introduction of a new transport system, such as SATS, the lack of an existing operational airline means that other entities must take up the task of analyzing market demand and setting mission requirements. As it is a public service transport, local government and institutions are responsible for balanced transport development and thus they should carry out the task or endorsing such an analysis looking for competent stakeholders.

Mission requirements include the following main airplane characteristics:

- number of passenger seats,
- cruise speed and typical block speed,
- operative range,
- takeoff and landing distance,
- typical flight profile,
- propulsion,
- avionics,
- economic and operational parameters (including costs limits and altitude of cruise and weather minima).

Operational, safety and environmental requirements are common for a given aircraft category.

Extended mission requirements describe airplane that meets customer requirements. The formulation of extended requirements define future aircraft performance and characteristics and thus to technical solutions that will be chosen in the design process.

Elaborating mission requirements for SATS airplanes must be based on:

- interregional mobility research and social demand,
- real technical and infrastructural rationale,
- specific business model and reliable socio-economical and cost data.

a. Current and near term social needs and mostly existing technologies (until 2020)

Let’s assume that during next years currently produced aircraft will continue to operate, and in nearest years (2020) new designs will be developed based on safety, environment and design requirements currently in force. Operational requirements, on the other hand, might change.

Based on these assumptions, in the EPATS project expected mission requirements, comprising SATS fleet, have been determined. These are shown in Appendix-2. These requirements are based on the results analysis of interregional mobility research carried out in DATELINE and ESPON EU projects and on available technologies used in passenger aviation. Because of gaps in the above mentioned mobility research and not thoroughly elaborated cost models and choice of transport mode models, the presented SATS fleet structure should be considered as an updated guideline.
Aiming to minimize energy use and detrimental effects on environment and seeking to optimize aircraft type and route on particular network connections, it should be expected that number of aircraft types should

increase and many models should be introduced. Specifically, it should be expected that a category should emerge to fill a gap between 19 seater commuter and 40 seater regional aircraft.

Determining what new small passenger aircraft types should, in a few years (until 2020), be developed from private and public funds and enter EU market should be done after having gained a clear picture of interregional mobility and reliable transport model.

Investment return period for design, starting production and introducing into market of a new passenger aircraft, reaching hundreds of millions of Euros, is about 15 years. Only the biggest aircraft manufacturers can afford such decisions. Similar cycle for small passenger aircraft will be below 10 years and the investment might be 50 – 150 million Euros. For small aircraft manufacturers these are huge sums and the risk is very high if there is not a reasonable expected return due to a foreseen market.

In his Notes on Common Vision Paper Bruce J. Holmes wrote: "*There is significant risk involved for industry in undertaking the design and development of aircraft for the on-demand air carrier services. The performance and economics of such aircraft may not optimally suit the historical market for general aviation manufacturers of owner-flown personal aircraft. Therefore, governments could support mitigation of technical and regulatory risks through public-private partnerships that target pre-competitive technology development. The investment required of a new manufacturer to develop, certify, manufacture and support a new aircraft design of the size envisioned for the on-demand markets is in the range of $1 Billion (USD). This is approximately the expenditure experienced lately for new startups in aircraft OEM production. Existing corporations can bring a new aircraft to market for substantially less due to existing manufacturing and product support infrastructures. However, the nature of the new markets and design requirements for on-demand aircraft may dissuade most extant OEMs from taking on the risks attendant to these new markets.*"

b. Future needs and new technologies (after 2020)

Further development of small passenger aircraft is constrained by the adoption of the SATS as a new transport mode by EC and MS and by starting new R&TD projects.

So far, only few research projects have been directly associated with R&TD for small aircraft. Planning to introduce SATS requires supplying the market with more advanced aircraft; clearly the goal is to have EU industry lead in manufacturing this class of aircraft and related systems for operations.

SATS aircraft to be operational after 2020 will differ from business aircraft currently in the market; hereafter, a non-exhaustive list of potentially relevant technologies.

- **Innovative Concepts and Configurations**
  - New configurations may be introduced.
  - Modular aircraft design will increase product adaptively to market requirements (among others, easy replacement of constantly modernized avionics). Base version should ensure development of derivative versions (e.g. with lengthened fuselage and number of passenger seats with the same wing and its nodes, tail, cockpit and propulsion).
- **Propulsion:**
  - Environmental friendly, lighter and more efficient small turbine engines with significantly lower manufacturing and operation costs.
  - Introduction of diesel engines powered by Jet-A or Bio-Fuel.
  - Higher efficiency propellers (above 0,85)
  - Innovative propulsion engines with low environmental footprint (e.g. electric, hydrogen)

- **Structure:**
  - Using new technologies and materials for structure to decrease weight and manufacturing costs.

- **Aerodynamics and Aeroacoustics:**
  - Increased lift to weight ratio and decreased stall velocity (through wing with innovative high lift devices).
  - Drag reduction technologies.
  - Noise reduction technologies.

- **Airplane control:**
  - All Electric Aircraft – airplane with fly by wire and electrical systems superseding other currently used designs (e.g. hydraulics). All Electric Aircraft will ensure effective use of IT during flight on for maintenance.
  - Easier and more intuitive flying,
  - Automatic flight control (allowing single pilot operation)

- **Flight management:**
  - Integrated flight management (flight plan, restricted airspace warning, air traffic intensity, terrain configuration and fuel level, loading, weather and other information). Easy gathering information on flight and position on PFD ((Primary Flight Display) and MFD (Multi-Function Display) instruments. Integration of electronic flight bag/ i-pad technology.

- **Standardisation:**
  - Introducing higher level of Standardisation of avionics, equipment and structure components.

- **Flight safety:**
  - Reduction of human error
  - Increased crash survivability - higher resistance of overloading caused by impact.
  - Ensure flight safety by more restrictive design regulations of SATS aircraft (CS-23 - through including chosen CS-25 regulations).

- **Comfort:**
  - Decreased noise and vibration level, smoother flight through use active abatement system, more roomy and ergonomic cabin (especially for single engined aircraft),

- **Costs:**
  - Lower purchase price – achieved through new technology solutions used appropriately to cycle of use, and through increased manufacturing scale and taking advantage of cooperation possibilities in EU.
  - Lower operational costs – achieved through lower fuel consumption, purchase price and service cost.

R&TD projects will have to address specific category of aircraft or transport system elements.

Testing in real environment of innovative technologies and concepts has to be performed.

5. Stages of SATS vision development.

Two main Small Aircraft Transport System development phases are assumed:

- **First phase – years 2010 – 2020,**
- **Second phase – years 2020 – 2030 and further**

a. First phase – years 2010 – 2020

The main impact to be expected is here outlined.

- **General acceptance of the added value of small-size aircraft, operating on commercial scheduled or non-scheduled flights, as a component of the European (Air) Transport system.**

- **Satisfying the RTD needs of the European manufacturing industry in order to become the world leader in design and production of small aircraft.**

During this first phase the new transport system should be accepted and developed on the basis of currently existing aircraft equipped with modern avionics and being compliant with current safety and environmental regulations.

The system should use existing airport and aerodrome network and operate as a part of current air traffic management and control system.

New business models and IT systems will be created to manage transport services and flight operations, this will allow to achieving high load factors and lower service costs. The system will be developed in regions most interested in low cost personal business travelling and in providing access to air transport; then, the SATS will spread gradually to other regions as its benefits are recognised.

Parallel to implementation, further research and development should be carried out in the framework of European FP7 and of National programmes; further projects, regarding SATS issues, should be carried out in Horizon 2020 Framework Programme. Further analysis of interregional mobility demand in the EU should be performed to refine SATS development planning.

Also studies on future means of individual air transport with time horizon reaching half of current century will be conducted during this phase. Currently, the „P-Plane" project is investigating these issues, although with a specific view that is the Autonomous Personal Transport. Complementary approaches should be analysed as well.

b. Second phase – years 2020 – 2030 and further

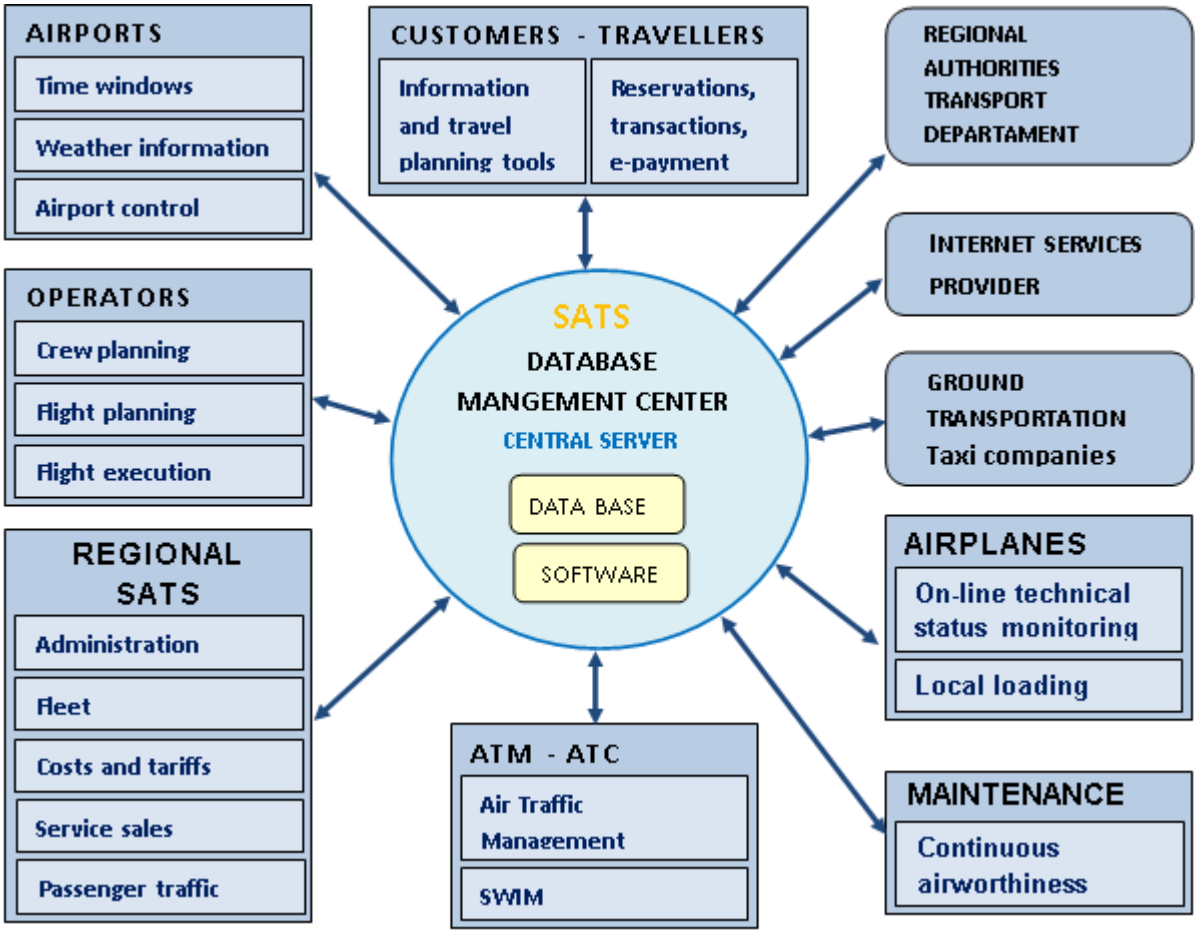
Results of „SESAR", and other projects within FP7 and Horizon 2020 Framework Programme will be implemented.

New safety regulations will be valid for aircraft operating in SATS. New aircraft and their propulsion systems developed in the EU will hit the market and benefit SATS. Implementing new communication, navigation and control systems (CNS) will lead to extend the SATS network and capability to perform free flights. Expanding IT networks managing services and flight operations will extend collaboration and expand SATS operational area.

The SAT-Roadmap project is going to develop a SAT technology roadmap that will be delivered by September 2012. Some examples of needed technology have been mentioned in section 4.b and have to be further debated in the next "SAT Common Vision Workshop" and in a dedicated "SAT Technology Roadmap Workshop" that will be organised in 2012.

Appendix – 1 INTELLIGENT SMALL AIRCRAFT TRANSPORTATION SYSTEM ARCHITECTURE

PROVISIONAL CONCEPT FOR DISCUSSION



BASIC CENTRAL SERVER BLOCKS (General concept for discussion)

a) Static Data Base

1. Airplanes (technical characteristics, Registry data, Manuals, overhaul plans).
2. Airports (serviced airports network, bases and fleet of aircraft).
3. Distances from city centre to airport.
4. Socio-economic data of serviced regions (including population mobility and travel costs outside transport).
5. Prices of supplies (fuel, services, airport fees, insurance, salaries of crews and personnel etc.).

b) Dynamic Data Base:

1. On-line localization of every airplane, its loading and operational flight plan.
2. On-line data on transport process events record (engine start, takeoff and landing, boarding, flight time, aircraft load etc.).
3. On-line data on seat reservation and acceptance of orders, airplane loading and routing.
4. On-line data on yield and costs.

c) Information:

1. For transport process participants (business activity area, conditions to participate, terms of signing an agreement, legal regulations, range, mode and terms of access to network data.)

2. For customers (transport service range, range of network data use, service tariff, terms and conditions of service.).
3. For Aviation Industry and Research Institutions representatives active in SATS development (development needs, collaboration areas, range and conditions of access to network data).
4. For broad audience (Educating of SATS role in personal transport system and its influence on safety, ecology and economy).

d) Advertising and marketing

1. Through respective SATS local logistic centres.
2. Through organizations and private companies interested in SATS development.

e) Application software

1. Application calculating SATS transportation cost.
2. Application calculating travel costs – tool for individual choice of optimal mean of transport.
3. Application optimizing use of private and fractionally-owned aircraft.
4. Application for tariff and service prices management.
5. Application for routing, fleet, services and flight plan management (annual, monthly).
6. Application for seat reservation and service orders management.
7. Application for flight operation record analyses.
8. Application for logistic reports management.
9. Financial Application (analyses, cost balancing, yield consolidation, settlements)

f) Device Drivers

1. External communication
2. Aircraft localization.
3. Internet communication.
4. GSM communication.
5. Application for central SATS server data access

g) Connection to cooperating Systems and organizations

1. Airspace Traffic Management and Control.
2. Meteorological information System.
3. Airlines.
4. Ground transport organizations.
5. Hotels and catering network.
6. Other

h) SWIM functions

In later development stages, aircraft localization and other management and control functions will be taken over by complex information management system - SWIM = System Wide Information Management that is planned for introduction in the framework of SESAR program in 2020 r

The system will cover the following scope of information and ATM:

1. Weather
2. Terminal data
3. Inter Agency
4. Aeronautical Information
5. Traffic flow management
6. Radar data
7. Surveillance
8. EnRoute data
9. Positioning – 4D
10. Traffic Awareness and Avoidance
11. Traffic Management
12. Flight Guidance and Control

Appendix - 2 SMALL AIRCRAFT TRANSPORTATION SYSTEM MISSION REQUIREMENTS

Class *		Pistons		Turboprops		Jets	
Class name		ACP-1	ACP-2	ACT-1	ACT-2	ACJ-1	ACJ-2
Main mission		Private and business travel, air-taxi service available on request, a short distance, middle class of service,	Air-taxi on demand, a short distance, middle class of service,	Business and private travel, air-taxi service on demand; available to the majority of the population,	Commuter according to flight schedules and on demand, for small passenger flows and a variety of routes; available for most of the population,	Corporate travel, business and private travel, air-taxi service on demand; for passengers with significant time value,	Commuter on request and according to flight schedules, corporate, business and private travel, high class service for passengers with a very high value of time.
Seats**		1+3	1+5	1+9	1+19	1+5	1+9
Cabin	Width [m]	>1,30	>1,40	>1,80	>1,85	>1,50	>1,60
	Height [m]	>1,30	>1,40	>1,70	>1,75	>1,50	>1,60
Toilet		No	No	Yes	Yes	Yes	Yes
Pressurised		No	No	Yes	Yes	Yes	Yes
All weather capability		Yes	Yes	Yes	Yes	Yes	Yes
MTOW [kg]		<1300	<2000	<5600	<8600	<5600	<7600
Cruise speed[km/h]		>300	>350	>550	>550	>700	>750
Cruise altitude [FL]		80-200	80-200	150-250	150-250	250-300	250-300
Takeoff distance [m]		<600	<600	<1000	<1000	<1000	<1000
Range fully loaded [km]		>600	>750	>900	>1200	>1500	>1800
Cruise fuel consumption [l/pas.km]		<0,035	<0,035	<0,04	<0,03	<0,08	<0,07
DOC [Euro/pas.km]		<0,15	<0,12	<0,20	<0,15	<0,35	<0,30
Price [k Euro}		<200	<400	<2000	<4000	<2000	<5000
Requirements***		CS-23 A	CS-23 A	CS-23 A	CS-23 A	CS-23 A	CS-23 A

*) Single engined MTL aircraft should be characterized by similar safety level as multi engined aircraft – which should be the main condition to allow commercial transport (air-taxi).

**) The first number denotes crew, the second one certified number of passenger seats.

***) Letter 'A' denotes amendment of existing CS-23 regulations with increased safety and environmental requirements in SMTL category.

LIST OF SATS AVIONICS. (*on the basis of „D4.1 EPATS aircraft missions specification")*

Aircraft class	ACP-1	ACP-2	ACT-1	ACT-2	ACJ-1	ACJ-2
Communications						
Dual 8.33 kHz VHF radio	✓	✓	✓	✓	✓	✓
SWIM dual data link	✓	✓	✓	✓	✓	✓
WiMax			✓	✓	✓	✓
Broadband services					O	O
Navigation						
Dual GNSS /w SBAS	✓	✓	✓	✓	✓	✓
Dual DME	✓	✓	✓	✓	✓	✓
RVSM					✓	✓
P-RNAV FMS	✓	✓				
4D RNAV FMS			✓	✓	✓	✓
ILS receiver(s)	✓	✓	✓	✓	✓	✓
Surveillance						
ADS-B in/Out 1090 ES	✓	✓				
Enhanced ADS-B			✓	✓	✓	✓
TAS	✓	✓	✓		✓	
TCAS II				✓		✓
ELT 406 MHz	✓	✓	✓	✓	✓	✓
FDR & CVR				✓		✓
TAWS-B	✓	✓	✓		✓	
TAWS-A				✓		✓
Lighting detection (sferics)	✓	✓				
Weather radar			✓	✓	✓	✓
Human machine interface						
IFD (PFD/ MFD / audio / AP)	✓	✓	✓	✓	✓	✓
HUD / SVS / EVS					O	O
EFB	✓	✓	✓	✓	✓	✓

O - OPTIONAL

ROUGH TIME OF FIXED OPERATIONS OF SATS AIRCRAFT [min]

Aircraft class	ACP-1	ACP-2	ACT-1	ACT-2	ACJ-1	ACJ-2
Check-list before flight, engine ignition and warm up	**5**	**8**	**8**	**12**	**12**	**12**
Boarding	**1**	**2**	**1**	**4**	**1**	**3**
Ingress to cruise altitude	**10**	**20**	**20**	**20**	**20**	**20**
Engine stop	**1**	**2**	**1**	**2**	**2**	**2**
Unloading	**1**	**2**	**1**	**4**	**1**	**3**

DISTRIBUTION OF PROJECTED RANGE OF SERVICE FOR THE CLASSES OF AIRPLANES