



Flapping Wings

THE ORNITHOPTER
SOCIETY NEWSLETTER

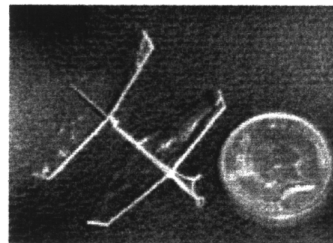
Smallest Flapper?

Peter Get sent us this photo of what might be the smallest ornithopter so far! He says his interest in ornithopters was rekindled around 10 years ago when, as a member of a slope soaring club, he watched a presentation by John Tipper. Tipper amazed the crowd with a small Equalizer tandem. Since then, Get has built several ornithopters, including three similar tandems descending in size. The one pictured here is his smallest to date with a wingspan of 28mm and motorless weight of about 6mg.

Peter describes some of the limitations of building this small: "Flight times are only around 10-15 seconds as it is very difficult to cut rubber small enough not to overpower it. As it is, I am cutting stock Tan 2 reasonably successfully with scissors to give motors 15mm long by 0.2mm square and getting up to 700 turns onto them! I think I can build smaller, given improvements in rubber cutting and finding thinner spring wire than the 0.125mm (0.005") I am using now. Membranes are Polymicro stuck with 3M Photo Mount. I had to control my breathing a lot of the time; next time I shall invest in a mask. I forgot myself at one point, breathed out normally and almost lost a wing!"

Wing spars are cut from stock prop wood (0.3mm), tapering from 0.3mm sq. to 0.3 by 0.15mm. The motor stick is 0.7 by 1.0 by 18mm, with a 0.7 by 1.0 by 4.0mm piece at the rear forming a T shape. All wood joints are made with medium thickness

cyanoacrylate. Crank throw is +/- 0.75mm. The thrust bearing is a 0.5mm square piece of aluminum can pierced and stuck to the pierced wood pylon (lower arm of T shape), with a 0.2mm length of medical needle at the crank elbow. The conrod is all wire, 3.5mm long. The rear wing pivot is wire through the pierced upper arm of the T piece, retained with a 1.2mm acetate disk pierced and pushed onto the protruding wire. The wing rotation angle is +/- 35. Both piercings in the T piece are hardened with thin cyanoacrylate to make bearings.



The coin is a 5p piece (18mm diameter, about the size of a US dime).

Linear Analysis of Flapping Thrust

Andrew Morin is developing a mathematical model to aid in development of his manned ornithopter. As is often the case with something as complex as flapping flight, his predictions so far require adjustment, so he has offered to share his methods so far in the hope that either someone will benefit from the information or someone may be able to help him perfect the calculations. Morin says he calculated the top speed for Albert Kempf's Truefly ornithopter at 8 MPH, though the video clip clearly shows it to be flying

much faster. He can send the current draft of his linear analysis of flapping thrust to you if you send him an email.

Morin requests: "Please tell me if I am covering old ground. I need to brush up on my calculus before I can attempt a 2nd order analysis, which isn't worth it if someone else has already paved the way. I expect this to improve my '8 MPH' score appreciably. I expect to be performing free-flight tests in the next few weeks. Admittedly, my confidence in my prototype vacillates from hour to hour as I run numbers and scale model tests. We'll see."

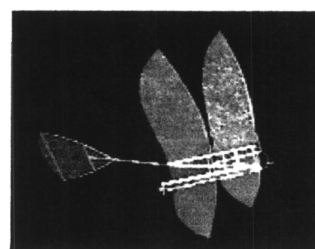
Write to andrewjmorin@mediaone.net if you have any info that might help.

New Ornithopter Site

A new addition to the world wide web brings us information on Ornithopter modeling in Japan. The site contains lots of great pictures, plus plans are available for the designs shown on the site.

WORKSHOP OF THE ORIGINAL ORNITHOPTER "AKATOMBO"

<http://homepage1.nifty.com/akatombo/e-home.html>



Batwing Flyer Enters Stores

by Nathan Chronister

Tedco Toys recently released a new toy ornithopter, available in stores in the United States and also directly from Tedco. While some companies have been marketing toy ornithopters closely based on the Tim Bird ornithopter made by G. de Ruymbeke of France, the Batwing Flyer is a totally new product. The design is based on Freebird 2, the easy-to-build ornithopter plan on the OS web site. However, the manufacturer has redone the design in plastic, allowing it to be mass produced.

Batwing Flyer uses essentially the same flapping mechanism as Freebird 2. It has the wings hinged at the centerline and achieves symmetrical flapping by having two separate crank positions. Unlike Freebird 2, however, the connecting rods are a little too long. This can cause the wings to lock in the overhead position. My Batwing Flyer does this whenever I wind it counter-clockwise.

Even though the frame is drilled with lightening holes, plastic is still heavier than balsa, so this ornithopter needs a thicker motor than Freebird 2. Since there is too much torque to easily hold the crank stationary after winding, Tedco has provided a clever locking device. This consists of a steel bar that slides out of the fuselage to interrupt the motion of the crank. It is spring loaded so it can't engage during flight. The Batwing Flyer comes with two big, green rubber bands. The rubber bands, one of which is a spare, are easy to install thanks to the open fuselage.

Compared with Tim Bird, the Batwing Flyer has a much deeper wing stroke and slower flapping rate,

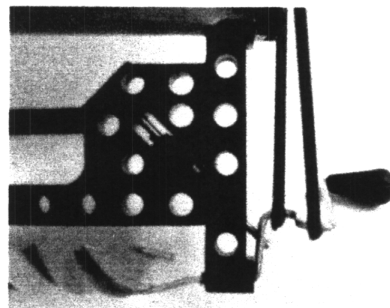
giving it a very birdlike impression. The fabric wings have a softer sound than Tim Bird's mylar. Launch requires a little more of a push than I'm used to, to avoid an immediate nosedive, but the Batwing Flyer has a nice climb and flies better overall than Tim Bird. The paper tail is not as precisely adjustable as Tim's ball and socket joint, but the Batwing Flyer goes nice and straight without as much need for adjustment. At about 12 grams, the Batwing Flyer crashes into things in your living room much more gently than Tim Bird, making it suitable for indoor use. You will find it more difficult to modify than Tim Bird.

Batwing Flyers are sold on a big square of cardboard with some interesting facts about bats, along with the very simple flight instructions, printed on the back. I was disappointed with the poorly executed bat design printed on the Batwing Flyer. I was also disappointed to see that Tedco, despite its efforts to make this an educational toy, hired an artist who thinks bats have two thumbs on each hand! Let not that detract from your enjoyment of this sturdy and effective flying machine.

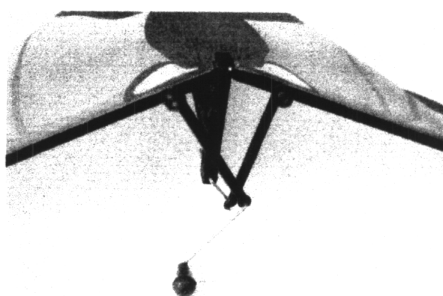
Hits: Flies well, fabric wings, locking device, accessible fuselage.

Misses: Conrods too long, bad graphics.

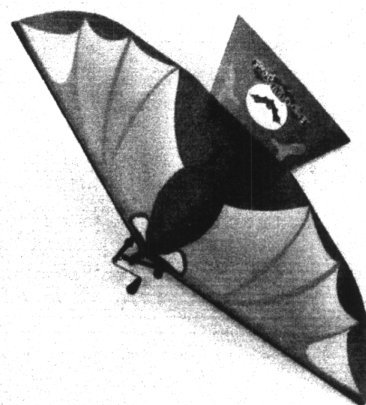
Tedco Toys
498 South Washington Street
Hagerstown IN 47346 USA
Phone: (800) 654-6357
www.tedcotoys.com



Close-up of the locking mechanism for the crank. The lightening holes are also visible.



View of the flapping mechanism and crank. Note the extended crank arm for winding the thick rubber band. This feature, plus the crank lock, make prepping for flight a snap.



Full view of the Batwing Flyer with fabric wings and paper tail.

Jim Theis Remembered

by Nathan Chronister

Sadly, I must report that Jim Theis, one of the most innovative ornithopter pioneers, has died as of 23 January 2001. Jim spent many years in a wheelchair, paralyzed from the waist down as a result of an accident that occurred when test-piloting his Nighthawk experimental aircraft, which successfully used an unusual, inverse-wing-warping approach to flight control, which is also used by birds. Despite his condition, Jim persevered with the help of many friends to revive the Nighthawk project and design a flapping wing version of the Nighthawk, which was under construction at the time of his death. Jim held fast to his vision of a manned ornithopter with birdlike, articulating wings with birdlike flight controls. His work, had he completed it successfully, would have greatly advanced the ornithopter field.



Dreams

Hold fast to dreams
For if dreams die
Life is a broken-winged bird
That cannot fly.

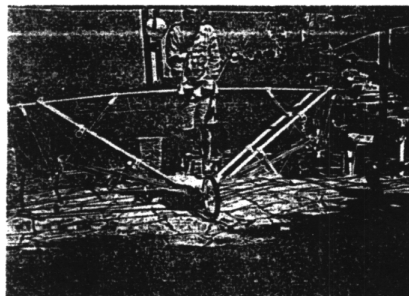
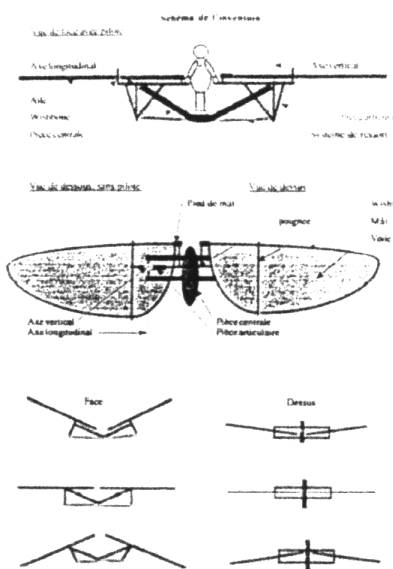
Hold fast to dreams
For when dreams go
Life is a barren field
Frozen with snow.

- Langston Hughes

New Prototype Under Construction!

Dr. Jean-Marie Dellis, from Ardeche, a new member to URVAM, is building his design for a human-powered ornithopter. The illustration shows the concept of the ornithopter and the flap routine. The vertical amplitude of the wings is 60 degrees and the horizontal, 20 degrees. The wings move in a figure-eight pattern, made possible by the universal joints. The system of springs balances the flight loads and reduces the power needed from the pilot.

The Preceding article was translated from the French newsletter *URVAM Express*

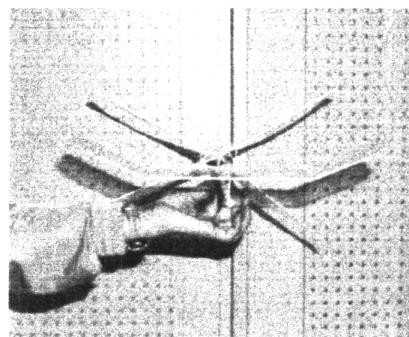


Danjo Wins!

Akihiro Danjo of Tokyo, Japan has won both categories of the International Ornithopter Postal Contest. Danjo's entry for category A (open) followed a canard biplane form. The specifications are as follows:

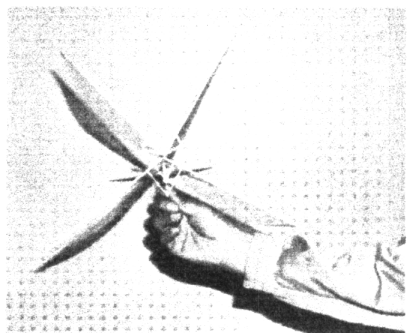
Span: 400mm
Length: 440mm
Weight: 1.7 grams (without rubber)
Rubber: 345mm loop, 1.06 grams

The winning flight of 7.20 was flown under a 13.5 m ceiling.



His entry for Category B (flapper lift) posted a fantastic time of 6:05. This category required all fixed surfaces be rearward of the rear motor hook. Accordingly, Akihiro's ornithopter was a rear-stabilizer biplane, with wings hinged at the centerline. Here are the specs:

Span: 400mm
Length: 515mm
Weight: 1.57g (without rubber)
Rubber: 215mm loop, 0.88grams
Ceiling: 13.5m



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Ornithopter Society Membership Info

Join the Ornithopter Society or renew your membership: Dues are \$12 per year in the USA. Dues outside the USA are \$17 US per year. Checks are payable to *Sean Frawley*.

Get published: Sean Frawley, editor of *Flapping Wings*, invites you to send your articles and photos to be published in this newsletter. Send your material to the address above or E mail it to frawley@warwick.net.

www.catskill.net/evolution/flight