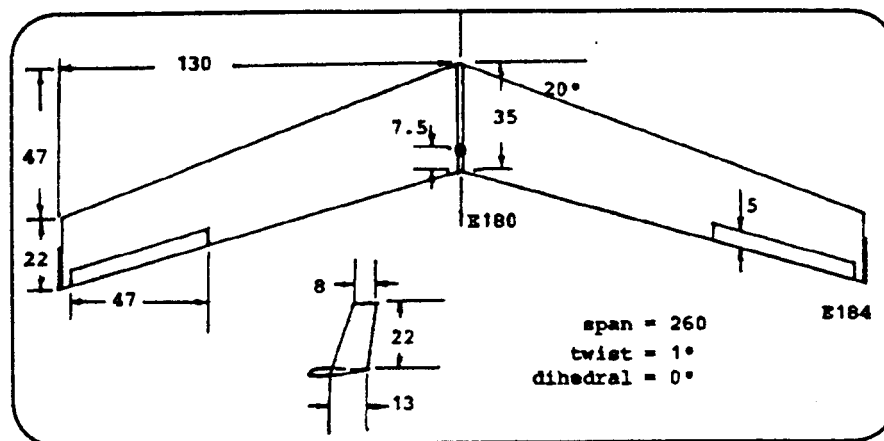


## FOUR GERMAN 'WINGS

Our own interest in flying wings is now five years old. (But our piles of accumulated information would make it appear we've held this interest for a substantially longer period of time.) While going through our files recently, we marveled at the improvements in flying wing design which we've seen over this relatively short period, and thought perhaps a brief description of several representative 'wings would be of interest.



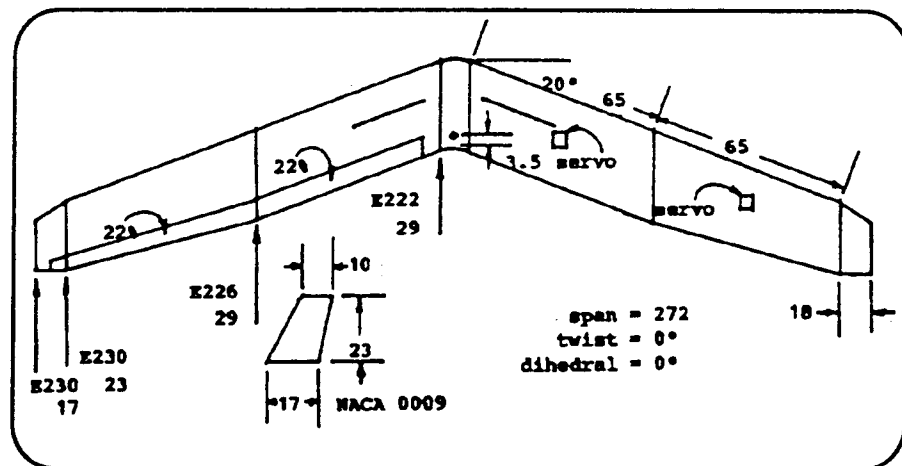
### ELFE II, 1984

Curt Weller's Elfe II has most probably had a greater effect on flying wing advocates than any other design, for it announced to the world that high performance swept wings are possible. Some of its performance characteristics are no doubt due to the fact Curt is a former Austrian F3B champion.

The Elfe II is easily constructed of foam/balsa/fiberglass using the dimensions shown here. Elevons are used as control surfaces and the speed range is quite broad even though there are no flaps. The elevon servos are mounted in the wings. No bridle is necessary and so only one tow hook is used. The plywood keel serves the dual purpose of

mounting surface for the tow hook and hand hold during launch. We have seen the fins both glued securely to the wing and mounted with flat head screws. The screw mounting technique allows removal for transport and easy replacement in case of damage.

Take note of the airfoils used: the Eppler 180 at the root and the 184 at the tip. These are good choices as they are both relatively low drag sections; the E 180 has a good lift coefficient, and the E 184 does not have excessive reflex. The use of these two sections also allowed Curt to use a minimum of wing twist to assure stability - just one degree. The Elfe II needs to be flown at all times, as it will not search out thermals like many plank designs. It is maneuverable and fast, but is also a very capable floater when the need arises. It does well in F3B and thermal duration contests, and at least one flyer has entered an Elfe II in a slope race.

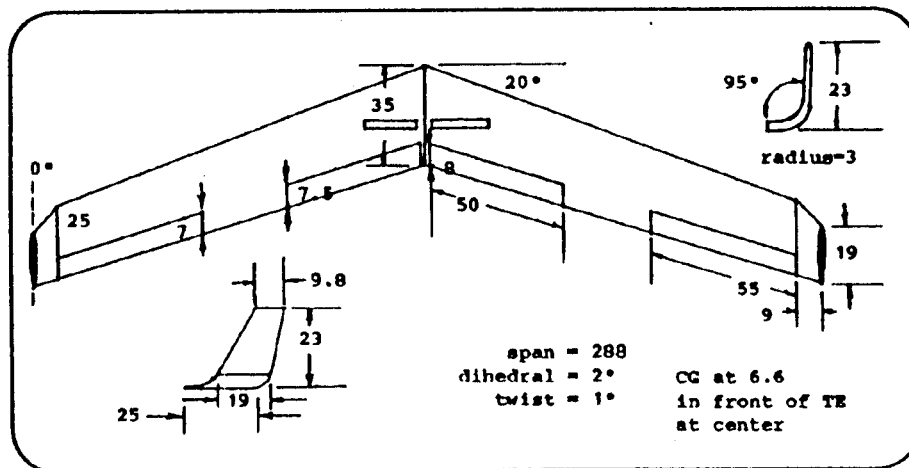


NURFLUGEL, 1986

"Nurflugel" is German for "only wing," and it's never been clear to us whether this is the actual name of this design or just a generic term applied to it. Designed by Klaus Brunswicker, this 'wing features flaps, spoilers, and pseudo-Scheumann tips, and seems well suited to thermal-duration tasks.

Significant is the use of the Eppler 222 - 230 series of airfoils. These sections were designed specifically for swept flying wings, and the use of the E 222, 226 and 230 on this design are an indication of what can be done with these airfoils. The E 222 is an undercambered section with good lift, and the E 230 can provide sufficient stability for the design without the necessity of twist.

The separate fuselage provides adequate room for batteries and receiver, and is shaped to promote a smooth connection between the quarter chord lines of the two wings. This is beneficial to the lift distribution and improves thermal performance.



#### JUST IN TIME, 1987

Hans-Jurgen Unverferth for some time wrote a flying wing column for the German magazine Flug- und Modelltechnik (FMT). He is a proponent of flying wings for F3B, and over the past few years has developed several designs, each a better performer than the previous. Following the evolution of Hans-Jurgen's designs is rather interesting, and demonstrates quantum leaps in design strategy.

"Pirx" (1985), an earlier design, used the Eppler 224 section at the root and the E 230 at the tip, with 15.5° of leading edge sweep and no twist. Elevons were the only control surfaces used.

"Just In Time" was nearly a complete departure from "Pirx," retaining only similar overall dimensions and wing sweep. Using a symmetrical Quabeck section of 9% thickness, and one degree of twist, Hans-Jurgen turned to flaps and airbrakes for speed and glide path control. Pseudo-Scheumann tips, but in a slightly different form than "Nurflugel," were used. "Just In Time" sported curved tips which blended the wing into winglets. The winglets were mounted at 95°, maintaining a good lift distribution and minimizing tip losses.

"Ceozwo" ("CO<sup>2</sup>"), Hans-Jurgen's newest endeavor, uses a constant chord wing and a pod fuselage. Elevons and flaps, like those on "Just In Time," are retained. We don't have much more physical information on "Ceozwo," but its performance at the 17th Ludwig-Kramer-Cup (F3B) held in Dortmund, Germany, allowed Hans-Jurgen to score 8274 points. The top flyer in the contest, with a tailed "Albatros," scored 8777.

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The above information was compiled from: Model Aviation; DELTA, the magazine of FSV Versmold, #5 and #7; Flug- und Modelltechnik (FMT), published by Verlag fur Technik und Handwerk GmbH; and The White Sheet (White Sheet Radio Flying Club, England) FW Special #2.