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Satellite Navigation in Aeromodelling

For many years, satellite navigation was exclusively available to superpowers as a top secret military affair. These days progressive aeromodellers are employing it very successfully to track and record the flight path of large radio-controlled model gliders.

First Satellite Navigation System for Model Flying

Once the satellite network was finally opened up for commercial applications, its peaceful use rapidly spread around the world. It didn't take long for a GPS navigation system to be standard equipment in mid-range cars. Although GPS receivers have become smaller and smaller and could eventually even be installed in wristwatches, it has taken a surprisingly long time for the aeromodelling world to catch on to the trend, until inventive model glider pilot Christoph Mächler developed a functioning satellite navigation system for model aircraft. It has long been every model aircraft pilot's – and especially every glider pilot's – dream to be able to constantly monitor climbing rate, rate of descent, altitude, speed and other parameters of his glider sailing along high above him. The first step towards realising this dream has been the proven variometer systems that process measurement data from a pressure sensor and transmit them to the pilot via a wireless connection.

Method of Operation

The GPS receiver with a module and data logger placed in the model continuously determines its current horizontal and vertical position. These data are processed by the module and relayed to a transmitter, which, like the GPS receiver/module assembly, is smaller than a matchbox. These two components require so little power that they can be supplied from the receiver battery. Their installation in the model is not fixed and they can easily be moved to a different model. The transmitter sends processed signals to the pilot's receiver and data are passed, via cable or Bluetooth, from the receiver to a pocket PC that has the appropriate software installed.

Only Software Allows the GPS Features to be Utilised

Using the software on the pocket PC, it is possible to define a triangular course tailored to the airfield, using only a few simple inputs. The software also provides the option of carrying out and analysing performance measurement flights. Finally the software also lets the system be used as a variometer, speedometer etc., independently of competition or performance flights. When flying a course, the course triangle is displayed on the pocket PC's screen along with flight parameters selectable by the pilot. Using the aircraft symbol moving over the display, the pilot and his navigator can visually check that the glider is on the ideal course. The information required for navigation can also be accessed via voice output, so that, after a period of familiarisation, the pilot will be able to accurately fly the triangular course even without a navigator's support. In addition to the information required specifically for flying a course, a

multitude of further parameters such as current climbing rate, integrated climbing rate, groundspeed, space velocity, current glide ratio and current altitude can be accessed visually or by voice message. Major innovations are multiple voltage monitoring of the on-board power supply and a further decrease of display time-lag. The pilot is now virtually flying online.

Nearly Unlimited Possibilities
By flicking a switch on the transmitter, suitable flight profiles, i.e. preset configurations of parameters, can be activated. If, for example, the flaps are set to the speed position, the navigation system automatically switches to the "gliding" profile. This focuses on the information on speed, gliding angle, wind components and rate of descent. If the flaps are lowered to the thermals position, the system independently switches to the parameters suitable for optimum searching and utilising of thermals, i.e. vario, integrated vario over several seconds, total energy compensated vario and altitude information. If the flaps are placed in a positive position and the undercarriage is lowered, the system displays the parameters for the towing profile, that primarily supplies accurate altitude information. The advantages of this system are obvious. The pilot no longer has to press keys on the pocket PC while flying to switch the software from one flying state to another. He can focus exclusively on flying and in every flying state the navigation system will provide him with the appropriate information, that he previously selected.

A New Competition Category: Triangular Gliding
The GPS system is an enrichment for model gliding. Without it there would be no triangular flying races which give large gliders and their pilots the opportunity to demonstrate their true abilities and compete against each other in an exciting atmosphere. The navigation system makes it possible to carry out these competitive flights without complex infrastructure and to have several planes racing round the triangular course simultaneously while still being able to accurately analyse each individual flight. This is why there are increasing numbers of large glider pilots that are fascinated by competitive flying on a triangular course. The focus is now fully on the correct flying tactics, which are what makes triangular flight so interesting. A pilot who, in the 30 minutes available per heat, messes around in a number of unprofitable circles in a weak lift, runs the risk of being left behind by his competitors. The heavy large gliders can be kept on the ideal course and accurately turned, even in strong side winds runs the risk of being left behind by his competitors. The heavy

large gliders can be kept on the ideal course and accurately turned, even in strong side winds. At the gliding speeds of 50-70 km/h that are common today, turning two or three seconds too late can easily result in having flown around uselessly for a hundred metres. The large gliders that are used are usually built to a scale of 1:3. On the one hand, wing span provides performance, on the other hand, a not too narrow profile is advantageous in poor visibility. Who knows – maybe in a few years time there will be World Championships in triangular gliding with GPS.

Good luck!