Dennis Weatherly's "JackWabbit"

This month's column describes a reader's tailless creation. Dennis Weatherly first approached us concerning information on one of the EH sections for a larger tailless design, but his smaller testbed so impressed us we just had to devote a column to it. Here's what Dennis has to say about his latest flying machine...

"First, a big thank you for your web page and for providing a source of information regarding flying wings. I have always been fascinated by them. I've only built one so far (an RCM Little Plank) but that is changing soon.

"A friend has helped me to design a swept wing that I will power with an electric ducted fan system. The proposed model will use an EH 2.0/10.0 airfoil, 14" root chord, 10" tip chord, 72" span and three degrees of twist. Projected weight is about seven pounds. Power will come from a WeMo Tec RK740E fan unit (4.2" diameter) driven by an Aveox 1412/4Y motor on around 28 cells. It should be exciting!

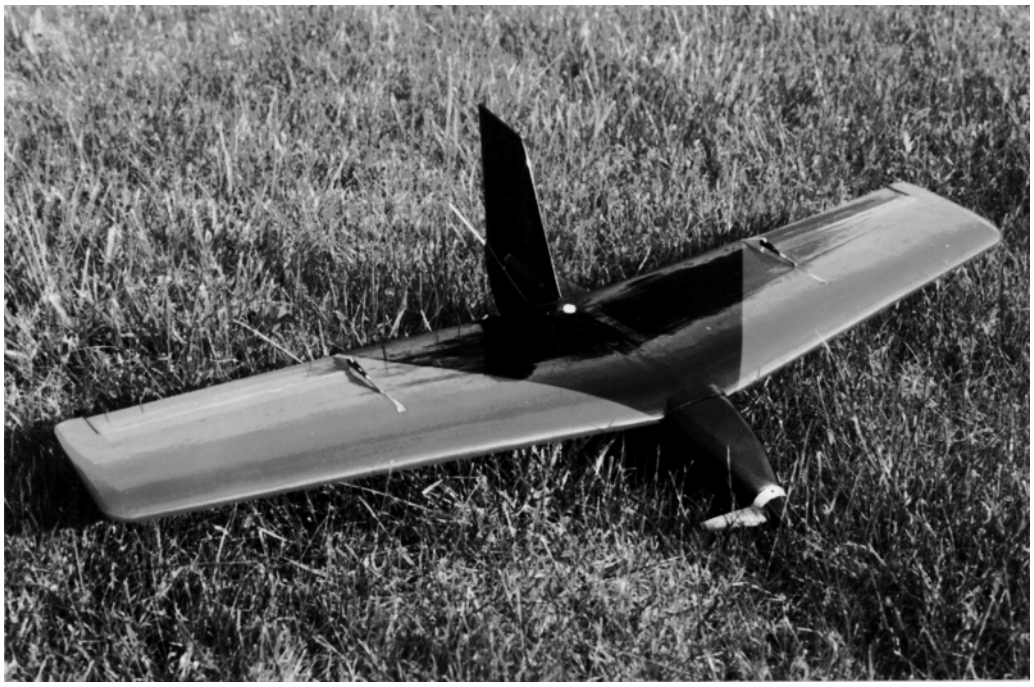
"Since I am a computer driver by trade I was interested in the program (my friend) used to determine the twist. He pointed me at your web page where I downloaded the Panknin Twist program. It works fine under QBasic and Windows 95..."

A few days later, Dennis wrote...

"To prove to myself that I could design and fly a 'wing, I shrunk the proposed big jet down to Speed 400 electric size. The resulting model shared the same taper ratio and sweep in a 30" span, 7" root chord, 5" tip chord and 180 square inch package. I used a stubby box fuselage and a single vertical fin, with the fin LE against the wing TE. Airfoil is the EH 2.0/10.0 with three degrees of twist. Ready to fly weight is 15 ounces.

"Only I goofed when I cut the cores and I ended up with 20 degrees of total sweep, rather than 20 degrees per panel. So it was more like a plank than originally planned. I plugged the numbers into the Panknin Twist program and got a CG of 2.9 inches back at the root, so I started there.

"Rolf Zurcher helped me with control throws and we gave it a toss. It zoomed straight up, rolled uncontrollably as it slowed down and then dove into the



tall grass (thank goodness)! Damage was minor and quickly repaired. Rolf figured that the roll problem was adverse yaw due to the low airspeed. We moved the motor battery ahead 0.5" and tried again.

"The second flight was better. I had my hands full trying to fly the plane, find the trim knobs and get some down trim dialed in. It was pretty quick! After about a minute of this I landed for a breather and to reset the surfaces.

"The trim changes had resulted in the elevons being depressed below the wing TE, so I guess the twist was too much. With the trim dialed in and a fresh charge we launched for flight number three. Success! The little plane accelerated straight away and flew beautifully. Pitch and roll control is solid and well damped. It tracks through turns like it's on rails. And it is <u>really</u> fast! Most people estimated the airspeed at over 60 m.p.h. flying straight and level. I flew it four more times at the Celebration of Silent Flight.

"A funny thing has happened since I reported my success on the e-flight mailing list; folks are contacting me as if I'm a flying wing "expert"! There are a lot of folks out there that are intrigued with them but afraid to try for fear of failure. Speed 400 sized models make great experimental tools since they are so small and cheap.

"It only took a week to design and build this little wing. My wife named it the JackWabbit. I think I'll try to build JackWabbit 2 and get the wing sweep right this time! In the mean time I am already receiving requests for plans and wing cores for JackWabbit 1."

While communicating with Dennis, it became apparent that the wing twist is indeed too much, despite the smaller than intended sweep angle. It appears that too large a design C_L was plugged into the Panknin program. As set up, a lower C_L is needed when powered, and thus down trim is required. If the design C_L is lowered, less twist will be called for by the Panknin program. This may necessitate some small amount of up trim when in gliding flight, but that pitch up under power needs to be eliminated from within the planform. With 20 degrees of sweep, the twist should probably be reduced to one degree.

Congratulations, Dennis, for a great looking and good performing design! And be sure to keep us updated on JackWabbit 2!

JackWabbit Dimensions	
Wing span	30" span, 7" root chord, 5" tip chord
Sweep per panel, at c/4	10 degrees
Wing twist	3 degrees (which proved to be a bit too much)
Airfoil	EH 2.0/10.0
Wing construction	foam core with l/32" balsa sheeting
Fuselage construction	balsa sheet
Power	Robbe Speed 400 6 volt motor, direct drive
Propeller	Graupner CAM 5x5 prop and spinner
Speed controller	New Creations 30 amp controller with BEC
Receiver	Hitec-RCD 535
Receiver antenna	Dean's base loaded
Battery pack	7 cell Sanyo 500AR
Servos	FMA S80 (micro); one buried in each wing panel
Ready to fly weight	15 ounces

To invent an airplane is nothing.
To build one is something.
To fly (it) is everything.

— Otto Lilienthal