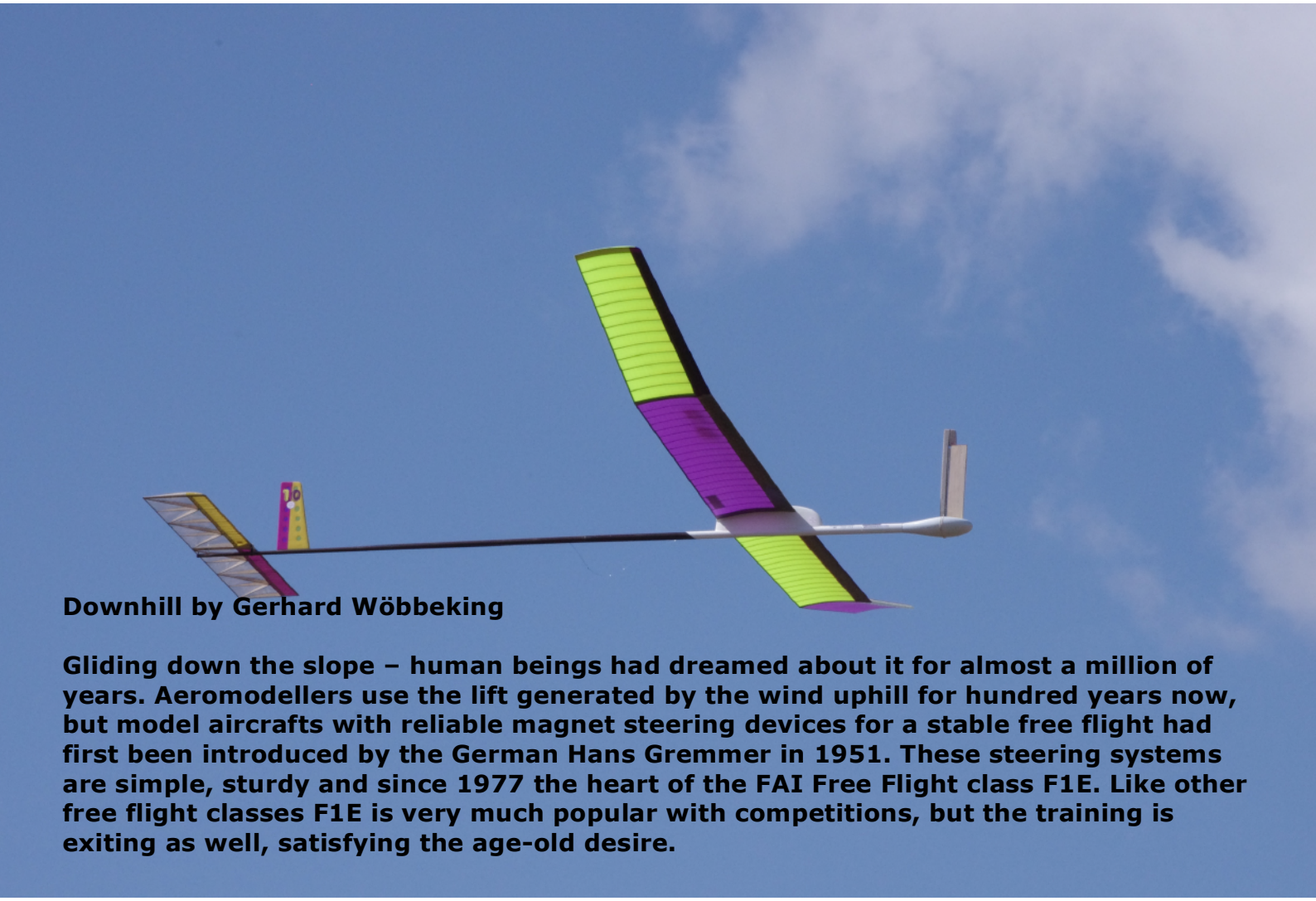
CIAMFlyer
Introduction to the Model Aircraft World
No. 5-2015

F1E - Fly an FAI Championship Class



Downhill by Gerhard Wöbbeking

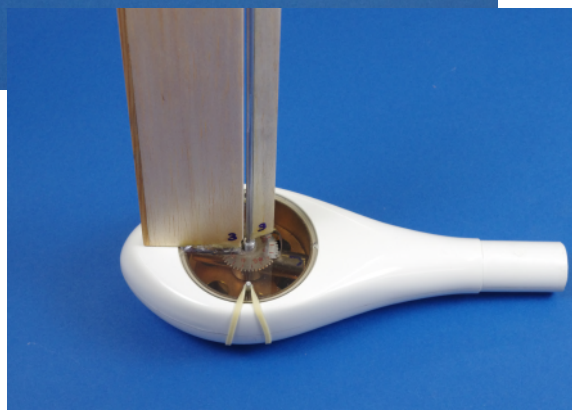
Gliding down the slope – human beings had dreamed about it for almost a million of years. Aeromodellers use the lift generated by the wind uphill for hundred years now, but model aircrafts with reliable magnet steering devices for a stable free flight had first been introduced by the German Hans Gremmer in 1951. These steering systems are simple, sturdy and since 1977 the heart of the FAI Free Flight class F1E. Like other free flight classes F1E is very much popular with competitions, but the training is exiting as well, satisfying the age-old desire.

In principle, a rudder is fixed above a strong magnet which turns freely on a hub in its center. Before the glider is to be launched downhill the rudder must be adjusted. It has to show in the flight path, with the magnet pointing to the north resp. south - as it is its nature. While gliding, the model aircraft will be disturbed by turbulences of the headwinds which even try to turn it back. But the rudder will be correcting the deviation – under the condition that it has been set properly. So, the glider flies downhill, the slower the faster the headwind blows. At one point, gliding and wind speed equalize each other and the aircraft stands still, hopefully high in the lift above its happy launcher. In competition, one prefers always a slow motion down the hill as a model in the air above the ridge may be in danger to disappear in the lee. Depending on the wind speed, the gliding speed is adjusted using extra ballast fixed at the center of gravity or one deploys a model fast enough to fight high winds by design. Five models are allowed to be processed at international championships by each competitor. Five rounds are flown, with a maximum time between two and five minutes, depending on the circumstances.

To end a flight the tailplane will move in the dethermalising mode, either controlled by an onboard timer or by an RC signal. - If you are interested, visit a competition (in Europe there are about hundred national and international ones), see and copy and start your own F1E flying!

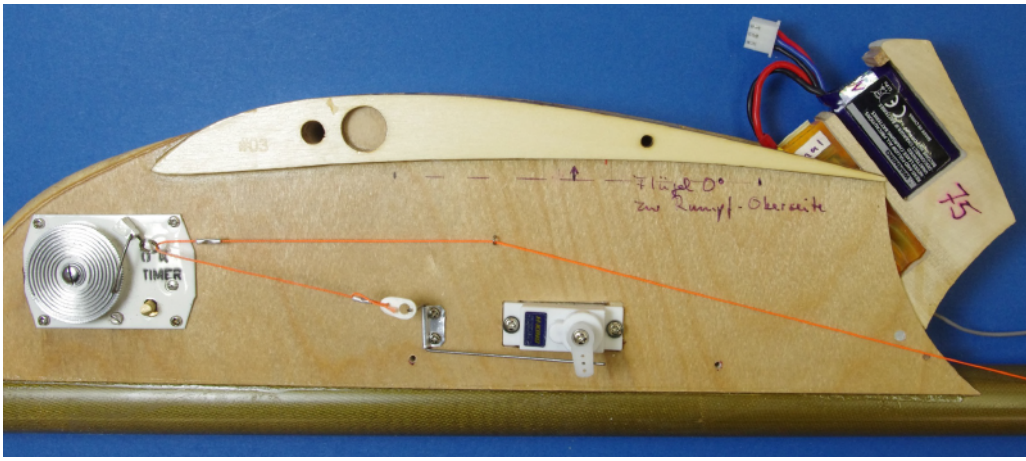
The F1E Model Aircraft

At the beginning one is inclined to equip one of the popular F1A free flight gliders with a magnet steering device. That's possible of course, as long as the wings don't have asymmetrical warps – those warps are poison for a straight flight. Special F1E gliders perform better: Their formula contains no restrictions of the surface area (yes, 150 dm², but that would be a free flight glider with a wing of 400 cm by 30 cm). In any case, size matters! A good start is a wing of 20 cm chord and 240 cm span.

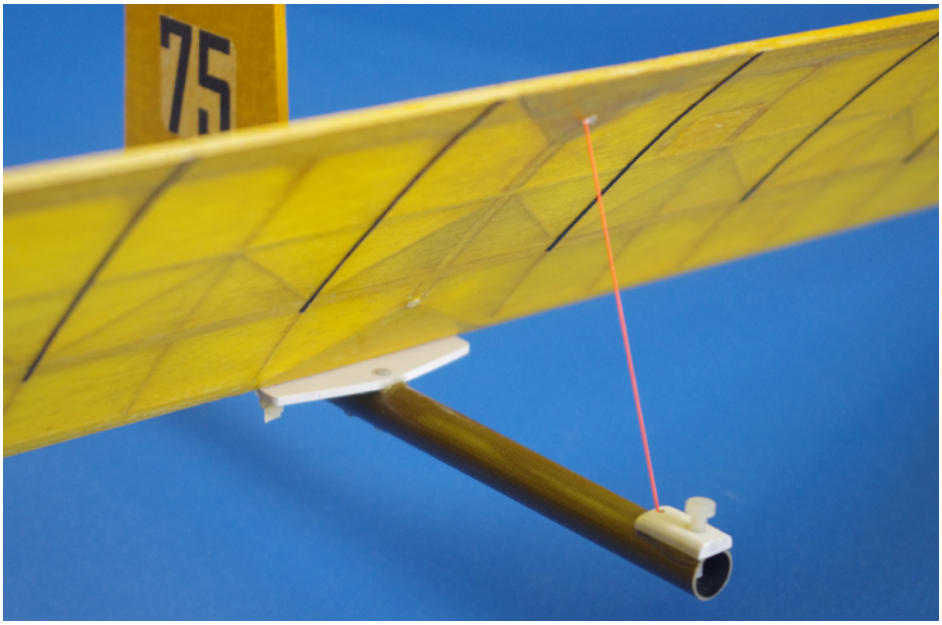


The parts of the magnet steering device with housing and rudder. The housing fits into the boom.

Magnet plus rudder fixed in the housing with a rubber band ➔



Combination of a clockwork timer with a RX controlled servo. Either the timer or an RC signal let the tailplane move into the DT mode. ➔



Aerodynamically an aspect ratio of more than 1:13 in the wing is not essential as the higher Reynolds number of a larger chord may outperform the lower drag of a slimmer wing. Build it rigid and free of warps, for instance with a tubular spar made of carbon. The wing airfoil can be thicker than one used for F1A; a Re-number of 60.000 instead of 40.000 reduces the drag and the plane is as happy with a 9% thick profile in the wing as with one of 6%.

Tailplane up in the DT mode

All you need for downhill gliding - glider, transmitter to stop the flight, speed meter for the wind on a pole.

The tailplane of an F1A integrates about 15% of the wing area. Same percentage applies to F1E, especially as the fuselage boom will be longer than that of an F1A, improving stability around the pitch axis. A big model dethermalizes as stable as a small one as long as the tailplane is equally loaded (and the DT-angle of the horizontal stabilizer is h45° or higher). Therefore the centre of gravity (CG) should be fixed as far back as a reliable stability allows, in practice between 55 and 60% of the average aerodynamic chord of the wing. It will happen that the moment arm of the front rudder with its heavy magnet and housing looks fairly short with such a CG – but don't be worried! The models turns around the CG, may it be for- or rearward. A short moment arm because of a light tail is something else. It may need a bit more time to turn the model back on its path, but the aircraft will gain additional airtime while winding its way downhill.

Konrad Zurowski, Junior World Champion 2013, about to launch (EuCh 2014) →

Florian Winker (GER) won in 2014 the Junior European Championship ←

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