# myCopter newsletter #4

**This is the fourth newsletter for the project myCopter, funded by the European Union under the 7th Framework Program.**

## Mid-term review meeting

As the myCopter project started in January 2011 and is financed until December 2014, we have now passed the mid-term mark. This point in the project's timeline constituted a good moment to reflect on what we have achieved and to look forward towards the aims and goals that we want to fulfil. In February we held our mid-term meeting in Karlsruhe, Germany. Our project officer from the European Commission also attended the meeting to experience our project's achievements at first hand. All partners reported on their progress, and we discussed plans for work up until our final workshop. To obtain an external perspective, we invited two keynote speaker: Stephan Wolf from e-volo and John Brown from Carplane. The presentations on their work in designing and building personal aerial vehicles resulted in lively discussions about the requirements and challenges for realising personal transportation, and provided us with fresh views for our work in the remainder of the project.

*Project members at the mid-term review meeting in Karlsruhe, including our EU project officer (image: Frank Nieuwenhuizen, MPI for Biological Cybernetics)*

## Scientific progress

After 30 months into the project, multiple experiments and analyses have been performed and several technologies have been implemented. We present some highlights below.

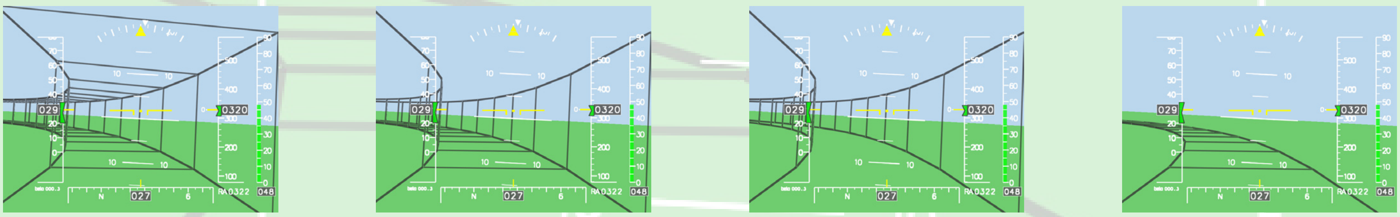
*Group discussion for socio-technological evaluations (image: KIT)*

### Exploring the socio-technological environment

Our work in exploring the socio-technological environment of Personal Aerial Vehicles (PAV) aims to provide a deeper insight into the socio-technological context and the infrastructural environment of a Personal Air Transportation System (PATS). For example, by looking at the mode choice behaviour of commuters, we can identify challenges that need to be considered in designing the infrastructure for PAVs, such as the fact that the vast majority of commuter trips is shorter that 25 km and does not take longer than 30 minutes. Peak hour delays are, on average, no longer than 15 minutes. Based on such considerations we have developed narrative scenarios to introduce our envisioned concept of a PATS in structured user group discussion that are planned later this year.

### Highway-in-the-sky and haptic shared control

We have developed a haptic-shared control architecture that uses the generic PAV model, such that we can provide haptic guidance forces to PAV 'pilots' performing a closed-loop control task. A Highway-in-the-Sky display provides visual cues concerning the trajectory that needs to be followed. We are currently evaluating this system to assess whether PAV 'pilots' can use these different cues and if this approach leads to increasing flight performance.



*Different visual representations of the same flight trajectory in a Highway-in-the-Sky display (images: DLR)*

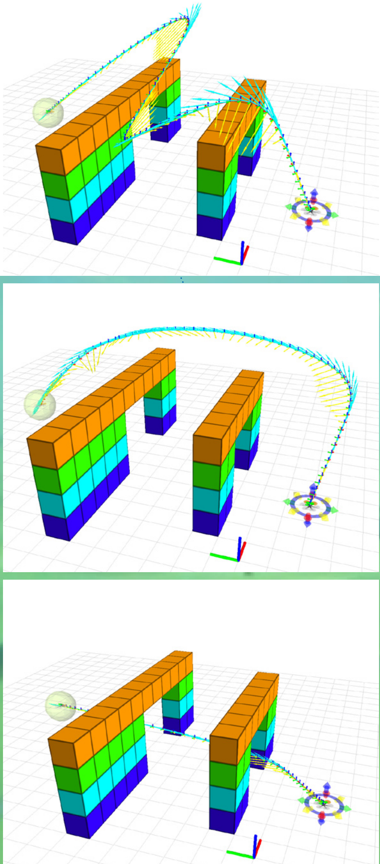
## Final generic PAV model and pilot aptitude assessment

We have finalised the generic model for PAV dynamic behaviour. The model contains new functionality in the form of an autopilot and a turbulence model. Furthermore, the different control modes have been optimised to ensure that the most desirable handling qualities are achieved. A simulated flight with the generic PAV model is shown in this video.

Currently, the generic PAV model is used to investigate the vehicle response types preferred by PAV 'pilots' of varying flight experience and aptitude. Eight participants have completed a full set of tests. The results indicate that the hybrid configuration of the generic PAV model, which contains elements of translational rate command functionality, is most suited for use with the majority of the test subjects.

## Vision-aided navigation in dynamic environments

The framework that we have developed for vision-aided navigation is now mature enough that more advanced navigation approaches such as path planning can be implemented for increased autonomy. In our system we fuse data from a monocular camera (the only exteroceptive sensor) with inertial measurements to achieve a self-calibrating power-on-and-go system. With this system we are able to create maps of previously unknown spaces, while planning trajectories that avoid obstacles and circumvent areas that do not have enough features to successfully employ the monocular camera.



*Intermediate and best paths found by the navigation system to get around obstacles (images: ETHZ)*

## Landing place selection and assessment

We have extended our landing place detection algorithm and are now considering rooftops of buildings in addition to landable fields and runways. We are currently investigating an extension that can perform landing site segmentation which exploits shape and appearance patterns that the system learns from annotated examples. An evaluation of our approach has shown that it significantly outperforms other state-of-the-art methods in detecting landable sites.

*Automatic rooftop detection with our landing place assessment algorithm. Ground-truth annotations are shown in yellow and rooftops detected with our algorithms in red. (image: EPFL)*

## Publications

We publish our work in scientific journals and at international conferences. An up-to-date list of our publications can be found on our website.

## In the press

The myCopter project has featured in more than 50 news articles, of which an overview is given on our website. The number of subscribers to our newsletter has surpassed 240 people, ranging from private persons to industry representatives.

*A simulated PAV flight (image: UoL)*

Pictures: DLR, myCopter, The University of Liverpool, MPI for Biological Cybernetics, EPFL, ETHZ, KIT

http://www.mycopter.eu
The myCopter project is funded by the European Union under the 7th Framework Program.
This bi-annual newsletter is published by the Max Planck Institute for Biological Cybernetics for the myCopter project.

Text Editor: Frank Nieuwenhuizen
Layout: Cora Kürner