

PROTOTYPE DESIGN AND TESTS OF A COMMERCIAL UL-AIRCRAFT EQUIPPED WITH WINGGRID WINGTIPS

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Abstract

Based on the reported successful fullscale testing of the Winggrid device in 1997 an existing production model UL-aircraft has been adapted to this device.

Adaption of the device to the given airplanes constraints is described. We describe first the special structural considerations for adaption of the device to a standard product. Then we give the performance precalculation, followed by the test results for confirmation of the design calculations.

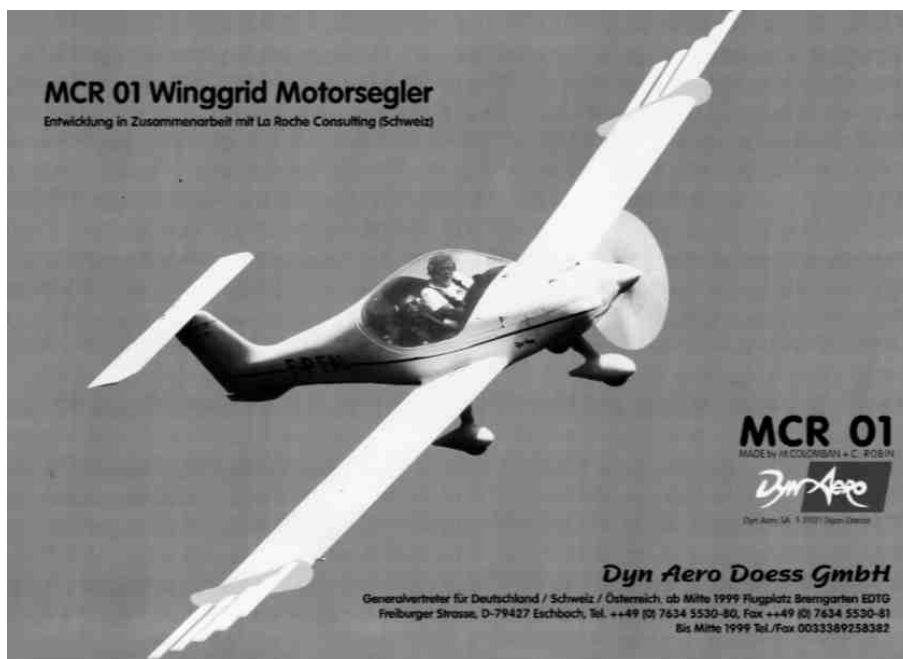
To the classic performance envelope comprising cruise performance, modified landing and take-off behaviour is added and a

soaring speed range with motorglider performance. For this additional performance no additional controls or add-ons (such as change of wing-pairs, etc.) are required. The performance increase in L/D attained for the optimum speed range gets the UL-aircraft to be classified as a regular motorglider.

Extensive test results including comparison to aircraft of the same type with same span, but equipped with different wingtip arrangements are reported. The relevant tests are executed under guidance of ONERA.

1. The base model aircraft for these tests is the MCR01 of DYNAERO SA.

MCR01 Motorglider-Version



Specification Data

Span: 9.8 m	TOW: 450 kg	Vmin 55 kmh	Vcruise 240 kmh
Vglide 90-140 kmh	Vmax 300 kmh	L/Dmax 30	Wing Area 9.35 m ²

2. Comparison of three testfigurations MCR01

The Winggrid is a successful technical implementation of a wingtip using multiple winglets (or blades), that is roughly ten times more effective than known classic winglets cf [1]. Several parallel blades in-line with specific spacing and angle to the main wing take over the lift of the main wing individually and produce multiple wakes. With this operation principle the configuration is far from being comparable to known vortex diffusion type wingtips or other wingtips that influence the vortex at the wingtip locally and do not allow for spanloading control independently from the wake interactions, cf [2].

The version WINGGRID tested has compared to the specifications above a reduced standard span.

The other two testconfiguration are the standard configuration and a configuration with classic winglets designed by ONERA. All three testconfigurations are having identical span, wing and fuselage.

References:

- [1] La Roche U. et al.. WING-GRID, Development, Qualification and Flighth Testing of a WINGGRID on a jetpowered testbed, Proceedings ICAS 98 Melbourne (Australia),
- [2] Stephen C. Smith. NASA Technical Paper 3598, Ames Research Center