

## Dear reader,

since this is the first HYPSTAIR Newsletter, let me take you few years back in the past to where it all began. In 2007, Pipistrel developed the first electric two-seat aircraft in the World, the so called Taurus G2, which was followed by the first electric four-seat aircraft, the Taurus G4, **winner of NASA Green Flight Challenge in 2011**. Siemens has met the same challenges and together with Diamond aircraft and EADS, developed the first serial hybrid aircraft DA-36 E-Star in 2011.

Mentioned aircraft successfully demonstrated the viability of electric propulsion for a light aircraft but they have lacked the commercial applications and certificability of solutions, as real world mission profiles and ease of use were secondary considerations. In collaboration with the authorities, HYPSTAIR

project therefore aims to establish missing certification requirements for aviation hybrid drive systems, paving the way for **hybrid and electric technologies** to be introduced to the market.

The main driver of the project was the necessity for the aviation industry to follow the trends in other fields of transport towards the utilization of sustainable energy sources and efficient use of energy.

This is even more of a pressing issue in the light aircraft, piston-powered segment of the market, where the leading engine manufacturers are providing units whose basic technology, although constantly updated and reliable, is now over 50 years old. Fortunately, it is in the light aviation segment where the application of all-electric aircraft technology, including propulsion, can be best applied and can give significant benefits.

We are proud that we are setting a new milestone in aviation technology and contributing to cleaner, safer and more comfortable future.

### Dr. Gregor Veble

*R&D Pipistrel Ajdovscina d.o.o*



## Introduction

HYPSTAIR is a project, financed under the Seventh Framework Programme, which aims to design components of a serial hybrid propulsion system for a small aircraft.

**A serial hybrid propulsion system uses an electric motor to drive the propeller.**

The electrical power can be sourced either from a battery pack, that can be recharged during the flight, or from an on-board fuel powered generator. This propulsion system will enable future small aircraft to operate with lower emissions, lower fuel consumptions, thus reducing the environmental impact and travel costs of the aviation.

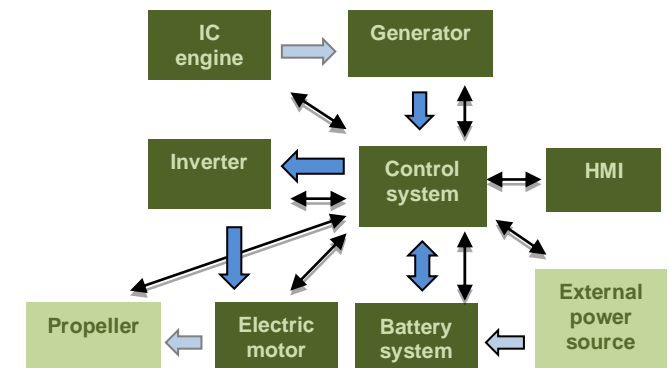
A serial hybrid aircraft concept currently represents the best efficiency versus range compromise in the light aviation segment. It can be considered as an electrically powered aircraft, with an on board generator used for extending the range when necessary.

Limitations of current electric energy storage technology make an electric-only propulsion system as yet unsuitable for long range flying, therefore an on board ICE generator provides a weight efficient, if somewhat less energy efficient, power generation solution.

All components will be designed in a way that they will meet the relevant safety and certification standards.

As there are currently no existing regulations for aviation hybrid drive systems, defining these in collaboration with the authorities will

be an important contribution of the project, paving the way for hybrid and electric technologies to be introduced to the market. These efforts will help create a competitive supply chain for hybrid drive components and reduce the time to market of such innovations.



***Schematic diagram of the hybrid propulsion system***



### HYPSTAIR's objectives



### Key facts

|                           |   |
|---------------------------|---|
| <b>TITLE</b>              | Development and Validation of Hybrid Propulsion System Components and Sub-systems for Electrical Aircraft |
| <b>ACRONYM</b>            | HYPSTAIR  |
| <b>CONTRACT AUTHORITY</b> | Seventh Framework Programme of the European Union   |
| <b>TIME FRAME</b>         | 1. 9. 2013–29. 2. 2016  |
| <b>BUDGET</b>             | 6.549.918,20 EUR  |

|                    |  |
|--------------------|--|
| <b>COORDINATOR</b> | Pipistrel (Slovenia)   |
| <b>PARTNERS</b>    | Siemens AG (Germany)<br>University of Maribor (Slovenia)<br>University of Pisa (Italy)<br>MBVision (Italy) |
| <b>LINK</b>        | <a href="http://www.hypstair.eu">www.hypstair.eu</a>   |





## Project partners

**Pipistrel Ajdovščina d.o.o.** (Slovenia) is a manufacturer of light aircraft, renowned for innovation, pioneering, performance and efficiency. Pipistrel's main products are single-to four-seat single engine piston aircraft, sold worldwide. It received numerous awards, most notably winning the NASA Green Flight Challenge 2011 sponsored by Google for the world's most energy efficient aircraft by flying the world's first four seater electric aircraft Taurus G4. It won the UKTI Award for innovation at 2010 European Business award.

**Siemens AG** (Germany) is a global powerhouse in electronics and electrical engineering, operating in the fields of industry, energy and healthcare as well as providing infrastructure solutions, primarily for cities and metropolitan areas. For over 165 years, Siemens has stood

for technological excellence, innovation, quality, reliability and internationality. The company is the world's largest provider of environmental technologies.

**University of Maribor** (Slovenia) is the second largest university in Slovenia educating about 22 000 students and employing about 1800 employees. It is an autonomous, scientific research and educational institution with purpose to transfer knowledge through different educational programs. Two Faculties with its research centres are participating in the project: Faculty of Electrical Engineering and Computer Sciences (Institute of Robotics) and Faculty of Civil Engineering (Transport Economics Centre).

**University of Pisa** (Italy) is one of the oldest European universities and today it boasts 11 faculties and 57 departments with about 55.000 students. Two departments of the

Engineering Faculty will be involved in the present project: the Department of Industrial and Civil Engineering DICI and the Department of Energy, Systems, Land and Construction Engineering (DESTEC).

**MBVision** (Italy) is a small enterprise focusing on generating new business or image opportunities through innovative projects and solutions. Company offers R&D activities, consulting, services, projects and products in the fields of design, new technology and communication for private or public companies/institutes that need to develop new products or services.



## Past events

### Kick-Off Meeting in Ajdovščina

On 10<sup>th</sup> and 11<sup>th</sup> of October 2013, partners first gathered around the project “Development and validation of hybrid propulsion system components and sub-systems for electrical aircraft” or in short **“HYPSTAIR”**. The HYPSTAIR project, which is co-financed by the Seventh Framework programme of the European Union, officially started in September 2013. During the two full days of the meeting, partners agreed on the measures and rules of the work, addressed several topics, from management of the overall project to more specific topics considering actual activities in project and most importantly got to know each other better.

### HYPSTAIR partners met in Nuremberg

On 19<sup>th</sup> and 20<sup>th</sup> March 2014 all partners of the HYPSTAIR project met in Nuremberg (Germany) at the second project meeting. During the meeting, hosted by Siemens AG, partners addressed all work packages of the project, including management and currently relevant tasks of the project. In general, first part of the meeting was dedicated to evaluation of work and efficiency in the first six months. Second phase of the meeting aimed at setting clear guidelines and plan for activities in the upcoming period.

### Kick-Off Meeting in Ajdovscina



### HYPSTAIR meeting in Nuremberg



## Past events

### HYPSTAIR at AERO 2014

In the scope of AERO Friedrichshafen 2014 (Germany), HYPSTAIR project partners in cooperation with ASTM international, implemented a workshop, which took place on 8<sup>th</sup> April 2014. Main theme of the workshop was **“Certification requirements of components for electric aircraft”**. Workshop was divided into two sessions, hosted by the project partners’ representatives and experts. 28 participants from 7 countries of the world visited the workshop and tried to establish a pathway to first milestones of certification requirements for electric aircraft. According to their statements, it was a great success.

### Transport and Research in the Danube Region

On the 3<sup>rd</sup> and 4<sup>th</sup> April 2014 Ministry of Infrastructure and Spatial Planning of the Republic of Slovenia organized a conference **“Transport and research in the Danube region”** in Ljubljana, Slovenia. HYPSTAIR project was present with new attractive promotional material; furthermore, Mr. Veble (Pipistrel) presented the project as the keynote speaker.

### International Electrotechnical and Computer Science Conference ERK 2014

From 22<sup>th</sup> till 24<sup>th</sup> September in scope of ERK 2014 conference (Slovenia), the technologies employed in the HYPSTAIR project in the propulsion system have been presented by Mr. Tomažič (Pipistrel).

### HYPSTAIR at AERO 2014



### HYPSTAIR at Transport and Research in the Danube Region





## Past events

### **Transformative Vertical Flight Concepts Joint Workshop on Enabling New Flight Concepts through Novel Propulsion and Energy Architecture.**

Objective of the event is to embrace emerging technologies and approaches, such as electric/hybrid power and distributed propulsion that offer the potential to fundamentally transform vertical flight configuration designs and operational concepts. HYPSTAIR's innovation technologies will be presented at the workshop, with the aim to find synergies between the participants and forge close ties for future cooperation.

## Upcoming events

**- 20<sup>th</sup> and 21<sup>th</sup> November 2014:**  
Creativity days (Italy): Presentation of HYPSTAIR project

**-27<sup>th</sup> till 30<sup>th</sup> January 2015**  
F44 General Aviation Aircraft (USA)

**- 12<sup>th</sup> till 16<sup>th</sup> April 2015:**  
AERO Friedrichshafen (Germany)

**-11<sup>th</sup> till 14<sup>th</sup> May 2015**  
I<sup>2</sup>MTC Conference (Italy)

**- August 2015:**  
Project Workshop: Current state of art in hybrid propulsion components and future developments

**-28<sup>th</sup> till 30<sup>th</sup> October 2015**  
F44 General Aviation Aircraft (USA)

## Special news

According to Aerokurier survey, one of Europe's leading General Aviation magazines, Pipistrel's Panthera won in the category „Single-Engine Aircraft of the Future“. Second award at AERO 2014 was handed to Pipistrel by Fliegermagazin for alpha trainer being the best aircraft of the year.

### ***Receiving the award for „Single-Engine Aircraft of the Future“.***

