„Exploring the socio-technological environment of PAVs“ Objectives & Results

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Description

WP7 investigates the **socio-technological context**, the infrastructural and operational environment, the potential impact of PATS on society and social expectations towards PAVs. It uses a constructive technology assessment approach and intends to contribute to a reflexive design of PAV/PATS by engaging stakeholders, technology developers and members of the general public early in the RTD process.

The key elements of WP7 are:

- **Screening of the socio-technological environment of PAV/PATS**
- **Discussing technology issues**
- **Identification of user perspectives and expectations**
- **Analyses of questions of the integration of PAVs into the transportation system**

For an overall collection and presentation of the challenges and key issues associated with PAV traffic a detailed literature review combined with expert interviews was performed in the first year. An internal workshop was organized to develop a common vision of the PAV mission, the requirements of the vehicle itself and expected user types.

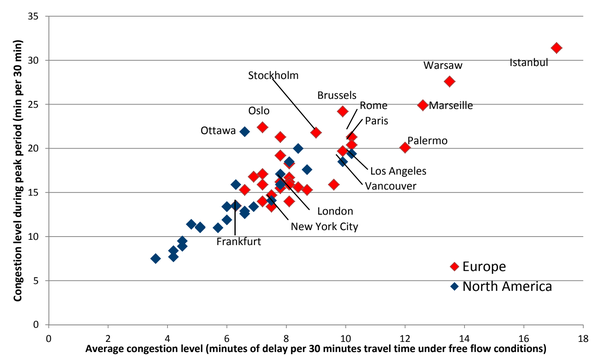
Results from this internal workshop were used for the development of short, scenario-like narratives which describe a typical PAV commuting situation (from home to work) from a user perspective. They had to be internally consistent and plausible and were used in the focus groups to stimulate and guide the discussions.
A **weather analysis** for an example region in Germany was performed to get an impression about the level of “reliability” or usability of PAVs in everyday mobility.

A major part of WP7 was the conduction of **four focus group** events and an **expert workshop** to identify perceived challenges and issues of this new transport option. This knowledge can then be used as an orientation for researchers and developers for their work on goal-oriented future solutions.

Commuting scenario calculation

To get an impression of the **traffic density** and, associated with this, the **requirements on infra-structure and traffic management** in a European model city, rough calculations of PAV numbers in the air and during approach for a morning commute situation were performed.

Assuming a number of approx. 300.000 people that commute every day into a major city, modal shares typical for European cities and a net substitution rate of 10 % of car traffic by PAV, an “automated” ATM for such a prototypical city would have to handle between 2.500 and 10.000 approaches per hour. Between 40 and 160 independent landing sites for PAV would be needed (assuming turnover times of 30 seconds and 30 seconds separation).
Further assuming a conventional business model (“individual ownership”) and limited autonomy (no ability of fully automated flying) of PAV, this scenario indicates a required storage capacity for 7.000 to 20.000 PAV within the city center.



Own calculations based on floating car data for Q2/2012 from TomTom International

Weather analysis

To get an impression about the level of “reliability” for the PAV, a weather analysis with data from the German meteorological service for a transect in Germany was conducted. The aim was to see on how many days of a given year a flight from A to B in this region would have been possible at certain times of the day. Three analyses with different pre-defined “no-fly” criteria based on common flight visibility categories of the General Aviation Forecast (GAFOR) were performed and led to the following results:

	< 1.5 km	1.5-5 km	5-8 km	8-10 km	> 10 km
> 5000 ft	X	M6	D3	O	C
2000 – 5000 ft					O
1000 – 2000 ft		M7	D4	D1	
500 – 1000 ft		M8	M5	M2	
< 500 ft	X				

Percentage of time periods belonging to the “no-fly” criteria of the different analyses for the year 2010 and GAFOR subpart 45

	6-8	8-10	17-19	19-21
only X-Ray	6.58	3.29	2.47	3.56
X, M8, M5, M2	22.47	15.89	12.05	14.52
X, all M, D1 and D4	33.15	42.74	33.70	34.79

As one can see the aim of a 90 % usability over the year for the PAV is only reached in the X-Ray category. This result illustrates that the **dependency on weather conditions is quite high**, and that the topic of how to expand the operability of the PAV into challenging weather conditions will have to be considered further.

Focus groups

Focus groups are a qualitative social science method. Its core is a guided discussion among a small group of people which is facilitated by a moderator. The interactive setting allows for open conversations between individuals. It is useful to learn more about perceptions and associations and to frame problems and issues in new ways. In the project, four focus groups with around 12 participants from the general public were conducted.

They were confronted with the vision of flying to work in an urban environment using small personal air vehicles. After a round of collective imagining that included clarification questions regarding characteristics and capabilities of the PAV themselves, **potential challenges and perceptions** were voiced.

The most discussed and mentioned challenges were:

- safety and environmental issues (energy consumption, noise, negative visual impact)
- the level of autonomy
- the legal responsibility
- infrastructure for PAVs (parking)
- sharing and ownership concepts



Expert workshop

In addition to the focus groups with potential users from the general public, an expert workshop with academics, pilots and interest club members was organized. Questions regarding the **design of semi-autonomous PAVs**, their **HMI** and potential **development paths towards full-autonomy** were discussed in greater depth. In general, the challenges identified by the experts were similar to those of the laypersons.

The role of the user as a backup in case of an emergency or partial system failure gained special attention. It was emphasized that this approach does not seem to be promising. It would be challenging even for well-trained operators and contradict the development goal of limited training requirements for the general user.

The experts recommended to consider a very communicative and transparent system which continuously informs the user about its current state as well as its intentions. For the semi-autonomous mode they suggested to permanently keep the user „in the loop“ to avoid long delays before full situation awareness.

This project has received funding from the European Union’s Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 266470