

# Solar Ship MPPT

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Solar Ship, a Canadian company, is developing a new system that could revolutionize the concept of air transport: flying with the energy of the sun! Nowadays it is no longer an utopia, the idea of traveling only with solar energy. We want to contribute to this work by designing and constructing a part of this airplane. The Solar Ship MPPT project is what best brings together all the knowledge acquired during our training at the BFH. Technology, efficiency and ecology. These are three words which we recently heard very often and which are the basis of our bachelor thesis.

## Solarship concept

The solar ship is an eco-friendly and compact means of transport. Currently there are many aircrafts that have a good capacity of transport but not all aircrafts are able to access remote areas and land in small spaces. Solar Ship instead is! Its wing-ship design allows for short take-off and landing (STOL), for example on a soccer field. This creative design also provides a large surface area for solar panels, allowing long and self-sufficient range. The main utility of the Solar Ship is the transport of aid supplies, due to its ability to land in areas affected by natural disasters and in under-developed regions. Other secondary activities are the monitoring of protected natural areas or, for example, tourist travels and advertising of products.

## Background

The sun does not reach the earth's surface constantly. For this reason, the energy received by solar panels is constantly changing. The power output has a peak, which is precisely called MPP, Maximum Power Point. The purpose of this project is to build a MPPT, a tracker that always works to this point. The result we want to achieve is an optimal battery charge and a maximum efficiency of electric motors. The initial conditions are the output power of 2kW, the output voltage from 160V to 200V and the input voltage varying between 80V and 130V. The resulting circuit is a DC/DC converter that must be able to raise the voltage adapting the current. One important factor is the electrical efficiency. To improve the flight conditions, we must create a circuit with very low power losses. In order to achieve this, we need the best components on the market, a proper

design of the power circuit and a low energy consumption of the control logic.

## Realization

The heart of the DC / DC converter is formed by multiple Boost Converters. In total we included two dual interleaved Boost Converters, which are handled separately. In this way we can implement a favorable energy consumption and a good redundancy in case of damages. The control circuit is carried out with two 32-bit microcontrollers. These processors manage the power blocs and the communication via CAN. The production process consisted of the following steps. After an initial planning, we performed multiple simulations in Matlab/Simulink and PLECS. Then we moved on to the practical implementation of hardware and software. Finally we commissioned a prototype.



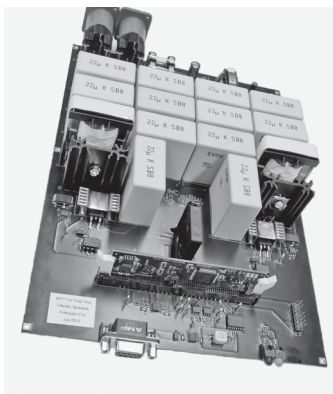
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MPPT prototype



Solar Ship