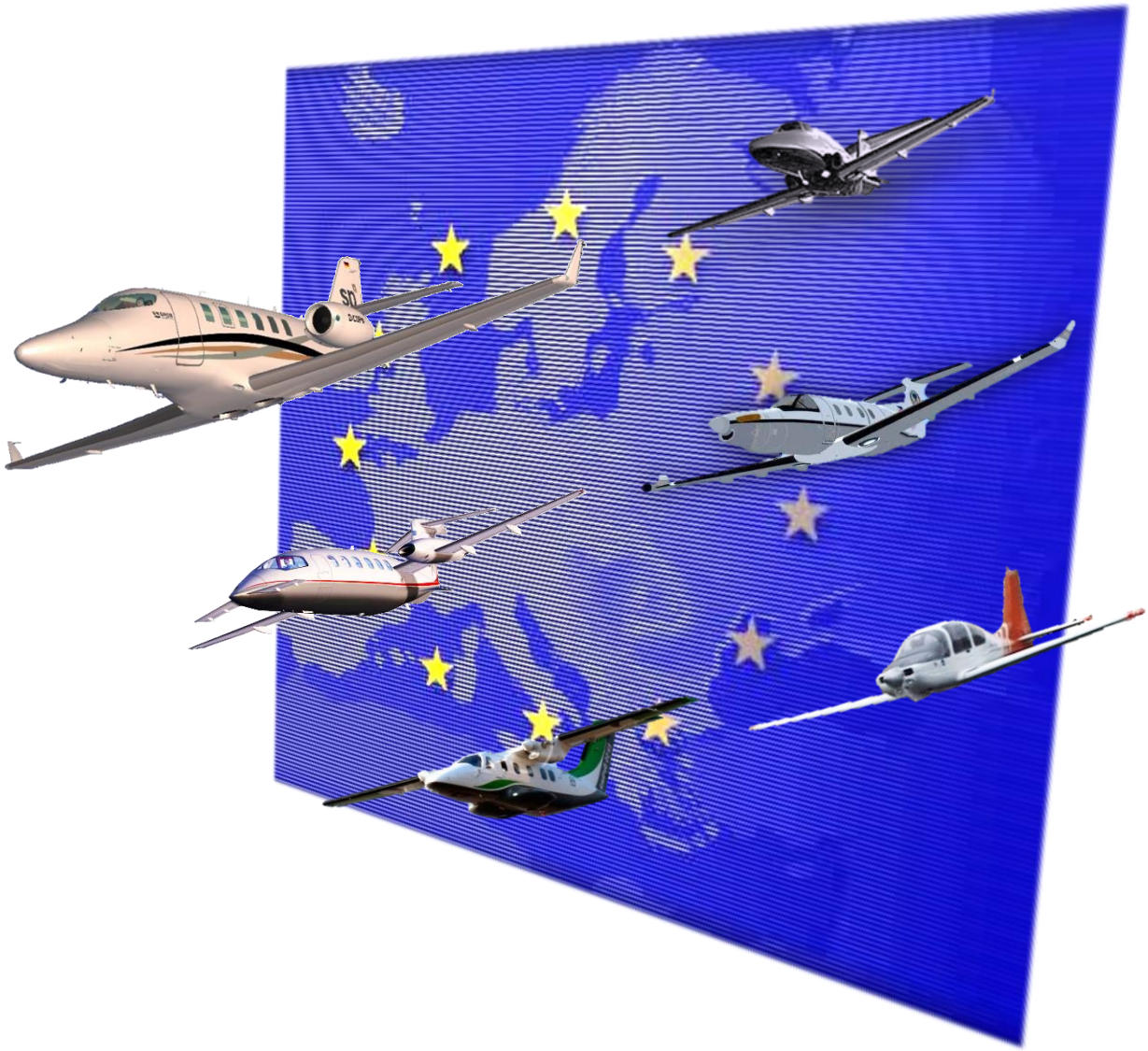
SEVENTH FRAMEWORK PROGRAMME



SAT

small air transport - roadmap

http://sat-rdmp.eu/

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Project Overview:

In the SAT-Rdmp (Support Action) a Vision and Research Agenda on the development of a Small Aircraft Transportation system (SAT system) have been developed.

The **major goals** of the projects are:

- Pave the way for the **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**.
- **Identify RTD needs** of the **European transport service operators and manufacturing industry** in order **to become the world leader in operation, design and production of small aircraft**.
- **Define a highly customer (passenger and freight) oriented service** able to achieve the strategic goal: 90% of travellers within Europe are able to complete their journey, door-to-door within 4 hours in Europe.

The **SAT system Vision and the Research Agenda** are aiming at **providing elements** to be included in the **SRIA** and also highlighting R&TD areas which should be developed within **Horizon 2020**, trans-national cooperation and national programmes.

Short term 2020

It is recommended to perform dedicated research and dissemination activities to develop enabling technologies, increase trust in the approach, to support public acceptance and promote political leverage. Small and regional airports are existing in a large number all over Europe even in remote areas, thus the basic infrastructure is available and eventually small upgrades are at low costs .

An integrated system demonstration should be launched in some Member States or Regions; this would allow building up a success story, to increase trust in the approach, to support public acceptance and increase political leverage.

History has shown that small aircraft are often at the forefront of technology. Modern small aircraft are in many respects more advanced that larger planes. (Laminar flow is already used in business jets, very advanced avionics, including enhanced vision systems are already used in small aircraft).

Further expected impact and goals are as follows:

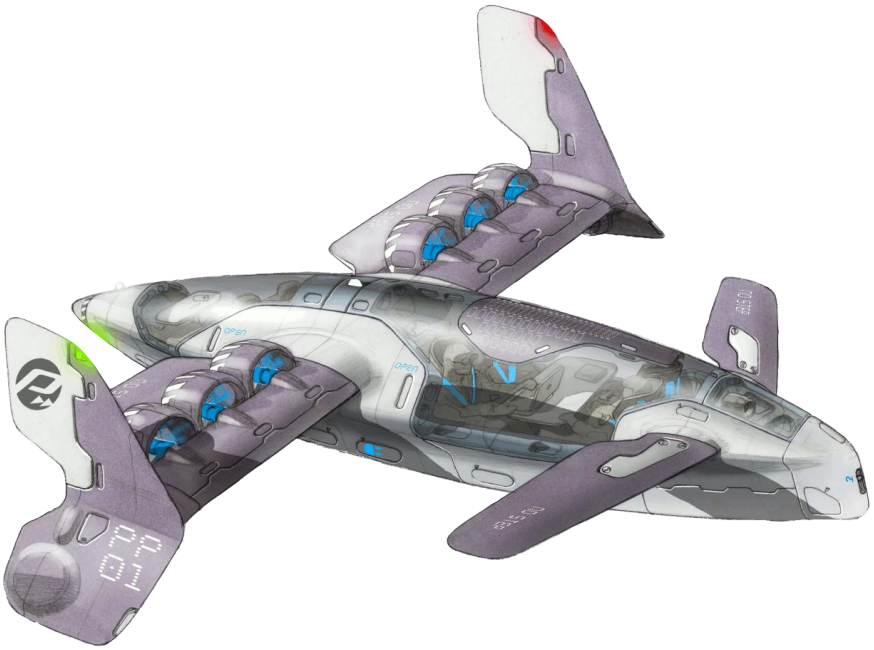
Medium term 2035

- Integration of small-size aircraft and rotorcraft, operating on commercial scheduled or non-scheduled flights, with the European (Air) Transport system.
- The European manufacturing industry becoming the world leader in design and production of small aircraft.
- Appropriate business models for a full deployment of the SAT system available
- Full public acceptance and political support.
- New advanced aircraft vehicles including propulsion systems (clean and silent engines) are available.

- Availability of innovative cockpit, flight management systems, and automation allowing situation awareness and single pilot operations. The technology should assist piloting requiring less trained pilots.
- Small aircraft are resilient to adverse weather.
- SESAR ATM takes into account the SAT system operations
- New safety and certification regulations are available
- Implementing new communication, navigation and control systems (CNS) will allow single pilot and remote pilot operations
- Innovative take-off and landing/launching techniques are adopted.

Long Term 2050

- Innovative small aircraft are developed in the EU with zero pollutant emissions, very small noise foot print, and low environmental impact all along the life cycle. Relevant data are collected to measure and validate the system.
- The SAT system has the same safety and resilience level of the current large A/C ATS.
- Integration of SAT system within a seamless inter-modality transport system.
- Free flight and/or free routing are the standard for operations.
- Fully automated SAT aircraft flying according to autonomous flight rules.
- New certification regulations for SAT system are fully deployed.



Drawning according PPlane Project

In view of the goals of the Commission and the Transport Sector to achieve environmentally friendly multimodal trips door-to-door within 4 hours in Europe, the SAT-Rdmp Team plans to continue research and technology development in Horizon 2020 and **introduced in Clean Sky 2 demonstration and validation activities for innovative small commercial aircraft technologies and small aircraft operations**, as an option of the Green Regional Aircraft ITD extension.

Currently SESAR is focused on demonstrating technologies for large airliners and scheduled flights. At this point in time it does not take fully into account the introduction of a small aircraft transport mode**. SESAR should include the SAT system into the ATM concept of operations**. The Small Aircraft community should be involved in SESAR and possible follow up. In SESAR 2 the concepts associated with more automation in the aircraft and in airspace management will have to be addressed.

- The SAT System is highly customer (passenger/freight) oriented, environmentally friendly, affordable, safe and secure, interconnected, accessible, predictable, dependable and comfortable.
- Small Aircraft and Rotorcraft exploiting small airports, aerodromes, heliports, seaplane aerodromes, will be an answer to the growing and segmented demand for air transport and will increase the accessibility to transport.
- The system is based on small aircraft and rotorcraft, with 4 to 19 seats (or more, if it is justified by the density of passengers flow), including amphibious aircraft operating in an integrated and intelligent transport management system.
- The SAT system approach will add a new modality within the Air Transport System and complement international and regional transport.
- SAT system offers increased mobility (door-to-door/point-to-point); it can be seen as a part of an inter-modal approach

Small Aircraft Transport System will serve:

- **the need for low-intensity intercity routes** (e.g. for west/east directives also in central Europe), which has been dependent so far on road transport;
- **regions with less developed infrastructures** (e.g. out of the central European “economic banana”, sea coastal regions and islands);
- **the needs of European personalized and business travel.**

SAT Aircraft

- New small aircraft will be developed according to mission requirements and system operational models.
- Aircraft will have to be designed with operational flexibility and multipurpose applications in mind.
- Both fixed wing aircraft and rotorcraft should service the SAT system market.
- Studies should be conducted on the aircraft types and performance requirements that best satisfy the SAT system needs.
- The aircraft will have to be environmentally friendly, energy efficient, safe, comfortable and allowing reliable operations.
- Product flexibility will have to be ensured: small aircraft should be designed taking into account the possible service flexibility foreseen: use of short runways, use of hydro-scales, passengers and freight mixed transport modes, etc.
- Families of aircraft should be designed with commonalities to reduce operative costs.
- Aircraft will have to be designed for greater autonomy and possibly speed.

- Innovative power plant systems (e.g. electric, based on alternative fuels,…) will be needed to reduce cost and environmental impact. In Europe there is not yet a settled capability for the development of engines for small aircraft. An effort has to be done in this direction.

- The new A/C requirements will pose new challenges for certification. Early engagement of the regulators is essential. New rules are felt as a determinant factor to bring innovation into the sector and an enabling condition for realising the SAT mode.
- New paradigms for maintenance specific for SAT, involving condition based maintenance, will have to be adopted.
- In the long term advanced configurations (e.g autogyro and amphibious planes) might become part of the SAT system
- New production procedures of small aircraft will have to be adopted to reduce cost.

Organization and operation of the system

SAT system will be a passenger transport system meant to provide public and private service. SAT System will be an element of the European development strategy for transport modalities and infrastructures, in particular air transport.

Organizational SAT system structure will comprise 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 Architecture scheme" as an initial concept to study the development of the business model. Aircraft operators will act both independently but also in corporations with agreements to provide transport services.

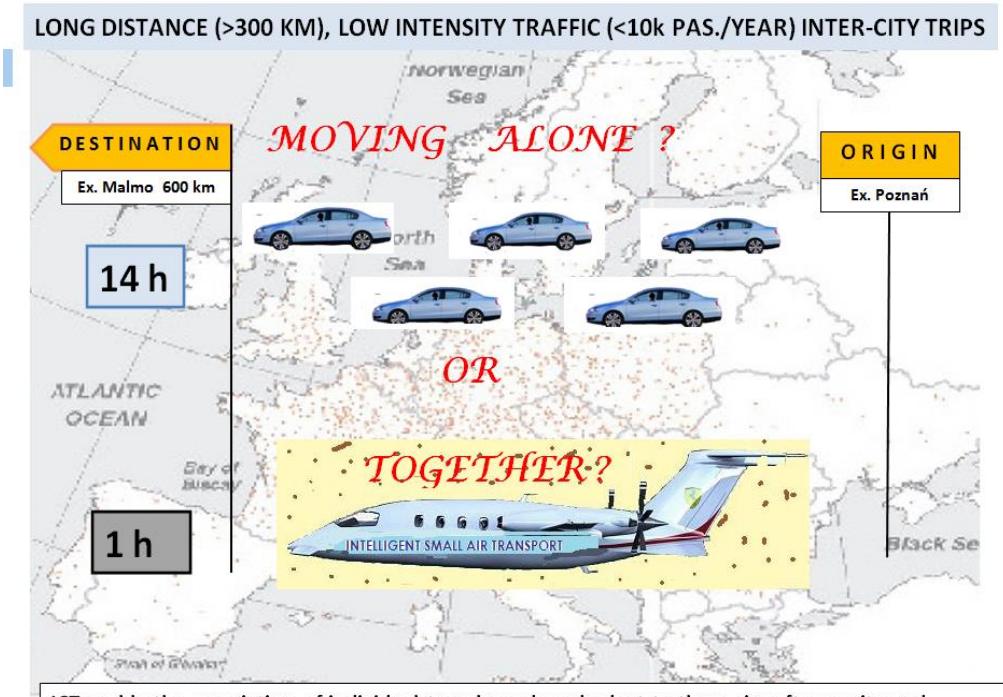
An IT based booking system that will allow timely bookings and on time and delay free flights, based on internet broker functions is needed.

Customers will have access to applications that provide door-to-door (departure to arrival) control & visibility with intelligent choices offered across a range of modes and services with options to optimise price, time, quality, comfort and flexibility with information being made available that allows for the choices made to be implemented while also delivering on going situational visibility

Depending on the adopted business model a real-time Fleet Management system must be developed.

Validated business models and IT systems will be operative to manage cost effectively transport services and to support flight operations, this will allow to achieve high load factors and lower service costs.

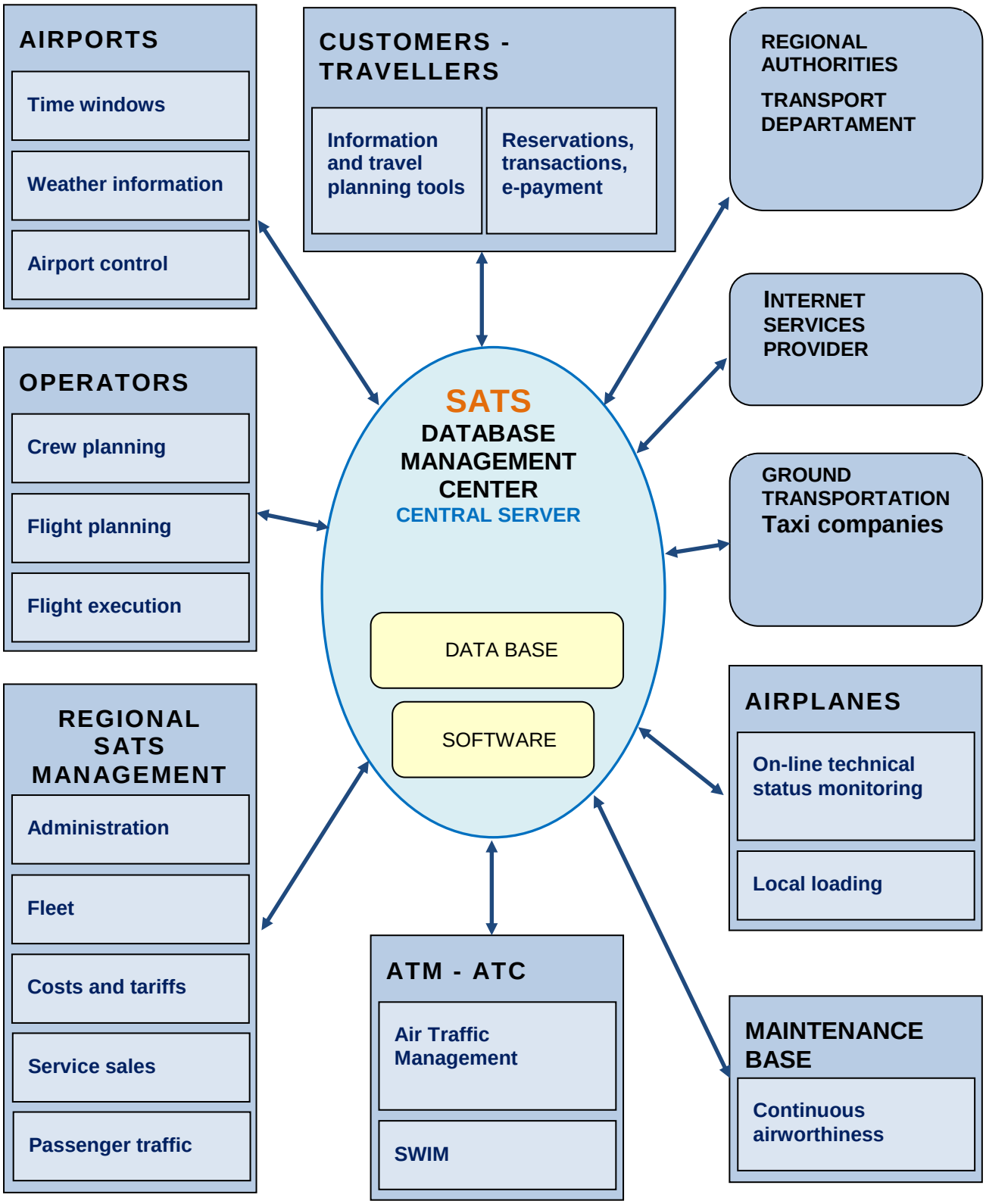
In the following figure the concept is sketched and some examples of possible applications are given.



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

PROVISIONAL CONCEPT

Intelligent Small Aircraft Transportation System Concept



The demand forecast

Based on the assumptions on of the four scenarios and the demand was forecasted for 2030 for each scenario.

The highest yearly demand is found to be:

- ~ 66 000 000 passengers travelling
- ~ 46 000 000 A/C movements

This would result in a fleet of ~ 39 000 A/C.

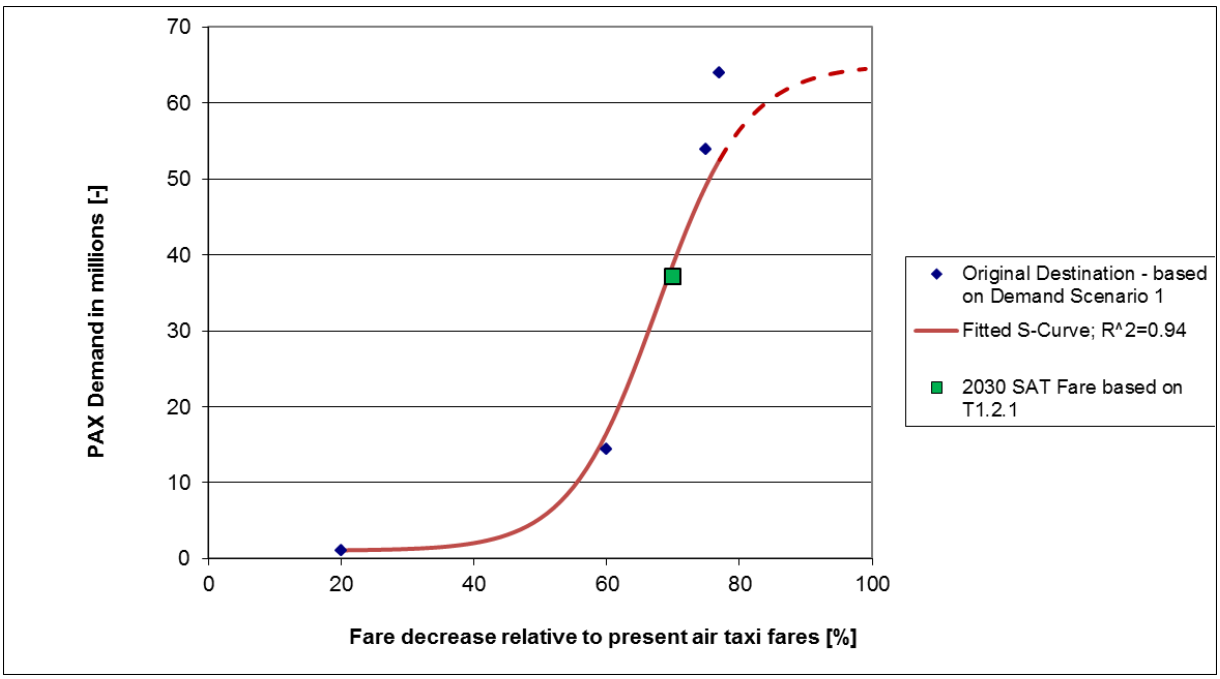
Anyhow, a sensitivity analysis showed that the most significant influencing factor (on the passenger demand) is the SAT cost. This finding is fully in line with the expectations and the literature related to demand modelling.

Major conclusions are :

- demand is highly cost sensitive,
- demand rises rapidly with cost decrease
- Key drivers of SAT demand: SAT fare, value of time, travel party size

Thus the demand forecast presented here has to be considered as a qualitative forecast useful for providing trends and important parameters affecting the demand.

Demand Sensitivity



Demand is highly cost sensitive

Example from Scenario-1 : demand rises with cost decrease