
# Low-drag glider development

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## Abstract (Oral Presentation)

Gliders are ingenious tools for ocean data collection that are limited by transit speed and by survey time. The two parameters are coupled; increasing survey time means slower transit speed so changing one or the other does not improve the overall coverage. In reality, the only way we can significantly increase the survey area is to change the available power.

The power budget in a glider is set by the average power consumption and by the available battery capacity. The battery capacity can be increased by using batteries with high energy density or by making the glider larger so it can carry more batteries. Larger gliders generally increase cost and make them more difficult to handle. Available battery chemistries have not really changed over the last decade. In conclusion, a longer survey time means that we need reduce the power consumption, ideally in ways other than reducing measurement cadence or the data transfer rates.

When analyzing the glider power budget, it quickly becomes clear that the dominant consumption comes from the act of moving the glider up and down, i.e. the energy needed to expand and contract the buoyancy engine that is central to all glider designs. If we assume a constant transit speed, the required energy is proportional to the drag on the glider body. To reduce the drag, we need to look at the industries that have been concerned about this for decades – the car industry and the aircraft industry. Using these results, we ran a series of hydrodynamic simulations to show how it is possible to reduce the drag also for gliders. We have also built scale models and tested these in a tow tank to verify the simulations. As the simulations show, the core issue is to have the glider move in the direction of the desired glide path and minimize the angle of attack. We have also reexamined the symmetry requirements that are common for up- and downward moving gliders to see how better wing shapes may reduce the overall power consumption.