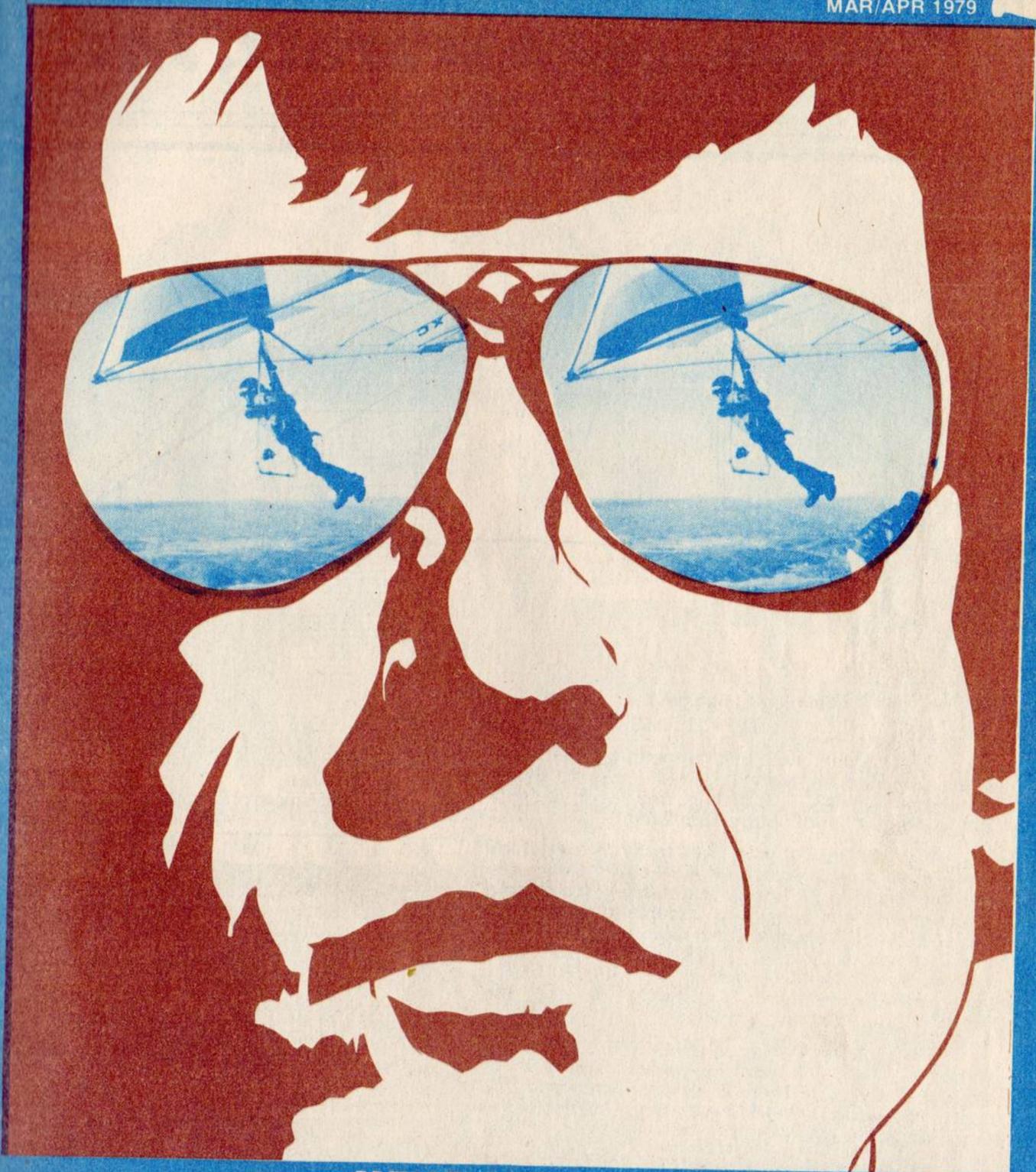


# whole air catalog

MAR/APR 1979



**HANG GLIDING--  
YESTERDAY, TODAY, and TOMORROW**  
solar power for foot launched ultralights.  
a special story, 'the comeback,'  
by paul burns. art pictorial, past thru  
tomorrow: and our popular columns.

Idea•Graphics, publisher  
WHOLE AIR CATALOG  
P.O. Box 144  
Lookout Mtn., TN 37350

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Coming next issue:

What is THE highest performing flex-wing?  
Read George Worthington's "Hang Glider  
Performance" in the May-June WAC.

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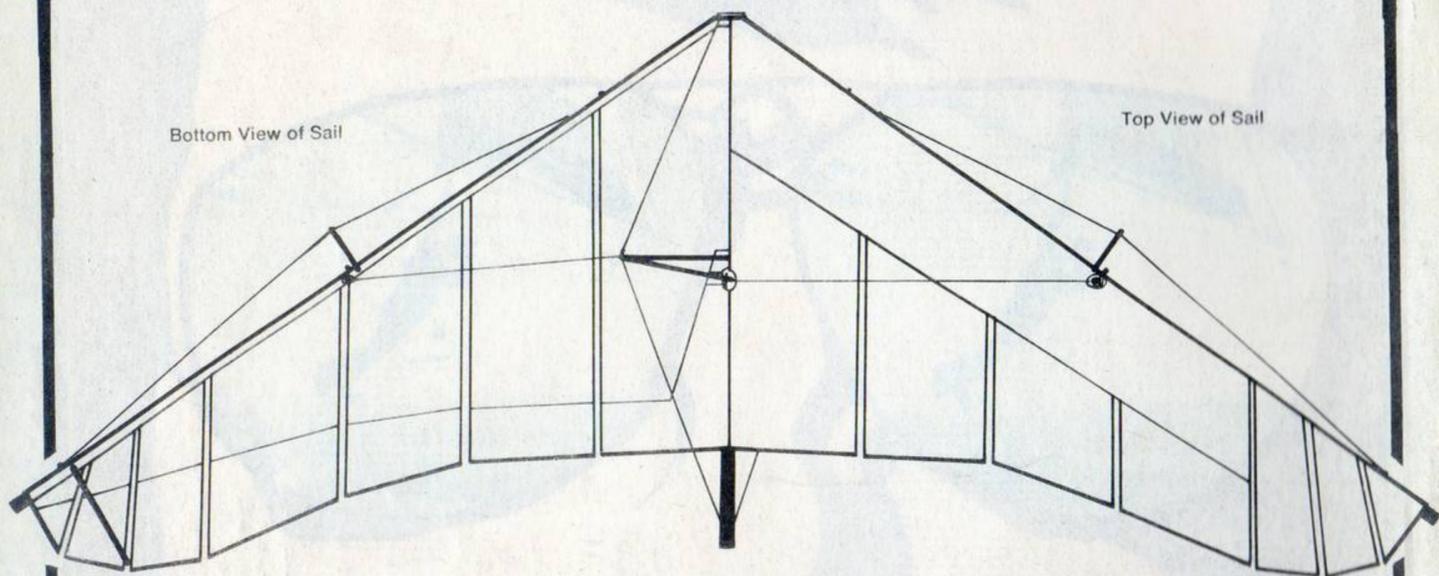


# Highster Aircraft, Inc.

1508 Sixth Street Berkeley, California 94710

Bottom View of Sail

Top View of Sail



## More Reasons for Owning a Highster — The ALL SEASON GLIDER !!

Most gliders excell at something; there are gliders designed for marginal days, for ridge flying, for thermal flights . . . which is fine — if you're a "one-condition" pilot. Most flyers aren't.

If you're a pilot who likes to fly in everything from 0 to 40 mph, there's now a glider just for you — **Highster** for 1979! Through extensive research and development, our wings are capable of very slow flight, while still retaining their famous top end. The speed range is nothing short of fantastic. Right through the whole line, whether the 150, 170 or the 190, you'll find proof that **Highster** has designed the first all-condition glider.

The roll rate is faster than in 1978, and just as docile. The sink rate has been improved by approximately 10%. There is also an increase in L/D due to the constant refinements being made to this time-proven design.

Other manufacturers are still trying to equal **Highster's** performance capabilities, yet need many specialty models to cover the broad spectrum of our double-surfaced glider . . . and **Highster** accomplishes all this with an airfoil that began flying in 1974!!

If you have fun flying, and don't want to miss a day because your glider's limits don't fit the conditions, then you'll have more fun — on the **Highster!!!**

### HIGHSTER SPECIFICATIONS

MODEL	150	170	190
Span	30'	32'	34'
Area	152 sq. ft.	168 sq. ft.	188 sq. ft.
Leading Edge Length	18'	19'	20'
Aspect Ratio	6	6.02	6.1
Root Chord	9'8"	9'11"	10'2"
Nose Angle	110°	110°	110°
Empty Weight	50 lbs.	52 lbs.	54 lbs.
Pilot Weight Range	105-155 lbs	150-180 lbs	170 lbs +

Fully ribbed 90% double-surface sail  
Wing loading factor 6.5 positive - 4.5 negative (all models)  
Passed 150° load test at 35 mph in 1978 (with quadral deflexors)

#### PRICE

- All Models  
\$1275 (retail)  
includes deluxe bag assortment - cover bag, rib bag, cross spar covers and wire pouches
- Rainbow tips - no extra cost
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  - Special designs available upon request

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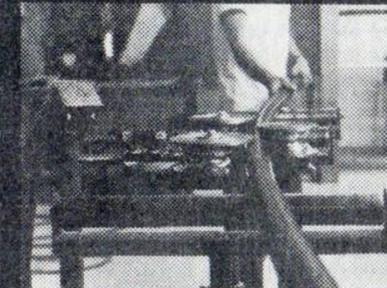
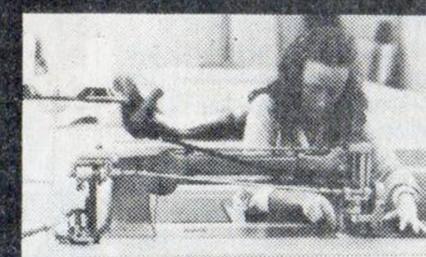
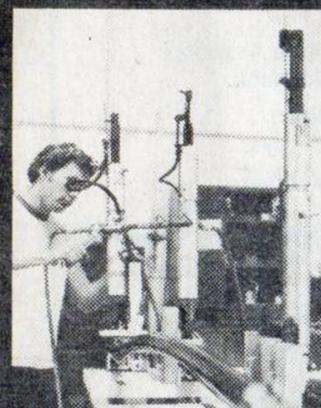
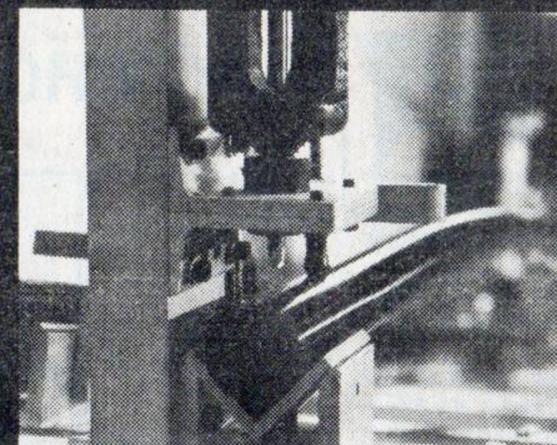
light blue, dark blue, dark green, lime, yellow, gold, orange, red, purple, brown, black, white

For the Dealer in your area

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## Announcing SEAGULL'S expansion . . . dedicated to quality and better service.



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Designed and manufactured, at great cost by SEAGULL, produces the semi-cylindrical curved leading edge.

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# PUBLISHER'S COLUMN:



Dan Johnson

On the eve of our First Anniversary Issue, we have assembled our best contribution to date. This March-April **Whole Air Catalog** culminates our first year of publishing.

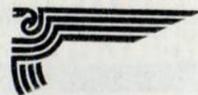
We begin with our popular columns, including the now famous, and widely read, "Hang Gliding Statistics." This edition we present a new survey into back-up 'chutes. Also appearing in this longest yet **WAC** (40 pages) are two other frequently requested columns, the "Consumer Action Line" and the "Used Glider Bluebook."

Pages 14 and 15 carry a special art pictorial by Chattanooga pilot-artist, Don Baker. It's the first of a series called "Past thru Tomorrow." Baker created the cover art for the very first **WAC**. Following that is our central feature, written by **Hang Gliding's** Eastern Editor, Paul Burns. We believe you will all be held by Burns' inspiring story entitled, "The Comeback." The article relates the struggles of a very determined hang glider pilot. Burns uses his unique style to create a very real and moving account.

The new feature material goes on strong with Hank Syjut's easily read technical investigation into solar/wind powered Ultralights. Syjut is known to those aware of hang glider art — he did the last **WAC** cover — and provides his own creative illustration (see page 32). Another of our columns, the "Crystal Corner," has two parts this issue. Writer Michael Smith first reports on Crystal's parachute seminar, held in early March, then offers some sensible thoughts on hang glider aerobatics.

You will find even more content, as we introduce a new column. On page 38, "Product Lines" reviews industry news in a simple, relaxed style reminiscent of Bill Allen's very successful "Flying Bull" column (**Hang Gliding**). Included in "Product Lines," we have highlighted some upcoming events that we believe will be of great interest to many pilots who are planning flying trips.

All in all, we are pleased with this issue as a pilot hooked in a big thermal. We hope you are also, and by the time you close the rear cover, we hope you will scan what's coming next with pre-launch anticipation.



## WHOLE AIR CATALOG

*Publisher: Idea Graphics*  
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Volume 2, Number 2, 1979

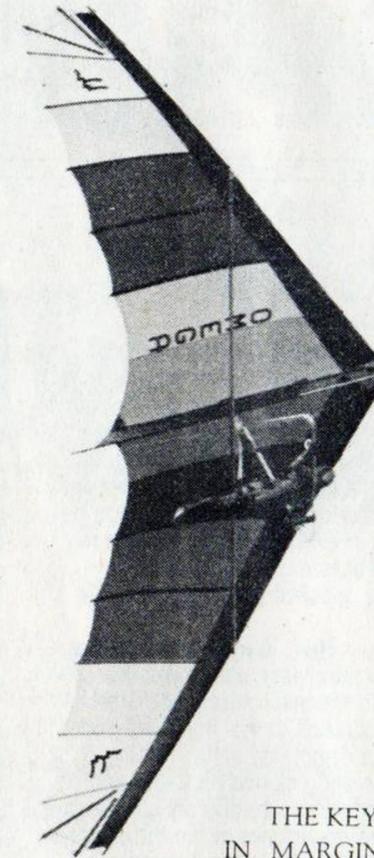
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Used Glider Bluebook .....	8
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## INTRODUCING THE WILLS WING OMEGA

THE "SUPER FLOATER" WITH MORE SPAN, MORE AREA,  
MORE SPEED, MORE PERFORMANCE  
AND MORE STANDARD FEATURES



### STANDARD FEATURES

APPLIED LEADING EDGES  
DELUXE TWIST - FASTENER BAG  
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QUICK BREAKDOWN FRAME  
CUSTOM SAIL COLORS  
ALL CABLES COATED  
QUICK DEPLOY TRIPLE DEFLEXORS  
VELCRO BATTEN RETAINERS  
VELCRO SAIL TIES  
WASHOUT CONTROL TIPS  
COMPREHENSIVE FACTORY FLIGHT  
TEST

### SPECIFICATIONS

	260	220	180
Span	40.5'	38'	35.5'
Area	260 ft. <sup>2</sup>	220 ft. <sup>2</sup>	180 ft. <sup>2</sup>
Aspect Ratio	6.3	6.6	7.0
Nose Angle	120°	120°	120°
Pilot (Flying)	200-	165-	130-
Weight	265	220	175

THE KEY TO GOOD SINK RATE PERFORMANCE IN MARGINAL LIFT IS LIGHT WINGLOADING, LARGE WINGSPAN, AND QUICK CONTROL RESPONSE. FOR YEARS **WILLS WING** HAS SPECIALIZED IN DESIGNING LARGE GLIDERS WITH EXCEPTIONALLY QUICK AND DEPENDABLE HANDLING. IN 1976, WHEN A MAJOR MANUFACTURER WAS ADVERTISING THAT THE MAXIMUM WINGSPAN FOR A FLEX-WING WAS 31 FEET, **WILLS WING** WAS FLYING A GLIDER WITH A 37 FOOT SPAN! IN 1977, WHEN OTHER MANUFACTURERS WERE PUSHING SMALL GLIDERS AS THE KEY TO RESPONSIVE HANDLING, **WILLS WING** WAS CERTIFYING A DESIGN WITH 265 SQUARE FEET OF AREA WHICH COULD BE EFFICIENTLY THERMALED BY A 145 POUND PILOT! IF YOU'RE LOOKING FOR A GLIDER THAT'S OPTIMIZED FOR MARGINAL LIFT, HOOK INTO A **WILLS WING OMEGA**. IT WON'T LET YOU DOWN.

**WILLS WING, INC.**

PHOTO BY STEVE PEARSON

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# CONSUMER ACTION LINE

March 20, 1979

Dear Whole Air Catalog:

Your Jan./Feb. 1979 issue of W.A.C. described a Consumer Action Line, "a service which (seeks) to aid consumers in their purchase difficulties." Truly an idea that has come of age. Seagull Aircraft, Inc. will happily assist you in any capacity necessary to make your Consumer Action Line responsive to the customer.

Should future inquiries turn up problems

or questions, for some reason unresolved through normal channels, please contact us directly and we shall focus our attention on the difficulty.

Again, your concept is worthy and deserving of support. Best of luck to you in this enterprise.

Cordially,  
(Signed)  
Mark Schwinge

SEAGULL AIRCRAFT

The above letter was printed to show how our Action Line will begin to do some good for the consumer. If all reputable companies can feel as Seagull does, a great many hassles may be cleared up to the relief of both buyer and seller. Thanks to Mark and Seagull for their "vote of confidence."

This second version of the "Action Line" continues the advice to potential motorized customers. This aspect of our sport, while rather different, is obviously of interest to many pilots, especially as on-going development refines the product. Hang gliding has matured a lot as its first decade nears the end. This helps us to have the perspective needed to reduce problems in the newer motorized segment. To help us in advising the would-be customer, we asked CGS Aviation to lend informed input. The Slusarczyks were very willing and provided us with several 'Consumer Watch-Outs.'

**Manufacturer/Dealer** — Do a little checking into the background of the supplier with whom you are considering a purchase. Do they have training and/or experience in the areas concerned? Check their length of time in business; this can be important if a new purchase develops problems later on. Determine if promises made will be honored. How? Ask for a list of customers previously sold. Try to speak to those you trust, or know personally. You might speak with companies who deal with your chosen supplier. Those who sell components, raw materials, firms using the powerpack on their designs, even those selling your supplier advertising, or other services, will have feelings about the manufacturers competence and honesty.

**Service** — Just like with your auto, your motorglider may need service that you are not qualified to handle. Is your supplier qualified? Is the service available full-time, or will it be if and when a break happens in new unit production? If they offer no service, how can you be certain if they even checked your new purchase before they shipped it? It should be checked for thrust and RPM outputs.

**Design** — Here is a demanding area for a new purchaser, unless you are really into the mechanical end. Start with the aircraft design if you are considering a completed unit. Pitching pressures and positiveness, with and without power-on are primary considerations. The importance of the thrustline and thrust direction cannot be overstressed. CGS feels, "Many designs have the thrust too high, and no (thrust) angle is set in. This can result in a dangerous power-on stall situation where the glider can actually be held in a dive after the stall." CGS can advise on specific angles for some designs. On other ultralights, generally speaking, due to the fact that the pilots are heavier than the aircraft and create as much drag, the thrust line should be closer to the pilot, not the wing. CGS Aviation goes on to say, "On flex-wings, (we) have no comment because, up until now, we feel the power unit designs for flex-wings (that are currently on the market) are not inherently safe (due to) high thrust lines, paths of prop blades (which are) in line with pilot's head, low power output, etc."

**Props** — "Consumers should stick with wood props," claims CGS Aviation. Wood is reliable, and has a solid history. Wood does not fatigue. Should you break a wood prop, it splinters, and splinters lose their destruction energy quickly. Metal, composite, fiberglass, and Kevlar can all be used for propeller material, but should then have extensive fatigue tests to establish their life expectancy, durability, and general safety. Quality control must also be much higher for these non-wood materials.

**Landing Gear** — In the Jan./Feb. WAC, we reported that nearly all powered sales use a landing gear system. CGS warns, "... landing gear design can actually damage the airframe, if improper." Easy Riser gear should not be attached to the hang tubes, as this type of design can place high loads on the trailing edge, causing fatigue. If you are planning on a wheeled under carriage, it might as well be steerable.

As you can see, much more than non-powered hang gliding experience is involved. The "Action Line" does not wish to become a technical motor column, but, rather, feels a word to the wise could be helpful to the new consumer. Seek out a knowledgeable firm, like CGS, or others. Then remember, **BUYER BEWARE.**

What is ahead for motorized? The Slusarczyks predict you will see more power added, from larger engines on better designs. "Improved power output will result in a better rate of climb, better reliability, and lower fuel consumption," says CGS. Their letters also end with "More Power to You." This could be a statement of the future for Ultralight Aircrafts.

# IF YOU'VE GOT THRUST,



## PROVE IT!

And that's what we did at the EAA Sun-N-Fun Fly-In in Florida. We hooked our newest design reduction drive power unit to a thrust gauge and showed everyone that we are getting a solid 90 to 95 lbs. thrust.

## 95 lbs. THRUST

With thrust like that behind you, there's no question about taking off! Our Mo-Glider power pack is completely thrustworthy... and we're the only ones to prove it publicly. Being the originators of the reduction drive system for hang gliders has given us a slight advantage. We've had time to develop powered hang flight to its fullest.



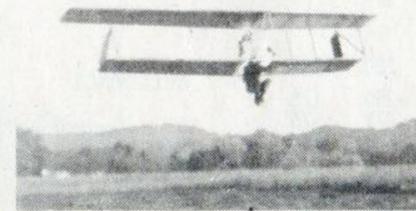
**CGSAVIATION**

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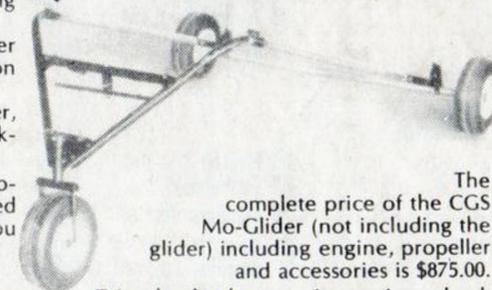
Consider this when looking at power systems:

- West Bend Engines (Mac 101 conversion available)
- Large Diameter 42" Prop
- Muffler as standard equipment
- No wing amplification of sound
- Faster takeoffs and climb rate due to more efficient, large, slower turning prop
- Four bolt mounting with eight rubber mounts to isolate engine vibration from airframe
- Mounting systems for Easy Riser, Mitchell Wing, Icarus V, and Quick-silver

That and a lot more makes the CGS-Mo-Glider power pack the engine you need to get you into the air fast and keep you there.



Our new design in tricycle landing gear has made take offs and landings a lot nicer. With the steerable nose wheel, you can taxi to takeoff and land on all three, or you can be a purist and use your feet. Either way, you can count on the CGS Mo-Glider power pack to get you up and back with the greatest of ease.



The complete price of the CGS Mo-Glider (not including the glider) including engine, propeller and accessories is \$875.00.

Tricycle land gear is torsion shock absorbing which means no need for external bracing cables. Has been drop tested to 4 G's; truly aircraft design. Complete with steerable nose wheel... \$190.00.

CGS Power Flight Harness \$65.00.

For further details, send \$4 for a complete information package and find out how easy it can be to get into the air with Chuck's Glider Supplies.

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# USED GLIDER BLUEBOOK

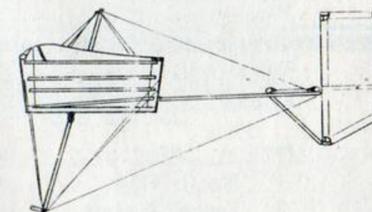
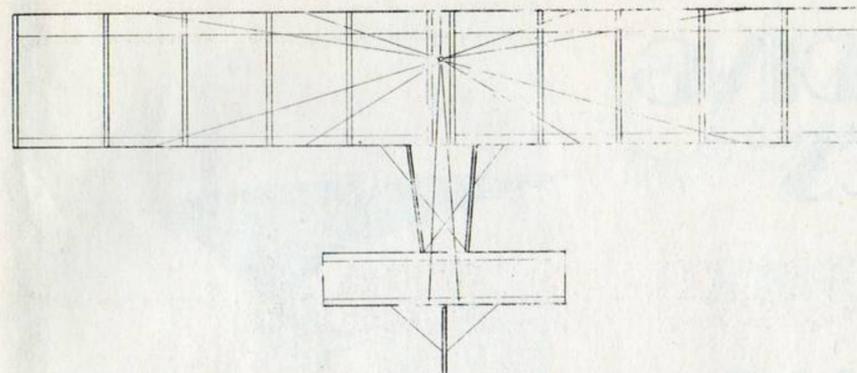
EDITION NO. 6

**CONSUMER NOTE:** The prices we present are not the last word in used glider value. Each craft must be closely inspected, and evaluated on its own merits. A dealer can very likely help you a lot, but, of course, some fee is then deserved, or a commission in the case of a dealer sale.

In these days of prices continually increased by the pressure of inflation, used gliders may hold great opportunity for savings. Used gliders can be examined in the air and on the ground. If they are good, it's relatively easy to see. If not, you can save your money. Student pilots may also find good use from a used glider. But care is recommended. The market is still buyer beware.

MANUFACTURER	YEAR	MODEL	SIZE	CLEAN PRICE	AVG. PRICE
<b>ALBATROSS SAIL GLIDERS</b>					
	76	ASG 20	C	550	300
	76	ASG-21	C	575	400
<b>BENNETT DELTA WING</b>					
	76	Phoenix 6B	Jr.	425	350
	76	Phoenix 6B	Reg.	425	400
	76	Phoenix 8	Reg.	450	450
	77	Phoenix 6C	Sr.	400	425
	77	Phoenix 6C	Reg.	500	425
	77	Phoenix 8	Reg.	550	375
	78	Phoenix 8 Super	Reg.	675	450
<b>CGS AIRCRAFT</b>					
	76	Falcon V	225	550	450
	76	Falcon V	185	575	400
	77	Falcon V	185	650	500
<b>EIPPER FORMANCE</b>					
	75	Flexi II	240	400	200
	75	Cumulus V	180	500	325
	76	Cumulus VB	180	450	375
	77	Flexi III	185	675	500
	77	Cumulus 10	Med.	595	525
	78	Flexi III	Lg.	700	550
<b>ELECTRA FLYER</b>					
	75	Pathfinder	20-18	200	150
	76	Nimbus	20-17	250	175
	76	Cirrus	3	475	375
	76	Cirrus	2	500	375
	77	Cirrus	3	450	350
	77	Cirrus	2	450	300
	77	Olympus	160	575	525
	78	Cirrus 5	C	675	600
	78	Cirrus 5	A	675	600

MANUFACTURER	YEAR	MODEL	SIZE	CLEAN PRICE	AVG. PRICE
<b>MANTA PRODUCTS</b>					
	77	Mirage	175	700	550
<b>MOYES DELTA WING</b>					
	76	Mini	180	525	400
	76	Midi	220	700	600
	76	Maxi I	200	750	600
	77	Maxi I	200	800	725
<b>SEAGULL AIRCRAFT</b>					
	75	Seagull III	220	325	250
	76	Seagull III	220	350	275
	76	Seagull VII	174	500	350
	77	Seahawk	170	700	550
	77	Seahawk	190	725	600
	77	10.5 Meter	—	950	850
	78	Seahawk	190	800	550
	78	10 Meter	—	1100	950
<b>SKY SPORTS</b>					
	76	Bobcat II	204	450	250
	76	Kestrel A	185	450	350
	76	Kestrel A	220	525	475
	76	Merlin	160	500	375
	77	Bobcat III	Lg.	775	600
	77	Sirocco I	156	775	500
	77	Sirocco I	175	700	525
	78	Osprey	175	875	775
<b>ULTRALIGHT FLYING MACHINES</b>					
	76	Easy Riser	Compl.	1125	850
<b>ULTRALITE PRODUCTS</b>					
	76	Dragonfly Mk. II	174	575	375
	77	Firefly	174	650	500
	77	Dragonfly Mk. II	196	700	550
	78	Spyder	176	850	675
<b>WILLS WINGS</b>					
	75	Swallowtail	22-20	200	175
	76	SST	90	600	400
	76	SST	100A	625	450
	76	SST	100B	600	475
	77	X-C	185	800	650
	78	Alpha	185	975	775
	78	Alpha	215	1000	800
	78	X-C	215	1025	800



The Eipper 'Quick,' in production since 1972, is still a sought-after glider. Safe, and proven safe.

Expensive? Only \$975.00 for colored sail kit.

Now preferred by many leading power manufacturers like CGS, Lone Star, and Rotec.

Easiest to learn to fly motorized because of slow take-off speeds. Plus, simplicity of repair.

## QUICKSILVER

# Eipper

## FORMANCE

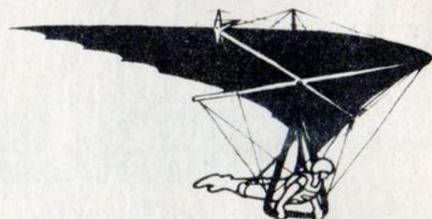
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San Marcos, CA 92069



Circle #5 on reader service card.

# HANG GLIDING STATISTICS

By Dan Johnson



In the January-February 1979 **Whole Air Catalog**, we surveyed for favorite articles. You readers chose the Statistics column in heavy voting. We are exceedingly pleased that you so enjoyed this regular department of **WAC**. Actually, all the articles in our Number Five issue got excellent response. The order ran thusly;

- 1 — Hang Gliding Statistics
- 2 — Dick Heckman Interview
- 3 — Consumer Action Line
- 4 — Crystal Corner
- 5 — Used Glider Bluebook
- 6 — USHGA Director List

One reader told us he turns immediately to the Statistics column as soon as his issue arrives. He wants to see which manufacturer is winning the brand popularity race. Since we have gotten several such comments, we will launch into this Fifth Edition with the Brand Market Survey. As in the January-February **WAC**, we are presenting the issue results and the cumulative results. The issue survey is a sampling over a two month span, and thereby, is more subject to fluctuation. On the other hand, the cumulative survey becomes more inelastic with longer survey periods. It also becomes more accurate and statistically reliable. This additionally means that it is harder for new entrants to make it on the list. We use only those companies which garner two percent or more of the market. Get your last **WAC** to notice that we added Moyes to the list this time. Probably this success is due to the United States Manufacturing by US Moyes in Michigan, for Moyes is the only foreign name even close to earning a berth. One final observation illustrates a drop in percentage of the market held by all other brands. While this is not surprising — we know the smaller firms drop off as the market develops — still we note that this share has declined a significant ten percent in just ten months of consistent surveying.

## BRAND MARKET SURVEY Jan/Feb WAC

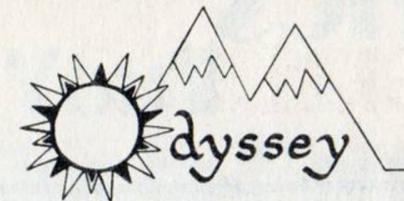
Rank	MFR	% Share	Last Rank
1	Electra Flyer	18.0	2
2	Seagull Aircraft	13.5	1
3	Wills Wings	12.0	3
4	Bennett Delta Wing	10.0	4
5	Sky Sports	8.5	5
6	Eipper Formance	6.0	6
7	Ultralite Products	4.0	6
	Ultralight Flying Machines	4.0	9
9	Moyes Delta Wing	3.5	11
10	CGS Aircraft	2.0	10
	Manta Products	2.0	8

Other brands less than 2% Market Share

## BRAND MARKET SURVEY Cumulative Results

Rank	MFR	Last % Share	Now % Share
1	Electra	15.2	15.9
2	Seagull	12.0	12.4
3	Wills	10.3	10.8
4	Bennett	8.3	8.8
5	Eipper	8.3	7.8
	Sky Sports	7.5	7.8
7	UP	3.8	3.9
8	UFM	3.5	3.6
9	CGS	3.3	3.0
10	Manta	3.0	2.8
11	Moyes	—	2.1
	All other brands	24.8	21.3

Most shifting in the steadier cumulative results occurred in the lower portion. The big got bigger with Eipper being the only "major" that lost ground. Eipper's sales were concentrated by the Quicksilver toward the end of last year. Pressure from motorizers raised production of this seven year old design. Motor pilots are not significant **WAC** Inquiry Card users which likely explains the Eipper drop. The movements were all small, showing the dampened response of the long time polling, except for the "all other brand" group. As we said, it has declined with great briskness as this figure was 31.5 percent after our first survey last July-August.



P.O. Box 60  
Wilton, N.H. 03086  
Tel. 603-654-6155

# HANG GLIDING PARACHUTES

??? THE BEST ???

## DESIGN

### CANOPY

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Reinforcement Bands At Canopy Skirt & Apex-Vent

## MATERIALS

### EXCEPTIONAL

All materials meet military specifications & in most instances, exceed them. They are all of high strength/low weight ratio. The canopy fabric is the tightest rip-stop weave available & has *ZERO porosity*, which makes the filling time the fastest possible. It is technically designed for parachutes of this caliber & contains the highest thread count & soft hand, thus allowing for a smaller packed container. The bridle is tested to exceed 4,000 lbs. tensile & the canopy lines are tested to exceed 425 lbs. tensile (per line).

RETAIL PRICES: 24 FOOT — \$325.00      26 FOOT — \$349.00

## ODYSSEY PROVEN

### ATTESTATION

Bob Gester — Reno, Nevada

"The Odyssey reserve functioned perfectly to such an extent that I was able to do a Stand-Up Landing."

Brad Kogi — San Diego, California

"I pulled my Odyssey reserve chute at about 190 feet and I had about a five second descent. I'm glad I had it."

??? THE BEST ???

Is it any wonder that throughout the World,  
ODYSSEY Flies with Hundreds of PILOTS?

# STATISTICS

Cont'd from page 10

While we are concerning ourselves with brands, it is timely to present our first survey into Back-Up Parachute Manufacturers. But before we list the results, we wish to report a favorable change discovered in this topic survey. The number of 'chute owners has gone from 35.5% to 47% since our poll of November/December '79. For the fifty-three percent of you still not flying with a 'chute, we present the Crystal Corner with continued commentary strongly encouraging chute ownership. Now the table of results:

## CHUTE BRAND SURVEY

Rank	MFR	% Share
1	Bennett	36.1
2	Advanced Air Sports	26.6
3	Windhaven	24.5
4	Odyssey	10.6
	All others	2.2

As we once gave warnings about our early Glider Brand Surveys, we caution you to not place undue faith in these figures. They are not cumulative, and thus will fluctuate as more pilots are included. No other brands had voting exceeding one percent. Time will probably change these totals, and we will poll again. Meanwhile the company that introduced the first commercial system maintains a healthy lead.

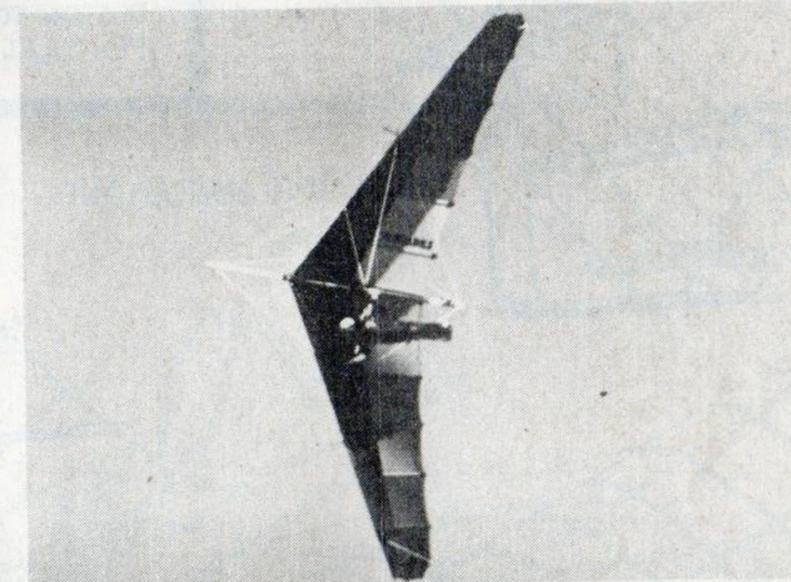
## MOST POPULAR MODEL

We now have cumulative figures for this topic, we survey for the second time. Notice the shifting, as we mentioned will happen to 'chutes later on.

Rank	From WAC No. 5	Cumulative
1	Electra Olympus	Seahawk
2	Wills SST	Olympus
3	Seagull 10 Meter	SST
4	Seagull Seahawk	10 Meter
	Electra Cirrus 2 & 3	Cirrus 2 & 3
6	Wills Alpha	Cirrus 5
7	Sky Sports Sirocco	Alpha
	Bennett Phoenix 8	Phoenix 8
	Electra Cirrus 5	Sirocco
10	UFM Easy Riser	Easy Riser

The cumulative results being more reliable, let us make a point or two. It is most significant to note appearance in the top ten of the SST, Cirrus 2 & 3, and Phoenix 8. They are relatively older designs — matter of fact age is in the order just written — and if they are still so prolific, they must have enjoyed two qualities. First, many sales must have been made. Secondly, they probably have good safety, performance, and handling records for so many to be airborne.

# One Day... You'll Discover Eipper-Formance



## ANTARES

The Antares, the newest Eipper-Formance model, represents a truly radical departure from conventional hang glider design. The most striking feature, of course, is that there is no crossbar. Instead, the leading edges are held rigidly in place by a bowsprit or extended keel in front of the nose plates.

# Eipper

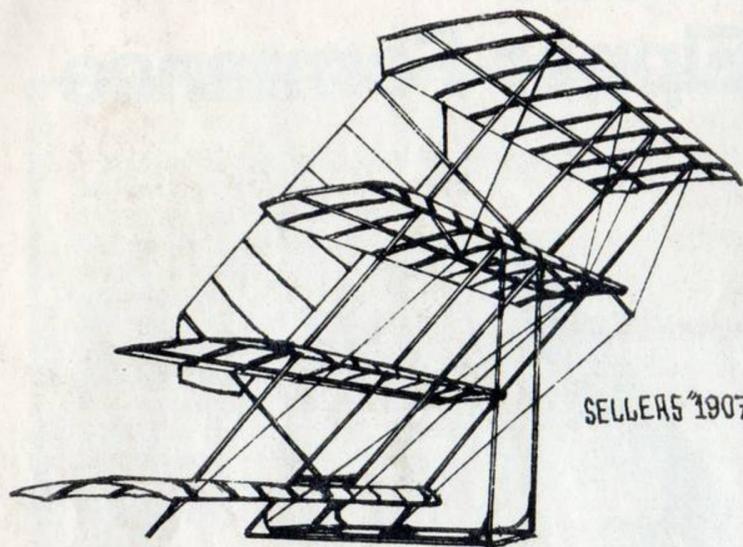
EPPER-FORMANCE

1070 Linda Vista Drive  
San Marcos, CA 92069

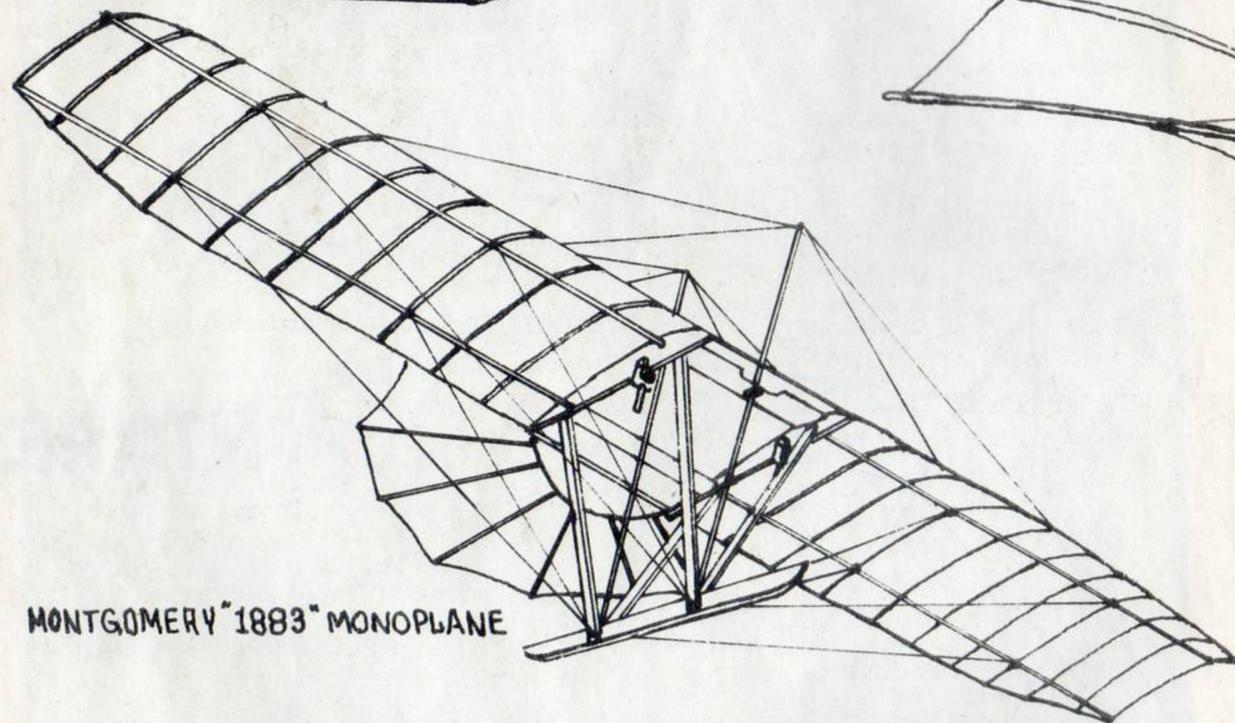
### Specifications

	18 ft (5.5 m)	19 ft (5.8 m)	20 ft (6.1 m)
Leading Edge	155 sq ft (14.4 m <sup>2</sup> )	172 sq ft (16 m <sup>2</sup> )	190 sq ft (20.5 m <sup>2</sup> )
Wing Area	33.5 ft (10.2 m)	35.35 ft (10.8 m)	37.2 ft (11.3 m)
Wing Span	7.25	7.25	7.25
Aspect Ratio	130°	130°	130°
Nose Angle	7 ft (2.1 m)	7.5 ft (2.3 m)	8 ft (2.4 m)
Root Chord	53 lbs (24 kg)	55 lbs (24.9 kg)	57 lbs (25.8 kg)
Empty Weight	130-165 lbs (59-75 kg)	150-185 lbs (68-84 kg)	170-210 lbs (77-95 kg)
Pilot Wt Range (Est)	.25°	.25°	.25°
Billow			

Circle #7 on reader service card.



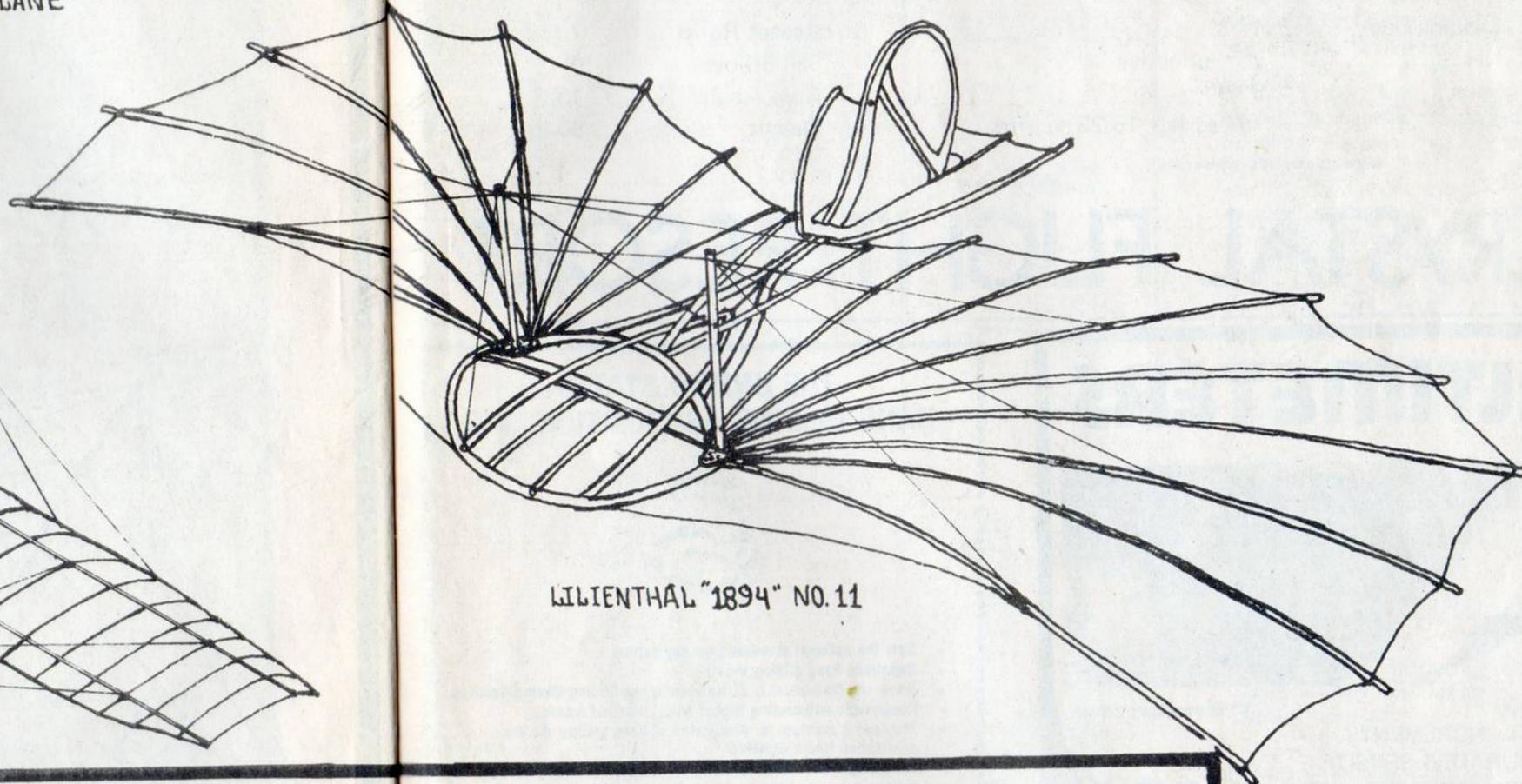
SELLERS "1907" QUADPLANE



MONTGOMERY "1883" MONOPLANE

MATTHEW SELLERS  
(1869 - 1932)  
A QUADWING FOOT  
LAUNCH RIGID WING. THE  
WINGS WERE STAGGERED  
AT 45° TO EACH OTHER.  
NOTE THE FIXED ANGLE OF  
ATTACK INCREASES FROM  
BOTTOM TO TOP - VERTICAL  
FIN IS FIXED.

ARTIST'S NOTES:  
THIS ISSUE BEGINS A SERIES OF PICTORIAL ART-  
ICLES ON THE HISTORY OF ULTRALIGHT FLYING.  
AS I FIND PHOTOS, PLANS, ETC. OF ULTRALIGHTS  
I WILL ATTEMPT TO RECREATE THEM AND PUB-  
LISH THEM IN THE W.A.C. SOME ISSUES WILL FEAT-  
URE SEVERAL MACHINES, OTHERS WILL DEAL WITH  
ONLY ONE BUT IN GREATER DETAIL. THEY WON'T  
HAVE ANY SET ORDER OR FORMAT FROM ISSUE TO  
ISSUE. LET US KNOW IF YOU ENJOY IT.



LILIENTHAL "1894" NO. 11

JOHN MONTGOMERY  
( ? - 1911)  
A MONOPLANE FOOT  
LAUNCH RIGID WING. IT  
HAD A 23 FT. WING SPAN,  
4 1/2 FT. CHORD AND WEIGH-  
ED 40 LBS. ON AUG. 28, 1883  
MR. MONTGOMERY CLAIMS  
TO HAVE FLOWN OVER 600 FT.  
IN THIS GLIDER.

NEXT - ISSUE  
A LOOK AT OUR  
FUTURE - 2000  
AND BEYOND.

OTTO LILIENTHAL  
(1848 - 1896)  
13 SQ. M. FLEXIBLE FOOT  
LAUNCH MONOWING. IT  
WEIGHED 44 LBS. AND  
FOLDED INTO A 4 FT. WIDE  
CONTAINER. LILIENTHAL  
MADE HUNDREDS OF  
FLIGHTS IN THIS GLIDER  
OF OVER A 1/4 MILE.

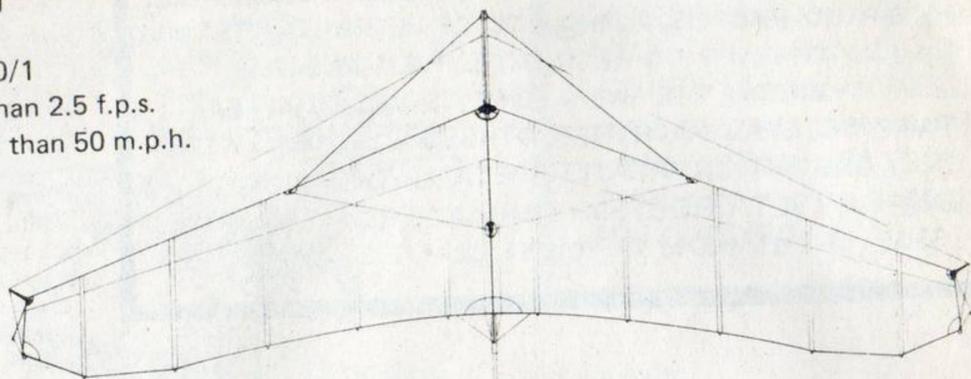
DWB.

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THRU  
TOMORROW**

# » 2 IN STOCK

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 Max. Speed better than 50 m.p.h.

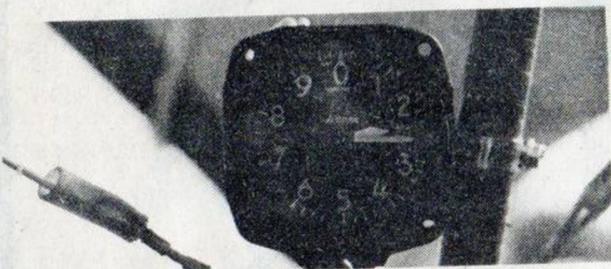


Leading Edge	17'3"	Aspect Ratio	7.
Keel	7'7" effective	Sail Billow	0°
Span	32'3"	Nose Angle	138°
Area	164 sq.ft.	Weight	50 lbs.

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(Special Australian Sail)		
Electra Flyer Floater (205)	.....	1,250 (N)
Various School Trainers	.....	250.00/up

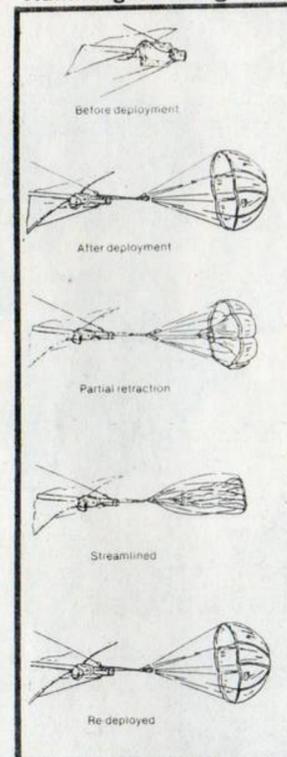
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# THE COMEBACK

"Chris (center) with brother, Dave, and canine friend, Ralph, at Lookout Mountain."

By Paul Burns

Possibly the most difficult accomplishment for an individual in the world of sport, is returning to a given activity after sustaining a serious injury. Those victimized by an injury must first overcome the physical handicap; an undertaking requiring a great deal of patience. Secondly, upon regaining physical health, one's confidence must be restored. Only when a person regains confidence, can he/she again actively participate in an aggressive manner.

In some cases, an individual's love for a potentially dangerous activity is an overpowering motivation toward resuming active participation. A couple of examples might be O. J. Simpson from Pro football, and Niki Lauda from Gran Prix racing. Courage and confidence are qualities shared by these greats, and a Hang Glider pilot named Chris Starbuck.

During the spring of 1973 Chris became interested in Hang Gliding. Strong curiosity prompted Chris' attendance at the "Tactile Flight Meet," Nags Head N.C., where he met such notables as Chuck Slusarczyk, Tom Peghiny, and Vic Powell.



Soon after the North Carolina meet Chris started construction of a bamboo glider, to the dimensions published in *Low and Slow* magazine. The designer, Dave Kilborne was one of the first to incorporate the modern style trapeze control bar. Starbuck used this feature on his bamboo strut braced machine.

A bamboo glider, as the name suggests, is constructed using a bamboo frame, covered with polyethylene plastic sail, rolled and taped to the frame. From this description it's not hard to understand the "Bomber" is rather primitive by today's standards. Times being what they were; 1973 in Pennsylvania, Chris concluded

the bamboo glider was adequate. Hang Gliding was becoming popular on the west coast, but in the east things were different. Pilots were few and far between, and there were no instructors!

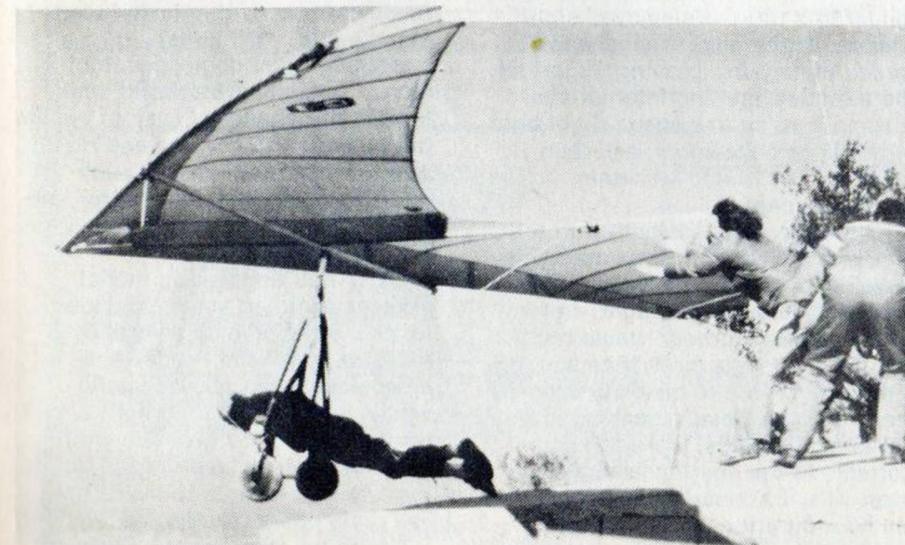
With help from Tom Peghiny, Chris enjoyed his first few attempts at foot launched flight in the Boston area. Soon Starbuck returned to the gentle sand dunes of Nags Head and began to teach himself to fly. After sitting out the long Pennsylvania winter, the fledgling returned to North Carolina and resumed his self-teaching program. Summer of '74 was to be Starbuck's "Golden Age of Flight." The season was spent traveling between flying

sites, and competition meets. In May, Chris flew in the Sundown, Connecticut meet. Flying from the 600' ski hill, along with the "Zephyr Team" flyers.

June of that year found Starbuck back in North Carolina again for the "Tactile Meet." In attendance this particular year were Pete and Hall Brock, Dave Muehl and Jack Schroeder. Chris joined the caravan from Nags Head to the Frankfort, Michigan meet, via Chuck Slusarczyk's home in Cleveland. Enroute, with Pete Brock at the controls, Chris' Corvair van threw an untimely rod. Transportation for



"Preparing for launch into soarable air, Chris (upper right) takes a harness check, and observes the wind indicators. (Second photo) On days with strong lift, a three or four man wire crew is recommended, to protect against upset from bluff rotor. Here, though, the back man is friend Chris Smith, getting set for a keel assist. (Last photo) It's a perfect launch, as depicted in this action shot by Doug Barnette, with Smith giving the initial energy needed by Starbuck. Once in the air, however, Chris is master of his own ship; the elements are his ally."



the remainder of the trip was supplied by Dave Muehl for Chris and the "Bomber."

Back to Pennsylvania with the Zephyr team in Captain Eddie's Winnebago, only to discover the "Bomber" had gone to Connecticut on another vehicle, ho-hum. During this layover the disabled van was torn down by the owner and new parts ordered. Chris then hitchhiked to Sugarloaf, Maine for the next meet of the season.

Arriving on time, they discovered the "Zephyr Team" had neglected to bring the "Bomber" for Chris. Reduced to a spectator for the meet, he was exposed to mountain flying for the first time. Watching take-offs from upon the 2600'

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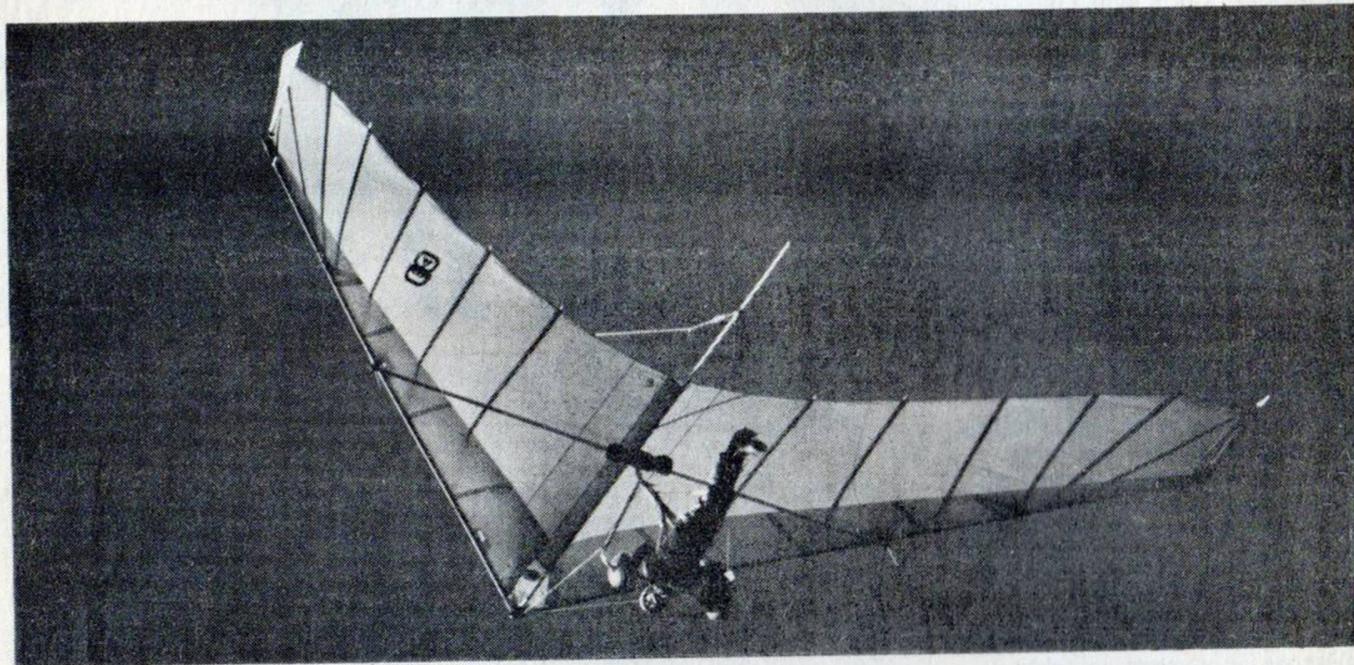
## THE COMEBACK

launch in mellow conditions Starbuck remarked, "This looks like a piece of cake to me, I'm gonna fly this place." Sometime later he was to learn that mountain flying is not always mellow.

After a quick trip to Oshkosh, Wisconsin for the annual E.A.A.

It was probably tailing about 5 m.p.h." In retrospect Starbuck analyzed, "I guess we were in a wind shadow at launch." The flight was much more turbulent than had been anticipated, as Chris and the "Bomber" were tossed like a leaf in the sky. "We didn't know a

entire 3 miles down the ridge and back, and learned to land on top. The culmination of this 10 day period was a flight of 3:50 duration, a futile effort by Chris to establish a new eastern U.S. duration record. The record holder at that time was Lee Keeler who soared 4:10 over



Fly-In, Starbuck returned to Pennsylvania and completed repairs on the old van. A shakedown run to western Massachusetts where an acquaintance from Sugarloaf, Brooks Ellison, was contacted. It was at Mt. Graylock that Starbuck enjoyed his first mountain flight on a clear windless morning at 9:00 a.m.

Continuing north to the Conway, New Hampshire area Chris phoned Don McCabe to inquire about local flying sites. Don's reply, "Sure Chris, I'm flying Mt. Washington tomorrow. Would you like to come along?" In reply Chris said, "Don I don't think you remember me, I'm the guy with the bamboo glider!" With this clarification recognized, McCabe indicated the invitation was still open.

The bamboo glider and pilot completed several flights from Mt. Washington. Launching flights from atop the 3000' vertical drop, Starbuck attained in excess of 1000' ground clearance. Remembering his third flight, a case of beginners bad judgment came to mind. "It was crystal clear with no wind whatever at take-off (which is 200' below the top of the mountain.)

thermal from a tadpole back then," laughed Starbuck. "Boy was I glad to get down." After a safe landing, Chris vowed to examine the conditions more closely in the future, exercising greater restraint in judging conditions — he was learning.

After a long absence Chris returned to Sugarloaf, with his glider this time. He enjoyed eight flights off the huge "loaf shaped" green mountain. Leaving Sugarloaf, he attended the 2nd International Symposium on low speed flight, held at M.I.T. in September, and then attended the Magic Mountain, Vermont meet.

Old Cape Cod is beautiful in the fall, and it was here Chris made his breakthrough into the realm of sustained foot launched flight. In two short weeks Starbuck would multiply his total time aloft, time and time again. Due to his early experience at Nags Head, launching into 20-25 m.p.h winds, Chris felt comfortable in the soaring launch situation. His first soaring flight was of an hour duration, accomplished easily in a glass smooth sea breeze. Soon Starbuck was flying the

Mt. Washington. Starbuck landed due to darkness and increasing winds.

Accomplishing mountain and long soaring flights certainly qualified Starbuck as somewhat of an expert, on his version of the Bamboo Bomber." Chris says "The Bomber was a good handling machine," keep in mind continual changes and modifications to the design were being made. "If I noticed the sail stretching I just doglegged it a bit more," explained Starbuck, who termed the changes "custom design through evolution!" The end result was a bamboo glider with such nicities as streamlined control bar uprights, and a cross spar faired in a lifting airfoil.

Chris has engaged in model airplane building since childhood. In 1961 after reading an article in *Aviation Week and Space Technology* magazine about Rogallo wings, he and his father built a small model. "It flew quite well," recalled Chris, who proposed building a full size glider to his father. The reply came bluntly, "no-way"! Not to be discouraged, Chris set out to build a wing which would

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## THE COMEBACK

not only be capable of carrying a man (himself) but also a 1954 Studebaker which he owned. Or, that's what the neighbors must have thought, anyway. Actually that old "Stude" may have been the first Hang Glider test vehicle. This glider contraption built of Polyethylene and 2x4's was held aloft by Chris, while his brother Dave drove it around the block. The end result was a horribly dented Studebaker roof and discontinuation of the project.

By fall 1974 Chris was ready to move up to one of those hot new Dacron and aluminum models. Chris acquired a Bobcat from Tom Peghiny and flew it for a couple of months, using the same seated position in which he flew the "Bomber."

The Sugarloaf meet was cancelled due to bad weather and Chris returned to Pennsylvania where he visited 650' Council Cup at Wapwallopen. The wind was blowing 25-30 m.p.h. as Chris and a group of Hang I pilots surveyed the conditions. Chris set-up and prepared to launch. "It took 6 people to hold the glider down," Chris recalls. On the first launch attempt, hesitation resulted in a stall and blow back situation, finalizing in a mild crash landing. No damage to either pilot or the machine. Another try — this time launch was successful and Chris turned away from the ridge, out of lift, and sunk to a landing in strong horizontal air. On the 3rd attempt Starbuck "skied-out to the amazement of all present and gained 600' above his launch point. This was the first time a soaring flight had been accomplished at this particular site overlooking the Susquehanna River; and possibly the first soaring flight ever in Pennsylvania.

Chris planned to build a prototype Hang Glider during the winter in Phoenix, Arizona. Upon his arrival in Phoenix connections were made with Mark Clarkson, who held the world altitude gain record of 5700 feet on a flight from Shaw Butte. Chris soared this site before becoming keenly interested in Tom Peghiny's new design, the Peregrine. This interest prompted a trip to Escape Country, Orange County, California for the 1974 National championships.

Arriving at Escape Country, Starbuck found bad weather and postponement of the competition. Chris took this opportunity to soar at

some of the nearby southern California flying sites; Pt. Fermin, Torrey Pines and Elsinore.

Back at Escape Country with pilots like Rick Finley, flying a prototype Windlord, and Roy Haggard, piloting the original Dragonfly. Tom Peghiny granted Chris' request to fly the Peregrine from the 130' Chandell Hill. The first flight was pretty much out of control Starbuck admits, but adds he realized the design produced a very flat glide.

The following day was the official start of competition. After Tom Peghiny pre-flighted his glider, Chris once again flew from the small hill. The ship was set-up for prone, and Chris used a seated harness which certainly caused some pitch trim problems. This flight ended in a tragic crash, as a glancing blow to the pilot's "tail bone" resulted in paralysis of the lower body. Starbuck's spinal cord was damaged at the T-12 vertebra.

**Dave vowed, "I'm personally going to put a prone harness on you, hook you in, and push you off the biggest damn mountain I can find!"**

A week after the accident Chris' mother and brother David came from Pennsylvania to California for a visit. Brother David was also a Hang Glider pilot and instructor. Days dragged by and Chris soon accepted the fact that he could be paralyzed for the remainder of his life; he slipped into a state of depression. David (his brother) helped Chris through this phase by reminding him that "Hang Gliders don't have rudder pedals." Even if Chris was to spend the rest of his days in a wheelchair he was going to fly again. Dave vowed, "I'm personally going to put a prone harness on you, hook you in, and push you off the biggest damn mountain I can find!" These statements kindled a spark within Chris, and provided the will to overcome his depression with a positive attitude.

After nearly a year of hospitalization, Chris was advised by doctors the paralysis would be permanent.

Released December '75, Chris remained in the Long Beach area, as an outpatient at the V.A. hospital, while he continued to piece his life back together.

In October '76 while visiting in Pennsylvania, Chris went with his brother to visit one of the local training hills. Dave helped Chris into a prone harness with knee hangers, and selected a Flexi II with training wheels already mounted. The idea Dave had in mind, was to keel launch Chris in the Flexi from the training hill, on the wheels. First attempts were not picture perfect, both pilot and launch crew polished their skills. "Soon," Chris says, "I was getting some pretty good flights." The spark becomes a fire!

After several good flights from the modest 60' elevation of David's training hill, Chris returned to California. The next flight in a Flexi II loaned by Dave Muehl took place at Pine Flats! Quite a progression, from a 60' training hill to a 3200' mountain! Chris handled the flight well; and the fire roared!

For Chris, returning to Hang Gliding; an activity which earlier inflicted such a serious injury (discontinuing the use of his legs for the remainder of his life) was difficult to say the least. Love of flight was the motivation which has returned Chris to an active life.

Unlike the "superstars" Niki Lauda and O. J. Simpson, who recovered from their physical handicaps, Starbuck lives with his. The strength of Chris' character is personified by his ability to overcome the limitations of his disability, and once more become an active participant in the activity which he loves, Hang Gliding.

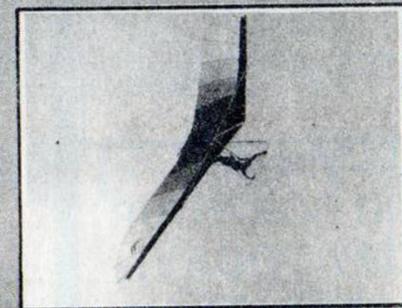
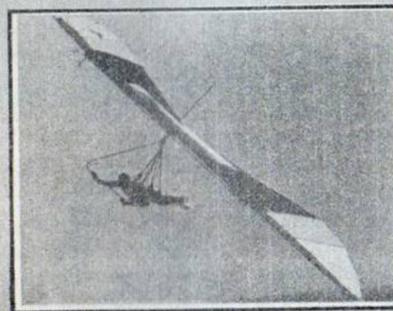
Residing in the Chattanooga, Tennessee area presently, Chris is again enjoying the eastern brand of soaring. Since his return to flying he has enjoyed several flights in excess of two hours, has logged 23 hours of air time and recently gained 3500' above take off at Lookout Mtn., Georgia.

Although he is hampered by obvious limitations of mobility on the ground, one enjoys a special kind of emotion watching Chris being shoved off a launch into soarable conditions. An immediate transformation occurs; from limited mobility, to total freedom. Once in the air, Starbuck moves with beauty and grace, with the sky for his playground.

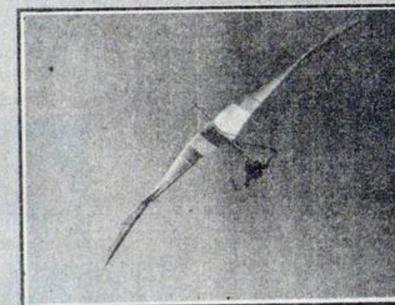


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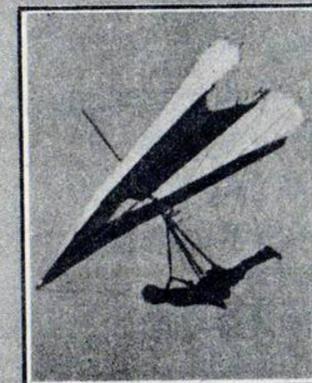
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PHOTOS BY STEPHEN McCARROLL



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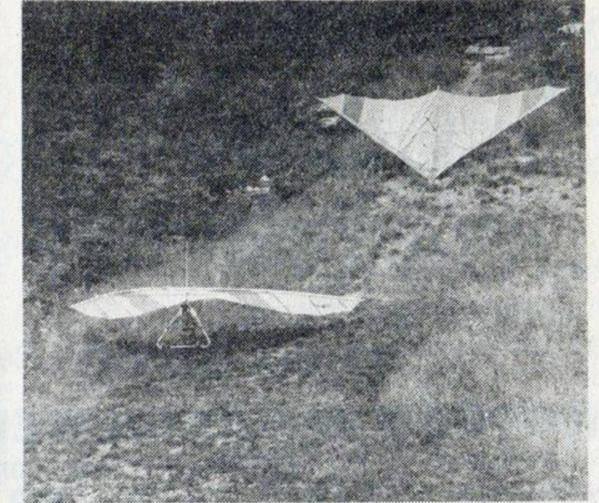
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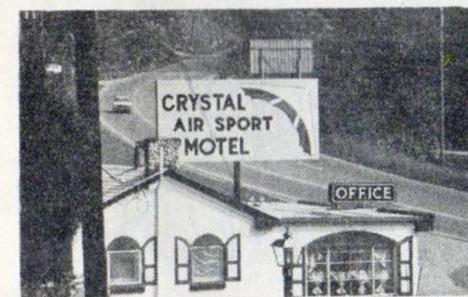
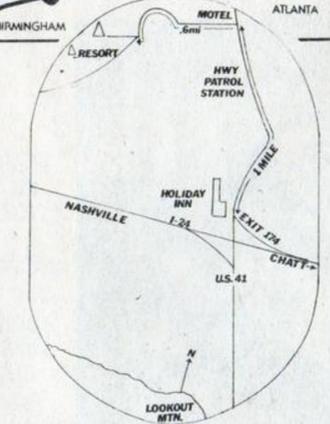
# CRYSTAL '79

FLY CHATTANOOGA, TENNESSEE



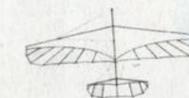
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The Flight Resort has '78 prices on lessons, repairs, and tram lift fees till May First.  
Both the Motel and Resort honor Mastercharge and Visa bankcards.

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Limited edition colour art prints as seen in *Glider Rider* by Albia Miller. Send \$10 apiece and \$2.50 mailing cost. Make checks or money orders payable to: Albia Miller, P.O. Box 201, Lookout Mountain, TN 37350. Phone 404/931-2470.

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# CRYSTAL accessories '79

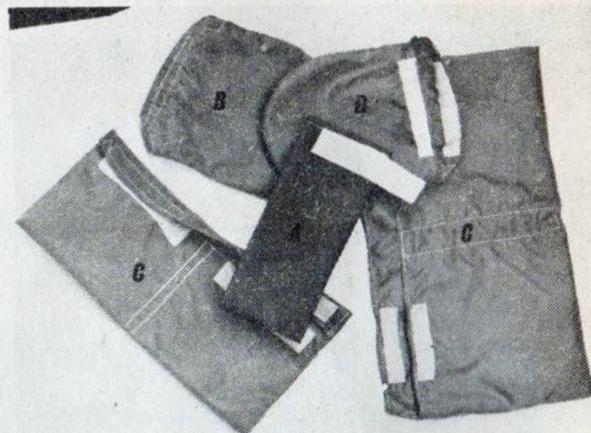
# CRYSTAL accessories '79

## To Protect Your Sail

### LOWER CABLE

*B or C*

Put your lower wire coils in bags and you will not only protect your sail, but you won't lose safety pins or other small parts. Bags available in a dual pouch, or single pouches for coils that stay on the control bar. **\$3.00, \$4.00**



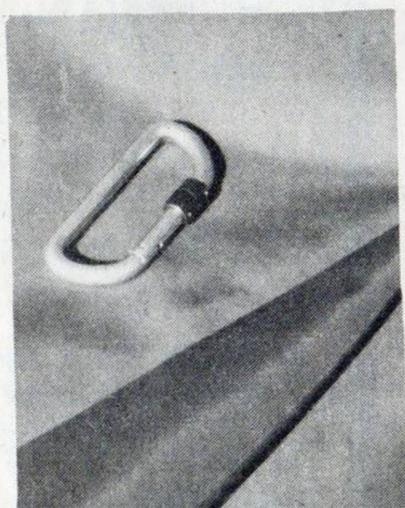
### KINGPOST or TENSIONER

Holds tensioners, or any other sharp fittings from tearing your sail. Also can fit over the kingpost top wires, covering the stop terminal nicos. **\$2.00**

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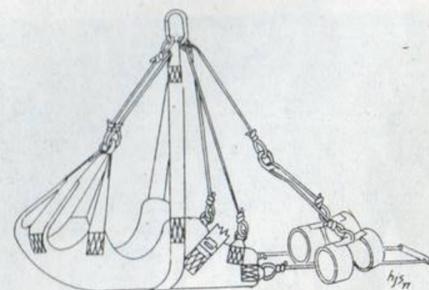


**\$4.97**

Aluminum, 2500 kg, with locking gate

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- Proven reliable body harness
- Adjustable leg straps
- double knee hangers
- with foot stirrup
- one size fits up to 6 ft. pilot



### DELUXE PRONE SOARING HARNESS

with Carabiner **\$89.**

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## AT CRYSTAL WE SEE A PRAISEWORTHY QUALITY IN ORGANIZATION.

*Padded carrying handle.*

*Aircraft quality hardware and Delrin® Zippers are used exclusively in construction.*

*Over 3 yards of 3 inch webbing is used for added support.*



*Inside velcro pocket.*

*Adjustable shoulder strap.*

*Padded bottom.*

Taking this into consideration, we decided to design and construct an equipment bag, especially with the needs of a pilot in mind.

Our styling allows you to use either the adjustable shoulder strap or the specially designed handle, which is padded, for extra comfort when hand carrying is necessary. We even padded the bottom to better protect those valuable contents from any kind of shock.

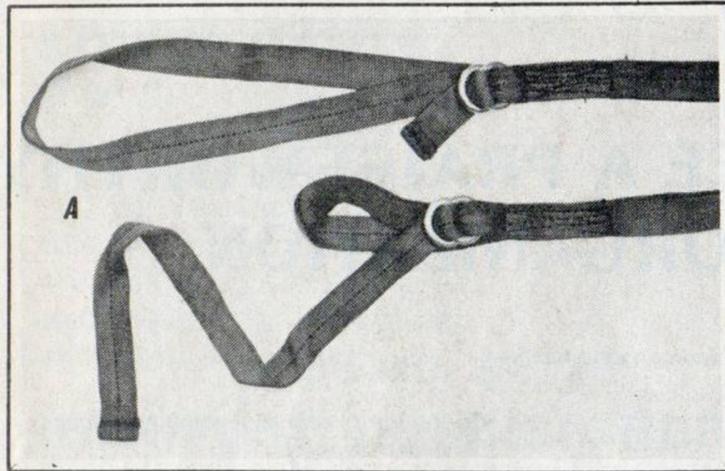
The hardware we use in construction, is the same aircraft quality you're used to.

We have two sizes to choose from. One size for supine or prone harnesses, the other for cocoon harnesses. They will both accommodate a parachute, vario, helmet, clothing and anything else you want to take with you.

See page 29, for ordering instructions.

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# CRYSTAL accessories '79



## ADJUSTALOOP®

**A** Deluxe adjustable loop with wide length range, positive locking.

SPRING '79 SPECIAL  
15% off any 2 loops

**\$7.00**

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- B** 18 inch standard loop **\$4.00**
- C** 15 inch standard loop **\$3.75**
- D** 12 inch standard loop **\$3.50**
- E** 9 inch standard loop **\$3.00**

### Tested to 20 G's!

**STROBALITE** Using alkaline "C" household batteries, it emits a brilliant blinking signal, visible for several miles in all directions. And Strobalite's powerful beacon lasts up to 7 hours per fresh set of batteries! Don't worry — Strobalite floats!



## VELSTRAPS

The finest hang glider tie straps now have a fine, low price.



**99c**

each  
minimum order — 5

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**Metal cinch ring**  
**24" long by 3/4" wide,**

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**Decreases Your Chances of a Mid-Air!**  
**Can you afford not to have one for only \$20?**

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# CRYSTAL accessories '79

### SUSPENSION LOOPS

- **A** Deluxe Adjustable Loop ..... \$ 7.00
- **B** 18 inch Standard Loop ..... \$ 4.00
- **C** 15 inch Standard Loop ..... \$ 3.75
- **D** 12 inch Standard Loop ..... \$ 3.50
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Two loop orders, take 15% off this Spring '79

### BAGS

- **A** Kingpost/Tensioner ..... \$ 2.00
- **B** Lower Cable (Single Pouch) ..... \$ 3.00
- **C** Lower Cable (Dual Pouch) ..... \$ 4.00
- **New Crystal Flight Bag, Std.** ..... \$35.00
- X-L ..... \$39.50

### VELSTRAPS

— Number of \_\_\_\_\_ X \$0.99 each

### CRYSTAL PRONE HARNESS

— Both Stirrup, and Knee Hangers, DELUXE .... \$89.00

### CRYSTAL SUPINE

— With Foot Stirrup ..... \$69.00

### CARABINER

— Aluminum, 2500 kg, with locking gate ..... \$ 5.95  
Mail Order Only Price ..... \$ 4.97

### STROBALITE

— Complete, no batteries ..... \$20.00

### BACK-UP PARACHUTE

— 24 foot, warehouse stocked ..... \$319.00  
— 26 foot, warehouse stocked ..... \$329.00  
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Send 50% deposit; Add no extra shipping charges.)

### HALL WIND/AIRSPEED METER & MAKIKI VARIOMETERS

- Hall Meter, with spinning disc ..... \$18.50
- Hall Meter Prone Bracket ..... \$ 5.50
- Hall Meter Seated Bracket ..... \$ 4.50
- Complete, self-contained, pellet variometers, with mounting hardware ..... \$50.00

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Name \_\_\_\_\_  
Address \_\_\_\_\_  
Zip \_\_\_\_\_

Please indicate method of payment:  
\_\_\_\_\_ Check, or Money Order, or Bank Draft, in US Dollars, enclosed,

Make checks pay to: "CRYSTAL".  
\_\_\_\_\_ or charge to VISA/BankAmericard, or charge to \_\_\_\_\_ Master Charge.

Account number: (list all digits) \_\_\_\_\_

Expiration Date \_\_\_\_\_

Signature \_\_\_\_\_

New Crystal Flight Bag

Colors available (all have black webbing and white zipper):  
Red, blue, black, orange.  
Allow 3 to 4 weeks for delivery.

Special Instructions: \_\_\_\_\_

Merchandise total \_\_\_\_\_

Tennessee residents, add 6.25% sales tax \_\_\_\_\_

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Amount Enclosed \_\_\_\_\_

COD \_\_\_\_\_

(COD orders will involve COD charges)

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# CRYSTAL

# CRYSTAL '79

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**CONSISTENCY** — Crystal Flight Resort flies nearly 80% of all days. Less days lost to poor winds, and with our eight year lease, we will be consistent for a long time.

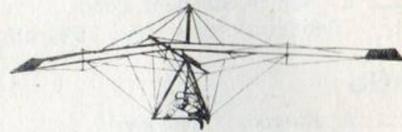
**THOROUGHNESS** — We won't just train you to get off the ground. If you can stick with it, we'll have you flying off an 800 foot mountain, like 50% of our students from 1977. Many students come to

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us after getting the basics from other schools.



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## SAVE NOW

**BASIC INTRODUCTION \$40.**

**SINGLE INTERMEDIATE INSTRUCTION DAYS \$30.**

(Prices Increase May 1, 1979)



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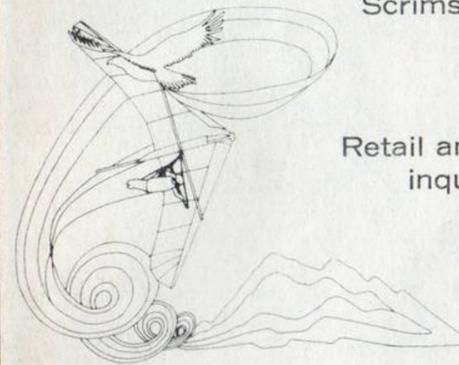
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FLY CRYSTAL

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\*FREE Price List, Master Charge and Visa

Ultralight Flying Equipment

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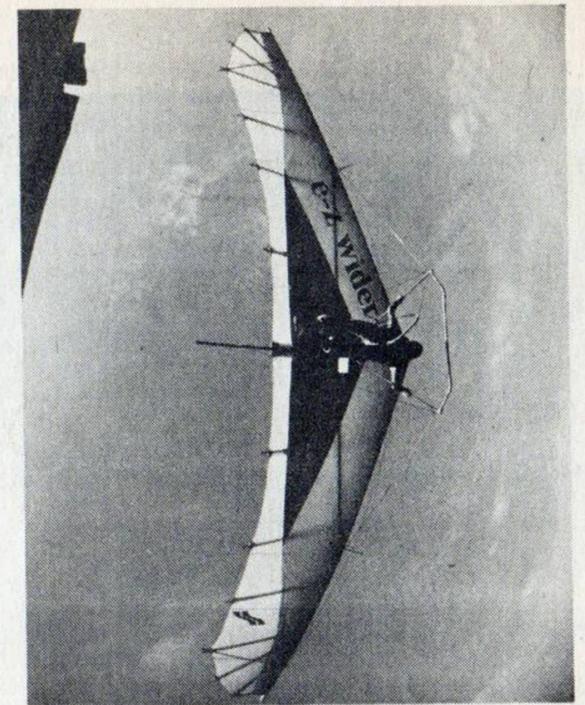


Photo by Albia Miller

Sky Sports offers the experienced pilot the most efficient, computer optimized double surface sail wing available. The inherent stability of the double surface makes the Sirocco 2 a ship that intermediate pilots can climb into and float away with too. Compare the quality workmanship and clean, wind cheating planform of the Sirocco 2. Match the L/D and handling.

Quality and experience: A Sky Sports trademark that produces the best gliders on the market. Easy to launch, easy to land and fun to fly! Treat yourself to a Sirocco 2!

Sirocco 1 & 2 HGMA Certified

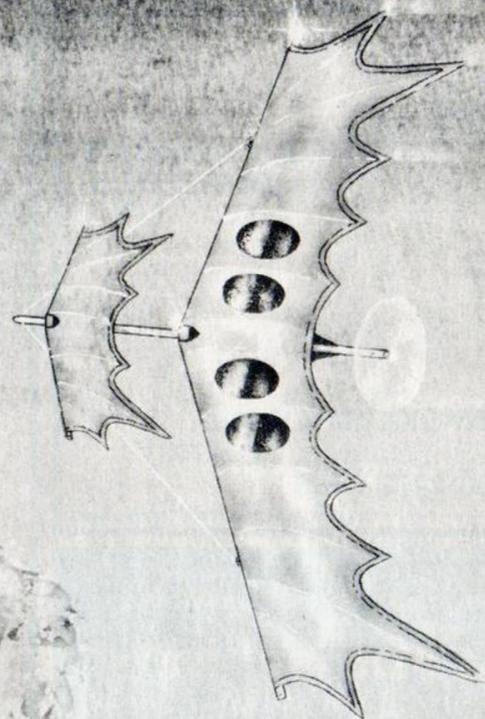
SPECIFICATIONS	165	185
Nose Angle	120 °	120 °
Sail Billow	0 °	0 °
Max. L/D	9 to 1	9 to 1
Stall Speed	18 mph	18 mph
Area	164.7	185
Pilot Weight	125-175 lbs.	155-220 lbs.
Glider Weight	51 lbs.	54 lbs.
Span	33.5 ft.	35 ft.
Leading Edge	19 ft.	20 ft.
Root Chord	8'6"	9 ft.
Breakdown	10'6"	11'6"
Price	\$1170.00	\$1190.00



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# SOLAR POWERED ULTRALIGHTS



©h.syjut '79

By Hank Syjut

While thumbing through some old model airplane magazines, I came upon a couple of articles which really excited my imagination.

The first, appearing in *R C Modeler*, July '76, featured a 100 inch span sailplane with solar powered servos and radio controlling rudder, elevator and spoilers, plus a thermal sniffer. The sun provides enough energy for "Sunbird," it said, to charge its airborne batteries in less than two hours, from complete discharge, while flying. Those batteries will provide enough power for one and one half hours of flight when the sun is behind clouds or has set. The weight penalty was less than three ounces for the solar array and control electronics combined; not enough to adversely affect performance. Fly all day . . . pretty neat, huh?

The second, "Project Sunrise," was even more exciting. Appearing in the January '77 issue of *R.C.M.*, it featured a 32 foot span sailplane with 90 square feet of wing area . . . Big! The wing was almost completely covered with an array of solar cells. Enough photovoltaic cells to power not only radio and control functions, but navigational equipment and electric powered motor with six to one drive and 30 inch wooden prop! A motor powerful enough to give it a climb rate of 100-400 feet per minute depending on the angle and intensity of the sun. Fully loaded it has a 4 ounce per square foot wing loading, a sinking speed of 1 foot per second and glide performance equal to or better than "any known high performance sailplane." The wing was tested to over 5 g's; it was flown in 25 m.p.h. winds and to altitudes of 60,000 feet! Calling it a "success" would be a gross understatement.

The implications were obvious.

Here was a completely successful, solar powered aircraft with nearly the span and half the wing area of a hang glider. Could we, in our sport, develop the first full-sized solar powered aircraft? We have already had great success powering ultralights with small gas engines. Our horsepower requirements are low . . . our wing area large. If it would work, fuel costs would be zero. It could be more dependable than one powered by an internal combustion engine and a lot more quiet! It would be pollution-free and allow much greater airtime than gas. It would revolutionize sport aviation!

Being a practical sort I had to acknowledge that this was a little far-fetched but how far I wasn't sure. Energy from direct solar conversion wasn't cheap, I reasoned, and electric motors and batteries are heavy, but the idea was hard to shake. I began to look for an expert on the subject. No, not a psychiatrist, an engineer or scientist working in this area.

The man I found was Terry Townsend. Mr. Townsend is a licensed engineer with both a B.S. and M.S. in Mechanical engineering. He is currently teaching at Chattanooga State Technical Community College and will complete his Doctorate degree this year. He is involved in a program studying direct solar conversion as it applies to modern energy use problems at Chattanooga State and he was happy to speak with me.

I began our conversation with the following proposition: If we could build a 275 pound (gross weight) aircraft with a sinking speed of three feet per second, (275 lb.  $\times$  3 ft./sec. = 825 ft.-lb./sec. or 1.5 h.p. in drag losses) could we power it with today's technology in solar energy conservation? "The state of the art is expensive" he began, "in terms of cost there is no way to compare it with conventional means." He did add, however, "scientifically it would work," and quickly grasping the nature of my investigation he added to my model. "What I would suggest is a combination of direct conversion cells with a wind turbine generator, solar works best in conjunction with something else so that if you do not have that incident energy, you'll have something else to back it up. By taking motion (wind) and converting kinetic energy into potential or stored energy you'll be that much better off.

"The wind generators evolved from jet aviation technology and

look nothing like windmills or propellers," he explained. They are turbines actually, composed of small, lightweight fan blades which will "spin if you breath on them." Enclosed completely except for intake and outlet ducts, Mr. Townsend suggested that we could incorporate them into airframe design with minimal effect on flow characteristics or drag. "The air passing through the turbines accelerates to many times your airspeed and charges your batteries as you glide through the air. So if the sun goes behind the clouds, a photo-sensitive switch could change modes to these wind turbines and they use basically the same converter as you would with the solar cells. If you have a consistent 5 m.p.h., or more, you're in good shape," he concluded.

Getting back to solar technology, I learned that Bell Laboratories began research on direct solar conversion more than 20 years ago. The first major breakthrough came in 1961 when Bell announced successful direct conversion at an efficiency rate of 5%. Two years later in 1963 they had it up to 12%. "There are some cells out now," he related, "that are getting from 15%-25% efficiency," and "some of the large companies are now tooling up to mass-produce these cells. They are going to cost about \$5 per watt, but they're hoping to get it down to 25¢ per watt by the mid-eighty's . . . maybe they'll break that." One man claims to have a 5¢ per watt cell and will produce it if he can get the funding he requires. That would be comparable to conventional means in terms of cost per horsepower.

So the semi-conductor cells are becoming more efficient and less expensive; more power for less money. It looks like they'll provide plenty of power, too, since they're able to power an average household's 115v, 20a. circuitry. What's more, climbing above the clouds into unobstructed solar flux, you'll experience a power boost of about 40% — cruising altitude!

Extra weight of batteries and electric motor are always a consideration when switching from high power to weight ratio gas engines. Mr. Townsend suggested that we may use the batteries as ballast, locating it in the structure to best advantage. Besides, the Department of Defense has reportedly been working for four years, on a California-based project, to reduce the weight and bulk of banks of batteries they maintain to insure

Continued on Page 37.

one who already is familiar with the procedure, or have the good fortune to attend one of Dave and Debbie's future seminars.

Practically the first thing I discovered from Dave is that there is no reason for you not to repack your own 'chute. Think about it. Sport parachutists have been repacking their own for years, why not ultra-light glider pilots? Repack-

This is very important since lesson number two that Michael learned is that your chute should definitely be repacked every four months, with no fudging. What do you mean — you do not own a Back-Up-System yet? You should! See the *Whole Air Catalog* (Jan.-Feb.) "Crystal Corner," and *Hang Gliding* (Jan. '79). The new Odyssey Back-Up-Systems even have a log pocket



by Michael Smith

I grabbed for the handle on my Odyssey Back-Up-System and pulled the envelope clear of the container, throwing it as hard and as far as I could. Luckily, all it did was bounce off the wall in Denny and Patty's basement. No, it was not an in-flight emergency, thank the wind, only a simulated deployment using my own 'chute, as I recently had the pleasure and opportunity to participate with most other area pilots in an Emergency Systems Seminar conducted for Crystal by Dave Aguillar, president of Odyssey, ably assisted by his lovely lady and number one go-fer, Debbie. Odyssey is a forerunner in the blossoming Back-Up-System industry. Dave came to the seminar with impressive credentials in decelerator-type design, testing, and use. His expertise was sorely needed in this area, and I suspect in other regions as well.

My own knowledge of the Back-Up-Systems working was so limited that I had not even re-packed my 'chute in the year I have been wearing it, and the only dumb excuse I had was not knowing how to go about repacking it.

I no longer have that excuse and neither will you if you take the time to learn the basics from some-



ing is actually a simple procedure which, with a little practice, you can do as well as anyone you pay to do it for you.

I won't go into details here on 'chute repacking, since there are several different types of hardware and construction depending on which Back Up System you use, but I do recommend you obtain instruction on repacking your unit.

attached to the container so you will have a record of when you last packed your 'chute and when it will next be due for repacking.

Without going too deeply into the details of the seminar, as Dave and Debbie can do that much more ably than I, let me give you a brief outline of the seminar's agenda.

Dave first deploys a current design Back-Up-System (not

necessarily an Odyssey, as Dave uses nearly all makes and models in his presentation) and thoroughly describes each part of the 'chute, from container to rubber bands and explains their function. After a brief but enlightening explanation of the physics involved in why a parachute opens, comes your chance to hook up to a simulator and give your own Back-Up-System a toss. I can think of no better way to prepare yourself for deploying your chute in an emergency situation than to deploy it in a non-emergency situation.

The last step in our seminar was re-packing our 'chutes, closely supervised by Dave and Debbie. Their methods are easy to follow, simple but thorough and everything you will ever need to know about properly repacking your Back-Up-System.

As a pilot I would like to sincerely extend my heartfelt thanks to Dave and Debbie for a job well done, and I highly recommend their presentation to all pilots fortunate enough to have them in their area.



## OPINION

Since I first started flying I have always been utterly fascinated by the never-ending array of personalities and individuals with whom I have come in contact. There are as many points of view on all facets of Ultralight Gliding as there are pilots.

For the past year I have been blessed with the opportunity to instruct a singular group of humanoids through their first few minutes of airtime. My next few remarks are intended for *prospective* and *new* Ultralight Glider pilots.

You are going to find yourself exposed to a lot of different ideas from different pilots concerning just how to go about flying an Ultralight Glider. You will meet some pilots who favor doing aerobatics. At the risk of raising the ire of a few friends, allow me to say a word concerning safety and give you my ideas on said aerobatics.

First, do not attempt them if you fly a flexible wing glider.

Flexible wing gliders have a good safety record when flown within the limits set forth on the cross-

tube of every Wills Wing and Seagull Aircraft glider, those being not to alter roll beyond 60° or pitch beyond 30°.

While some aircraft such as the Pitts Special are designed for aerobatics, flexible wing gliders do not have a good safety record when flown outside these limits, whether they are flown by an expert or a novice pilot.

You should know how to maneuver your Ultralight glider quickly whenever necessary. There will be times when you will have to exceed safe limits for safety itself. If you ever see an F-4 Phantom coming at you, as some pilots already have, I suggest you roll your glider as near vertical as comfortable to show more of you sail area for visibility purposes and to lose altitude quickly. However, some of the pilots engaging in aerobatics do so for the adrenalin surge, for kicks. In my opinion, to engage in aerobatics in an Ultralight flexible-wing glider for kicks is to take unnecessary risks.

Flying an Ultralight Glider is as safe as you make it. Some pilots

who continually stretch their limits have stretched them too far and are no longer with us, and some, have lost friends needlessly.

If you will fly your glider within safe limits and make each flight your best flight, long will you fly, and you may achieve a quiet inner sense of achievement like nothing else you have ever experienced, for you will know a man (or lady) *can* really fly.

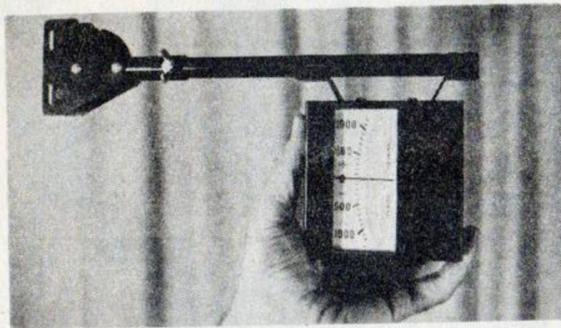
Should you plan attempting aerobatics in an Ultralight Glider I recommend that you follow the Tennessee Tree Toppers guidelines which suggest you first attain a minimum of 50 hours logged airtime, to allow yourself to come in contact with as many variables in the wind as possible, keep radical maneuvers above 500 feet A.G.L. minimum, for goodness sakes wear a parachute, and please fly somewhere besides Crystal. All pilots flying at Crystal are directed to keep their flying within safe limits.

The folks at Crystal hope to see y'all in the skies of Chattanooga this summer!

Michael Smith

# Flight Designs VARIOMETER

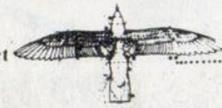
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## Solar Powered Ultralights

operational status of defense computers during power failures, etc. "And, they're expecting to work it into direct conversion for residential (and commercial) purposes," he then added, "for what you're looking at, it would be ideal."

Electric motors are becoming lighter also. Space-age materials with high heat capacities are primarily responsible. They, too, are quite expensive though they are highly efficient. Weight and expense are inversely proportional in this area. "However," he said, "you can't look at the cost of these things for (just) one cycle, but for many cycles."

"I think that the field of aviation is going to be, just like in the space race, a leader," Mr. Townsend offered. "If we can get your people to start thinking about it . . . there's no telling what might happen." He referred again to the 5¢ cell saying "The fellow who developed it didn't even go to college, in fact, his father was a junk dealer, and he's a self-made entrepreneur. Bell Laboratories has been working on direct conversion by photovoltaic cells since the fifties and they weren't anywhere near him. They spent billions of dollars on research and he spent just a few hundred thousand and he's come up with this revolutionary way of doing it. Maybe the shapes of airplanes will have to change," he went on, "but it will work!"

That was the most encouraging thing he could have said to me, and I'd like to thank him here, for his help was intrinsic to this article. I hope this speculation will stimulate someone else's imagination as it has mine. My apologies if I haven't been scientifically accurate in all areas; I'll leave those details to the inventor of the first "space drive" ultralight. Unfortunately, for now, if you have to ask what it would cost, you can't afford it. Maybe Goodyear can afford a "solar blimp" . . . how about it?

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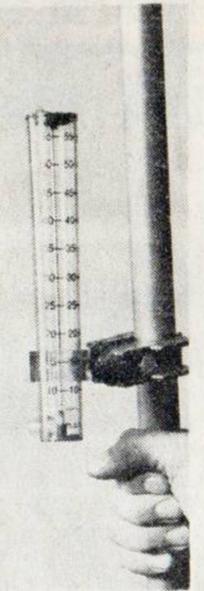
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# PRODUCT LINES *the beginning*

## with calendar items

Here's our newest column. In case its look gives you a case of *deja vu*, this as close a copy (format-wise) of Bill Allen's old "Flying Bull" column as we could make it. The *Ground Skimmer/Hang Gliding* version was very well received, but no one rose to Bill's call for a succeeding author, when he finally let it go. Some months passed . . . now it's back, in **WAC** . . . we hope you like it as you liked the genuine predecessor. **Flexi Fairings are back**. Or are they? We relayed Tom Milke's announcement that he was ending operations as Laminar Systems. This, he claimed, was due to the newly offered Bennett Drag Foilers. Then we had a conversation in early March with **LEAF's Bill Raisner**. Bill had spoken with Milke while in California, concerning an order in progress. Yep, he'd get his order, but no, not sure when. Increased demand (post-Drag Foilers) from dealers of Flexi-Fairings has done a couple of things. Made for a backlog of orders, and caused Milke to re-think it all. So, according to Raisner, you can still choose between two fairing brands. **Wills, Seagull and Electra**, currently the big three of hang gliders, are on the road with their dealer clinics. **WAC** is glad to see it. Their timing is good — it's early in the season. Dealers of these main brands will be well informed, also early. You consumers will probably be able to hitch demo rides (even on the right size) and have close inspection opportunities like never before. All three companies will no doubt accelerate sales substantially using this approach, which will reimburse them for the cost of doing so. Everybody wins. 'Course it'll be harder on the competition. But, that's life in America. **Highster Aircraft** has a new design, the HR series, in two sizes. Both are small, 135 and 171 square feet in the hardworking tradition of double surfaced sails. Nose angle of the new model is 130 degrees, at the wide end of current state-of-the-art. It's notable for Highster to be so contemporary in offering a new model at season's opening. Here is one small company that acts like it's going to stay around. Good for **Mike Giles** and his crew. Thinking of Albatross, Peregrine, Sun, Zephyr, and others proves it is not so easy a market in which to last. The **Sirocco III** is approaching. Author, and National Champ', Dennis Pagen, reports his new ownership of a "3." After an enviably good competition season, **Ed Vickery** has worked industriously throughout the winter to assure speedier deliveries this year. Last year, a slow start caused problems in this area, then magnified as Sirocco 2 contest

victories brought in many new orders. Design-wise, **Terry Sweeney** must be confident, as we hear he's hanging out "somewhere in the Carribean, strummin' tunes. Sure beats those New Hampshire winters," says **Dave Aguillar of Odyssey**. Anyone for competition? The year is underway and we have a few calendar notes of interest. **Wills Wing** clinic at Kitty Hawk Kites on April 13 through 15. Then again at **Crystal Flight Resort** the 20, 21, and 22 of April. Crystal also has a fly-in scheduled for the April 12-15 weekend, just for fun. The schedule gets more serious in May as Kitty Hawk again has the **Gliding Spectacular**. It's now the Seventh Annual, with a full itinerary planned. Sounds like a good time for all, featuring **Rogallo speaking** on the history of his design, and a **Seagull clinic**, with prez' Don Whitmore directing. There'll be competitions for Distance, Target, and Duration, films, and a street dance, all in the happy spot of Nags Head. If you've never been there before, you ought to try to make it. The family or friends will enjoy the resort atmosphere by the ocean. Pilots — bring proof of USHGA membership, please. For more intense competition, head to Chattanooga the 18 through 21 of May. It's the **Region 10 Qualifier** for the USHGA Nationals. Not only the first qualifier, the contest represents another innovation. A joint sponsorship by **Air Space Flight Park** and **Crystal Flight Resort** has not been attempted prior by two commercial site operations. A welcome new atmosphere of cooperation from the two prominent sites will provide for more certainty, as one location or the other will likely fly every day. Even so, the last day (5/21) is a rain day. You'll have to show an Advanced Rating (Hang 4), and pay thirty-five bucks to enter. But before you cringe, consider what a quality meet costs. Paid officials and meet director, paid for all days, fly or no, USHGA sanctioned, trophies, and social events (parties) will come from the fee. If costs don't run to \$35 per helmet, money may be refunded, or put toward costs of the '80 Qualifier. Transportation will be provided at both businesses for the reduced rate of a dollar a ride, tram or truck. A combined **Region 10 Meeting and Tennessee Tree Topper** meeting will also be held the Saturday night of the competition. **Dick Heckman** will chair the Region 10 meeting. One last note. The Region 10 Qualifier will not require certified gliders. But the Nationals will. Got news? Send to Product Lines, Box 144, Lookout Mtn., TN 37350.

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