

Achieving the Potential of Tailless Planforms

As mentioned previously, Hans-Jürgen Unverferth is an ardent supporter of tailless planforms. He has been involved in the design, construction, and flying of a large number of tailless aircraft, both glider and powered. His list of accomplishments includes “Just In Time,” “CO²,” “CO⁵,” “CO⁷,” “Joined 1” and “Joined 2,” and other sailplanes, plus “Extase,” an electric powered pylon racer. He is the author of “Faszination Nurflugel” (“Fascinating Tailless”), published by Verlag für Technik und Handwerk GmbH in Germany, and is now completing a second book, entitled “Der diskrete Charme des Nurflugels” (“The Discreet Charm of Tailless”). This latest book is a continuation of “Faszination Nurflugel,” and includes detailed information on “CO⁷,” his latest design.

Hans-Jürgen has been building and flying model aircraft since 1969, when he was in his teens. He quickly found radio controlled speed models, powered by OS Max .15 engines, to be his favorite. In 1976 he discovered RC sailplanes, and almost immediately became involved with F3-type models, flying F3B in international competitions.

In 1985 Hans-Jürgen was out slope soaring with a friend who was having some problems flying his tailless glider. The friend asked, “Do you want to try?” Hans-Jürgen accepted the invitation, and has been hooked on tailless aircraft ever since. Hans-Jürgen has been flying swept wing tailless entries in various contests throughout Europe, competing several times at Kaltenkirchen and in the Viking Race. Additionally, he made an attempt at breaking the world speed record for gliders using his “Joined 1” design. Together with Reinhard Sielemann, Christian Behrens, Stefan Siemanns, and Christian Tallmien, Hans-Jürgen has tried to improve the performance of tailless gliders and establish them in F3B, F3E, F3J, and F3F. Despite this continuing endeavor, Hans-Jürgen feels the real values to be derived from tailless planforms are fun, a little bit of adventure, and a feeling of being one of the aviation pioneers!

Over the last decade, many advancements have been made in the realm of swept wing tailless sailplanes, both full size and model. Winch launching of tailless swept wing models, for instance, had always presented a number of difficulties, including instability on tow and lack of height upon release from the line. Both of these problems have been solved from within a rapidly evolving design process consisting of incorporation of anhedral, proper

location of the tow hook relative to the CG, better airfoils, and programmable full span camber changing.

Despite these advancements and performance improvements, there is one area where tailless sailplanes have not quite met their tailed counterparts — sink rate. Tailless planforms can be designed to have excellent glide ratios, but they tend to fly significantly faster than their tailed counterparts when operating at the same wing loading. Their sink rate is therefore higher, and duration times in still air are shorter. Through careful tailoring of wing section and other planform parameters, however, this last gap in performance is rapidly shrinking.

Hans-Jürgen's focus is now the perfection of a system by which the center of gravity can be moved in flight. Together with some amount of automatic stabilization, a moveable CG may be the key to unlocking extremely high performance from the tailless planform.

In the past, various methods have been used to move the CG in flight. One popular method is to simply connect a servo to the battery pack. Since the mass of a battery pack is relatively small in comparison to the entire airframe, it's difficult to get enough CG movement. Tests done by Hans-Jürgen's team, for example, show a CG movement of around 4 mm on airframes suitable for competition. Stefan Siemanns, however, has perfected a way to move the entire fuselage, thus obtaining CG movements over a 15 mm range, which is quite an improvement.

In the words of Hans-Jürgen, "Why do we use radio controls? To build constructions characterized by very high 'own-stability'? It's a joke! We have to be creative; fantasy has to rule our thoughts! Think about the F-16, B-2, all the modern fighters. There is no 'own-stability,' there is a computer! This is the future of model sailplaning. And there is one geometry waiting for this time — the tailless glider!"

A system which integrates the power to move the center of gravity over a wide range and a method of maintaining aerodynamic stability should allow tailless planform performance to far surpass and remain permanently ahead of that of conventional tailed designs.

As noted earlier, Hans-Jürgen has a number of projects in which he is currently involved. We will attempt to keep readers of this column informed of the progress and results of these various endeavors.