Max-Planck-Institut
für biologische Kybernetik

myCopter – Enabling Technologies for Personal Aerial Transportation Systems

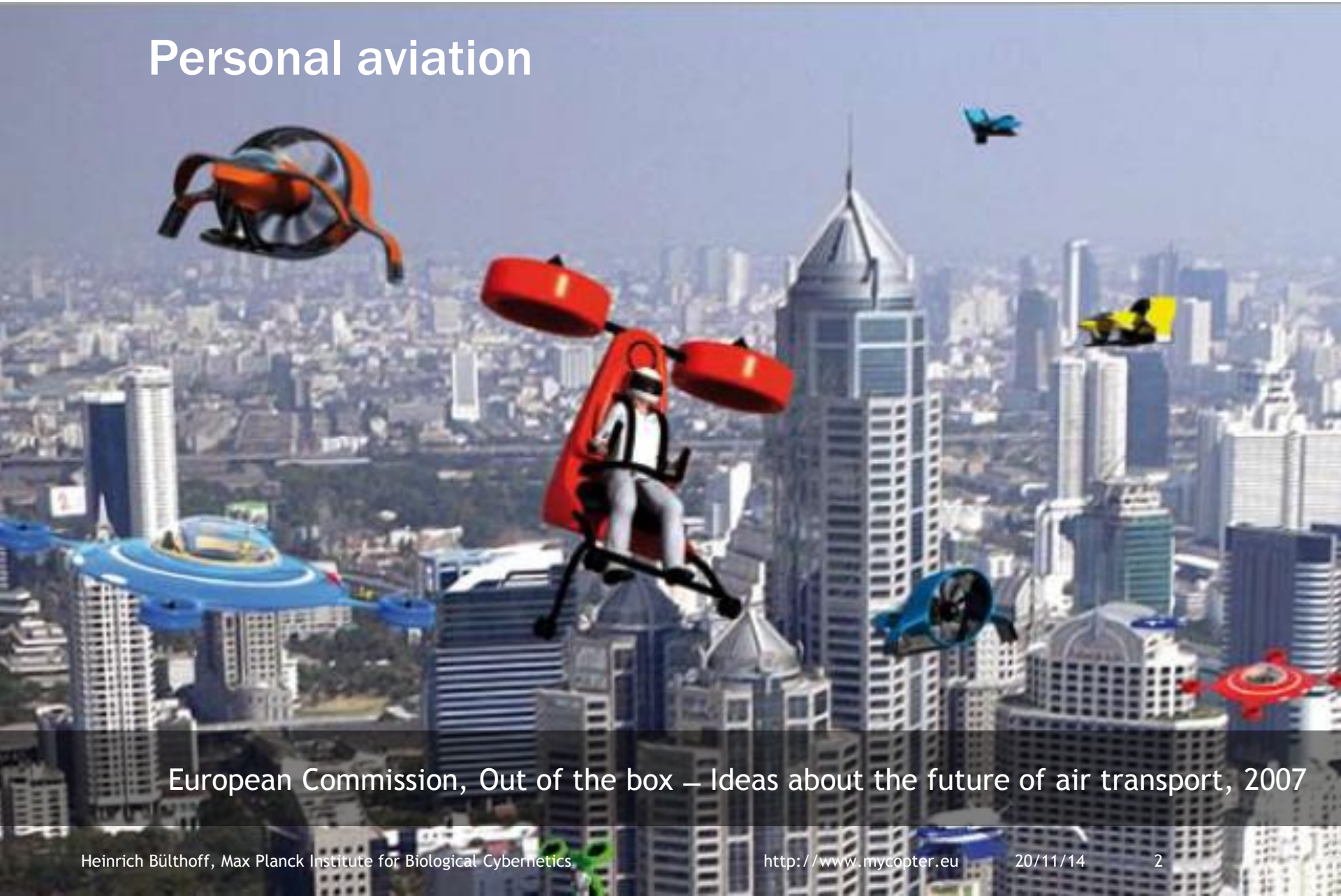
Prof. Dr. Heinrich Bülthoff

mycopter

http://www.mycopter.eu

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

Personal aviation



European Commission, Out of the box – Ideas about the future of air transport, 2007

Motivation for personal aviation

100 Billion Euro is lost yearly in the EU due to congestion

"Green Paper – Towards a new culture of urban mobility," Sept. 2007, Commission of the European Countries, Brussels.

Motivation for personal aviation

20x more fuel is wasted in the USA in traffic jams than is used by the entire General Aviation fleet

"2009 Urban Mobility Report," The Texas A&M University System, 2009

Motivation for personal aviation

In large European cities, car drivers spend **more than 50 hours per year** in traffic jams

"Roadmap to a Single European Transport Area," 2011

Pioneering the air transport of the future

"Designing the air vehicle is only a relative small part of overcoming the challenges… The other challenges remain…" [EC, 2007]

It is necessary to explore

- "innovative technologies that might facilitate the step change required for air transport" [FP7]
- "technologies … which will enable future individual air transportation" [FP7]

"Personal air transport … has been regarded as a possible solution to the ever increasing congestion in road traffic, providing at the same time greater speed and flexibility" [FP7]

European Commission, Out of the box – Ideas about the future of air transport, 2007
FP7 Transport call for research, November 2007

EU-project **myCopter**

- Duration: Jan 2011 – Dec 2014
- Project cost: €4,287,529
- Project funding: € 3,424,534

Max-Planck-Institut
für biologische Kybernetik

UNIVERSITY OF LIVERPOOL

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

KIT
Karlsruhe Institute of Technology

DLR

Personal Aerial Vehicle (PAV)

Technology exists to build aircraft for individual transport

- different concepts have already been developed

Drawbacks of current designs

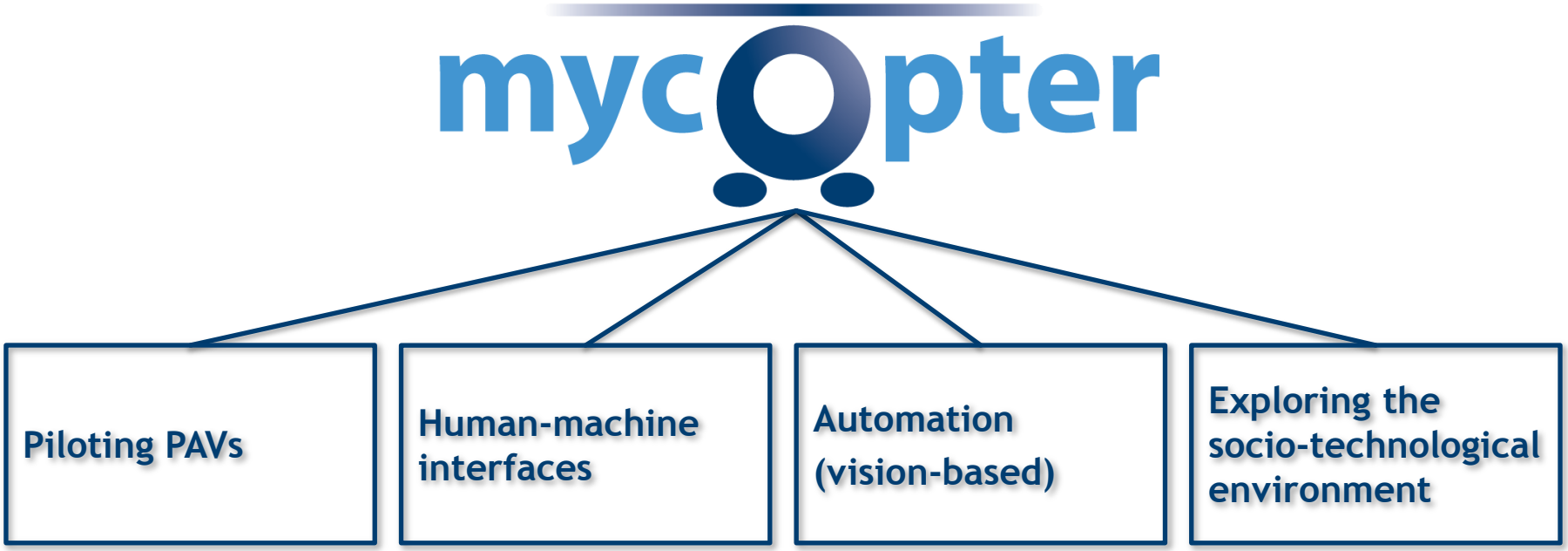
- not for everyone (pilot license)
- compromise between car and plane
- needs infrastructure (landing strip)
- focus on vehicle design instead of an integrated transport system


Transition Terrafugia


PAL-V PAL-V Europe N.V.


Volocopter E-volo GmbH

Enabling technologies for personal aviation



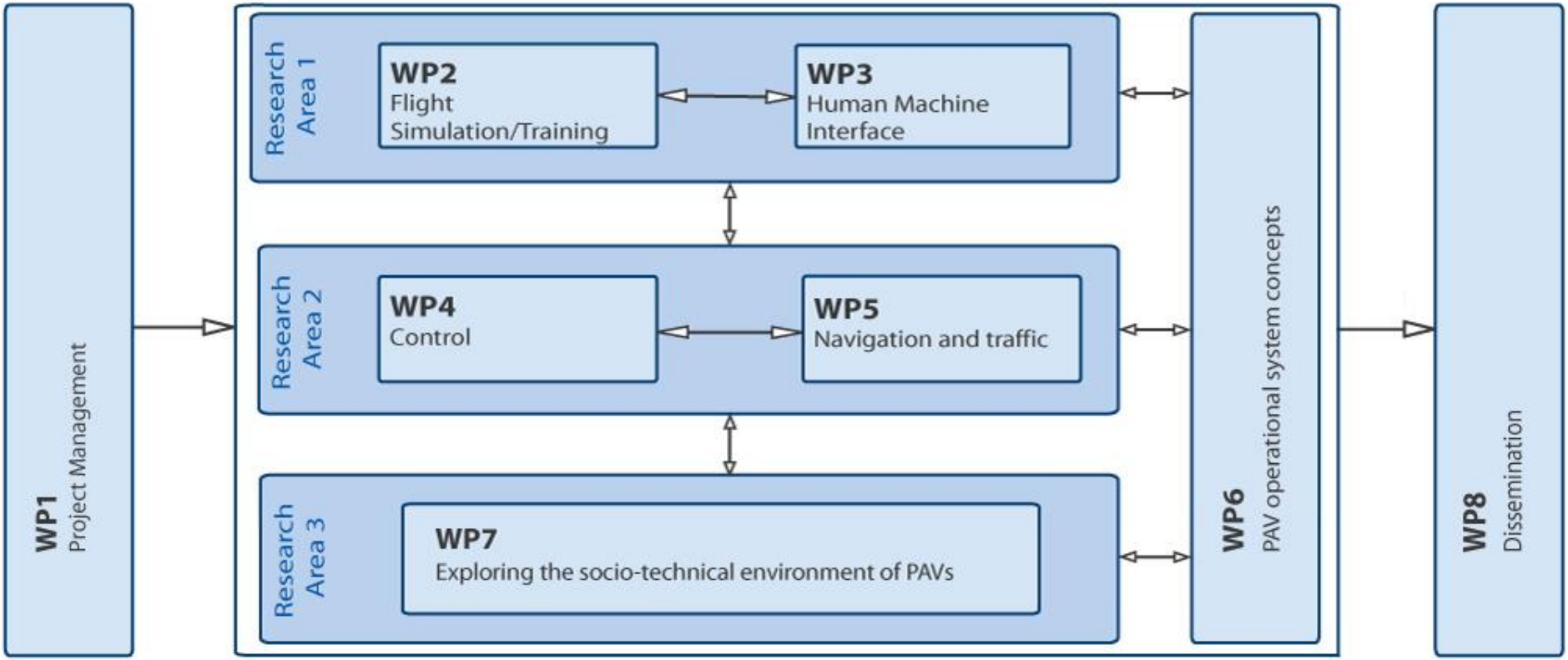
- Handling Qualities for PAVs
- Training requirements

- Control interfaces and displays
- Multi-sensory feedback

- Navigation
- Landing place assessment
- Collision avoidance

- Acceptance: safety, noise, fuel, cars overhead
- Integration into current transport systems

Project organisation



Piloting PAVs

Develop PAV Handling Qualities

Challenges

- Flying a helicopter is difficult and requires much training
- It is not clear which skills prospective pilots should have when he is supported by automation

UNIVERSITY OF
LIVERPOOL

WP2: Flight simulation and training

Objectives

- Development and analysis of flight dynamics PAV models
- Developing training requirements for flight-naïve pilots
- From driver license to PAV license with minimal training cost

Human-machine interfaces

Develop human-machine interfaces that make flying as easy as driving a car

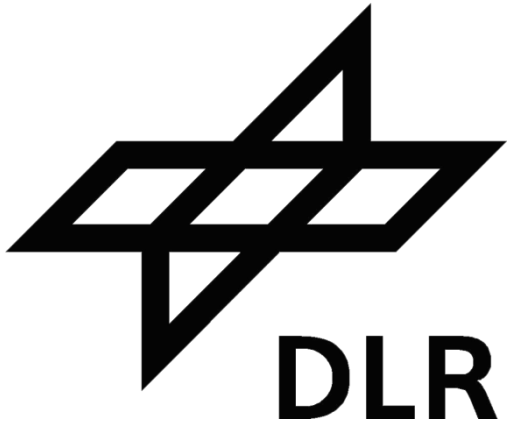
Challenges

- Current flight controls and displays are not intuitive
- Multisensory perception is not taken into account
- No reliable objective measurements of pilot workload

WP3: Human-machine interface for controlling a PAV

Objective

- Design and evaluate novel concepts for human-machine interfaces
- Develop ways to measure pilot workload



WP6: PAV operational system concepts

Objective

- Verify operational system concepts in flight
- Novel steering wheel concepts for PAV

Novel approaches to automation

Develop robust novel algorithms for vision-based control and navigation

Challenges

- Current air traffic control is not suitable for PAV flight
- Instead we will do what every VFR pilot does
- looking outside of the cockpit for
  - Obstacles / other traffic
  - Surfaces to land on
- but we replace eyes and brain by cameras and computer vision

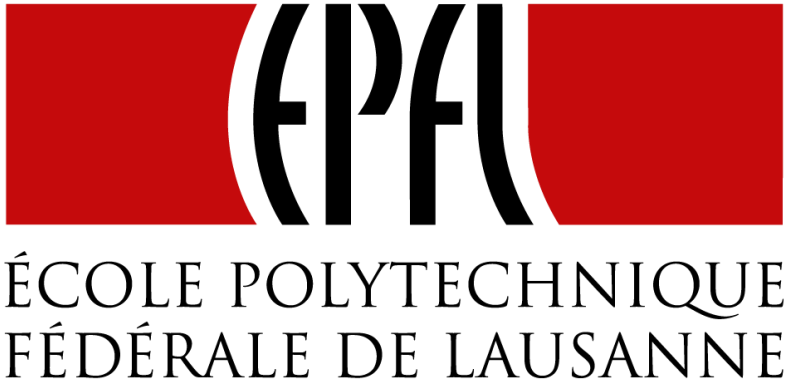
ETH

Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

WP4: Control and navigation of a single PAV

Objective

- Develop control strategies for automating PAV flight
- vision-based control of flight path



WP5: Navigation in the air and interaction with other traffic

Objective

- Replace centralized air-traffic control with onboard and distributed control
- Vision-based landing place assessment for emergency landings

Exploring the socio-technological environment

Generate knowledge on the demands and preferences of society towards PAVs

Challenges

- Investigating where PAVs could have an impact
- Identifying major hurdles for introducing PAVs
- User expectations and objections

WP7: Exploring the socio-technological environment of PAVs

Objective

- Develop scenarios for PAV use (personal or shared)
- What infrastructure is necessary
- What should be the main use (commuter or leisure)

A vision from the Swiss Energy and Climate Summit