



Patrick Senn

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Subject Area	Physik allgemein
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HSaiR – Helvetic Solar Airship

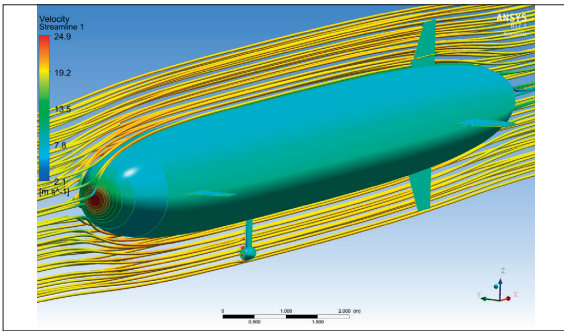


Figure 1: CFD simulation of the airship design

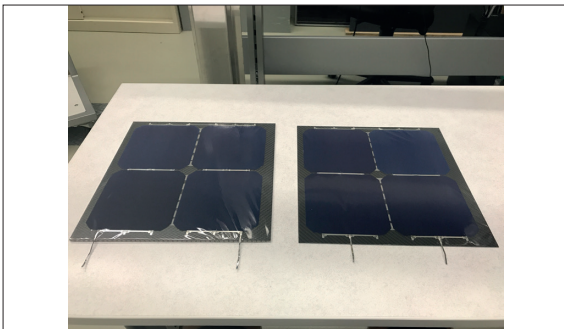


Figure 2: Self-made solar modules on carbon plates



Figure 3: HSaiR airship inside the Aero Drum Ltd. workshop in Belgrade

Introduction: The assignment of this bachelor thesis was to finish the design and build a solar powered airship, which was roughly designed during the previous semester thesis. The airship should be able to fly using only solar power. The solar power employed for propulsion was to be produced entirely by suitable lightweight photovoltaic modules. The airship was built in collaboration with an industrial partner: Aero Drum Ltd. Because the first choice of lightweight solar modules was too heavy for the use on the airship, another module had to be found or self-manufactured out of highly efficient cells.

Approach/Technologies: During the first visit to Belgrade in February, the design was finished with Aero Drum Ltd. The aerodynamic behaviour and the drag coefficient of the design were checked with a CFD simulation. While the project went through all administrative processes at the university, the search for lightweight photovoltaic components began. Various alternatives were tested. The final assembly of the airship was carried out together with Aero Drum Ltd in June during a second stay in Belgrade.

Result: Two different self-made solar modules were manufactured and tested. As these modules are complicated to manufacture, the freshly engineered bendable lightweight module from Flisom was chosen, which supplies up to 142 W/kg on STC. The administrative processes for the project were complicated and delayed the project up to six weeks. The remote-controlled airship is 13 m long and has a diameter of 1.9 m. The drag coefficient of the new design remains at 0.104. The production process is nearly finished and the airship will be transported to Switzerland for the test flights. All necessary components are available or expected to arrive on time. The final assembly and bringing into service with Aero Drum Ltd at HSR in Rapperswil is planned for June 30. The test flights will be carried out with assistance from experienced RC pilot Hugo Markes on July 1 and 2. The test flights will reveal whether it is possible or not to fly only under solar power. There is room to improve the electrical system, as batteries and solar modules are not directly connected. An onboard loading system for the sensitive lithium-polymer batteries should be developed. Further work may result in the development of an autopilot.