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 SKYHAWK PIREP & PROSTAR OWNER SURVEY**

# WHOLE AIR

The Magazine of Hang Gliding and Ultralight Soaring

AUGUST 1984 — \$2.50 (Can. \$3.25)

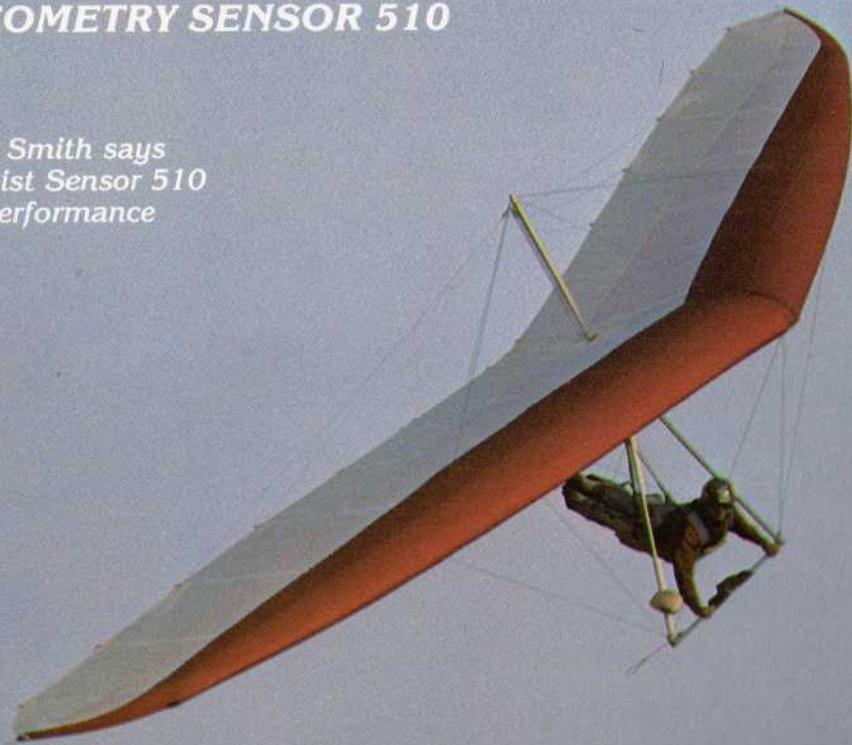


**BOURBONNAIS' 107 MILES  
 IN NEW YORK**

# BREAKTHROUGH IN HANG GLIDER PERFORMANCE

## Introducing the new in-flight VARIABLE GEOMETRY SENSOR 510

Champion pilot Stu Smith says the new variable twist Sensor 510 offers world class performance for glider pilots world-wide.



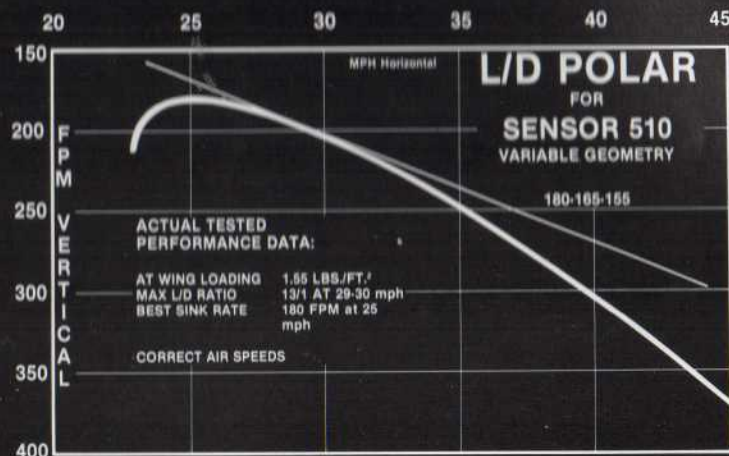
Significant improvements in performance and handling are available now on the in-flight variable twist Sensor 510. Seedwings knows that the most important aspect of hang glider performance today is drag elimination and low twist. In-flight variable twist, improved wingtip camber, mylar trailing edge cloth and additional ribs in the airfoil combine to produce a significant performance gain over other high performance gliders.

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# WHOLE AIR

ISSUE NO. 37, VOLUME NO. 7, NO. 4, 1984

## PILOT'S PERSPECTIVE

- 26 BOURBONNAIS' 107 MILES  
Within days of Gary Engelhardt's precedent-setting 104-mile flight, Mark Bourbonnais of Canada flew 3 more miles for the new east coast record.

**WHOLE AIR Magazine** is published bi-monthly by Idea-Graphics, whose mailing address is P.O. Box 144, Lookout Mtn, TN 37350-0144, and whose executive, editorial, and advertising offices are located at 3308 Rondaboo, Chattanooga, TN 37409; telephone 615/825-5274. ©1984 by Idea\*Graphics. All rights reserved. Nothing in whole or in part may be reproduced without written permission of the publisher. Publisher assumes no responsibility for unsolicited material. All photos, artwork, and manuscripts must be accompanied by a stamped, self-addressed return envelope. This publication is purchased with the understanding that information presented is from many sources for which there can be no warranty or responsibility by the publisher as to accuracy, originality, or completeness. It is sold with the understanding that the publisher is not engaged in rendering product endorsements or providing instruction as a substitute for appropriate training by qualified sources. **Change of Address & Subscription Inquiries** — Send to *WHOLE AIR*, P.O. Box 144, Lookout Mtn, TN 37350-0144. Expiration date marked on mailing label in a four digit sequence, followed by two letters. The first two numbers are the year; the second two are the month of subscription expiration. Please give six to eight weeks advance notice of address change. Send both old and new address plus mailing label from recent issue, if available. Subscription rate: U.S. and Possessions, one year \$12.00; Mexico and Canada, one year \$16.00; All other countries, one year \$20.00; Air Mail available, write for rates. Single copy price \$2.50. **Back Issues:** Many past issues are still in stock. To order, send \$3.50 plus 95c postage to Back Issue Dept., P. O. Box 144, Lookout Mtn., TN 37350-0144. No orders processed without the proper funds. **All Payments:** U. S. Funds only, please. Application To Mail At Second-Class Postage Rates is Pending At Chattanooga, Tennessee. **POSTMASTER:** SEND CHANGE OF ADDRESS TO: *WHOLE AIR*, P. O. BOX 144, LOOKOUT MTN., TN 37350-0144. Printed in the USA.

## FEATURES

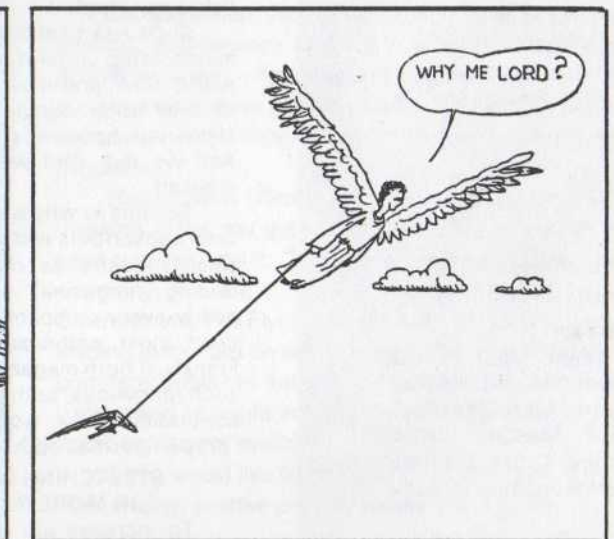
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The first, halting step in trying to determine just how well our modern Superships perform. Pandora's Box has been opened with Seedwings' 13/1 Max L/D claim; here's some new ideas on the dilemma.
- 20 "MINIMUM" MOTORGLIDER  
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Cartoon by Bob Lafay





Volume 7, No. 4, 1984  
ISSUE NO. 37

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*German Correspondent*  
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Mark Bourbonnais  
Bruce Wolfe  
Dan Johnson  
Tom Phillips  
Dr. Albrecht Fischer  
*Drachenflieger* magazine

*Cover Photo*  
Peter Brock

#### On The Cover:

British Team pilot, Chris Elison, launches his HiWay Explorer from Mazourka Peak during Rick Masters' 1984 Owens Valley Cross Country World Championships in early July.

# Publisher's Column

WHOLE AIR IS DOING  
SOMETHING THAT IS  
VERY EXPENSIVE!

In issues past, this column has pointed to a need to better market a more professional approach to our favorite sport. Now, finally, some of our own efforts to help in correcting that problem are bearing fruit.

By our October '84 issue, *Whole Air* will sell nearly 3,000 copies to newsstands and bookstores at over 500 locations in all 50 states and in several countries abroad. While we struggle with the rest of the industry trying to keep all our old customers, the so-called slump has nevertheless reduced our numbers. This tremendous new surge of newsstand sales has put *Whole Air* on the road to attracting those sorely-needed newcomers. Our advertisers can obviously share our joy in this success.

But newsstand and bookstore distribution is obtained with "blood money . . ." as all small magazine publishers are too-keenly aware. Discounts are extremely high; freight is high as well, and we must pay it "up front;" reimbursement for sold copies takes many months to be completed; and in any event they'll usually sell only 30-50%, the latter figure being considered "quite good sell-thru performance." *Whole Air* is terribly glad, therefore, to sell 80% on the average, because all unsold copies are basically free . . . not paid for. Ouch! *Whole Air* does so well because our distribution is limited, and those outlets which do carry our title have customers looking for hang gliding magazines. Surely though, you can see the risk is very high.

Such risk cannot be well assumed by membership organizations. USHGA, EAA, AOPA, SSA, and most others do very little of their total circulation by newsstand. *Whole Air*, however, can make the gamble. And we did. And we've got our fingers crossed.

So, this is why we appeal regularly to both subscribers and advertisers. In such a small industry as ours, we (and *Hang Gliding* magazine) literally must have nearly every company as advertisers, and need most participants as subscribers. Frankly, if both magazines cannot maintain such followings, both could have difficulty continuing their work, at least in the "proper" format both use today.

#### STRETCHING OUT ABROAD FOR MORE INVOLVEMENT

To increase our market base, *Whole Air* is really stretching our reach. We've already made terrific strides in Canada, where nearly 20% of all *Whole Air's* are read. Now, many months of communica-

tion and effort are starting to form an image in Europe and elsewhere abroad.

From the english-speaking countries of England, Australia, South Africa, and New Zealand (plus Canada, of course) to the densely populated European continent, and even into the Orient, we can count about 35,000 active pilots who are showing a growing interest in reading about America's developments and activities in *Whole Air*.

This October, I will travel to Europe for a month-long trip aimed at increasing *Whole Air* circulation, and at enlisting foreign advertising support. Further, many feature stories will begin from this tour which will continue our already active program of reporting foreign developments and activities to American readers.

Our goal is to appeal to the international community of ultralight soaring pilots . . . to bring America to them (good for American manufacturing advertisers), and to bring foreign news to the USA (good for American pilot/readers). The interplay of knowledge, between nations can only help our sport mature we feel. Plus, the additional revenues will help *Whole Air* continue. This too, is a very expensive endeavor.

#### WHOLE AIR GOES 3rd TO 2nd CLASS

For its six-plus years of publishing, *Whole Air* has always gone Third Class Mail. The reasons were many, but one was that 3rd Class received, to quote a postal official, "essentially the same service as 2nd Class," but without most of the interference of complex postal regulations.

However, in exchange for accepting that regulatory environment, 2nd Class mailers receive considerably lower rates. This is dramatically more so if ad density (percentage of all pages) is low . . . as it unfortunately is in present-day hang gliding. Now, as we grow larger (i.e., higher mailing expenses) and as our foreign subscribers and newsstand sales increase (lower 2nd Class rates apply to overseas mailings as well), we can expect to cut our postal costs by over a third, it is forecast. That's good. We can employ the savings to further sustain and promote *Whole Air*. But just the bucks saved has never been enough incentive.

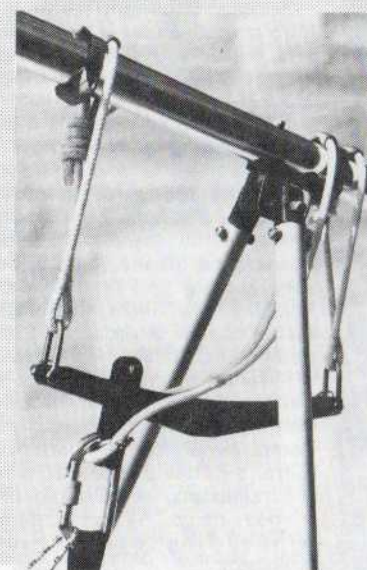
This fall, the Postal Service will change Second Class service a great deal. It will provide much faster delivery, and as one postal director put it, "Second Class will basically be 'surface-level First Class service,' and the times for delivery may be cut in as much as half, or even more!"

#### THE BOTTOM LINE

All these new changes and developments make us feel very good about *Whole Air's* future. The past 2½ years have been very, very hard in hang gliding — you can ask virtually anyone "in

*Continued on Page 10*

## Perfect Pitch.



Looking for simple, compact, stowable pitch control? Get a Speed Rail.™

Light pull-in, flat body attitude for improved performance. Landing flare-out without 'Lockup.' Static load tested to 10 G's.

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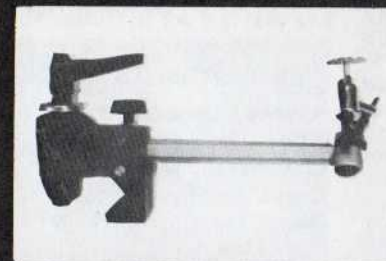
INTRODUCTORY PRICE: \$68.00\*

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dealer inquiries invited

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Cliff Whitney

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Home: 615/265-1539

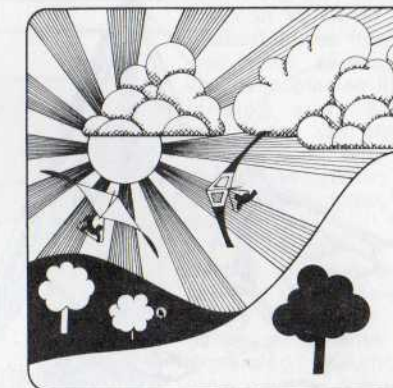
700 Colville Street

Chattanooga, TN 37415



ALSO DEALERS FOR BALL VARIOs WHEN ONLY THE BEST WILL DO

## EMPLOYMENT OPPORTUNITY



CRYSTAL AIR SPORTS, ONE OF THE OLDEST AND LARGEST HANG GLIDING BUSINESSES, is looking for the right individual to join our organization. Primary responsibility will be in the area of instruction. Crystal has recently acquired the use of a new 140 foot southwest facing training hill and expects to expand its operation to include additional training hours and evening training. Training in the use of our unique "Crystal Simulator" will be provided as well as familiarization with our other customized Tennessee training methods. USHGA Basic Instructor Certification desirable, or at least experience in training and all other requirements for certification completed.

Duties will include: Instruction from "Simulator" to mountain lessons using approved techniques; Maintenance and repair of training equipment (tho Crystal uses new state-of-the-art intermediate trainers reducing maintenance efforts); Simulator preventative maintenance; and slope grooming.

Sales of equipment will be an equally important responsibility. Crystal pays extremely liberal commissions in order to encourage sales activity. Therefore, only those applicants who are "into" sales will be considered. Friendly, out-going, assertive are the qualities we seek. Crystal has a large inventory of current gliders and accessories to support an energetic sales person.

Experience in glider repairs as well as a desire to do this type of work is required as Crystal does offer this service to its customers.

Compensation: Hourly rates will be paid on a contract basis for training, maintenance and repair work as available (averaging 35 hrs/wk in season - April through October). Commissions will be paid on major equipment items and lesson packages. Limited use of "shop equipment" is permitted. Profit sharing and potential for ownership is negotiable.

This position offers a high degree of responsibility and creative freedom. What you get out of Crystal will be entirely determined by what you put into it. Crystal is a progressive, development-oriented company. We are the ones who created the world's only Real-Environment, Full-Flying Hang Glider Simulator. We are one of the leading authorities on aero towing of flex-wing hang gliders. Our sister company publishes the only independent magazine devoted to hang gliding and ultralight soaring [WHOLE AIR]. We represent only the finest equipment available.

If you would like to be part of this team and consider yourself a high energy, positive person, please contact:

TOM PHILLIPS  
615/825-1995

Crystal Air Sports  
Rt 4, Cummings Hwy.  
Chattanooga, TN 37409

# INDUSTRY NEWS

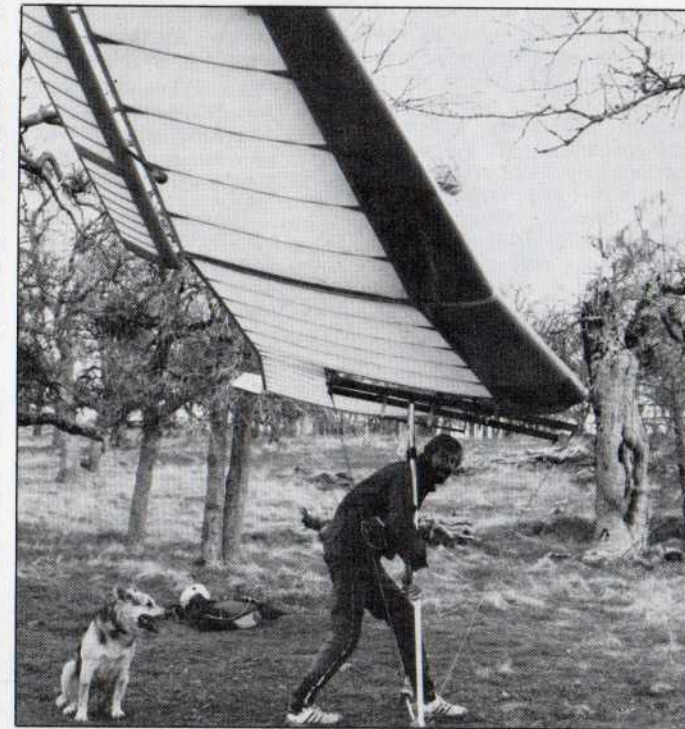
cannot yet be forecast. Tim is being treated in the Santa Clara Valley Medical Center (address below), which is widely revered for its advanced spinal unit. Victims of back injuries are flown in to Santa Clara Valley Medical Center from all over the west coast, as was Morley who was helicopter air-lifted from the landing site. Spine repair technology has also reportedly come a long way in the past decade which offers further hope to Morley's family and many friends.

The hospital is of course treating the injury delicately, and has him in a special bed which moves constantly to simulate bodily movements, to help in preventing pneumonia, among other possible complications.

Well known in the hang glider community for his road representative services for Wills Wing, as well as the newer Mitchell project, Morley has friends across the USA who may wish to drop a card or note of encouragement. The hospital staff requests *no phone calls* at this time, please.

Those wishing to write may do so at:

Santa Clara Valley  
Medical Center  
751 Bascom, Room 179A  
San Jose, CA 95128.



## Mitchell U-2 Developer, Tim Morley Seriously Injured

MODESTO, CALIF — After almost single-handedly re-awakening a whole new wave of interest with his control-bar-fitted Mitchell Wing U-2 developer Tim Morley has sustained a serious injury that has at least temporarily put the exciting project on hold.

In the 120% service-oriented style that characterizes Morley's business practices, the U-2 developer was providing a tandem hang glider flight to a prospective student. While using a flex wing glider for the introductory lesson, the two suffered a landing crash that flung the student onto Morley on impact, dislocating the numbers 4 & 5 vertebrae.

Witnesses say conditions were not soarable, and Morley apparently knew the landing would be difficult. The accident, which occurred Sunday, June 24th, has left Morley paralyzed from the shoulders down. No other injuries were apparent at press time, however, medical personnel on the case say it is just too early to know what the future holds. Morley has some dull (not sharp) feeling in his feet, and the vertebrae are dislocated, not severed, both potentially encouraging signs. Nevertheless, any spinal injury is very serious, and the course of the paralysis

parachute/hang glider.

Another important factor is a club magazine that is informative and makes you smile — "Flight Line" often stimulates belly laughs!

Now to the advertisement! We are arranging an Air Show to promote the image of the sport and encourage new pilots into the sport. We also hope to make some money for the Muscular Dystrophy Association. This is going to be a very exciting and unique event. The theme is "Silent Air Sports!" Listen to the attractions: Static equipment displays (new and old); a "friendly" competition, hot air balloon and balloon-dropped hang glider, synchronized flying demo, aerial "ballet," parachute jump, tug/tow demo, kite flying, R.C. sailboats, homing pigeons, frisbee demo, falconry demo, windsurfing demo, flight simulator.

Date: Sept 23rd, 1984  
Time: 8 AM to 3 PM  
Place: Ed Levin (Milpitas, California)

Those interested may call me at (home)415/462-9225, or (work) 415/498-7073.

JIM HERD,  
Pleasanton, CA

## More From HGMA Prez Mike Meier

Dear Editor:

I would like to respond to Jean-Michel Bernasconi's letter in the May '84 *Whole Air*.

I'm afraid Mr. Bernasconi has missed the point. What the ad should have said was, "Load tested to 3700 pounds." Period. Without *any* reference to HGMA

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## More On U-2 and Pro-Dawn

Dear Editor:

The *Whole Air*, May 1984 cover I thought (had) a very dramatic photo of the Mitchell/Morley U-2 Superwing being launched into what appeared to be the beginning of a deep X-C voyage. It wasn't until I read the article that I realized that Tim Morley had added a conventional control bar configuration to the ol' new Mitchell wing; something I never thought could be done; the Mitchell wing a never-to-be-underestimated perennial surprise, now in the Mitchell/Morley U-2 Superwing edition.

Please write more articles on the Mitchell/Morley U-2 Superwing, and on Progressive Aircraft's Pro-Dawn, designed by Dick Boone. Both are interesting R & D developments.

EDWIN G. SWARD,  
Worcester, MA

## W.O.R. on Muscular Dystrophy

Dear Editor:

The Wings of Rogallo, Northern California Hang Gliding Club has become increasingly active over the past five years. I would like to describe some of our successes and do a little "advertising" for our most ambitious event to date — The WOR Silent Air Show.

Some facts: Club meeting attendance up 100% from around 35 to 70; membership up from negligible to 300 since 1979; site "ownership" up from one to three (the two new ones are frequently soarable!); financial assets doubled over last year; Bay Area records increased from 15 to 47 miles (Kevin Dutt); club competitions increased from 1 to 4 per year; voice synthesized weather station (original idea through installation and commercial marketing); frequent "Observer days" and "site work parties;" sponsorship program from safe progression up the hill; no major accidents and minimal minor accidents in the last two years.

An analysis of why this has happened shows that several key factors have come together. First, the nucleus of vibrantly active members has grown both in number and in characteristics — young vs. old(er), "technical" vs. "artistic," organizers vs. executers, professional vs. amateur. The local shop (Mission Soaring) provides much of the "new blood" so vital to club health.

Second, the meetings focus on fun rather than boring business, with specialties such as "family and food night" and special guests like "Udo" with his hybrid

was an article on how *Whole Air* was now going to distribute its magazines on the newsstands across the United States. Well, if they're going to do it in the USA, why not in Canada?

Time for the idea in letter form to *Whole Air*. Within ten days, Dan Johnson had phoned me showing interest in the program. Back to the news agent. No problem!

I have no idea on how much impact having *Whole Air* on the newsstands will have in encouraging the masses to join the sport, as the program only began with the June and July issue, but any form of encouragement cannot hurt. At this point only time will tell.

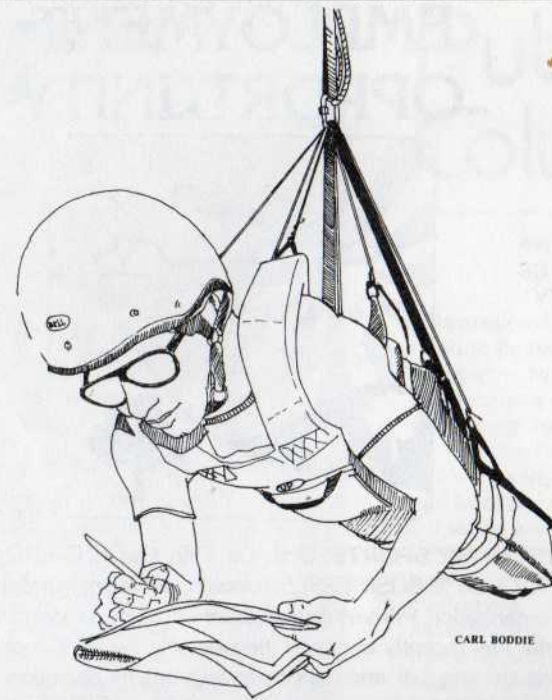
ROD PORTEOUS,  
President  
Fly-West Hangliding, Ltd.

*Whole Air* deeply appreciated your work, Rod. We're sure this will help us, help our sport, and help your retail business (see this issue's Publisher's column).

While the costs are high and risk awesome, for a small publication like ours, your efforts were too wonderful to pass up. For so long as we can handle the expense, we'll keep sending copies to news agents, now numbering almost 3,000 copies per issue ... and rising.

You're partly to thank, Rod, and we do, heartily!

—Ed.



# FORUM

## Some Help From Our Friends

Dear Editor:

Since the latter part of 1983, I began reading the unpleasant articles in *Whole Air* and *Hang Gliding* on the slow but sure drop in numbers of hang glider pilots staying or becoming new members in the sport. I couldn't imagine what I would do if I couldn't feel the freedom of flight.

I began to rattle my brain and ponder the idea of how to reach the masses with the concept of flight. I thought that maybe magazines on newsstands could be a possible way of informing the public. I phoned Stewart Midwinter (the local editor of the AHGA Newsletter) and asked him his views. Stewart thought the idea was great.

Starting at Square One, I went to the local convenience stores to see if they would put some magazines on their newsstands. They told me I would have to speak to a company who is the distributor for all the magazines in Southern Alberta. I managed to speak to the news agency's director who in turn thought the idea was sound.

Now to only get hold of *Whole Air* to see their response. I had thought it might be a long shot in the dark, so I left the idea for a couple of months.

In March of '84, I picked up an issue of *Whole Air*, and lo and behold, in the Publisher's Column

16th, 1984.  
**DISTANCE & ALTITUDE GAIN:**  
 109 miles — *Official* Canadian Record. Altitude gain was also filed and has been recognized: 3,140 meters [approx. 10,300 ft.]: by Cliff Kakish of Calgary, AB — flew from Cochrane to Ponoka, AB on April 9th, 1984.

**DISTANCE:** 126.7 miles. *Official* Record Claim filed, pending approval: by Willi Muller of Cochrane, AB — flew from Cochrane to Richdale, AB on June 3rd, 1984.

*Whole Air* congratulates these fine achievements in long distance soaring flight by high caliber Canadian pilots!

### GQ Security Releases Rocket Recovery System

GQ Security, supplier of hand deployed parachutes to the hang glider industry, has released a solid-fuel, rocket-deploying parachute system. The aerodynamic-shaped canopy generates a high coefficient of drag, with rates of descent in the 18-20 fps range.

It claims a low drag profile when compared to bulkier mortar-type systems. And the system uses a continuous one-second thrust curve which allows for rapid, low-altitude recovery at very low airspeeds. Most significantly, this

## INDUSTRY NEWS

type of firing system does not transmit the slightest amount of reaction or recoil force to the airframe. As such, this may make the GQ Security system more applicable to hang gliders and ultralight sailplanes, as large recoil forces do not have to be absorbed by the airframe.

For more information, write former Odyssey Hang Glider Accessories owner, now corporate vice president of GQ, Dave Aguilar, at Box 3096, San Leandro, CA 94578, or call 415/357-4730.

### Magic III's Sweep First 3 British Leagues; Set New Distance Mark

Airwave Gliders' Magic III has taken the first three British League meets by storm, taking all four top placings in each meet, less one second place finish by an S4 Racer.

**FINAL RESULTS**  
 First League

1st — Robin Rhodes (Magic 166)  
 2nd — Tony Hughes (S4 Racer)  
 3rd — Johnny Carr (Magic 166)  
 4th — Michel Carnet (Magic 166)

**Second League**  
 1st — Michel Carnet (Magic 166)  
 2nd — Phil Huddleston (M-166)  
 3rd — John Pendry (Magic 177)  
 4th — Bob Calvert (Magic 177)

**Third League**  
 1st — John Pendry (Magic 177)  
 2nd — Robert Bailey (Magic 177)  
 3rd — Michel Carnet (Magic 166)  
 4th — Mike McMillan (Magic 166)

In addition to the above victories for Airwave, John Pendry, whose Magic III 177 is sponsored by Planters Peanuts, set a new European and British cross country record by flying 210 kilometers (131 miles) earlier in the month of May, 1984. Pendry's flight took him from Brighton in Sussex to Seaton in Devon, breaking the previous record by 6 kilometers (3¾ miles).

### Swedish Firm Announces Folding Propeller

The Universal Propellers with the Kolecki airfoil boasts 32% for efficiency and 21% higher thrust than conventional propellers, but will likely be of more interest to soaring pilots because of its foldable construction.

The performance tests were evidently conducted by the Department of Aeronautics at the Institute of Aviation Technology (The Royal Technical College in Stockholm), with support from the Swedish Board for Technical Development.

The propellers are offered in three types: constant and variable pitch, folding, and variable pitch for soaring possibilities. Further, the propeller blades, made of an aluminum alloy, are strong enough to be used as "aquaprops" in float flying. The blades are interchangeable, and have the ability for adjustments to optimize thrust depending on the application. The design claims to be protected by patent in North America and Europe.

For more information and a technical report, contact: Jerzy Kolecki, New Aviation Engineering, Box 1046, 12222 Enskede, Sweden.

### Mission Soaring Introduces The Speed Rail

The Speed Rail is a new device which allows light, adjustable bar pressure throughout the entire speed range without bulky, complex mechanisms. It was designed to be lightweight, aesthetically pleasing and compact.

With the Speed Rail, the body CG can be pulled farther forward, effortlessly, with the pilot's body remaining horizontal, therefore significantly reducing body drag and increasing top-end speed and glider performance with less fatigue.

The Speed Rail has been load tested in excess of 2,000 pounds without yield, the equivalent of 10 G's for a 200 pound pilot. Main support shackles are stainless steel and all aluminum components are "hard" black anodized 6061-T6. It stows easily inside the glider bag, developers report.

Simple keel mounts are specially designed not to slip and will allow quick, positive positioning of suspension lines as well as a back-up rope.

When the Speed Rail suspension roller is against the stop limit, as would normally happen during a flare for landing, the bar pressure will never be greater than what would be felt with a regular hang-loop suspension. This is unlike the "connection" type mechanisms which can cause significantly heavier-than-normal bar pressures when the mechanism is locked solid during flare. This is an important feature for the glider which requires an aggressive push-out for landing.

The Speed rail comes ready to install with complete easy-to-follow instructions and diagrams, as well as all mounting hardware and pre-cut 5/16" diameter 3,400 pound Dacron rope for the back-up and main suspension lines.

Retail price is \$68 plus \$3 for shipping and handling. Please add applicable taxes. Dealer inquiries are invited. For further information, contact Mission Soaring at 43551 Mission Blvd., Fremont, CA 94539, or phone 415/656-6656.

### New Remote Hydraulic Pressure Gauge for Skyting Available

Midwest Motorglider Supplies announces the availability of a new remote hydraulic pressure gauge designed especially for Skyting-type towing.

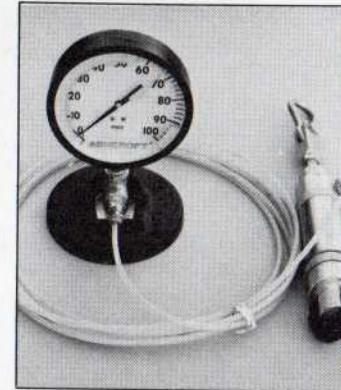
The cylinder mounts on the rear of a vehicle and the pressure gauge is hood mounted by means of a large magnetic base. The pressure gauge is 4.5 inches in diameter for easy reading and comes calibrated for recommended tow pressure.

## INDUSTRY NEWS

With this new mounting system, the gauge can be positioned for forward so that the driver's eyes need not re-focus between the road and the gauge. The system is also easily transferred between vehicles.

The complete remote pressure gauge system retails for \$130.

The company also offers a complete line of Skyting hardware for the hang glider enthusiast. A free Skyting catalog is available from Midwest Motorglider Supplies by writing 2638 Roberts, Waukegan, IL 60087, or by phoning 312/244-0529 after 8:00 PM, CST.



### VOX Operation Available for CB's

Don Boardman, heading the research and development efforts of Susquehanna Flight Park, Inc., of Cooperstown, NY, has designed a voice operated switch (VOX) for use with the Radio Shack five-watt hand-held Citizen Band radio.

The VOX unit eliminates the need to operate a push-to-talk button. Simply speak into a microphone connected to the input of the VOX unit and the CB is instantly switched from receive to transmit. A microphone is connected to the VOX using a

standard miniature phone plug. The microphone's signal is carried from the output of the VOX to the external mic-jack of the CB by 5 DIN patch cord provided with the unit. Add a set of earphones plugged into the external speaker jack of the radio, and a headset configuration is completed. Directions for a headset hookup are included with the unit.

The voice-activated operation of the CB radio permits a pilot to fly with full time hands on control whether scratching in ridge lift, coring a thermal, riding on tow, or just cruising in smooth air. "Speak and you shall transmit, it's that easy," says developer Don

Boardman. The VOX unit is compact and lightweight. It fits conveniently on the left side of the CB radio and does not interfere with any of the radio's standard features. Power for the VOX is provided by a single, externally-mounted 9-volt battery. A dual battery switch is used on the unit allowing for a second, internally-housed reserve battery. Also featured are a mic-sensitivity control, a time-delay control, and a low battery indicator.

In-flight testing has demonstrated the unit's ability to provide convenient, effective, and dependable VOX operation. The unit is priced at \$115 retail, and carries a one year warranty.

For further information, contact Don Boardman at 6433 Karlen Road; Rome, NY 13440.

### Region 5 Regionals Concluded

Below are the official results of the two-part regionals from Region Five:

**High Country Regionals**  
 Sand Turn, Wyoming  
 May 25-28, 1984

1st — Rick Altig (177 Magic III)  
 2nd — Russ Kidder (165 Comet 2)  
 3rd — Ross Henson (185 C-2)  
 tie — Jeff Mazer (165 Comet 2)  
 5th — Joe Brakefield (180 Duck)

**Treasure Valley Regionals**  
 Boise, Idaho  
 June 7-10, 1984

1st — Mike King (185 Comet 2)  
 2nd — Kevin Christopherson (180 Streak)  
 3rd — Howard Osterlund (Esprit)  
 4th — Joe Brakefield (180 Duck)  
 5th — Kenny Brown (Magic 166)

### "Worth a Thousand Words" Again

The well-worn phrase which says a picture is worth a thousand words is well-worn for good reason.

Here's two photos worth twice that perhaps. See if you can follow the flight's too-quick termination

for Chattanooga flying veteran, Chris Smith, as (photo #1) he launches from Lookout Mtn, only to land on the rocky ledge below (photo #2 -- Smith is seated at the point of impact with his fractured left arm held up, elbow on knee). The glide angle calculates to something like ½:1!

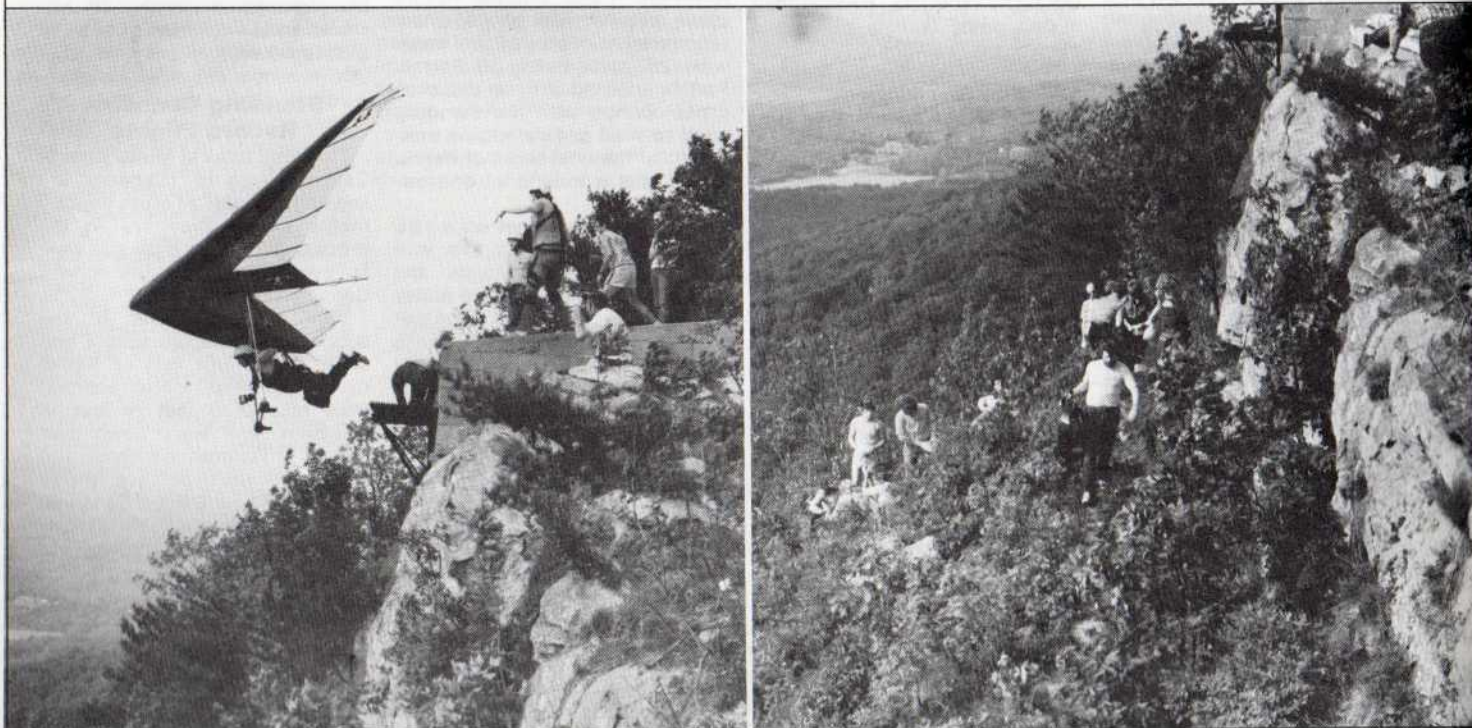
Atlanta witness and photo supplier, Chris Voith reports,

"This photo fascinates me; it was taken by a whuff (Voith is a photographer himself), and appears to show Smith's launch just as the angle of attack goes negative. Notice the right tip particularly and the luff lines working.

"It was really eery to witness; everything was perfect (i.e., wing "loaded" equally, plenty of "up"),

then went to hell fast. The launch crew's postures seem to reflect their doubts about whether or not aviation is happening . . ."

*Whole Air* wishes to thank Voith for these illuminating photos. Smith's arm is out of the cast now and healing properly.



### L.A. Expo To Add All Recreational Aircraft To Show

The largest collection of recreational aircraft ever assembled under one roof will be presented again at the L.A. Convention Center on November 9-11, 1984.

Responding to the rapid evolution within the personal

aviation market, H.I. Marketing's new Show mandate is to bring all lightweight, affordable flying machines to the forefront — hence the natural progression of show formatting.

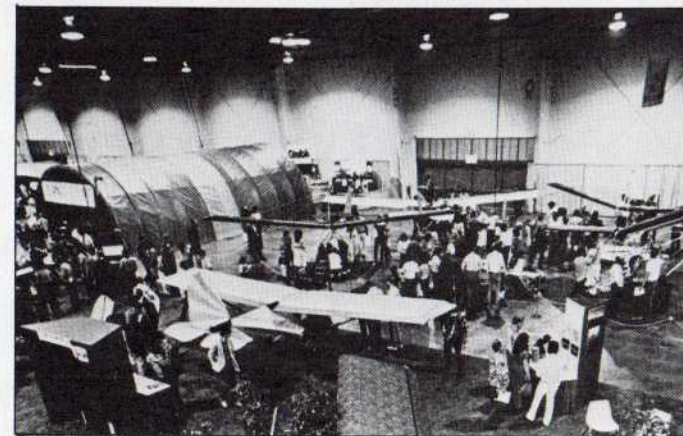
The Expo will encompass all facets of the explosive Recreational Aircraft market, including ultralights, kitplanes, ARVs and personal helicopters.

**NOTE:** In addition, the organizers of the Expo will once again (as last year) offer free meeting space facilities and discounted entry fee passes to hang gliding leaders or HGDA members who may wish to meet together at this centralized location. Such leaders wishing to access this offer may contact Doug Martin at the address below.

Organizers report that 22,000 people jammed into the Convention Center last November to view over fifty displays of aircraft along with a host of accessories to the industry.

The L.A. Recreational Aircraft Expo '84 has been expanded to include more aircraft displays, as well as the introduction of a "Fly-Market" area to allow many small companies an opportunity of showing their wares to the public at a very reasonable cost.

For further information, contact Doug Martin or Roland Boily at H.I. Marketing Services Ltd., 253-375 York Av., Winnipeg, Manitoba R3C 3J3 Canada, or phone 204/944-1464.



## CALENDAR

Kitty Hawk Kites — West  
Sept 4-10 — Owens Valley XC Tour, includes: Ground school and XC seminar; maps and preparation guide; 5 flying days with an expert OV guide; rides up Piute, Gunter, Horseshoe Meadows; daily flight plan and conditions analysis; retrieval from major roads.

This trip is open to all qualified pilots and is the recommended introduction to flying America's ultimate XC site. Limited advanced reservations required two weeks prior to trip. Fee is \$250. Contact Kitty Hawk at 408/384-2622.

AUGUST 18 — Chute clinic.

## INDUSTRY NEWS

AUGUST 25 & 26 — Mountain clinic; Hang III ratings and thermal soaring.

SEPT 4-10 Owens Valley Tour (see above).

DEC 26-31 — Southern California flying tour.

L. A. Aircraft Expo

NOV 9, 10, & 11 — Los Angeles Recreational Aircraft Expo '84; Los Angeles Convention Center.

North Hall. Largest indoor assembly of ultralights, kitplanes, and personal helicopters. Admission: \$6 at the door. Children, no charge.

For further information, contact Doug Martin or Roland Boily at 253-375 York Av., Winnipeg, Manitoba, Canada R3C 3J3 or phone 204/944-1464.

Kitty Hawk Kites — East

AUGUST 4 & 5 — Towing clinic/Fly-in.

AUGUST 15 — 37th Anniversary of the Rogallo Wing, which lead to hang gliders. Hear Francis Rogallo speak.

SEPT 8 & 9 — Hang III rating clinic  
OCT 20 & 21 — Hang III rating clinic.

NOV 3 & 4 — Towing clinic/Fly-in.

DEC 16 & 17 — "Man Will Never Fly Society ... a zany affair; and the 81st Anniversary of the Wright Bros. First Flight.

For more information on these and other events at Kitty Hawk in North Carolina, contact Steve Wendt at 919/441-4124, or write to P.O. Box 340, Nags Head, NC 27959.

## FORUM

Continued from Page 8

standards. As it reads the letter contains more misinformation than the original ad did, and indicates that Mr. Bernasconi still doesn't understand the policy that the ad violated. There is no provision in the HGMA Standards for certifying structure in any manner other than that of the specific vehicle load tests described in the standards, which do not involve specific loads or "G" factors, but rather the combination of specified speeds with specified angles of attack on a test vehicle. The test results from the DHV testing would *not* be acceptable as documentation by the HGMA certification committee, unless they were done in accordance with the requirements of the HGMA Standards and presented to the HGMA certification committee in the required format, which they have not been.

With regard to my failure to communicate with Skylines, Ltd., on this matter; one purpose of my letter was to remind the editor of *Whole Air* of the HGMA policy, and ask him for his support of that policy. To my knowledge, Skylines is neither a manufacturer of hang gliders nor a member of the HGMA, so I don't understand the complaint about my failure to establish a "working relationship of (the) manufacturer's association." It is my impression that the members of the HGMA have been reasonably satisfied with my efforts on behalf of maintaining a working relationship among the manufacturers. If not, I hope they will let me know. It's not always been an easy job, and I'm sure it could be done better, but as no one else has volunteered, I'll just have to muddle along as best I can.

MIKE MEIER,  
President, HGMA

### First Woman Places In Spectacular

Cindy Black, a hang glider pilot from Washington, D.C., broke the all-male tradition in mid-May this year, at the Kitty Hawk Kites-- East 12th Annual Hang Gliding Spectacular. Flown on Jockey's Ridge in Nags Head, NC, Black earned Second Place in the Hang I & II Division, becoming the first woman in the event's history to win an award.

Black finished second in a field of ten pilots in the lower division for less experienced pilots. The Spectacular was her first competition and the second place trophy was her first award.



### Crossbow Revisited

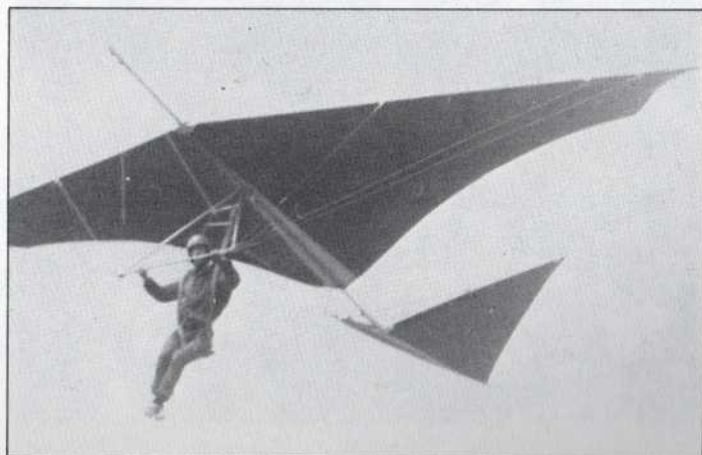
Dear Editor;

In the references made to my article "The Crossbow" (March '84 *Whole Air*) on the cover and in the article itself, mention was made of it having a tail. This implies that it had horizontal flying surfaces both in front (the canard) and at the rear. In fact it only ever had a vertical fin at the back, and not a tail as such.

I did once build a V-tailed glider of my own design which flew in 1976 (see photo). It was intended as a vehicle for research into the possible performance advantages

of separating lifting and stability functions of a weight-shift flexwing into separate dedicated parts (i.e., the wing and the tail), and also as a defense against pitch stability divergence — the dreaded luffing dive that was the monster waiting to devour us if we got too cocksure about the airworthiness of the wings we were flying in those far-off days! The magazine is good.

Everard Cunion,  
ENGLAND



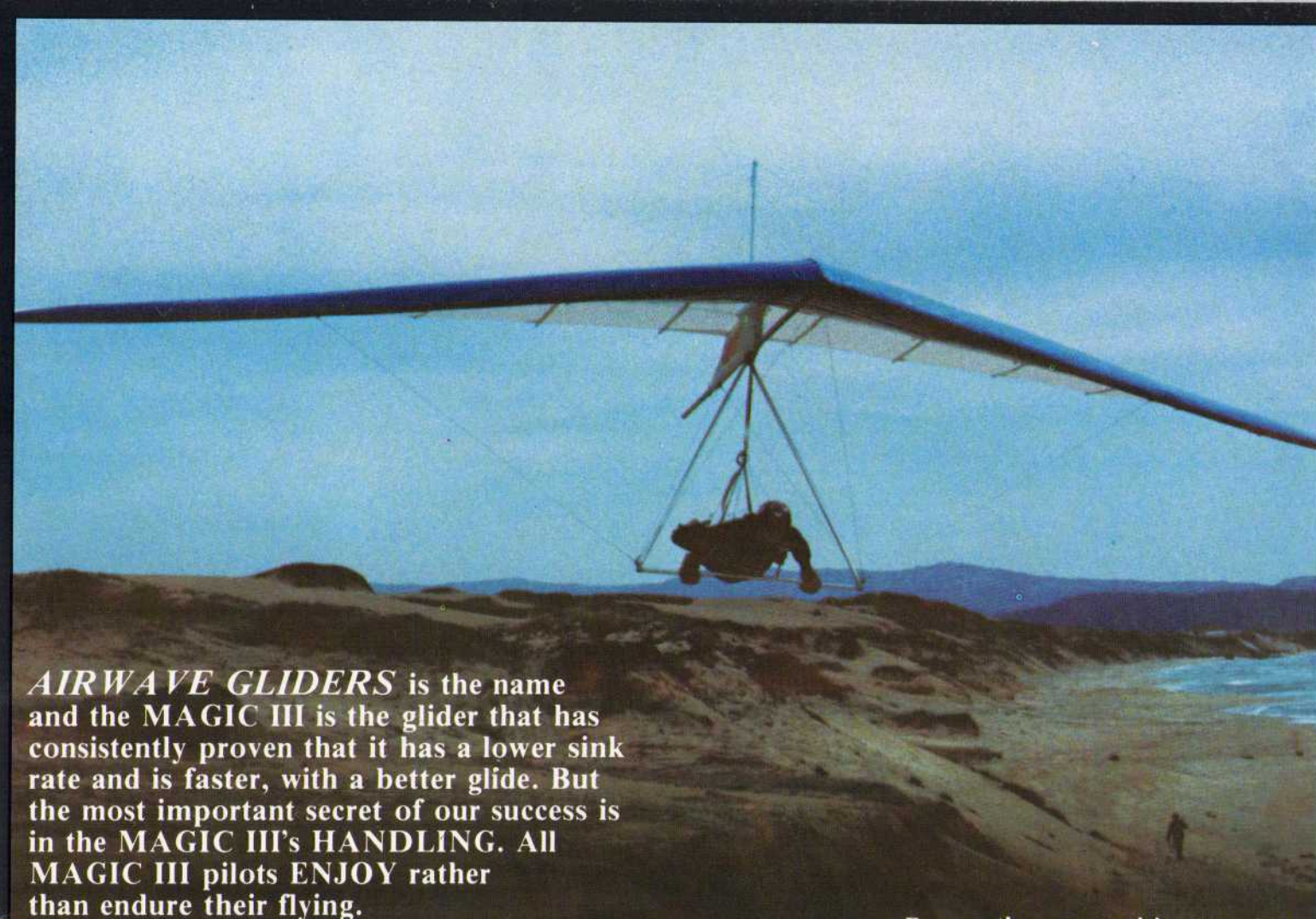
## PUBLISHER'S COLUMN

Continued from Page 4

the business" just how hard. If our fine sport is to continue along the top-quality lines which have brought it into prominence in a mere dozen years or so, more solidity is mandatory for all its businessmen, and definitely including (both) its publications.

Ultimately, the bottom line is written by you... you the pilot, you the reader and subscriber, you the advertiser, and you, the grass roots representative of hang gliding and ultralight soaring. If your interest remains high... if you support dealers and manufacturers with your equipment purchases... if you encourage your friends to visit your local flight school to start hang gliding... and if you subscribe to and support *both* American publications... we will all be able to continue to enjoy our fine sport in the deluxe style to which we've become accustomed. If not, who ya gonna blame?

Thanks,  
Dan Johnson



**AIRWAVE GLIDERS** is the name and the **MAGIC III** is the glider that has consistently proven that it has a lower sink rate and is faster, with a better glide. But the most important secret of our success is in the **MAGIC III's HANDLING**. All **MAGIC III** pilots **ENJOY** rather than endure their flying.

Proven thru competition to be #1.  
Prove it to yourself with a test flight from one of the following dealers. They have a Magic III for you to fly.

**AIRWAVE MAGIC III 1st**  
**AIRWAVE MAGIC III 2nd MARINA STEEPLECHASE**  
**AIRWAVE MAGIC III 3rd**  
**AIRWAVE MAGIC III 1st**  
**AIRWAVE MAGIC III 2nd FORT FUNSTON RACES**  
**AIRWAVE MAGIC III 3rd**

**JOHN PENDRY AIRWAVE MAGIC III EUROPEAN X/C DISTANCE RECORD (130 miles Devon to Briton)**

### MAGIC SPECIFICATION

MAGIC III	155	166	177
Optimum Pilot body weight	140-160 lbs	155-175 lbs	175-200 lbs
Aspect ratio	6.72	6.8	6.84
Wing span	32.8 ft	34.12 ft	34.8 ft
Packed length	19.23 ft	19.81 ft	20.36 ft
Optional breakdown length	19.23 ft	12.81 ft	13.36 ft
Glider weight	64 lbs	66 lbs	71 lbs



P.O. Box 1153, Mercer Island, WA 98040 — (206) 232-7466

Dealer Inquiries Invited

Morningside Flight Park  
Rt. 12, RFD No. 2  
Claremont, NH 03743  
603/542-4416

Crystal Air Sports  
Rt. 4, Cummings Hwy.  
Chattanooga, TN 37409  
615/825-1995

Northern Sun  
9242 Hudson Road  
Lake Elmo, MN 55042  
612/731-1311

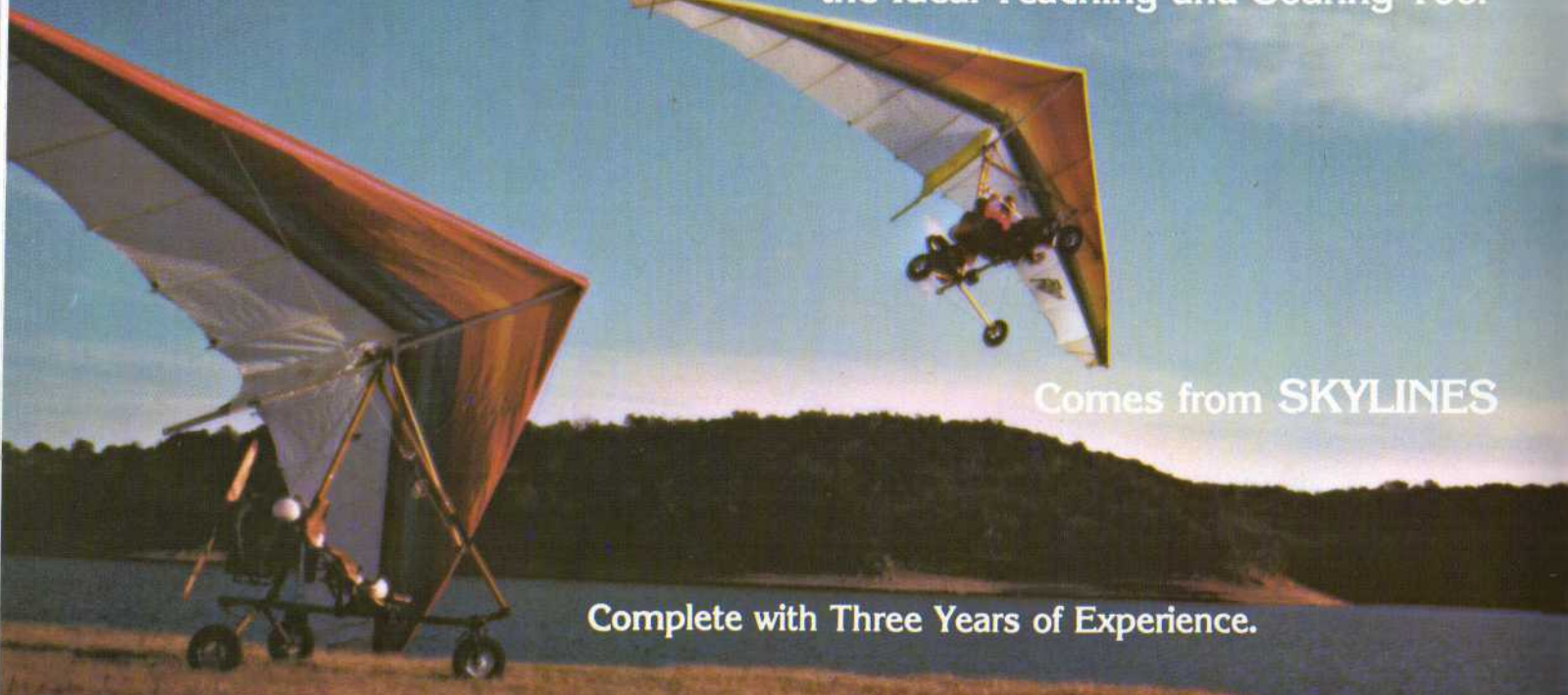
Austin Air Sports  
5508 Parkcrest  
Austin, TX 78731  
512/451-2505

Aerial Voyages  
705 - 90th Pl. S.E.  
Everett, WA 98204  
206/347-3844

San Francisco Windsports  
3620 Wawona  
San Francisco, CA 94116  
415/731-7766

For the Professional of the Sport,

the Ideal Teaching and Soaring Tool



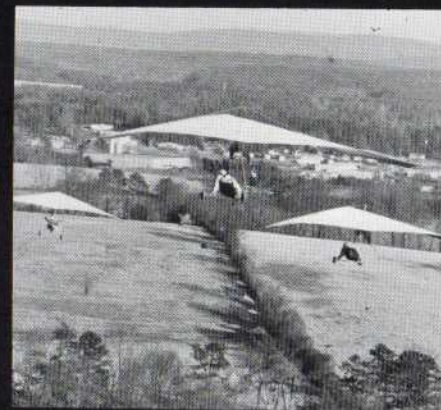
Comes from SKYLINES

Complete with Three Years of Experience.



**GLIDER FEATURES**

- 211 square feet, tested in Germany to 3700 pounds positive load.
- A quick, simple set-up procedure.
- Deformation-free hard-alloy 7075 preformed ribs.
- Mylar-faired nose section.
- 40% lower drag, due to the Torpedo kingpost system.
- All nyloc nuts secured with Locktite.
- Mylar/sandwich cloth sail tip section.



To insure the safe introduction to the American pilot, SKYLINES is requiring attendance at a factory-sanctioned training clinic. The factory currently offers training and service centers on both east and west coasts. For further information, contact:



**SKYLINES — CALIFORNIA**  
P. O. BOX 4384  
SALINAS, CA 93912  
408/422-2781

**SKYLINES — EUROPE**  
LA MOUETTE  
-33- (80) 56-66-47  
Telex #350-053

**WARNING**

U. S. Patent Number 8219419, issued November 18, 1982 will be strictly enforced.

During the past 1983 season, literally thousands of European pilots of all skill levels got introduced to and adopted an entirely new way to reach cloudbase and go cross-country . . . the SKYLINES aero towing system. Its safety record? . . . 100% perfect.

This 1984 season in America, the introduction of this proven and complete soaring tool is without a doubt creating the beginning of a new era for our sport, hang gliding.



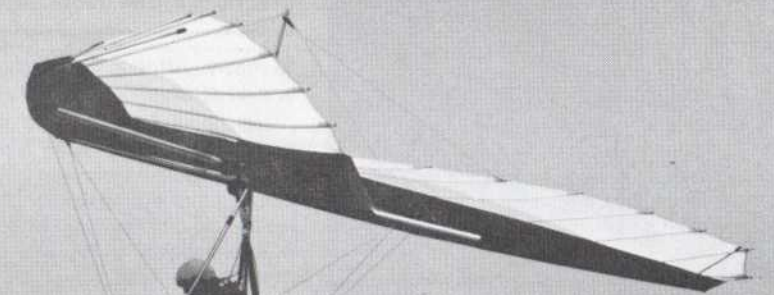
**TRIKE FEATURES**

- Rugged but comfortable two-seat trike.
- Folds down to trunk size in just seconds.
- Vibration-free (Lord mounts) for engine mounting, and glider-to-trike connection (also offers yaw dampening).
- 440 cc/50 hp powerplant, developing 330 pounds of thrust.
- Two throttle controls — foot pedal for precision flying and over-ride hand-operated "cruise control" throttle for safe and effective back seat instruction.
- Both electric and pull starters.
- Front wheel brake.
- Front wheel suspension.
- All nyloc nuts either safety wired or secured by Locktite.

With an engineering design and finish you can be proud of — over three years of trike manufacturing went into designing the most reliable and affordable two-seat training and aero towing system available in the world today.

# WILLS WING SKYHAWK

Our Paul Burns takes you high in the sky on Wills Wing's Skyhawk. Read what he thinks of the newest model from the prolific manufacturer in Santa Ana, California/report and photos provided by Paul Burns



MY EARLIEST EXPOSURE to Wills Wing products was years ago when I first visited the Chattanooga, Tennessee area. At that time, the "Super Swallowtail," or SST, was quite popular, and quite visible as well. On the ground, the bright yellow cover bags were distinctive enough, but add the stenciled letters that spelled out "Sport Kites" (as the company was then named), and even the casual observer could identify a Wills Wing glider. Identification in the air was even simpler. Just look for the highest flyer and it would invariably be an "SST."

Throughout the years, high performance and comfortable handling qualities have been trademarks at Wills Wing. Modern HGMA nomenclature and shifts in ownership have advised discontinuing the name "Sport Kites," just as the more aircraft-like "Utility Class Hang Glider" now replaces "trainer glider." At

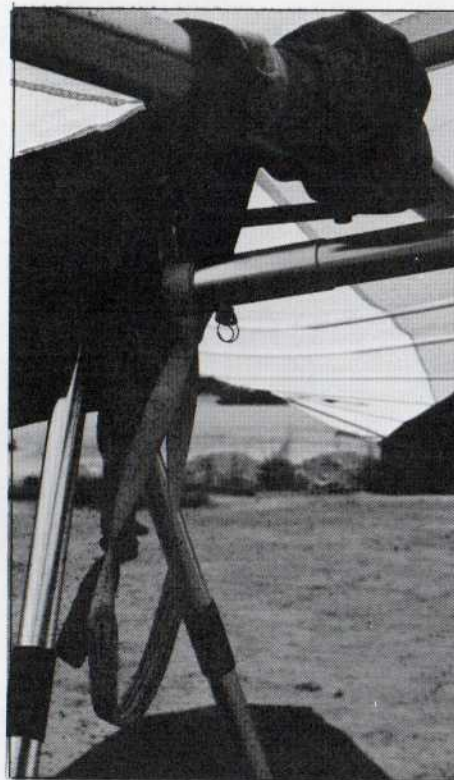
Wills Wing Incorporated, the 1984 Skyhawk continues the Wills Wing tradition of providing equipment designed to keep the "sport" (and fun) in hang gliding.

Setting up the Skyhawk should be no problem for the many pilots familiar with the Harrier II or the Duck, as the Skyhawk shares construction and hardware features. Any questions about procedures are answered in the Owner's Manual, which is very thoroughly illustrated, descriptive, and informative. The manual provides a preflight check list, procedures for break-down, transport protection, tuning, and sail care and cleaning. A preventative maintenance schedule is included along with tips on launching, landing, and flight limitations. One section even covers the dealer's responsibilities to assure that a proper test flight has been

done prior to delivery to the customer. Additionally, complete specifications are presented for every frame member and hardware attachment, with exploded detail drawing of each assembly. Every nut, bolt, washer, saddle, pop rivet, screw, and safety is clearly covered in graphic detail. Impressive!

The Skyhawk's span-wise sail layout offers the consumer many interesting possibilities for customization with a broad range of colors including spectrum cloth. Sail construction is top quality, with plenty of reinforcement points for longevity. The sail on the two gliders I flew remained "clean" throughout the speed range.

Frame construction on the Skyhawk is impressively stout with preformed ribs made from half-inch tube stock. Those ribs nearest the root section are fitted with



fiberglass "arrow-shaft" ends for reflex. The 188 square foot model has 1" x .049 leading edges with a full six foot innersleeve at the junction of the crossbar (which is also 2" x .049 innersleeved at the ends). The 168 square foot model incorporates 1 1/8" x .049 crossbar dimensions, sleeved ends, and 1 3/4" x .049 leading edge, also with a six foot innersleeve. Both models are equipped with a 1 1/2" x .049 keel. All tube frame components are 6061-T6 bright dip anodized. A pilot's first impression of the

**"Any questions about procedures are answered in the Owner's Manual, which is very thoroughly illustrated, descriptive, and informative."**

Skyhawk, after a thorough inspection, is one of strength and quality construction.

Ground handling the Skyhawk is no problem in light wind conditions, and launch procedure is equally straight forward. In moderate to strong winds, a nose wire assistant is always recommended to provide an additional margin of safety.

My first flight on the Skyhawk was on

the 168 model, at the "E" launch in Lake Elsinore, California (a site notorious for low-level turbulence). Take-off in light winds was easy and uneventful. Gliding towards the first "house thermal," my progress was very smooth, with little need for control input to maintain a straight course — the first impressions in flight was *stability*.

Upon encountering a small thermal, I initiated a turn at a moderate bank angle and was pleasantly surprised with the smooth response and comfortable bar pressure. Climbing several hundred feet, I was able to reduce the bank angle as the Skyhawk climbed, easily performing flat, efficient soaring turns. Little pitch input was necessary to coordinate this maneuver. Between thermals, the Skyhawk demonstrates a very good glide, at an airspeed *uncommon* to an exposed crossbar design. In fact, the Skyhawk provides an exceptionally wide usable speed range, while remaining directionally controllable at speeds both faster and slower than normal soaring speeds.

Bar pressure in pitch control increases dramatically at the extremes of the speed range, providing excellent airspeed feedback and stall warning. Deliberately pushing the Skyhawk into a stall from a straight course results in a mild break as the nose falls through, followed by a quick recovery of airspeed. Stalls in a turn produce a slight yaw as the low wing accelerates. Recovery is smooth and predictable.

**"Upon entering a small thermal, I initiated a turn at a moderate bank angle and was pleasantly surprised with the smooth response and comfortable bar pressure."**

Flying in mountain thermals or in smooth coastal ridge lift, the Skyhawk demonstrates an excellent sink rate. Glide performance is very good, with a broad speed range to handle varying conditions. The Skyhawk exhibits enough versatility to take a beginner from first flight to thermal soaring and cross country flights.



The Skyhawk's landing qualities may be its most impressive asset. *It is easy.* Even steep, mush speed approaches with a good flare result in zero ground speed landings. Even when landing deliberately cross wind, the Skyhawk shows little tendency to tip stall or drop a tip — qualities enjoyed by both student pilots and their instructors.

In recent years it seems the trend in hang glider design has leaned toward performance often at the expense of handling or landing qualities. Today, one can note an ever-increasing demand within the sport for a return to the roots of hang gliding... a return to the concept of fun, to a low-cost form of sport aviation. The Wills Wing Skyhawk meets this demand.

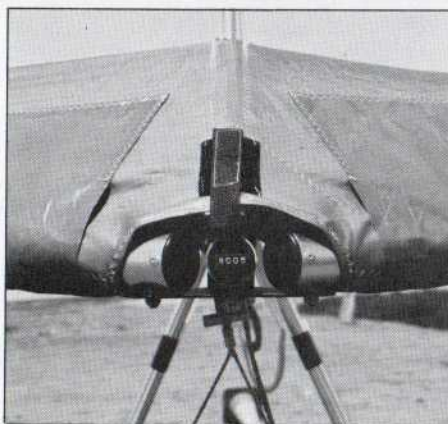
**"The Skyhawk's landing qualities may be its most impressive assets."**

For the student, the Skyhawk offers lightweight, comfortable static balance, slow launching and landing speeds, smooth, predictable control response, and forgiving handling characteristics. For the recreational soaring pilot, the Skyhawk is both strong and stable, offering well-coordinated handling, excellent sink rate, broad speed range, and respectable glide performance.

Owners of Wills Wing products share a somewhat intangible quality. This quality is confidence; confidence spawned by Wills Wing's commitment to conscious engineering, to top-quality materials, to strict quality control, to extensive testing standards, and to the knowledge about pride taken by Wills Wing in their products. This pride is apparent from the owners, to the employees, right on through to the world's largest and most professional dealer network.

Ever since the SST era, Wills Wing has made a commitment to manufacture quality products at a fair price. Their tradition of sound business ethics and impressive safety record of product reliability, has elevated this company to the pinnacle of the industry.

The Skyhawk is the result of this ongoing dedication to the sport of hang gliding in general, and specifically to the Wills Wing pursuit of excellence. §



## WILLS WING SKYHAWK

### SPECIFICATIONS

Model Identification	168	188
Sail Area	166 FT <sup>2</sup>	188 FT <sup>2</sup>
Span	30'2"	32'10"
Nose Angle	115°	115°
Aspect Ratio	5.5	5.7
Recommended Pilot Weight: (For Optimum Performance)	130-190 LBS	155-230 LBS
Glider Weight	57 LBS	64 LBS
Retail Price (Inventory Colors)	\$1775	\$1775

### BOX SCORES

#### WILLS WING SKYHAWK

[1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent]

#### GENERAL CHARACTERISTICS

Set-up Time/Ease	5
Ground Handling	3
Static Balance	3
Frame Hardware/Finish	5
Sail In-Flight	5
Sail Cleanliness	5

#### FLIGHT CHARACTERISTICS

Handling — Low Air Speeds	4
Handling — High Air Speeds	5
Bar Pressure — Roll	4
Bar Pressure — Pitch	4
Roll Control Initiation	4
Roll Reversal (45° to 45°)	4
Yaw Stability	5
Turn Coordination	5
Speed Range	5
Sink Rate Performance	5
Glide Angle Performance	4

#### LANDING CHARACTERISTICS

Flare Authority	5
Parachuteability	4
Directional Control at Mush Speed	4

#### SKYHAWK SPEED RANGES

Skyhawk 168 (57 lbs) — 170 lb pilot = 1.3 lbs/ft<sup>2</sup> wingloading:  
Stall Speed ..... 17 MPH Indicated  
Top Speed ..... 38 MPH Indicated

Skyhawk 188 (64 lbs) — 170 lb pilot = 1.3 lbs/ft<sup>2</sup> wingloading:  
Stall Speed ..... 16 MPH Indicated  
Top Speed ..... 37 MPH Indicated



# M-O-R-E

BRS "return" customers  
do the talking . . .

Dear BRS:

"During a routine training flight, the 2-seat (ultralight) suffered a structural failure. We deployed the BRS at approximately 250 feet . . . the BRS performed as per spec's, with full deployment within two seconds.

We now intend to install the BRS on all our aircraft. Thank you for your great 'chute."

Bill LaPointe,  
Canada

Dear BRS:

"When the engine on my ultralight failed, the only field available suddenly looked very small. At 300 feet, there was no way I could have deployed a hand thrown 'chute.

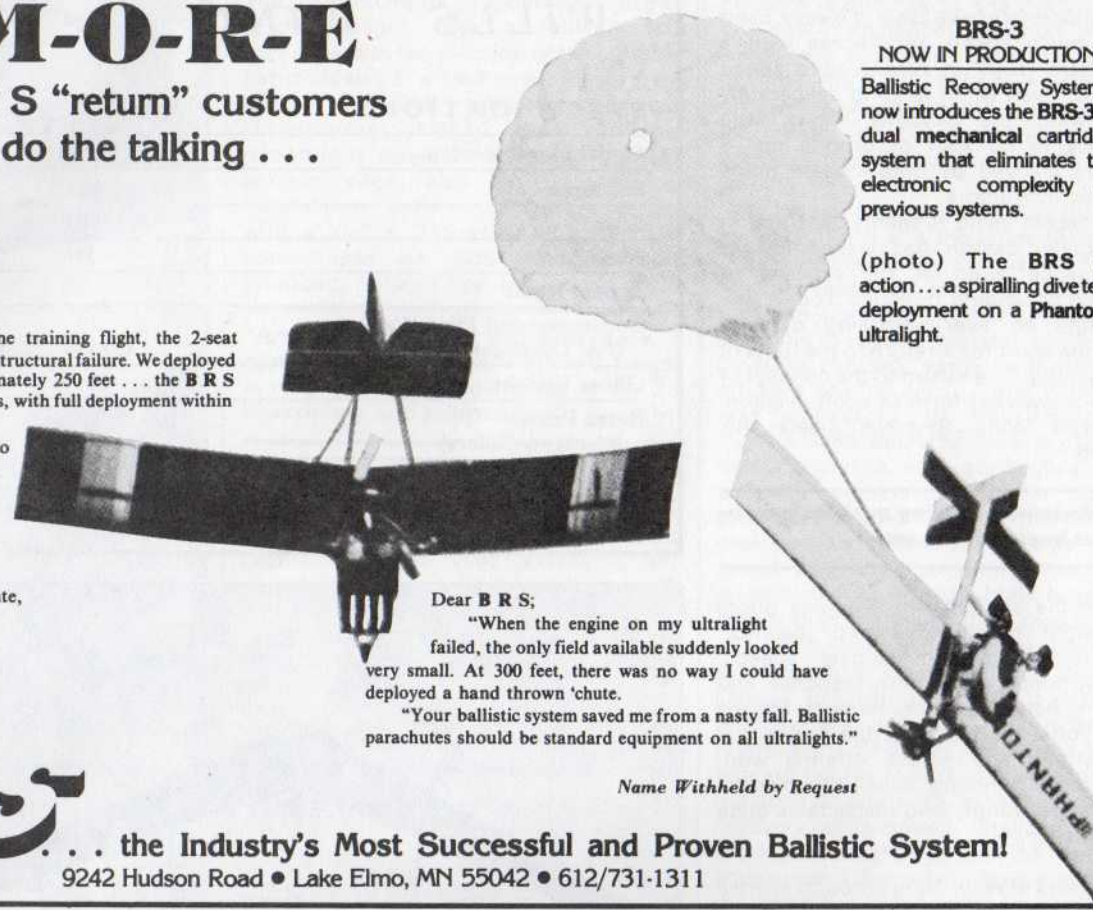
"Your ballistic system saved me from a nasty fall. Ballistic parachutes should be standard equipment on all ultralights."

Name Withheld by Request

## BRS-3 NOW IN PRODUCTION

Ballistic Recovery Systems now introduces the BRS-3, a dual mechanical cartridge system that eliminates the electronic complexity of previous systems.

(photo) The BRS in action . . . a spiralling dive test deployment on a Phantom ultralight.



GO WITH



. . . the Industry's Most Successful and Proven Ballistic System!  
9242 Hudson Road • Lake Elmo, MN 55042 • 612/731-1311

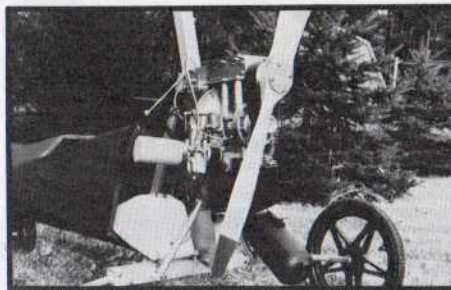
## AMERICA'S MOST PURPOSE-BUILT SOARING TRIKE . . . the WAT-SS1



WOLFE AVIATION's WAT-SS1 has received closer attention to engine-off soaring performance than any other American-built trike!

Big statement? We don't think so. And we think the photographs speak the message loud and clear. But let's give you some real-time facts to add to your close inspection of the photos.

Weight for the Yamaha engine WAT is a mere 105 pounds (only 25 pounds more for the popular Rotax engine). Plus, *standard* equipment includes Pod, Back-up Hang Strap, Throttle and Kill Switch on the trike's airframe (see photo).



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Real-time performance testing comes to America with the advent of the aero towing tug. Here, Dan Johnson and Tom Phillips relate their experiences at beginning this form of evaluation/lead photo by Cliff Whitney

IN THE DARK AGES of hang gliding — oh, let's say 1975, for a nice round number — the race was on, pedal to the metal. As soon as one manufacturer claimed their "standard" rogallo hang glider exceeded the once rather universally acclaimed Four-to-One glide ratio, it seemed everyone would jump on the bandwagon.

Probably those flappy old standards really didn't achieve even the modest slope of four to one. That didn't matter. It quickly became a relative thing. Well, the figure had to start somewhere. Some square parachute builder must've stated their canopy performed three to one, and goodness knows, our fine gliders of the day were tons better than that. Call it four to one, then.

But let's give them credit. They did, indeed, get us to the base of four to one sand dunes. (We won't say anything about ground effect performance.) So when the keels shortened conservatively to one foot less than the leading edges — *can it still be*

*stable in pitch?* . . . Or when a deflexor was added — *now we'll see increased glide!* . . . Or maybe it was less billow — *the first trepidatious moves dropped billow from a mountainous four degrees to a "flat" three and a half!* . . . well, certainly, that must've caused a leap in glide (wisely, no one spoke of sink rate in those pre-historic days) to . . . oh, say five to one. Yeah, that sounds good, doesn't it? Thereafter the stage was set.

When some firm like Pliable Moose (*member them?*) dared claim five to one — and all the manufacturers *just knew* it was a smaller increase than that — what could they do but whack off some keel length, throw on a deflexor, flatten some billow, and themselves claim, "Five to One!"

In a responsive little industry like hang gliding, where the differences in gliders, measured by performance alone, were not too obvious, it seemed nearly impossible to sit still and *honestly* claim performance while the Moose folks were blabbing "Five to One!" all over the countryside. It became

a fever.

For years afterwards, the ripples could be felt, as season after season, the new high performance glider of spring became the training glider of fall, so rapid were changes bringing enhanced performance. Seemingly, with each addition of some new technology, the glide ratio went up a whole point. Most foresaw that at a point of glide angle increase per year, it was only a short matter of time before the claimed performance was totally preposterous, and even your below-average whuffo could see Brand X couldn't possibly have ten or twelve to one.

In trying to resist the temptation to sensationalize what they knew was untrue or at least unproven, the better manufacturers began to *not* advertise or claim glide angles which could not possibly be so. A new era of performance claim responsibility was upon the industry. In fact for years, manufacturers used competition records to boast

performance, or concentrated on handling, price, dealer support, or other sales points. Besides, as time passed and only the better manufacturers remained, performance of one brand to another was so close, no one would any longer have believed outrageous claims.

Until 1984.

With the so-called performance barrier in everyone's way, changes became increasingly subtle. Yet the desire to have higher performance was a gnawing hunger which all sought to satiate . . . both manufacturer and pilot alike.

Finally, Seedwing's Bob Trampenau — whose Sensor 510 accomplishments have earned him a solid niche as designer — made an evaluation of his own which alledged to reveal a "measured 13:1 max L/D."

Raised eyebrows resulted from the other manufacturers by this claim in an advertisement. And they were also bound to be somewhat flippant about its effect. Who'd believe it?

Yet only a few months later, we find pillars of the industry like Wills and Delta Wing answering that ad claim in their own ads. With tongue in cheek, Wills added "14:1!!?" to their ads (Didn't everyone know they couldn't believe it?), which in turn, compelled Delta Wing's ad man to say, "Must be 15/1 by comparison???"

Where does that leave us now?

Have the 14 and 15 to 1 announcements had any effect? Do readers of these ads think 13:1 is also silly, or do pilots wonder if they all could possibly mean it? After all, Trampenau's claim said, "Measured." And he is obviously no slouch to be able to design and build such a beautiful craft as the Sensor 510. Further, Wills and Delta are old hands at this game, and are neither fools nor liars.

The nagging question has erupted again . . . "What is the glide angle of our modern Superships?" Can it be accurately measured? Can gliders be compared, without reference to "absolute" performance numbers? "Will I fly longer, further if I choose one brand over another?"

So here in 1984, interest in the topic has been running very high. *Whole Air* decided to employ one of the new aero tugs to see if more light couldn't be shed on the subject.

**"The nagging question has erupted again . . . 'What is the glide angle of our modern Superships?'"**

BUT . . .

PLEASE READ THIS! The report which follows and the findings which are published below are *not* presented as clear-cut facts. Perhaps this analysis won't work. Perhaps the methods are all wrong. Perhaps those devising and performing the analysis have an inadequate idea of what they are doing. Perhaps it is too sacred an area to even try to investigate. Nonetheless, some figures are presented.

Their *primary* purpose is to generate interest, more information, suggestions on better methods, and assistance in general. They are *not even supposed to be* the last word on the subject. Comments from all entities are solicited (via Glide Angle, Box 144, Lookout Mtn., TN 37350).

AT FIRST

The initial plan was different than that which appears here. Originally, two aero tugs were to be used, pulling up two gliders for a wingtip-to-wingtip release. Two gliders of similar performance were envisioned, with about the same sail area, and being flown by two pilots of about the

same weight and skills. They would fly various speeds for various time intervals, but would attempt to remain wingtip-to-wingtip.

Of course, if indeed performance was different between the two, it would reveal itself by the fact that the two pilots could no longer stay side-by-side. In effect the "test" would have ended when one illustrated a convincingly better performance.

Then the test would be repeated at the same speed till a consistent pattern was obvious. When this effort was concluded, the whole process would begin again, at a different speed. Perhaps later, pilot weights could be changed, or other factors introduced so as to visualize the effect of these changes (e.g., drag-reducing devices).

The staging of this overall endeavor became difficult to achieve. The second aero tug could not be used as no other qualified tug pilot was available at the time. Plus, this method required four or five people, four pieces of equipment, instrumentation and on, ad infinitum. All this assemblage of machinery and talent would need to be at a nearby airport by 6:00-6:30 a.m., to beat the onset of summer heat convection. Signals or radios would be essential to assure both pilots were released at three or four thousand feet, with their wingtips nearly touching. The tug pilots would also have to fly rather close to bring this off, and the entire task began to get too complicated. This was thought especially so as no one really knew how it would go.

TWO TO TOW

Evaluators Dan Johnson and Tom Phillips realized the inefficacy of the above-mentioned test. If they waited till all the ingredients were available, the testing might never occur.

Article Continued on Page 31

## TABLE OF DATA AND RESULTS

DESCRIPTION	FLIGHT NO. ONE	FLIGHT NO. TWO
Date	June 14th, 1984	June 26th, 1984
Time At Launch	8:02 AM	7:55 AM
Tow Pilot	Tom Phillips	Tom Phillips
Tug Pilot	Dan Johnson	Dan Johnson
Glider Used	Wills Wing 180 Attack Duck	Wills Wing 180 Attack Duck
Wingloading (@ 205 pound hook-in; 68 pound glider)	1.52 LBS/FT <sup>2</sup>	1.52 LBS/FT <sup>2</sup>
Temperature (F°/C°)	70°F/21°C	68°F/20°C
Humidity	87%	71%
Wind Direction and Velocity	West at 4 MPH	North at 4 MPH
Barometric Pressure and Trend	30.12 and Rising	30.01 and Rising
Calculated Density Altitudes:		
On Field (Elevation/Density Altitude)	630 FT/1489 FT	630 FT/1361 FT
At Release (Elevation/Density Altitude)	6630 FT/8819 FT	6630 FT/8697 FT
General Weather Description	Very Smooth, Very Hazy, No Visible Inversion Layer	Light Convective Activity, Quite Clear, but Inversion Layer at 5,000 FT
Times to Climb:		
to 2,000 FT	8 MIN	10 MIN
to 3,000 FT	13 MIN	17 MIN
to 4,000 FT	18 MIN	24½ MIN
to 5,000 FT	23 MIN	30½ MIN
to 6,000 FT	30½ MIN	37½ MIN
Average Rate of Climb	197 FPM	160 FPM
Glide Calculations:		
Airspeed Maintained	22 MPH, Indicated	22 MPH, Indicated
Glide Time (6,000 FT to 1,000 FT)	21:37:33 MIN	23:50:05 MIN
Average Sink Rate	231.16 FPM	209.82 FPM
Yields Glide Angle of:		
Glide Angle with 10% ASI Error	8.37:1	9.23:1
Glide Angle with 6 MPH Error	9.21:1	10.15:1
Glide Angle with 6 MPH Error	10.66:1	11.74:1

NOTE: Besides regarding the glide ratio figures as suspect, the reader should further consider all data as subject to error, and insufficiently voluminous to be very reliable. In addition, it should be noted that the sum of errors in the Ball Airspeed Indicator (mounted where it was) could be 10% or up to about 6 MPH, with the indicated airspeed being artificially low. If the ASI was 10% slower than the actual airspeed, the glide angle on Flight #1 would be 9.21 and 10.15 on Flight #2. If the ASI was 6 MPH slower — as once indicated by an article by Chris Price in *Hang Gliding* magazine — then the glide angle on Flight #1 would be 10.66 and 11.74 on Flight #2. The reader must keep in mind that *only when* many, many more tests are completed will the figures maintain sufficient reliability.

WHEN DAN JOHNSON AND I FIRST STARTED getting involved with aero towing of hang gliders, we realized that one of the interesting side benefits of having this capability was that it would allow for the first real attempts at performance evaluation. For the past few years performance statistics have been noticeable absent from glider manufacturers ad copy, relative performance being implied by publishing competition results instead. Ironically we are now beginning to see one manufacturer who is publishing a "measured polar" and an L/D figure. The result has been that other companies have jumped into the fray with the advertising claims that "...since our gliders beat this other glider in competition, we must have an even better L/D, so we will claim an arbitrary L/D point higher." Confusing the consumer seems to be the name of the game, and we seem to be going backwards to the mid-70's in terms of our understanding of these parameters of our sport.

Glide ratio and sink rate are the two important figures in which we are interested. Sink rate is the easy one. It takes a stopwatch and a calibrated altimeter. Glide ratio (L/D) is considerably harder because it requires that you accurately measure the airspeed of the glider. It was shown years ago (by results in an article in *Hang Gliding* magazine generated by Chris Price et. al.) that an airspeed instrument mounted on a glider under the wing will read low due to the compression of air under the wing. So the first problem is how to get an accurate reading. The solution is mount the ASI transducer remotely from the wing in "clean air."

The most difficult problem of all is in the actual gathering of

data. In order to get pure, uncompromised information you need absolutely still, stable air, and a lot of it. The larger your sample, the more valid your results, as every Statistics 101 student learns.

Our big brothers, the sailplane pilots, have been doing this type

**"Our plan is to develop our experimental model and then expand to testing other gliders and publishing those results."**

of testing for years and the results have helped them push the L/D of modern "glass ships" to the incredible 60-plus to one range. Richard Johnson conducts regular independent tests and publishes the results in *Soaring* magazine. Using aero tows to 12,000 feet, he accurately measures and re-measures the polars of the new ships as they come out; and if his results vary from the factory-published polars, he does experiments to discover why. One common test is to use a wave gauge to measure the surface of the wing to see how smooth the finish is, to thousandths of an inch! Try that on a rag wing.

Twelve thousand feet is well above most thermal activity in the early morning hours when the tests are performed. It is also well above the launch elevation of most hang gliding sites. The fact is that our manufacturers and independent researchers have never had reasonably easy access to this "clean" air and so for ten years, we have been guessing at our performance. Ultralight aero towing has changed that picture somewhat. Twelve thousand feet is still pretty high for an ultralight tug, but 6,000 feet is relatively easy and good enough for a start.

Article Continued on Page 31

## ULTRALIGHT FROM A BACKPACK

In this issue I describe some personal experiences with a new foot-launchable "Minimum" soaring system for hang gliders that is in production in Germany, and further include an excellent article (translated by Rike Markmann and Hans Bausenwein) from the German *Drachenflieger* hang gliding magazine. The latter article describes this system and the developmental stages that have been considered for such past units as the Soarmaster in the USA, the present Minimum system, and some ideas that may be used in the future.

### UTOPIA COME TRUE

[from April '84 *Drachenflieger*]

The final success is here. A Minimum-motorized aircraft is in production. At only half of the pilots weight, it complies with all of the certification restrictions.

It gives you a climb rate of 1.5 m/sec [295 fpm], using a 25 kg [55 lb] hang glider (with minimum sink rate of 1 m/sec [200 fpm], and a glide ratio of 10:1). The motorization unit has a weight of 12 kg [26½ lbs] providing 8 horsepower with 40 kp thrust, while employing a test pilot of 80 kg [176 lbs].

Professor Dr. Albrecht Fischer makes this report:

For an involuntary flatlander like me, there was always the desire to have a small, lightweight, low-noise power unit, to fit to my glider. I wanted to be able to foot launch it from any open field and to hook the next thermal. Then you should be able to switch the engine off and on, or restart it at any time in flight. It should be of as low drag as possible, not like a "bird cage" as many of the common ultralights available. Also, car-top transportation should be easy.

#### What are the possibilities to make this dream come true?

Well, first, since we are in Germany, you need, even if you do not want to go cross-country, an ultralight pilot's license. This costs up to 5,000 German marks [\$1,828.50] and a lot of work. Then, if you are a home builder, it costs another 3,500 DM [\$1,280] to get your glider and power unit certified. The costs involved are a lot lower in other countries, like the USA, because not as many restrictions exist. This might also be the reason for a much bigger number of do-it-yourselfers in America.

#### How much power do you need?

Let's use realistic figures: a hang glider of 30 kg weight [66 lbs], glide ratio of 8:1, and 1.2 m/sec. sink rate [236 fpm], with pilot weight of 90 kg [200 lbs], and motorization unit weighing 15 kg [33 lbs]. For level-flight, 17.5 kp thrust is necessary, using these figures.

To get a climb rate of 1.2 m/sec, you need to double this, that means 35 kp. It is possible to get this amount of thrust from an 8 hp, 125 cc, two-stroke engine. A reduction drive of 3.6:1 is used. The propeller has a 1.4 m [55 in.] diameter, 2,000 rpm, the tips of the prop remaining under ½ mach, thus not producing too much noise.

# "MINIMUM" MOTORGLIDER



THE SOARMASTER PERFECTED? In this complete look at powering the hang glider, our German Correspondent, Gib Eggen, D. O., brings us up to date on the German-developed "MINIMUM." reports by Gib Eggen, and Professor Dr. Albrecht Fischer (translated from *Drachenflieger* magazine) photos by Gib Eggen and Rike Markmann. Centerspread photo compliments of *Drachenflieger* magazine.

#### What engines are available?

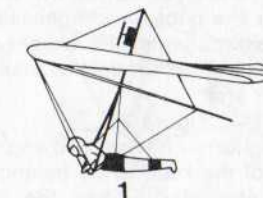
The McCulloch 101B (USA) is not in production anymore; the Chrysler 620 (USA) — used for the Soarmaster — costs, by the time it arrives in Germany, almost 2,000 DM [\$730]. But the Sachs-Dolmar chainsaw engine, with 118 cc, is sold by Kummerle for only 800 DM [\$293], and has a net weight of only 4.6 kg [10 lbs]. But it is possible to get even more thrust using two 50 cc chainsaw engines of 2.2 kg each [5 lbs], earning 4 hp with reduction drives and 1.2 m [47 in] propellers (each offering 20 kp thrust). Two engines *do* have an advantage!

Where is the best place to fit the motorization unit to the glider?

(refer to engine position chart)

Figure 1:

Ten years ago, some of the first pioneers fixed their engines in front of the kingpost. But there a strong pitch-down moment was created, and the glider was forced into a dive. Because many of the gliders of the early days were prone to a luffing dive, some pilots died, because the glider could not recover anymore, even with the engine turned off. This was the reason why this method was not used any longer.

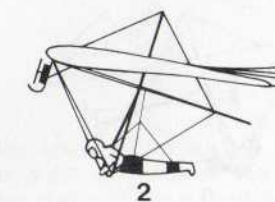


The lesson that we can learn from this is . . . the thrust vector has to be parallel to the direction in which the glider is flying. It has to act on the center of mass of the glider and pilot. The center of mass is located approximately in the center of the A-frame.

If the thrust vector acts there, no pitch momentum is created. If it sits a little lower, a light pitch-up momentum is created, which is useful for the take off and climb out.

Figure 2:

If the motorization unit is fixed to the noseplate, as on a conventional airplane, the pilot has to move his hang point further back, in order to balance the aircraft in flight (power x power arm = load x load arm). During take off and landing, the

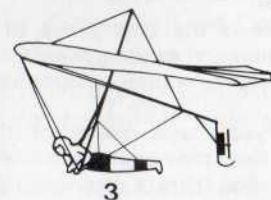


glider is statically very nose heavy. It is very likely to nose-in and to damage the propeller at the landing. A strong skid or wheel could help this.

Figure 3:

To mount the engine on the other end of the keel is a lot better. During the take-off run, the tail heavy glider is skidding on the engine skid with a high angle of attack. As soon as the glider is lifted by the thrust of the propeller and flying in ground effect, the pilot's weight starts to compensate for the tail heaviness of the aircraft and launch is performed almost automatically. The pilot just has to keep on running.

Another advantage of this system is that the pilot does not have to carry the weight of the engine at launch and landing. The distance between the propeller and the

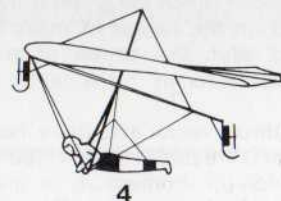


pilot's feet has to be big enough that the pilot's feet are not endangered. A disadvantage is that it is hardly possible to use this system on a floating keel glider.

In banked flight, the weight of the engine locks the glider into a spiral dive, even with the engine turned off. It is not possible for the pilot to compensate with his own weight against the weight of the engine at the end of the keel because of the longer lever arm.

Figure 4:

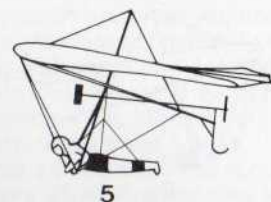
This version — having two engines at both ends of the keel, to be balanced in-flight and statically — has the above-mentioned disadvantage plus the disadvantage of the nose-mounted engine in fig. 2.



In a crash the pilot swings forward and can hit the propeller or engine with his head. Therefore, a front mounted engine cannot be used!

Figure 5:

The Soarmaster system . . . hundreds have been sold worldwide. These numbers show that hang glider pilots are hungry for



minimum motorization. A forward mounted engine drives a pusher propeller via a long driveshaft. This motorization unit can be easily fitted to any glider that does



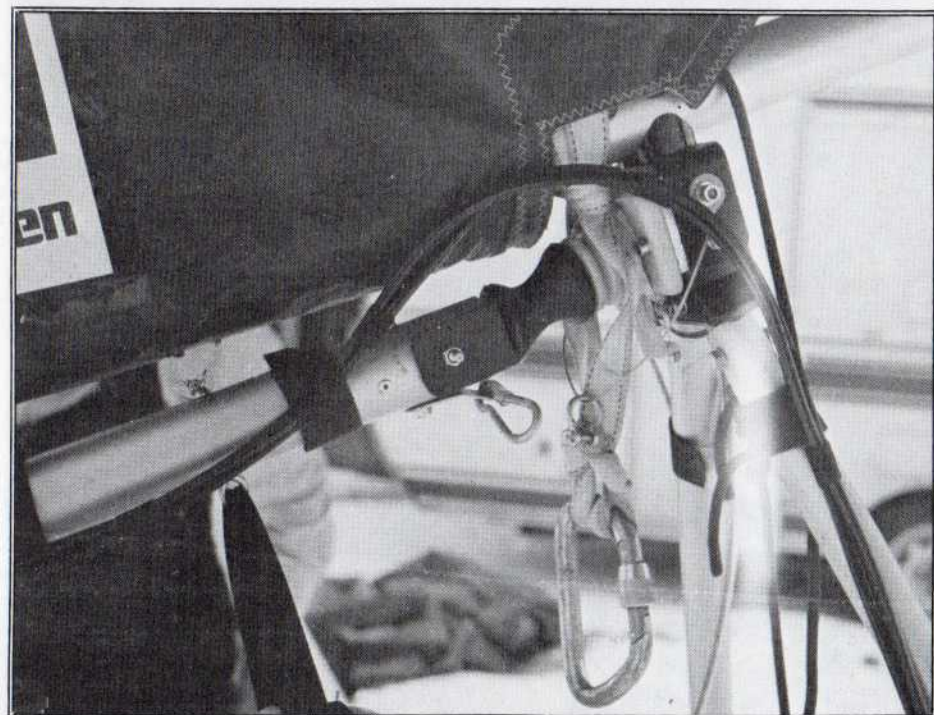
not have a floating keel, using vibration-absorbing mounts.

The system is statically balanced, but thrust is effected above the center of mass and thus again creates a pitch-down moment. Also the pilot has to lift the complete weight of the glider plus engine. The propeller shaft is only 2.2 m [7¼ ft] long, and some cases have been reported where the propeller struck the pilot's feet. The long driveshaft is heavy and the engine has to be fan-cooled because it is not

exposed freely to the airstream. This also adds to the weight of the system (16 kg or 35 lbs). Hermann Kummerle of Bonnigheim is marketing an updated version of this kind of minimum motorization called the Mini-Fly-Set.

NOTE: Comer of Italy makes a similar unit where the engine attaches to the top of the A-frame, usable with floating keel gliders. Engine displacement is 137 cc, two-cycle self-winding start, 14

(Above) Wulf Seifert launches the "Minimum" system. Note that the system is not attached directly to the rear of the keel, but via the pilot hip tubes, wires to the leading edges, and at the top of the control bar frame . . . as in (below) . . . detail of the A-frame connection. The pilot's movement has considerable effect on the thrust line.

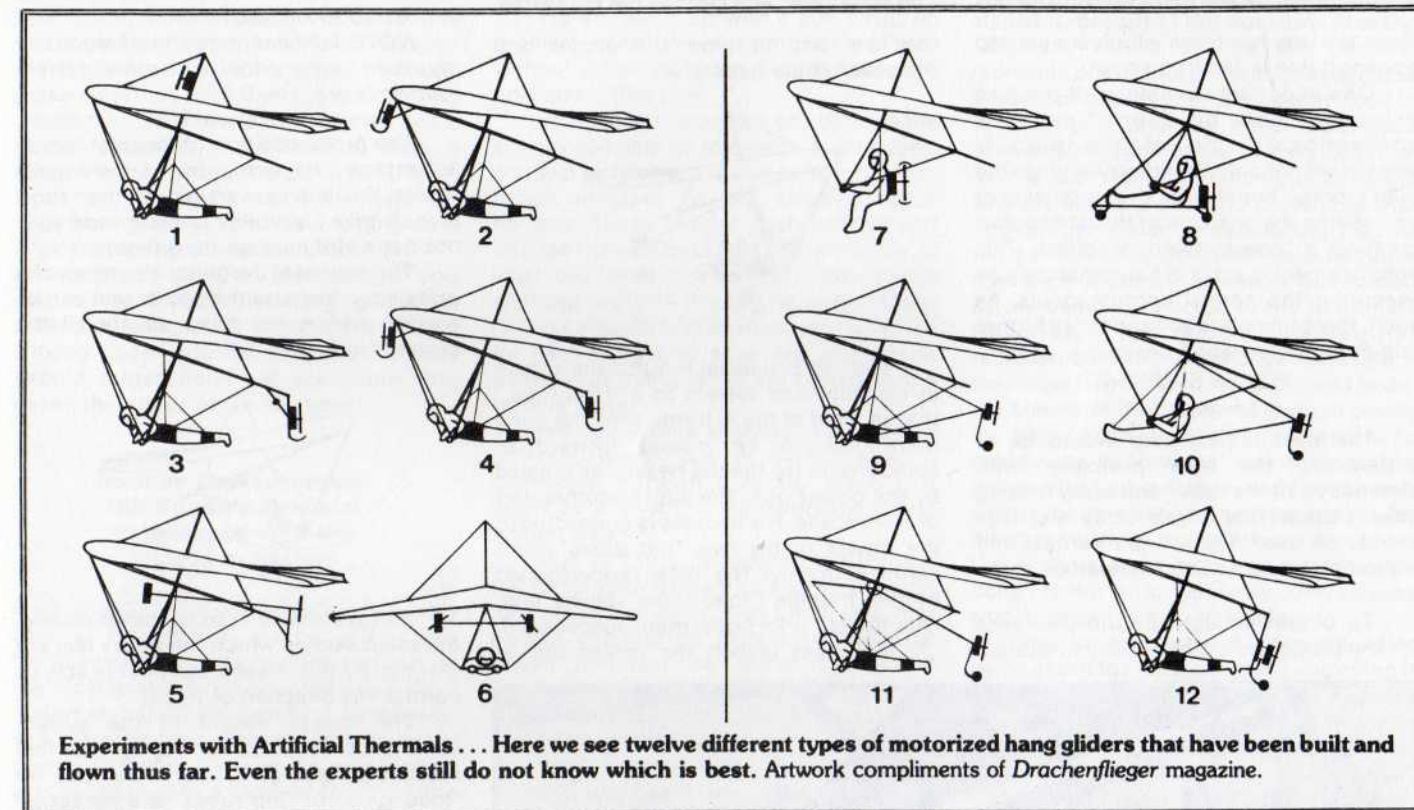


horsepower at 8500 rpm, providing 55 kg thrust [121 lbs] at 3200 rpm (propeller speed). Comer uses wheels on the base tube and a rear wheel on a keel strut, launching and landing in this system in the prone position. Ultralight Italia uses a similar system, but substitutes one monster pontoon for all three wheels attached to the base tube and keel strut, and a small pontoon on each wing tip, for water starts and landing. —G.E.

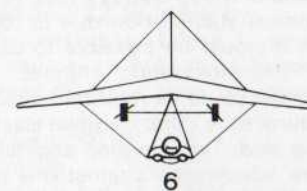
### PROBLEMS AT LAUNCH

Figure 6:

It is tempting to fix two engines left and right of the pilot in the plane of the A-frame. It would be the easiest to have both engines hanging from a tube that is crossing the upper part of the A-frame, as shown in the figure. There, the engines



would still be above the ideal thrust line. Therefore the tube has to be downward V-shaped.



NOTE: While Germany may be unaware of the Gemini power system, American readers will certainly recall this type of powered addition, marketed by Gemini of Nevada, and Sky Sports of Connecticut, circa 1979 or thereabouts. —Ed.

The primary disadvantage of this construction is that both engines have to be at least 3 meters apart [10 ft] from each other, so that the pilot cannot touch the propellers.

If one engine produces more thrust than the other one, a yaw moment results from this fact. It might become necessary to turn off both engines. Also, the head and body can easily be hit by parts of the propeller that may break loose. Also, the complete weight of the aircraft must be lifted at launch.

Ap Mulders in Holland is flying a glider with two 60 cc model airplane engines and has absolute confidence in it.

Another disadvantage of all the above mentioned systems that are controlled by weight shift of the pilot, is that the bigger the mass of the glider plus engine gets, the

power unit in the USA (while employed by Bill Bennett's Delta Wing Kites and Gliders, Inc). This was back in 1975. The propeller was guarded by a cage and a ring; but to fly around with such a screaming noisemaker tied directly to one's back might not be to everybody's taste.

Figure 8:

Therefore, the pilot was seated in a construction of metal tubes, on which the engine was mounted and which was simply swinging from the center of gravity . . . the trike was invented. The first trike is said to have been flown, not in England, but in Germany by Gerd Wilden.

The trike is not a minimum power unit. It is too heavy and also too bulky to be transported easily. The engine has to be mounted low, not to cut through the rear rigging of the glider; on the other hand, the

propeller has to have enough ground clearance, making a rather tall construction necessary. This nacelle with

less effective the pilot's weight shift input becomes. Also, the gyroscopical momentum of the rotating mass of a big and heavy propeller stabilizes the glider against the control inputs of the pilot.

Therefore you should not fix the engine to the glider, but connect it to the pilot and thus intensify his control inputs.

Figure 7:  
Dick Boone was the first man to experiment with such a "rucksack-type"

landing gear has to sustain 6 G's. This needs a lot of material and that again creates the need of a powerful engine (40 hp), which again means more weight. Anybody who has a sense for clean aerodynamics will try to avoid such an agglomeration of tubes and wires. Also,

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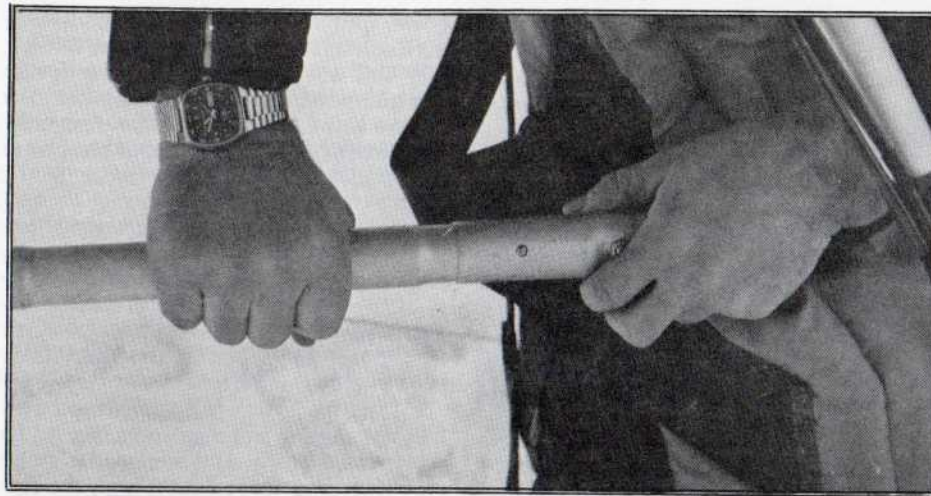
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(Above) Hip tubes easily connect to your harness with pip pins. (Below) The "Minimum" system, unattached to its pilot. Note throttle on base tube, and clothes pin kill switch.

there are very few trikes which are car-top transportable in the true sense.

One important advantage of the trike principle can be identified. The conventional input of the pilot is intensified not only by adding weight to the pilot's body, but also by the possibility of controlling the direction of thrust and thus creating a "power steering" effect. This enhancement is achieved automatically by executing the normal control inputs. As such, this principle is advised for all further minimum motorization designs.

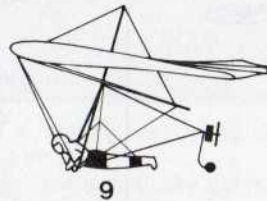
#### POWER STEERING

Figure 9:

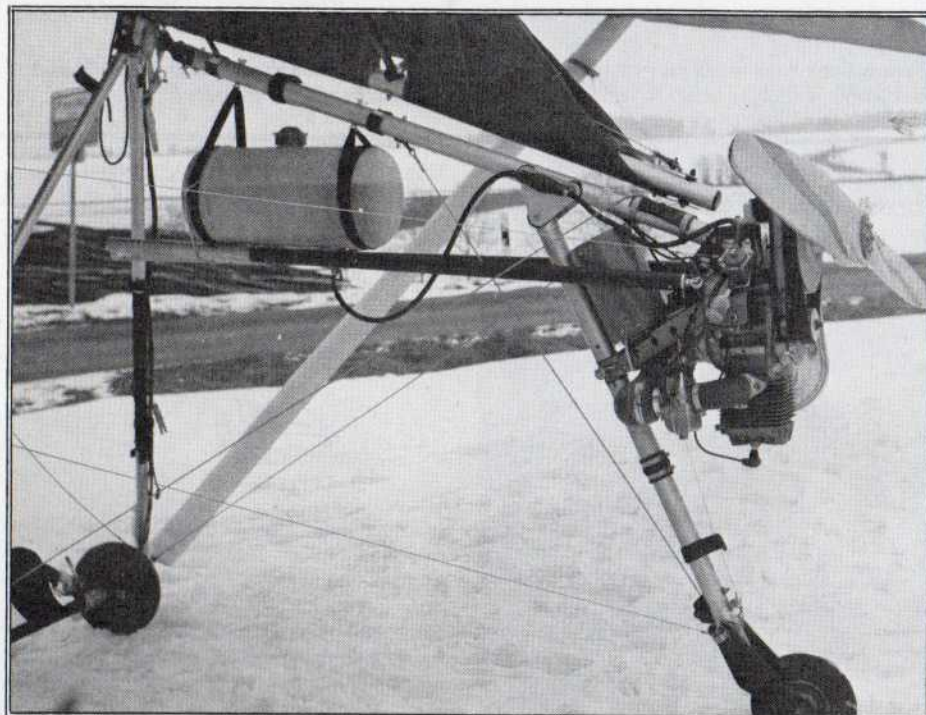
The next logical step would be to adhere to the trike principle, with elimination of the heavy and bulky landing gear. Instead, the pilot's body and legs should be used. Lightweight harness and webbing should be used instead of all the metal.

To obtain enough ground clearance for the propeller, it is necessary to shorten

the keel and to have the engine and propeller in the back of it.



Wilfried Bleidiesel mounts the engine in his minimum system to a "load-tube," that is fixed at the A-frame top. The hang point has to be moved forward to compensate for the tail heaviness created by the power unit. The pilot becomes part of the nacelle. His harness is connected to the power unit by two "hip tubes" (pilot center of gravity). The "trike" is now formed by this triangle ("load tube," power unit, "hip tubes," pilot body, main suspension). In a foot launch the power unit is



pushing along behind the pilot on a small tail wheel. The angle of attack of the glider is corrected automatically, when it is pushed by the power unit. It first starts to lift itself and then the pilot. As soon as the whole system is lifted off the ground, the in-flight balance is correct and the pilot can go prone.

The automatic "power steering" effect of the trike system is retained and the weight of the power unit is also added to the weight-shifted masses. The feet are protected from the prop by the hip bars.

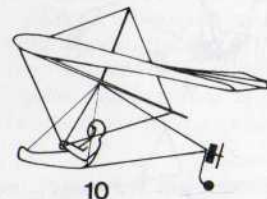
The foot-launchable "trike" (the minimum system) has been certified now, and is produced by Norbert Schwarze. It features a 15 hp, 220 cc Solo engine (60 kp thrust, 2.5 m/sec [500 fpm] climb rate). I personally do not like the vibrations of this engine, but Bleidiesel and his team have flown with it from Basel to Flensburg, almost 1000 km [625 mi].

*NOTE: I did not mind the vibrations — my own experience with this system follows later.* —G.E.

Figure 10:

The prone position of the pilot has an advantage dragwise, but I personally prefer the supine version of the "foot-launch trike." Visibility is better and your not get a stiff neck on long flights.

The control of the glider also should be quite easy, because the power unit can be twisted and is not fixed as are all the systems in figures 1-6.



A cross tube is fixed to the elastically-mounted skid on which the pilot's feet are resting. By this means the pilot is able to control the direction of thrust.

The overall weight of this system should be reduced to 15 kg [33 lbs] including some gas. This is because no "load tube" or "hip tubes" are necessary anymore.

It is impossible for the pilot's feet to touch the propeller, as long as they are resting on the "control tube." The additional weight hanging at the end of the keel would only be 10 kg [22 lbs]. To avoid gyroscopical stabilization due to rotating masses, it would be possible to use two smaller counter-rotating engines. These two engines could be mounted directly to the "control tube," that is joined elastically with the skid. Two smaller engines also have the advantages against one bigger one, of greater efficiency, less noise, and fewer vibrations. In this arrangement it also would not be critical if one engine does not run. The resulting yaw moment would not be very strong and can be controlled by the pilot. It partly corrects the direction automatically, because the engine that is still running twists the "control tube" to one side. It is also easier to restart a smaller engine with an electric starter in the air.

The next improvement would be a folding propeller. (See *News*, this issue, pg. 8) This version is currently being tested (patent pending).

I could not mention too many details of the different systems described in this article, because this would have been beyond its scope. But one important detail remains that applies to every foot-launchable power unit. It is the question, "How to operate the throttle?"

I found the best system is the one used by Soarmaster, the mouth-operated "clothes peg." In case of a crash you just have to spit it out and the engine stops running. In flight it should be possible to fix it to the control bar. It also should be possible to lock it, so you do not have to squeeze it all the time. It is important that the cable is long enough in case of a crash. I broke two teeth in a crash with an original Soarmaster unit, because the cable was too short and I forgot to spit out the lever.

If you have to deploy your parachute, make sure that the engine is not running anymore. If you use a system that has a pusher propeller, it is better to have a kingpost-mounted parachute (Help-System). It could be worth the expense! The risk of getting the parachute tangled is a lot smaller with a folding propeller.

Keeping all the enthusiasm, you should not forget that hang gliding is inherently dangerous, and that motorizing a hang glider adds to the risks. Nobody should forget about all the pilots who risked their lives for innovations!

#### German Correspondent Gib Eggen's Personal Experience with the Minimum System

I was up in *Gorauer Anger* late last February for a *Fasching* party with the Nordbayerischer Drachenflieger Club at the local gasthouse below the ridge (150 meters high [500 ft]). *Fasching*, by the way, is a *Carnival* time with six days of heavy partying all over Germany, by everybody. I was called over to a table by Toni Juri, the local instructor, to meet Wulf Seiffert. He wanted to know how to do loops in his Firebird CX. While going into the pros and cons of this, they told me he had just flown across the whole of Germany, south to north, with a new Minimum ultralight that weighed only 22 kg [48½ lbs].

"You start is up, take 5-10 steps, and you're gone — nothing to it." *Hummm . . . I've never flown a trike or Soarmaster before . . .*

"Want to fly it?"

*Hummm . . . "Y E S!"*

That was before he told me you could attach it to any modern glider, fly from two to four hours on ten liters [2¾ gal] of a 55:1 gas/oil mix, and that the sink rate of your glider would increase about 50%, maybe less. In other words, you can fly *thermals* with this job, even with the engine off! His sink rate with the Firebird CX (no kingpost — has struts for wing wires) was 1.5 m/sec., about 280 fpm. Not bad.



Well, the next morning, he opened up his Firebird CX, then took about ten minutes more to hook up the Minimum apparatus (the name reflects its nice simplicity). It had a safety (mouth) switch, and a lever throttle on his speedbar.

We started it up with a pull cord, no problem, and the system worked well without much vibration. The decibels are only about fifty five.

Looking at the photos you can see the system consists of two large main tubes, and two smaller spars that hook into small tubes attached to the sides of your harness. These are for pitch control and change the vertical angle of the engine as you move forward or back. No lateral thrust changes occur — the engine always faces midline. Near the base wheel, are two wires for each wing that span out and attach where your flying wires are bolted to the leading edge.

The upper tube attaches to the keel in different ways, but in Wulf's kite, it connected through a rubber piece that acted as a shock or vibration-absorbing system also.

True to form, he opened the throttle full force, then quickly picked up the kite, took about five steps, then a hop, skip, and a jump, and was off. After flying about for fifteen minutes, he came down, and cruised into a perfect rolling landing in the three-inch-deep snow, after cutting power about five meters up.

Now, for my turn. This dude was smart, "If you break any of the Minimum's tubes, no problem — they replace easily, I've got lots of them; but if you break the kite, you pay." Fair enough, sounds good to me.

Wulf decided that since it was my first time, he would push the throttle full open while I stood holding the Firebird off the ground, with me hoping I could catch up to the thing as it roared off for the trees fifty meters away. He instructed me to run with it just as I would off a ramp — do not stall it, let it pick up some speed and ease the nose up; continue running into the air, for good measure.

Well, Wulf pull started the engine (after a hang check). I picked up the kite while saying my prayers; he shoved the throttle wide open, and I started off across the field against a whisper of wind in my face.

The rear wheel lifts off the ground in about two to five meters, and you are soon gone also — I got about five steps, the

Firebird lifted me smoothly off the ground, and I was gone — climb rate of about 2 m/sec [400 fpm]. The kite controlled easily, no surprises, and no significant vibration felt. It was also relatively quiet, apparently fifty five decibels according to Wulf. He states that you glider will handle just about as it does with the Minimum, and after this one flight, I am inclined to agree.

I took it up to 700 meters [2400 ft], and started to see how the Minimum would affect aerobatic maneuvers. I found that roll response pressures were strong, but Wulf stated later that that sounded just like the Firebird's usual handling characteristics. I flew several series of wingovers and managed to pick up enough speed to get one up to 110°, but could only do so by side slipping the Firebird down, or by stalling it with the power on and dropping the nose. Actually, I never fully stalled it, because I did not know how the Minimum would change the pitching moments of the kite, perhaps driving it into a tuck; nor could I get the nose that close to vertical, and after an initial downward acceleration coming out of a wingover or from a near stall, the spinning prop would actually act as a brake to prevent further acceleration from air resistance. I could not get the nose down vertically because the range of pitch movements was limited by my being connected to the Minimum. However, for thermal or regular recreational flying, the pitch range is fine. If the range is increased, as Wulf plans to do, the Minimum definitely has enough power to help push you through aerobatic maneuvers. Its "braking" action may not be too much of a hindrance, and I performed some nice aerobatic maneuvers at a slower flight speed with the Minimum. How safe that really is, and which ones can be safely done, remains to be seen. Overall, the whole system felt quite stable.

Now for eating the humble pie. After flying about for thirty minutes, whooping it up and flying by the poor land lubbers below with my thumbs up . . . I landed with my schnozz down. I cut the power off, and forgot my range of flare was limited. It was a three-point landing, all wheels at once, but not perfect — I crunched the rear engine spar and bent a side spar (easily replaceable), but no engine or kite damage.

Wulf just grinned at my apologies and refused to take any money for the spars. It is apparent that you need to fly it in a little faster than usual, and on a flatter glide, although those who are better at it can actually land on their feet.

Wulf's partner, Wilfried Bleidiesel, has been developing the Minimum for three years now, has the German *Gutesiegel* for it, and a European patent. If it makes it to the USA, you could make a nice 100-mile jaunt, no problem. Wulf is working on a system now to restart the engine in the air.

That will have to do it for now — I myself am looking forward to a system like figure 12 (see chart), with a folding propeller that can be attached to floating keel gliders.

Auf Wiedersehen! §

THE BEST TIME of the year to go cross country at Hammondsport seems to be May. The problem is that May is totally unpredictable. Last year I took off the first two weeks in May and got rained out. This year, I booked off the third week to try to avoid the rain. I could only get one week off work this time. Well, sure enough, the first few weeks were full of rain. My friends — Dave, John and Dick — were down for the whole month, and so far, had found no good flying.

Well, it was now Thursday, May 17th, the seventh day of my vacation and so far it rained every day with a bit of snow here and there for good measure. The only day we managed to fly so far was on Monday, and I only managed thirty three miles before it overdeveloped. However, today looked a little more promising. We were on the edge of a high pressure system and didn't expect rain until later that night. Winds were to be light northerly and cloud base was a dynamite 10,000 feet.

We arrived at launch shortly after 10:00 and were ready to go in no time. We all thought Herb was a little desparate as he quickly threw himself off in light winds and flew out of sight in the direction of the west bowl. The five of us hung tight waiting for him to emerge in the landing field.

"No sign of Herb... gee, he must have landed out," I commented to the others. As I turned from launch, someone said, "Wait, there he is."

Herb was sitting pretty, about three grand over, just behind us on the west ridge. Andy and I quickly grabbed our gliders and stumbled to launch, and waited... and waited... Nothing happened. It would come in about 8 mph, with a 45 degree cross from the northeast, and then die. *What on earth was Herb in?* If that was a thermal, it sure was big for this early in the day. He was still going up and was flying straight out. After about fifteen minutes Andy offered to move over if I wanted to chance it.

*Sure, why not?* I couldn't stand to see Herb three thousand over while I stood on the ground. I plunged over the edge at 11:08 after picking what seemed to be a down cycle. I couldn't get up. I worked for

**"My saviour thermal was still there, only it had drifted a little farther east. Boy, that was close! Only about 20 miles into the flight and I almost blew it."**

about twenty minutes before I gained enough altitude to venture to the west ridge. As I got there below the top I figured, *Now you've done it; you'll never make it back upwind to launch and nothing looks good over here. What on earth has Herb got?*

Then I smelled it, away from the ridge and west of the landing field — fresh manure. What a sweet smell when you are plunging to the landing field at three hundred down. My vario started to sing as I quickly rose up to meet Herb. *Whew! What a relief.*

Then I remembered Eric's tip about the

# 107 MILES!

**HAMMONDSPORT, NY . . . TO NORTHUMBERLAND, PA!**  
**New East Coast Record Holder, Mark Bourbonnais describes the exciting flight that took him 107 miles across two states, and earned him a new title/photo by the author**

by Mark Bourbonnais  
 (pronounced Bourbon-né)

*MARK BOURBONNAIS, 26, hails from Mississauga, Ontario, where he operates a truck for his employer, Canadian Tires. He has been a hang glider pilot for the past six years, and travels from Mississauga to the Bath-Hammondsport area every weekend, except for the raw winter months. His 107-*

*mile flight breaks not only the site record of 46 miles, but his own best previous effort of 47½ miles from last fall while flying at another club site in the Toronto area. The 100-mile-plus flight on May 17th followed Gary Engelhardt's 103.9-mile-flight by a mere eight days.*

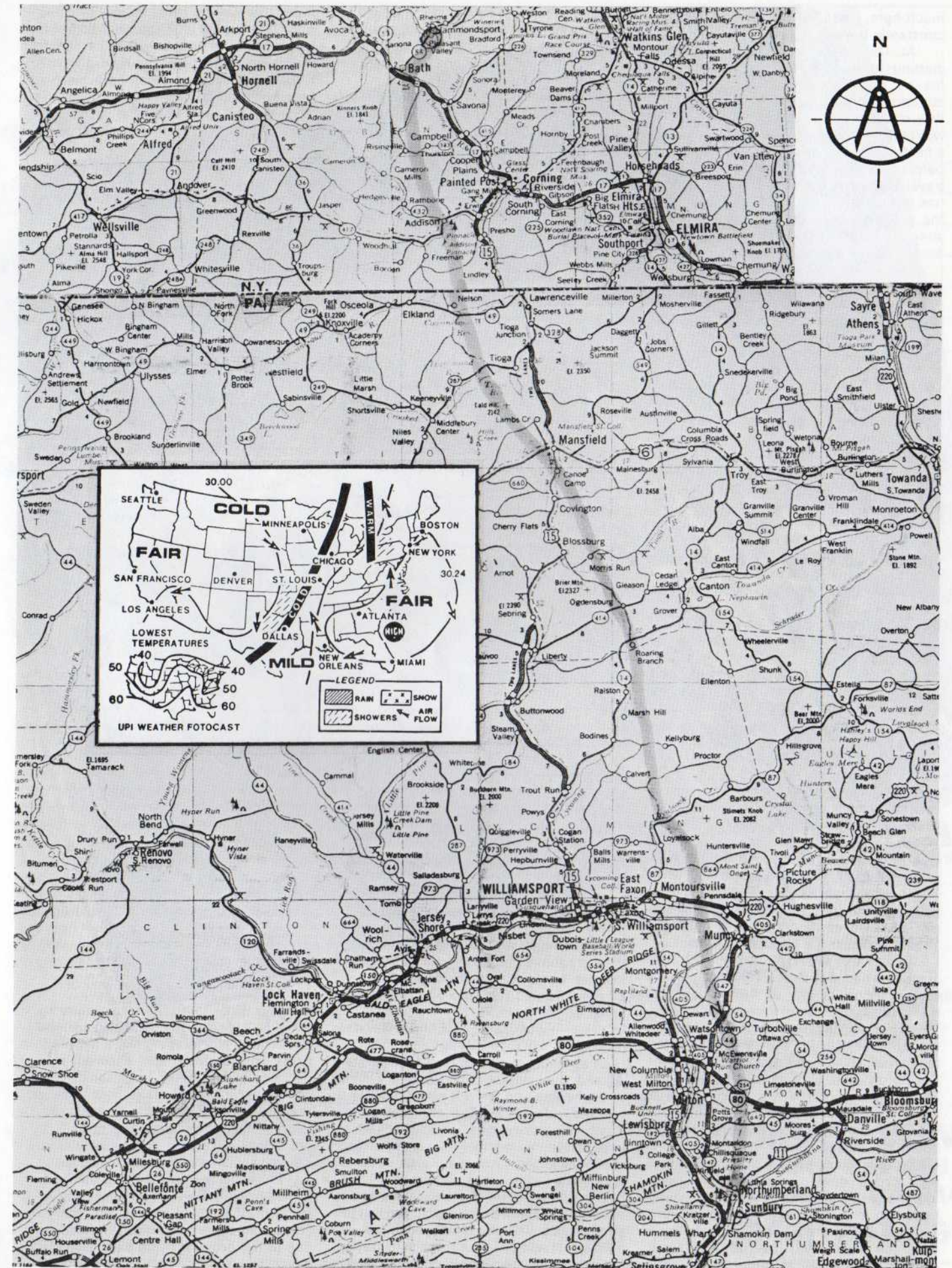


radio tower being good when the wind crosses from the north. I left Herb and ventured upwind toward the tower. *No way.* I was only over the launch and already down to a thousand over. Better head back to the west ridge. I got back fairly low and saw Andy real low, scratching for all he was worth. That has got to be the lowest I have ever seen anybody scratch and make it back up into the lift.

As usual, we Canadians out-numbered the locals ten to one. Eric was the only American here today. Well, I couldn't wait around to see how the others were doing. The cross country bug was itching, but it was still too early after gaining back my lost altitude. I decided to fly across town to Mossy Banks. It would surely be less cross there since it faces only ten degrees off north. To my surprise it was blowing in nice and smooth and no was present.

*Where was everybody? After all, the only reason we were at Hammondsport today was because it is walk-in site, and our gliders were still there from yesterday.* We figured if it was too cross at Hammondsport, we would fly the gliders down early and rush over to Mossy. I caught another thermal upon arriving and took it up to about 5,000 feet.

I looked at my watch only to find out it was still pretty early for cross country. I had never left at noon before and I was a bit leary. But I am sometimes known as a bit of a "go for it," so why not now? So I headed on for the next cloud downwind only to see its shadow breaking up as I arrived. I headed crosswind to the east and caught a little lift from this cloud before it also started to break up. I continued south to a couple of familiar lakes where I had landed once before. Knowing I would not get



much here, I headed further east, getting constantly lower.

At last, here was a new shadow starting to form. I caught this one and max'ed out a little over 5,000 feet. I continued south only to find nothing... no new clouds for a long ways. *Now what?* I was really beginning to get low and noticed a field that had given me a lucky save once before. But this day, it was to no avail. I traveled south in the direction that thermal had drifted my, but still nothing. As I got to the shallow ridge where it had gained in strength it still failed to provide so much as a beep on my vario.

The town of Addison was now just slightly to the east. With only five or six hundred feet to spare, I headed towards town thinking it was all over when my vario beeped slightly. After cautiously combing the area, I was able to center in on three to four hundred feet per minute up. My saviour thermal was still around, only it had drifted a little farther east. *Boy, that was close. Only about twenty miles and I almost blew it.* Well, after topping out about six grand, I continued south.

One o'clock was approaching and the thermals were really starting to cook. I crossed the Pennsylvania border with lots of altitude and persisted with cloud hopping. The thermals were now pegging my vario and I was topping out close to seven grand. No need to get low now.

As I crossed Hammond Reservoir near Tioga, I looked back to see it totally overcast. *Oh no, things were starting to overdevelop early. I had better step on it.*

I passed 6,000 feet over Mansfield which overlooks a beautiful riverside golf course. I followed the river down to Canoe Camp where it turns a splendid aqua blue color. The view was gorgeous, not unlike the glacial rivers of British Columbia.

Now along the eastern edge of Canoe Camp, I was lower than I had been for the last hour. As I watched my shadow going past the tennis courts I noticed another shadow beginning to form over a field to my left. I quickly dashed over and found the early stages of a real boomer. As I drifted past Covington, I reached 7,300 feet, what was to be my best altitude gain of the flight. By now, my toes had lost all feeling. I rubbed them continuously in a hopeless attempt to keep the circulation going.

I knew this was it, Covington PA, the place that had stopped further progress on Dave's record flight of 46 miles from Hammondsport. Now I could see why. Trees, nothing but trees, for miles. This was the moment of truth; the chance to break the barrier. I was now a couple miles east of Covington and drifting south over the trees. I was losing precious height but still had the opportunity to bail out.

But then I noticed it... a small mining operation in the middle of the bush. It wasn't much but it was a place to land if I was forced down. I gnashed my teeth together and tried to calm the butterflies as I decided to push ahead. As I got closer I could see a small cloud starting to form over the top. As I neared the small excavation area all I could think was,

*Please don't let me lose it now. It would be a long hike out from here. Sure enough, though, it was producing lift; just enough to gain some lost height and glide to some open fields in the distance.*

Well, I made it. I don't believe it but I made it. I kept on thermalling over the open fields around Ogdensburg, but one more cummie past it and I found myself running into Roaring Branch and another mountain of trees. I could see small cummies forming along the canyon where Highway 14 goes, so I followed them down to Ralston where I allowed myself to drift over the trees in another thermal because the road was starting to curve to the west. I made it past another barrier of trees to meet up with a few light thermals from some small wet fields. A few more miles and I met up with Highway 87 and another mountain of trees.

I followed the canyon along 87 getting constantly lower as I went. Nothing but open fields were visible as far as the eye could see after this point, but it didn't look as if I was going to make it out of the canyon. The last mountain quartered into the wind slightly so this was my last chance

**"Whe...Whe...Where am I?" I blurted with a deep chill still in my bones.**

to get above the hill tops and into the open fields. Luckily it was producing enough lift to get me above. I circled slowly and climbed to about 2,000 feet before losing it.

Another cloud was still growing larger a couple miles to the east. It was the only cloud within reach, but would I make it with all this sink? I had to try it. This was my only chance to get back up. *I sure hope this one doesn't 'OD' before I get there. This has got to be the field producing that beauty.* I thought. It was huge but with only about four hundred feet above the ground, *was I high enough to use it?* As I got part way across the field I knew it was all over. This was going to be my landing field. My vario agreed with 300 fpm down. My heart sank as I prepared to land.

Then suddenly, with the force of a freight train, the bar was nearly ripped out of my hands. The vario screamed as the needle went off the scale. I hung on at first, then gradually initiated a turn. Now I could just lie back and watch everything get smaller. Soon I had max'ed out and was again cruising south.

Here it was, Bald Eagle Mountain. This must be it, 1600 feet of mountain that ran west as far as my vision could penetrate. I passed over Mountoursville just east of Williamsport and knew it was hopeless to run the ridge now. The sky was almost totally overdeveloped, and it would be impossible to jump the huge gaps without thermalling. All I could do was continue south to whatever blue remained.

Ten miles past Williamsport I had to alter course towards the east to the last few sunlit fields. The thermals were now very light and it was all I could do just to stay up. I managed to gain another ten or twelve

miles thermalling every couple of miles in only 200 fpm up lift. I approached another ridge; this one was only 600 or 700 feet high running east-west along Highway 80. It didn't produce so much as a beep as I raced on by. This was to be my final glide.

I headed for a town that cornered the forks of the Susquehanna River. I cruised in on the east end of town and landed in a small dry field right off the back yard of a curious Stanley Kohl.

As I walked into his yard with my wing, I was greeted with, "Where on earth did you come from?"

"Whe-Whe-Where am I, I blurted with a deep chill still in my bones?"

"Northumberland, PA. Where did you come from," Kohl repeated?

"Bath, New York."

Naw, couldn't have," he replied, "that's 140 miles from here."

"What?!? Are you sure?"

"Sure, I'm sure."

After quickly dropping out of my harness and whipping out a couple of road maps, we measured out a straight line distance of 109 miles.

"I don't believe it," I kept repeating!

After the great hospitality of the Kohl family and a delicious meal of barbecued pork chops, we proceeded to load the glider on Mr. Kohl's pickup truck and headed for Bath. Two and three quarters of an hour and 141 miles later we pulled up behind my van with Herb and Chester pulling up right in front of us.

"Where the heck have you been," Chester yelled? "We were worried."

"You'll never believe it," I blurted!

After the three of us jumped up and down hugging each other for a while, a puzzled Mr. Kohl and son looked on wondering if we had lost our sanity. We bid farewell to the most hospitable family I'd ever met. It seemed that the people around here are friendlier than anywhere on earth.

Arriving around 10:00 after the best flight of my life, I was a little tired from five hours of flying, but ready to celebrate nonetheless. Chester made a quick call back home to an Etobicoke Hang Gliding Club meeting to tell them about my flight.

I limped into the Ramada with Chester and Herb. My toes were aching from the holes I had nearly worn into them from the constant rubbing. Herb treated with a carafe of wine and I even had the energy to dance a few.

*What a day, eh?*

The next day I was a celebrity for a while as I tried to act calm and collective, but inside I still jumping like a hyperactive frog. The aerial maps showed a true distance of 107 miles. I still can't believe I went that far from our local flying site, yet I dreamed of how far it could have been if it hadn't totally overdeveloped at only 4:00 pm. Only time will tell what potential Hammondsport still holds in store for us.

I have to end by thanking Bill Bennett for the best glider he has ever produced: the Streak. And, of course, Mr. and Mrs. Parulski deserve my gratitude for the use of one of the greatest flying sites on the east coast. §

the success . . . .



Photo John Heiny - Design Andrew Harper

Must be 15/1 by comparison????

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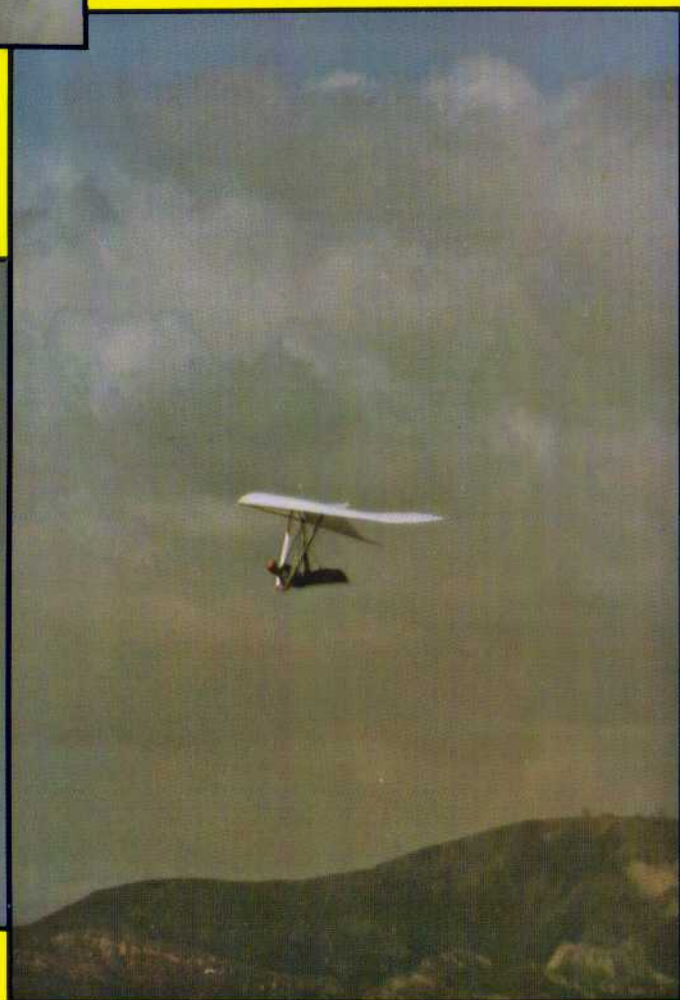
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# Beginning a New Excellence in Aerodynamics & Structure



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So, it was decided to pull a single glider up behind a single tug. Instead of being comparative evaluating, more "absolute" numbers would be sought.

## AERO TEST I

*Continued from Page 19*

So, you rig your instruments on the glider, take off at dawn, through 5,000 feet of air holding your airspeed constant. This gives you one point on your polar graph which represents the glide ratio at that speed. You do it again and again, repeating the same airspeed to get a confirmation of previous findings, and then changing the airspeed to fill out the polar curve. Of course, you used the same glider, harness, instruments, pilot, clothing, et cetera.

When you are all through you have a true and accurate polar graph of the performance of the Bag Wings' War Dog 185 hang glider, proving that it has an L/D of 19 to 1, right? WRONG! What you have are results which may be accurate for one particular glider, pilot, accessory combination, assuming that the air used was "clean" and your instruments were accurate.

The biggest factor which will compromise your results when applied to other gliders of the same make and model, or even in comparison to other models, is you and the other junk you hang on it. That's right, any difference in the drag profile between you and that War Dog test pilot will mean that you will get different performance from his. After all the "D" in L/D is drag.

So, why bother with all this expensive research (not to mention getting up before the crack of dawn)? Because glider performance is probably the most talked about, argued, bitched about subject in hang gliding, and since we all like to discuss it so much, we want data to back up our positions. I once asked Mike Meier and Steve Pearson of Wills Wing what they thought the L/D of a Duck was. Their answer was "around 7 or 8 to 1." They said this with a straight face, almost. Since then, Bob Trampenau of Seedwings has come out with an ad which features a polar graph and the words Max L/D of 13/1, measured. Now I have flown my 180 Attack Duck in competition with Stew Smith in his Sensor 510 VG, and simply do not believe that the difference in 8 vs. 13 to 1 at any speed.

Most of us have assumed a 10 to 1 figure. I have heard it used when talking to whuffs, and it's a nice round number. I use it myself, but not without a twinge of guilt for failing to say, "... but no one knows for sure."

We have so far managed to make two preliminary flights to 6,000 feet. We used our Skylines Cosmos trike tug and towed myself in my Wills 180 Attack Duck, equipped with a Skylines double french connection. My measuring instruments were a Ball 652 deck (vario, digital altimeter, and airspeed indicator), a Winter

ASI, and my Casio stopwatch. In addition the tug used a Hall wind/airspeed indicator. The results are shown in the table. We would have done more flights for this article but climbing to 6,000 feet is demanding on any ultralight, and we found that our engine developed an air leak so we were not getting the best performance. We are novice engine mechanics, so it is taking a while to get things right. We will pursue this program and publish further results.

The data we gathered is highly suspect at this time. First of all, the 22 mph trim speed figure does not correct for the compression factor (though calculations are presented in the table for differing amounts of re-calibration error). Computations therefore yield a lower than expected L/D, which ironically tends to agree with Meier and Pearson's predictions. Also, the air was not *perfectly calm* on either flight. The first flight showed minor turbulence on tow which was not very evident during glide, and I believe the results from this flight are the more reliable. The second flight was definitely more "thermally" and these results are only useful as a learning experience. We learned we have got to get up earlier and off the ground at or before sunrise.

We are reporting the published weather conditions for the flights because we feel that such things as density altitude have a direct bearing on this type of research and its results.

**"We are now beginning to see one manufacturer who is publishing a 'measured polar' and an L/D figure. The result has been that other companies have jumped into the fray."**

We intend to carry on with this project because it interests us personally. We have started with my glider because it is available and I like to fly it, and want to know more about it. Our plan is to develop our experimental model and then expand to testing other gliders and publishing those results. With an additional tug we also plan to do some direct wingtip-to-wingtip glide-offs. This latter experiment may hold the more valid and interesting results.

We promise you, the reader, that we will try to give you the most unbiased results we can obtain. However, you should know that we represent some but not all of the manufacturers of gliders in our various business ventures and we must be suspect in spite of our best efforts. The ideal situation, of course, would be for an entirely independent person/organization to pick up this effort.

Anyone want the job? §

Though this invited more error, and criticism of *whatever* results were obtained, it would, hopefully, promote interest and dialogue, while beginning the process.

Frankly, though the volume of information is woefully small, the knowledge gained was more illuminating than at first expected. The places for error became more apparent. The total amount of man-hours required to achieve the desired ends also became more apparent. Nevertheless, it was encouraging to have accomplished what many regard as the toughest part... beginning (at all).

The two outings and the data associated with them are presented in tabular form in these pages. You are encouraged to review the figures and draw whatever conclusions you will.

You are even more strenuously requested to react to the data and communicate your feelings, thoughts, ideas, criticisms, or what-have-you. The more minds pursuing this line of logic, the better will be the resultant tests and their data. §



# OWNERS SURVEY

## ProStar

No. Five in Whole Air's popular Owner Survey series, this time on the Progressive Aircraft ProStar/Analysis by Bruce Wolfe

The ProStar, produced by Progressive Aircraft Company of Simi Valley, California, is the subject of this fifth Glider Owners Survey in *Whole Air's* popular series.

Originally this article was to have appeared in the June/JULY *Whole Air*. However, the Gemini Owners Survey was presented in its place so the reader could compare notes with the Gemini Pilot Report by Paul Burns. Response to that effort indicated you enjoyed the two perspectives immensely.

This Owners Survey offers the summary of nearly 2,400 answers to questions on the *Whole Air* Owner Surveys returned by sixteen ProStar pilot/owners.

### THE PILOTS

The pilots in this survey range in age from 24 years old to 60 years old, the average being just over 36 years of age. That is two years older than the average age for Gemini pilots which was the oldest groups thus far. Weight-wise, the ProStar pilots averaged 162.5 pounds, with a range of 140 pounds to 220 pounds.

ProStar pilots are Hang IV/Advanced (83%) and Hang III/Intermediate (17%) with an average airtime figure of 179 hours accumulated over a mean of 6.3 years of flying hang gliders. This group is not competition oriented, as only 6% participated in their regionals and no one went to the U. S. Nationals. However, 19% did fly in some sort of competition.

Well over half, sixty two percent, of these pilots had airtime in other aircraft. Those who did averaged nearly 284 hours airtime over twelve years. That makes this group the most experienced in other aircraft.

Survey participants were asked to rate sixteen specific glider qualities in order of importance to them. The scale used was 5 = Vitally Important; 4 = Significant, But Not Vital; 3 = Average Importance; 2 = Low On Scale; 1 = Not a Priority At All. Those qualities, listed in order of their assigned

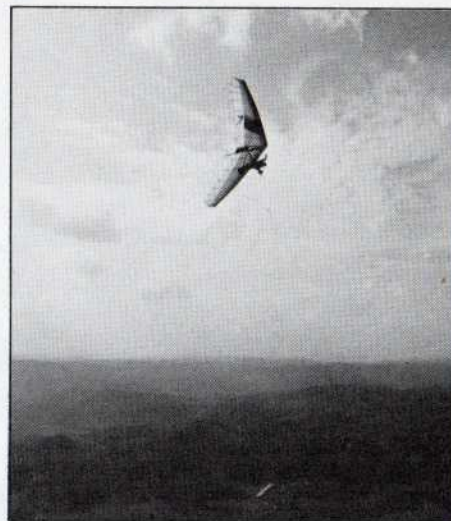
value, appear below:

- 4.9 Structural Integrity
- 4.6 Sink Rate Performance
- 4.5 Glide Performance
- 4.2 Light Handling
- 4.1 Quick Handling
- Speed Range
- 3.7 Mellow Handling
- 3.6 Price
- 3.5 Set-Up Ease
- Light Weight
- 3.3 Delivery Time
- 3.0 Innovative
- 2.5 Brand Name
- 2.2 Contest Successes
- 2.1 Popularity
- 1.9 Uniqueness

Based on this priority list it is apparent that ProStar pilots place a high priority on performance qualities, followed closely by handling characteristics. Next, a group of convenience features are rated between significant and average importance with the remaining qualities ranging from average importance to a low rating. Keep these priorities in mind when reading the glider evaluation section.

The last item concerning the pilot is the equipment they use. Listed below are ten accessory items and the percent of the ProStar pilots who use each item.

- 100% Helmet
- Vario (if answered)
- 2nd Hang Strap ("")
- 94% Parachute
- 50% Compass
- 47% Two-Way Radio
- 25% Airspeed Indicator
- 7% Ballast
- 0% Strobelight



### THE GLIDER

The specifications on the ProStars in this survey are as follows: 80% are '82 year model gliders, the rest are '83's; over half (53%) are 160's, forty percent are 195's, with only one 130 square foot size. According to the survey participants, all are certified.

Only one ProStar was bought second hand and that was for \$1,000.00. The average new price was \$1,695, with a price range of \$1,451 to \$2,400.

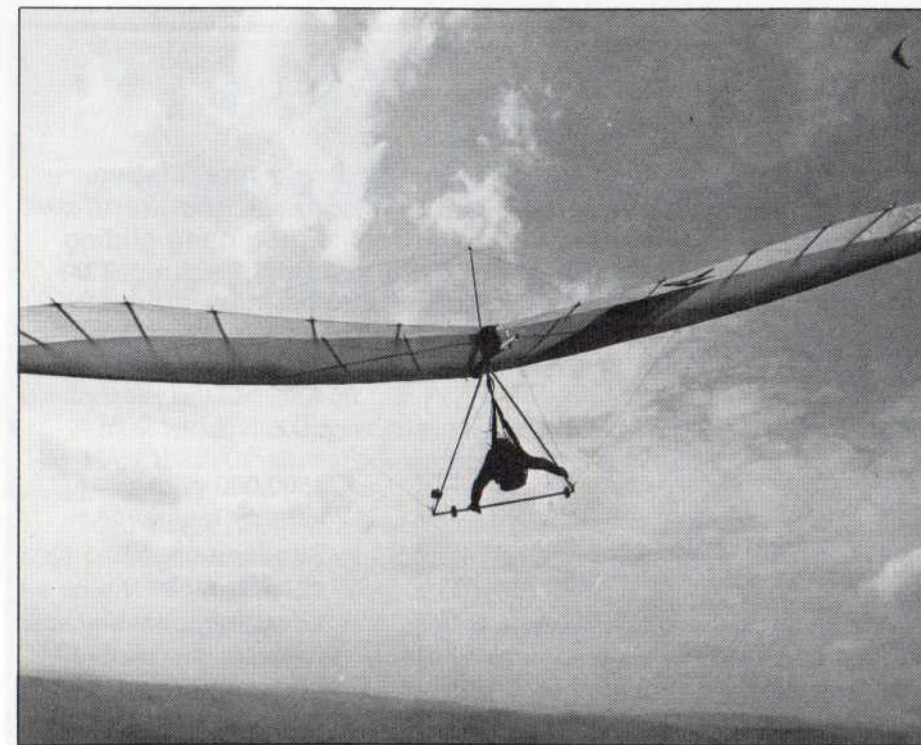
As far as sales were concerned, 64% were purchased from dealers, 28% directly from the factory, and only one glider was purchased from a private source.

ProStar pilots spent an average of fifteen minutes to set their wing up. The fastest time recorded was ten minutes and the longest thirty minutes. Pilots rated the setup procedure just a little above "Good" at 4.2 rating. The figures for breaking down the ProStar were exactly as above except the fastest time cited was six minutes.

The survey asked pilots to rate the quality of flying their wing. The scale used was the standard one, being: 5 = Superior; 4 = Good; 3 = Average; 2 = Fair; 1 = Poor.

ProStar pilots rated the overall quality of flying their glider at 4.1 (Good) and ranked twelve other areas as follows.

- 4.2 In Thermals
- 4.1 In Ridge Lift
- In Turns
- Pitch Trim
- To Ground Handle
- 4.0 To Coordinate Turns
- 3.9 Roll Trim
- To set-up/hold approach
- 3.8 Maintaining Hands-Off Flight
- 3.7 To Lift (Weight)
- 3.6 Generally, To Land
- 3.5 To Flare



Note that half of the areas are rated at a Good quality with all of the other areas rated above average.

Pilots were asked next to rate the ability of their glider to perform — as compared with other gliders — in fourteen specific areas. The rating scale is the same as for the quality rating (above). The ProStar was rated as follows.

- 4.3 Overall Strength
- 4.2 High Speed Handling
- Glide Performance
- 4.1 Light Handling
- High Speed Stability
- 4.0 Sink Rate Performance
- 3.9 Speed Range
- 3.8 Low Speed Stability
- Low Speed Handling
- Straight Ahead Stall
- 3.7 Quick Handling
- Mellow Handling
- Accelerated (speed) Stall
- 3.6 Turning Stall

What is really striking here is the very consistent one-tenth separation of the ratings. Although rounding figures off is partly responsible for this, a very close grouping can be seen for all these areas. Of the four surveys I have worked on to-date, this is the most intermixing of performance and handling qualities I have witnessed. Usually the glider ability ratings have either performance or handling characteristics grouped at the top, with the other set of characteristics grouped at the bottom. If you look at the previous owner surveys of the Harrier, Sensor, and Gemini, you will see a definite separation of handling and performance qualities.

NOTE: In a future report, author Wolfe

will write a comparative evaluation, pulling figures from all surveyed aircraft. —Ed.

Glider maintenance was another area covered by the survey. Twenty five percent of the ProStars needed some type of non-crash related repairs, which received a 3.6 rating, while crash-related repairs were rated similarly at 3.7 value. Only one pilot reported some parts falling off his ProStar, one-third had trouble with ribs bending, and over half noted some wear early in their ownership. This last figure has been fairly constant with the gliders covered to date. Half of the pilots thought their downtubes were stronger than previous gliders, while 19% thought they were weaker. The rest of the pilots felt the ProStar's downtubes were about the same as other gliders. The overall workmanship on the ProStar was rated at 4.0 (Good).

### THE MANUFACTURER AND DEALERS

The first area considered in this next-to-the-last section of this report is Progressive Aircraft's advertising reliability. Using the same 1 to 5 scale used earlier, owners rated the company's honesty in eight areas.

- 4.3 Handling
- 4.2 Materials Quality
- Set-Up Ease
- 4.1 Performance
- Weight
- Workmanship
- Overall
- 3.5 Delivery

Owners felt the company did good or better in all areas except delivery, which has usually come in last for the other surveys as well.

Sixty two percent said that the advertising was a factor in buying the ProStar.

Half of the ProStars were ready to fly on delivery. Those that had to be assembled were rated as easy to build by everyone but one owner, who said it was moderately easy. One third said they needed tools to assemble the glider from the shipping tube, but all parts were included and fit together.

Eighty six percent of the ProStars had test flown stickers and all but 18% were signed by the test pilot.

These pilots rated the overall quality of their dealers' service at 3.4 value. Ninety three percent of the owners received an owner's manual, 54% said they got a service manual, 7% had spare parts included, and 93% received rib charts. When asked about test flying, 58% said their dealer did test fly the glider, while 71% of the dealers demonstrated set-up procedures and 81% went over the owners manual with the new owner. About a third of the owners said the factory contacted them about their purchase.

The average distance to a dealer was 77 miles, but only 42% of the ProStar dealers were full time and only 8% had store fronts. The average rating for the dealer's stock of parts was 2.3, well below average. The average delay for parts not stocked was eleven days.

Pilots rated the overall workmanship on the ProStar as 4.5, between Good and Superior. The quality of materials used in construction was rated Good.

### CONCLUSION

Finally, ProStar pilots had these concluding remarks.

The ProStar was given an overall Good rating (4.1) with 94% of the pilots saying they would buy another glider from Progressive Aircraft. However, only 88% said they would recommend another pilot buy this glider. Ninety three percent would recommend this company to other pilots. Thirty eight percent felt the ProStar was not worth the retail price, but 93% felt it was worth the price they paid.

Fifty eight percent said the ProStar should not be sold for use by a novice pilot.

The most common best feature listed for the ProStar were both performance and handling. Both were mentioned about the same number of times.

Landing was the most cited worst feature. There were the usual number of complaints of wear points, bending ribs, and some isolated comments on trim and turning problems.

And that completes the ProStar Owners Survey. Next issue we will take a break from the Owners Surveys and look at a summary of pilot demographics. This will prove interesting not only to American readers, but as the October edition of *Whole Air* will be the first issue widely distributed in Europe, this information will be especially valuable to the growing group of European pilots. §

photo by Bettina Gray



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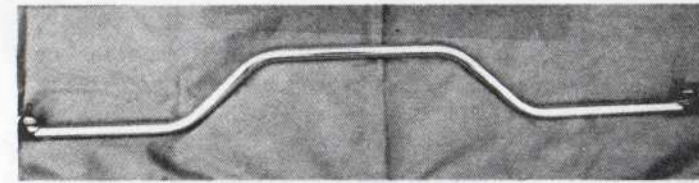
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# PRODUCT LINES

CHATTANOOGA, TENN. — "Once Upon A Time . . ." is a popular way for fairy tales and children's stories to begin. Guess that makes it OK for *Product Lines* to start that way, as some consider this folksy, gossip-y styled column to be a fairy tale. We don't mind. Really. More readers turn directly to this page than anywhere else in our little book. But we begin this edition of *Product Lines* with a "Rags to Rigids" fable. So . . . Once Upon A Time there was a big interest in what we then labeled "rigid wings." We had Icarus II's and V's, Fledges, Easy Risers, Sundances, Valkyries, and Mitchell Wings. We could still have 'em all. Still do actually, as Fledges can still be gotten (tho Manta is setting a record for low visibility). Plus interest in **Tim Morley's new Mitchell U-2** has the energy of a raging brush fire in the dry season. But rigid wings really never got much altitude. Rag wings were just too portable, too self-manageable, too cheap, etc. We all know the rest pretty well, tho it was amazing as performance was very different between rags and rigids. No more. Things have changed, and we mean more than the closing of performance differences. Complacency and laziness of "aging" hang glider pilots, coupled with maturing life styles, with performance increases and barriers, joined with center of mass towing, aero towing, and common 100-mile flights . . . all worked in concert to trigger a revived interest in rigid wings. Here in late July '84, it is simply incredible to witness the new fever for rigid superships (and the performance potentials they offer). Betcha didn't know this . . . we can count six (yep, 6!) separate projects involving superwing development (or maybe some should be called ultralight sailplanes). First is Morley's U-2, a near-reality in spite of Tim's tragic disabling accident (see *News*, pg. 7). You'll be able to buy one soon! Another one Morley has told us about just recently is **Eipper Aircraft's new sailplane**. What?! Eipper, the motorhead company?! Yep. Tom Price, Roger McCracken, and a couple other self-professed "aging" hang glider pilots have one nearly constructed. Underway as a special project with Eipper's full knowledge but with zilch developmental budget, the wing may fly by Labor Day, it was forecast. The Eipper sailplane, currently configured, has a 32 foot span, about 155 squares, flaps to "55%," cable bracing, and a weight of "right at 155 pounds." Glide is projected at 12 to 15:1, which sounds quite possible to us, once its full pilot enclosure is completed. We asked why "only" 32 feet of span, and they replied this is an effort to stay within known parameters on a first model (sounds like the earlier **UP Arrow** reports), but also to stay within the 155 pound weight limit of F.A.R. Part 103. BUT *don't call 'em*, it's no where yet! Really, NO CALLS! We mentioned a mums-the-word-type-project by **Bob England** at his new headquarters in Salinas, near the Pacific Windcrafters. Mum is still what we hear, but we can hope, eh? Then a rumor has it **Delta Wing** is "doing something" with a project begun up in Washington state. No announcements (of course) of anything from them yet either. Next-to-last is another "for sure" project in the Atlanta area by a fellow named Henry Cherry, hence the **Cherry Wing** as a nickname assigned by other local pilots aware of the effort. Henry doesn't wish publicity yet, but we've seen the drawings and heard of his initial prototyping underway in a pretty "proper" shop in Georgia. Add all that to a several-year-long-enduevior by Mr. Sensor, **Bob Trampenau**, and you begin to get a picture of quite reasonable promise for *True Ultralight Sailplanes*, perhaps during the 1985 season. We'll try and keep ya posted on all these. Meanwhile though, you might be interested to see what shows at the Sailplane Homebuilders "convention" over Labor Day. More info can certainly be obtained via the Soaring Society of America at P. O. Box 66071, L.A., CA 90066. A last interesting bit of news on wings is that Tim Morley indicates **Rich Pfeiffer** will take on the first flying chores of the now-ready "Darth Vader-looking" U-2. According to Morley, Rich will fly the pre-production craft in the Owens Valley, which all by itself could be most interesting. We will definitely keep you aware on this one. **Drachenfliieger** and **Finesse 10** (German and French diver mags) have both expressed a great interest in Morley's U-2. Speaking of other magazines, one in which some hang

gliding companies recently advertised — **Outside** — plans a story on aero towing and skyting in their OCT 84 issue. Watch for it on newsstands everywhere . . . color photos and all. The folks at Crystal Air Sports have gotten some good publicity for their **Simulator**, as articles appeared in the July '84 **Popular Mechanics** (readership: 5 million or so) and the Summer '84 **Kansas Motorist**, plus **Gallery** magazine (paid circulation: 700,000) plans inclusion in their issue due on newsstands everywhere by October. Anybody else getting this kind of media mileage, so we can report it?! In yet another unlikely place, the August '84 **Ultralight Flyer** supplied a nice, very positive piece by, of all people, ex-Pterodactyl-owner, **Jack McCornack**. Titled "FAA considers towing proposal," Jack writes optimistically on aero towing and the emergence of ultralight sailplanes (not motorgliders even), because of which Jack predicts a coming-together of the powered and unpowered flying communities. Good goin' Jack and *UL Flyer!* Y' oughta pick one up and read it all. Jack's got a neat writing style. Some hot flights of late deserve mention. First is a confirmed flight by Windsport Int'l's **Joe Greblo**, who went some 151 miles (El Mirage, CA to Jean, NV) on a 160 Streak after a winch tow launch!! Great job, Joe. Does anyone know if that's an unofficial record for distance after release from tow launch? It is as far as we know. We've contacted Joe about a story on this exciting jaunt. Further east, in Colorado, a pilot named Ian (last name unknown) reportedly gained enough altitude to reach **23,600 feet**, with a barograph! Flying a Comet 2, it was said by our reliable informant, the early July flight apparently did not claim a record due to its "illegality." Though under Part 103, hang gliders may indeed fly to such altitudes, prior permission (and possibly a transponder) must be secured. Evidently this wasn't done, though its a heckuva flight and we'd like to report more even if covertly so. Oops, let's flash back to land/winch towing for a second, as it and altitude gains coalesce in our minds. The German folks are pretty big into winch towing as it is used heavily by Germany's 40,000 sailplane pilots. Hang glider pilots have thereby come by it naturally enough. So what, eh? Here's what! They are doing something we will call "**Reverse-flying the winch**." What they're doing furrowed the foreheads of some very experienced Florida tow pilots. They launch normally with pull from a steel cable wound up on a reel by a VW engine. When the pilot gets overhead of the winch, a knowledgeable winch operator puts the machine on a free-wheel mode (we guess), and the pilot 180's to fly back to a point over where he launched. Then the winch is fired up again, yanking the glider and pilot up some more. The process can be repeated till no cable is left. Reports in *Drachenfliieger* and from our German Correspondent (who tried it himself) tell of an altitude gain to **2,000 meters (6562 ft)**! Our guy, Gib Eggen, did the "Reverse Act" to 800 meters (2600+ ft) and said it was quite easy. Also it uses very little space and even the bother of aero towing can be obviated. It must, tho, have the requirement of a very aware winch operator. We've asked Eggen to begin us a further story on this procedure. By the way, they use a body tow (center of mass) attachment. Some final items . . . Kenny Brown of **Airwave Gliders U.S.** called to say that amidst civic strife, the Himalayan Hang Gliding Rally was held. USA's **Chris Bulger** took Second, bowing only to France's **Gerard Thevenot** of LaMouette. In a letter, Thevenot said he'd also cranked out 550 kilometers (342 miles) in *only four flights* at the Lariano Triangle XC contest. That's some hot flying by a consistent pilot. (By the by, we're planning a tour of LaMouette's factory — world largest manufacturer, they say — in our DEC 84 issue after our visit there in mid-October.) Some recent "personnel changes" resulted in former UP'ers, **Gene Blythe**, **Mark Bennett**, and **Kevin Kernohan** all flying Ducks in the SoCal Regionals. Interesting, huh? At those regionals, Kevin finished first, followed by Steve Pearson, flying a 25 to 50 mile course. Congrats to Kevin and Steve (plus Wills must be smilin')! That's about it for now Flyboys (and girls). Got news or an opinion? Send 'em to *Product Lines*, Box 144, Lookout Mtn., TN 37350.

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photos by Bill Bennett

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