Ken de Russy Collection

WHOLE AIR MAGAZINE
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ONE DOLLAR

MAY-JUNE 1980

SECOND ANNIVERSARY ISSUE

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Seagull introduces the SEAHAWK 155 and 9 METER the first hang glider designs especially for the light weight pilot.

To insure that smaller gliders handle and perform optimally at the recommended wing loading, it's necessary to use experienced light weight test pilots. This procedural requirement became obvious to us during the fourteen month development of the SEAHAWK 155 and 9 METER. This important aspect of small glider development has been neglected for too long.

In developing the SEAHAWK 155 and 9 METER, we enlisted the aid of two of Frances leading enthusiasts: designer/test pilot Michel Katzman and test pilot Odil Jocteur-Monrozier. This talented duo did the bulk of flight testing of the SEAHAWK 155 and 9 METER and contributed greatly to the development of the gliders. Michel and Odil tip the scales at 130 lbs. and 102 lbs. respectively.

The SEAHAWK 155 and 9 METER are the result of SEAGULL AIRCRAFT'S uncompromising efforts to produce the best performing, best handling gliders for small framed pilots.

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Photo : Don Whitmore

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ATLAS

ON TOP OF THE WORLD

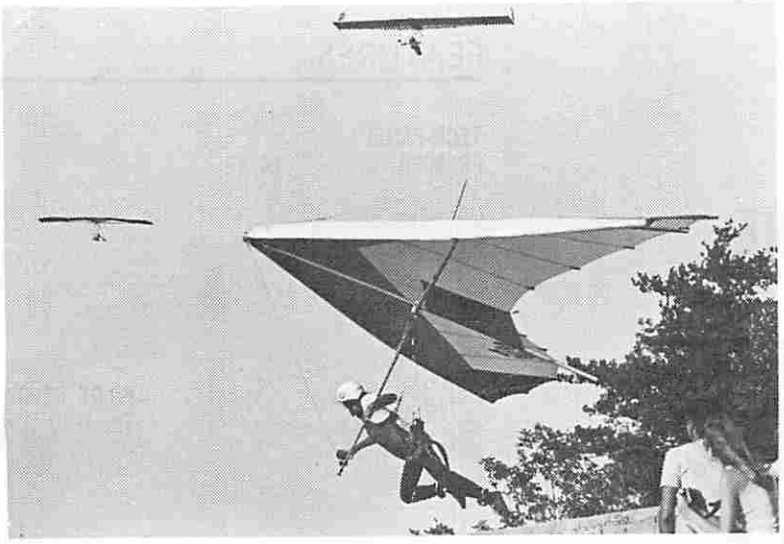

PHOTO BY JIM HENDERSON

Seven **ATLASES** made the top ten at the 1979 world championship. And now the **ATLAS** is winning over America.

With its innovative mylar-stiffened leading edge pockets, internally sleeved control bar uprights and cross bars, break down bar, and deflexorless, split cross bar airframe, the **ATLAS** is newer than 1981.

The **ATLAS** has defined tips and trailing edge lines, contributing to its impeccable pitch stability. Full HGMA certification is pending.

No other modern glider sets up as quickly; all you need is five minutes--no tools, wing nuts, or safety pins, just two ball lock pins. Velcro closures for battens, black coated cables, a batten bag, and a deluxe glider cover (with double zippers and a built-in protective cushion) make the **ATLAS** a true value.

Fly an **ATLAS**. The best evidence is your own experience. And the best experience is **ATLAS**.

Over six hundred **ATLASES** are flying in Europe. **ATLAS** — the French blueprint for next year's U.S. gliders.

SPECS:	ATLAS 14	ATLAS 16	ATLAS 18
leading edge	17'6"	18'8"	19'9"
keel	11'4"	11'4"	11'6"
nose angle	120°	120°	120°
span	30'6"	32'1"	33'6"
area	155 ft²	175 ft²	192 ft²
weight range	100-160 lbs	130-210 lbs	170-270 lbs
stall speed	14 MPH	14 MPH	14 MPH
top speed	47 MPH	47 MPH	47 MPH
glider weight	57	59	61

all **ATLASES** use 6061-T-6 greater than 1.75" dia.

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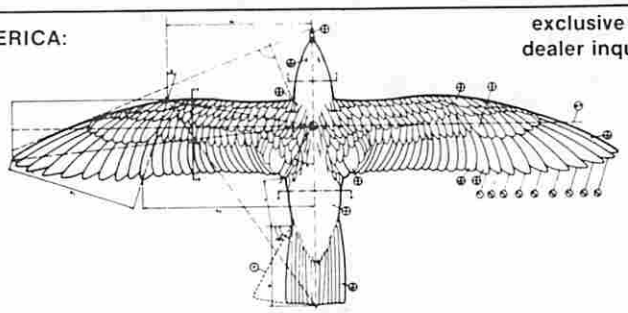

FLIGHT DESIGNS

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ON THE COVER:
Hank Syjut with Rod Gay (photographer) coming down after their mile high tandem flight at Lookout Mountain.

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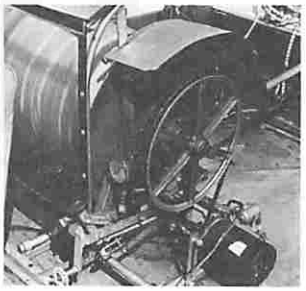
FEATURES

Syjut



A PILOT'S PERSPECTIVE

ULTRA LIGHT TOPICS

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Fly Highster And Soar With Confidence

The Glider

The New Highster is a unique flex-wing glider! It performs with the highest aspect gliders yet it offers beginning pilots a glider they can grow with as their flying skills improve.

The New Highster is an exceptionally strong glider yet weighs less than sixty pounds. During maximum load tests, Highster surpassed all H.G.M.A. minimums by at least 25%. For example, during the negative 150° Break Tests in which the glider is facing tail to the wind, Highster was accelerated to the maximum speed of 42 mph before failure (H.G.M.A. minimum is 32 mph). That is a 25% safety margin for *you*! Highster exceeded this margin in all other structural testing. This is the strength pilots demand! Flying a Highster means flying with confidence in your glider.

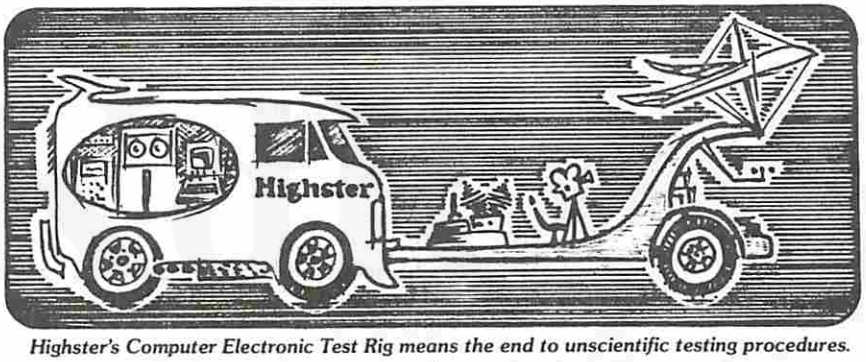
During flight comparisons with all other flex-wings available, the new Highster proved its superior glide angle while preserving its great penetration powers. With a low sink rate and flat turn capabilities, soaring in marginal conditions with a Highster is an ease. At Highster Aircraft we are two surfaces ahead of the future!

Thierry Guignard & Mike Giles. Thierry winched towed Mike's Highster to a world record of 5512 ft. earlier this year in Switzerland.

The Designers

Mike Giles is Highster's president and designer. Thierry Guignard is our Structural Analyst. Together they have twelve years of combined knowledge and experience to draw from.

Mike started building gliders seven years ago in Oregon. He was a major force in developing the double surface design. His gliders are one of the most successful sail wings flying as well as being the most popular of the double surface designs. Mike has served the last three years on the H.G.M.A. board of directors working for the advancement of hang gliding.



Highster's Computer Electronic Test Rig means the end to unscientific testing procedures.

Thierry has been working with Ultralights for five years. He has a degree in Mechanical Engineering and wrote his thesis on Aerodynamics with emphasis on flex-wing gliders. He has done extensive studies in Pitch Stability of Rogallos and has initiated numerous structural innovations. More recently he has developed new tow flying techniques in Europe.

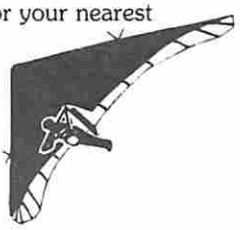
Mike and Thierry are a great asset to Highster as well as to the world hang gliding community.

The Test Rig

In the summer of '79 our Research and Development Department made a major breakthrough in testing procedures. Our idea of a Computer Electronic Test Rig was made a reality! The new Highster Test Rig gives us an accuracy of .01 in the following areas: sink rate, L/D, pitching moment, yaw roll, zoom speed pitching moment, stall speed, tuning to maximum performance, all load tests and the thrust line and power development in Ultralite motorized flight. At Highster Aircraft, with computerized electronic testing, our specifications are not an estimation, they are the fact!

With the Highester Test Rig, we have taken the guess work out of testing. Research and Development means more to us than just designing and modifying gliders. At Highster, we are constantly working to improve flying safety.

If you are flying a conventional single surface flex-wing and not getting all the advantages we offer, we invite you to give Highster a test flight. Call or write us today for your nearest Highster dealer.



Highster Aircraft, Inc.
1508 6th St., Berkeley, California 94710
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Publisher's Column

The *Whole Air Magazine* continues to evolve. This issue celebrates our second anniversary, and we proudly begin our third year.

You'll notice continued changes this time, as we grow in overall dimensions to standard magazine format. The *WAM* is now identical in size to our older counterpart, *Hang Gliding Magazine.*

You can also see we are printing on improved paper stock, in a non-glare matte finish. This better paper permits vastly finer photograph reproduction — compare this one with the last. It will also allow us to run full color photos or ads anywhere in the magazine with top results.

And we've made some editorial changes. The glider reporting we've been doing all along remains one of our most popular services. Now *Hang Gliding* is renewing this effort — as well as *Glider Rider.* All readers will undoubtedly enjoy this. But here at *WAM,* we want to do even more. So, in this issue we begin our new approach to glider reports. We are renaming them PILOT REPORTS, and the first is on the Wills Raven.

More than a lot of nice words, we've spiced it up with lots of constructive criticims. We have added full specifications, three view drawings by artist Hank Syjut, and the narrative covers many more points of real interest to pilots. The report has grown from two pages to five.

This issue has editorials about this effort by George Worthington and myself. Many of George's sage comments are incorporated in the new report. Plus, we have compiled some new statistics about glider buying. The column appears near the Raven Pilot Report, this time.

Two other features accompany our usual menu of regular columns. The *WAM* Tech-Panel premiers this issue; we're real excited about it, and hope you feel similarly. Flying Sites for May-June spans the country as East meets West. Naturally, we continue our efforts toward power and towing as well. Regular columns appear by Chuck Slusarczyk and by Ed Quirk, who invited Harry Robb to help fill the towing information void.

We hope you thoroughly enjoy the whole magazine. Let us know what you liked and disliked . . . use your free reply mail Reader Response Card. And help us help you even more by subscribing today. Already have? Thanks a million, tell your flying friends to do the same.

Again, thanks!
Dan Johnson

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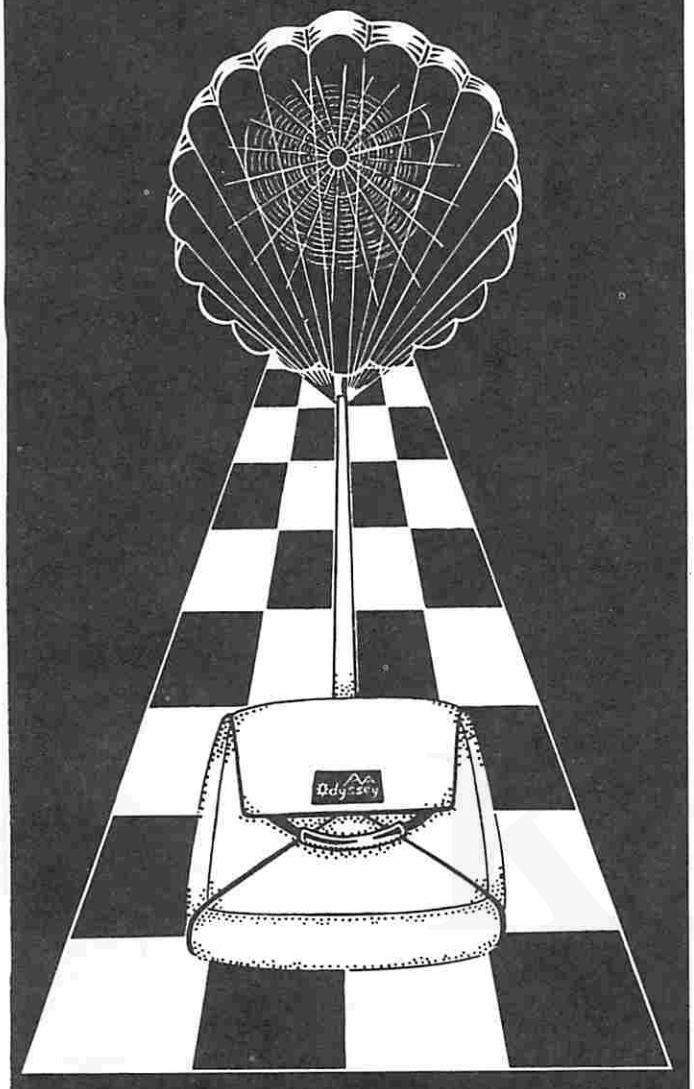

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SAFETY ADVISORY

CRYSTAL FLIGHT RESORT — RACCOON MOUNTAIN, TENNESSEE

by Tom Phillips

Sunday morning looked to be a repeat of Saturday. The wind was southwest and light after having blown strong and gusty until well after dark the night before. Two pilots had reported smooth flights at around 11 a.m. but by noon the tree tops were showing strong gusty conditions, though this was not felt in the landing area. The windsock on launch, which is visible from the shop, was showing strong and changeable.

The Raccoon Mountain launch is at about 835 feet above the field and is on the east facing side of a north east bowl. Southwest winds are deceptive because the shape of the bowl will rotor the winds straight into launch. Chattanooga has a lack of good SW sites so it is tempting to fly Raccoon on those days.

Three pilots went up to launch around 12:30, one was an experienced though not local pilot, the second was working on his Hang II rating and the third, Ben Collier, was making his seventh flight from Raccoon Mountain, his only mountain experience. The glider was a Moyes Maxi MKII which belonged to the Purdue University hang gliding club, that Ben had flown only once before.

The first two flyers launched and had very rough flights. The Hang I pilot showed several unintentional stalls and a downwind landing on his wheels.

Ben's flight was unremarkable until he was in his landing approach. He was correcting for the turbulence while coming out from the mountain. However, it appeared that as he set up to land he encountered stronger turbulence generated by the slope and tall trees on the southwest side of the field.

Ben was flying a standard pattern across the field toward the southwest when he was pitched up into an almost vertical wingover at about 75 feet and he leveled out into a steep dive. In pulling out of the dive he was hit again at 30 feet by a guest which threw the glider nose high. A loud rip was heard and Ben was thrown out and down at a 45 degree angle. His attempt to hold onto the base tube only served to cause him to fall feet down as it was snatched out of his hands. The glider pitched on over and struck the ground nose down.

Ben suffered a badly broken left leg above the ankle and a cut on his chin, probably from striking the control bar.

The adjustable hang loop was found to have separated at the stitching and he had no back up loop. This loop had been in use about six months.

Static load tests have been done on this type of hang loop construction and demonstrated a breaking strength of just under 4000 lbs. or 20 g's. These tests were done on NASA equipment and did not look for instantaneous or shock loads.

The "Crystal Accessoaries" adjustable loop is similar in construction to that of other manufacturers and with over 500 in use no other failures have ever been reported.

A secondary, or back up loop, would seem to be an obvious cure for this type of problem, although given the turbulence present, it was still questionable whether Ben could have landed safely. Even if the loop had not failed he would have found himself in an extremely high angle stall 30 feet above the field.

Recommendations are: Use a back up loop, avoid turbulent air (listen to the locals), wear a parachute. Ben had none. What if this had happened at 3000 feet instead of 30 feet?

(Additional Editor's Note: Crystal has a series of quantitative shock load tests devised. When these are completed a follow-up report will be presented in *WAM.)*

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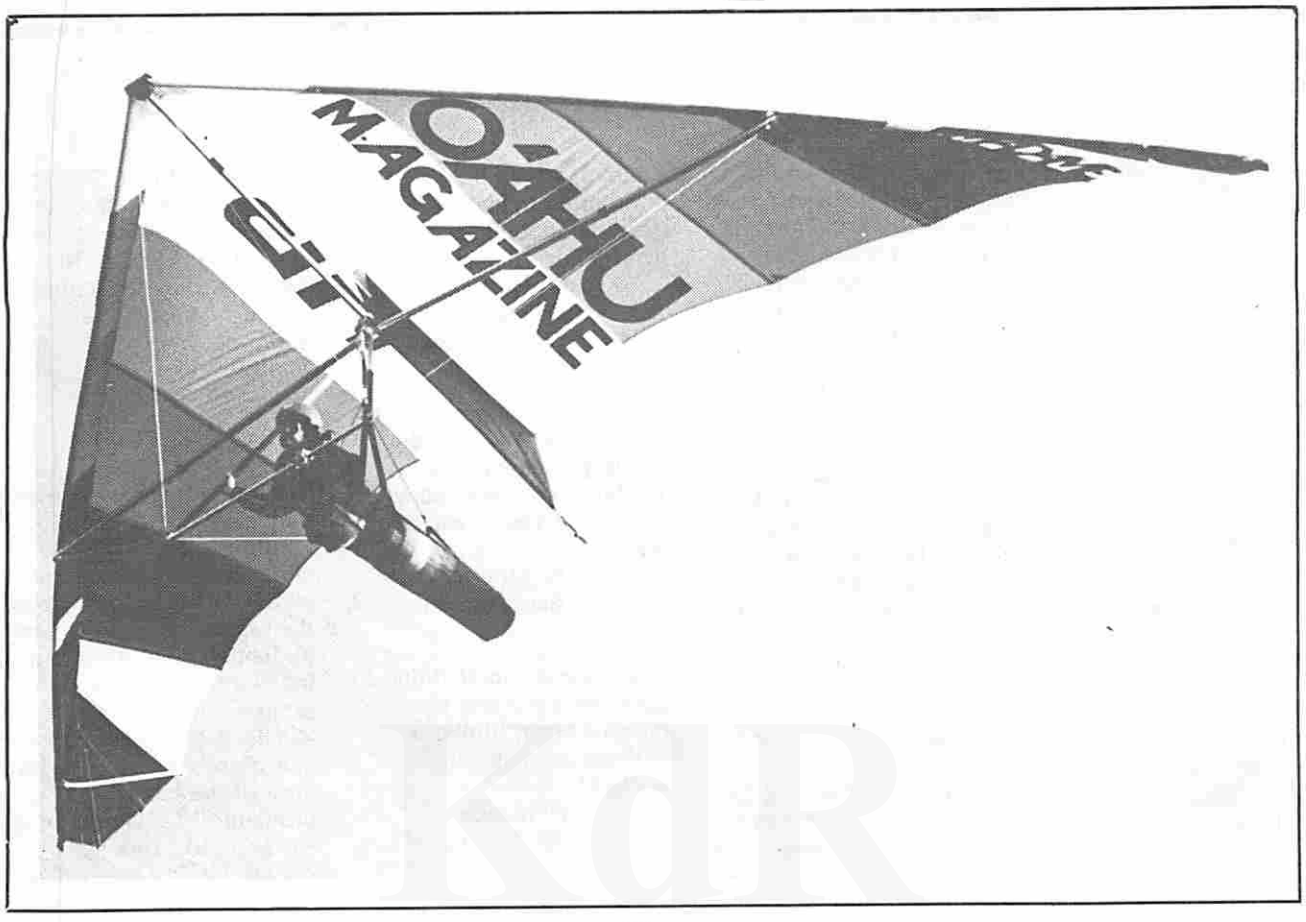
UP Firefly 2B



SETS NEW WORLD'S ENDURANCE RECORD!

RECORD: 24.5 hrs.
PILOT: Jim Will, Honolulu
GLIDER: UP Firefly 2B~ 181
SITE: Makapuu, Hawaii
DATE: 4/30~5/1.1980

	149	181	216
AREA	149 sq. ft. (13.84 m^2)	181 sq. ft. (16.815 m^2)	216 sq. ft. (20.07 m^2)
NOSE ANGLE	107	107	107
WING SPAN	28.6 ft. (8.72 m)	31.6 ft. (9.63 m)	34.5 ft. (10.52 m)
ASPECT RATIO	5.5	5.5	5.5
SPEED RANGE	17-42 mph (27-67 kph)	17-42 mph (27-67 kph)	17-42 mph (27-67 kph)
WEIGHT	46 lbs	51 lbs.	56 lbs.
PILOT WT. RANGE	103-155 lbs. (47-70 kgs)	130-193 lbs. (59-87.5 kgs	160-220 lbs. (72.5-99.8 kgs

UP, INC. P.O. BOX 582 RANCHO/TEMECULA, CA 92390 USA TEL: (714) 676-5652

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FORUM

FEDERAL REGULATIONS

Let's keep Hang Gliding regulated by hang glider pilots. We're doing a better job now than any FAA bureaucrats can ever think of doing in the future. Great Mag — Keep it up!

J. J. Lamarche
Elmhurst, NY

The bad thing about Federal Regulations is for us to even think positive about them. Where is our *FREE COUNTRY?*

E. Bumbacco
Sault Ste Marie,
Ontario, Canada

I am for FAA awareness of Hang Gliding activity, i.e., high altitude soaring, filing a flight plan with FSS.
I am opposed to certified FAA gliders, instruments or pilots.

E. Stubbs
Annapolis, MD

I am against government regulations. However, it does appear imminent and the first glider and aircraft near miss or collision will bring it in for sure.
I feel we should try to work with the Government and come out with a joint regulatory committee under U.S.H.G.A.

D. Tyler
Melbourne, FL

The bad thing about Federal Regulation of hang gliding is that there is presently no reason for it. It will decrease freedom for pilots and manufacturers. It will decrease the excitement and fun which freedom always brings. It will add an extra unneeded layer of bureaucratic politics and mismanagement.

G. Worthington
San Diego, CA

Yes, Federal Regulation is bad because taxpayers have to pay for it. Regulation is proving bad for airlines and plane manufacturers and passengers. Also, all certified gliders should compete together. I'm not convinced that a Fledge is the hot set up in all competitions. I bought one because of its reputation for strength, speed and L/D. I also like the idea of a collapsible rigid. Ground handling has been an unpleasant surprise. Ugh!

R. Barker
San Francisco, CA

I am against government regulation. I was a government bureaucrat for 30 years. The "make-work" is sickening. One regulation leads to another. Careers are built on wordiness and complication and hang gliding would be no exception. It would be government interference, not assistance, we could expect. We're doing a good job on our own. Hope we can keep it that way.

J. Baker
Odenton, MD

Great Magazine! Thanks for the articles on Towing.

D. Kirkland
Keystone Hights, FL

I can never get enough to read about H.G., your mag is going places and I intend to follow it.
Ric Lee's article on stalling hits home with me, my first low level stall was unintentional and very educational (also expensive) but I have learned.
See you at the Nationals, in Ellenville.

B. Havreluk
Ossinging, NY

I think it would be interesting to know how many pilots build their own glider.

A. Hartl
Wurzburg,
West Germany

Foot-launch home builders seem to be a dying breed. Could you query your readers as to how many have built their own, and when?

S. Moore
Santa Barbara, CA

Is *anyone* doing *anything* to train Hang II pilots to become Hang III pilots without breaking their necks??

P. Mance
W. Seneca, NY

I haven't seen any type of consumer advisory reports on instruments, chutes or any other of the multitude of accessories you can now purchase. Get someone in there who isn't afraid to speak his mind, You're the only consumer oriented mag. Hang in there.

W. Thomas
LaPlata, MD

More news would be appreciated on motorized ultralights.

J. Stratton
Oklahoma City, OK

I would subscribe to *WAM* if it was devoted to hang gliding to the exclusion of towing and motorized flight. Motorized in particular has little in common with the spirit and practice of hang gliding and would be better served by a separate publication.

T. Reynolds
Pine, CO

Your Hang Gliding *Statistics* and Used Glider Bluebook are the most informative and interesting articles. The other monthly publications have no comparative features. Keep up the good Quality!

E. Buchele
Toledo, OH

During a recent wire launch I knocked one of my wiremen over a 400 foot cliff. Fortunately he was safety roped, unfortunately the rope broke. Miraculously he landed on a three foot ledge 10 feet below the ramp — unhurt. In retrospect — check all safety ropes and harnesses. Is everyone sure of the launch procedures? Take nothing for granted. This near double fatality was caused haste and overconfidence.

J. Alden
Columbus, OH

To help satisfy those who feel that certification retards hang glider improvements perhaps the U.S.H.G.A should have all uncertified gliders to compete in an experimental category.

H. Wise
Corpus Christi, TX

I would like to see more contests limited to the intermediate and Hang III (Intermediate) — i.e., Escape Country pre-1977. Many championships exclude beginning pilots due to limited experience. Many of us would like to fly competitively but . . . unfortunately not all of us possess Eric Raymond's or Tom Price's ability.

R. Anten
Pomona, CA

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USED GLIDER BLUEBOOK

EDITION NO. 13

These prices are designed to be guidelines for evaluating your glider or one you wish to buy. We do not intend for these figures to be considered the final authority. Consult your local qualified dealer.

Manufacturer	Year	Model	Size	Clean Price	Avg. Price
BENNETT DELTA WING	76	Phoenix 6B	Jr.	425	350
	76	Phoenix 6B	Reg.	425	400
	76	Phoenix 8	Reg.	450	450
	77	Phoenix 6C	Jr.	550	450
	77	Phoenix 6C	Sr.	425	400
	77	Phoenix 6C	Reg.	500	425
	77	Phoenix 8	Reg.	650	375
	78	Phoenix 8 Super	Reg.	675	450
	78	Phoenix 12	Reg.	750	525
	79	Phoenix 6D	185	875	775
	79	Lazor	190	1150	1000
CGS AIRCRAFT	76	Falcon V	225	550	450
	76	Falcon V	185	575	400
	77	Falcon V	185	650	500
	77	Falcon V	220	600	475
	78	Falcon 5½	Med.	750	625
EIPPER FORMANCE	75	Flexi II	240	400	200
	75	Cumulus V	180	450	300
	76	Cumulus VB	180	450	375
	77	Flexi II	185	525	475
	77	Flexi III	185	575	500
	77	Cumulus 10	Med.	550	525
	78	Flexi III	Lg.	650	500
	78	Cumulus 10	Med.	675	500
	78	Antares	Med.	875	800
	79	Antares	Med.	975	900
	79	Antares	Lg.	950	900
ELECTRA FLYER	76	Nimbus	20-17	200	125
	76	Cirrus	3	425	350
	76	Cirrus	2	425	350
	77	Cirrus	3	600	400
	77	Cirrus	2	500	300
	77	Olympus	160	575	525
	78	Cirrus 5	C	700	600
	78	Cirrus 5	A	700	575
	78	Olympus	160	775	625
	78	Olympus	180	725	550
	79	Cirrus 5	A	850	725
	79	Olympus	160	900	850
	79	Floater	205	925	825
MANTA PRODUCTS	79	Fledge	IIB	1200	1000
MOYES DELTA WING	76	Mini	180	525	400
	76	Midi	220	625	575
	76	Maxi I	200	650	550
	77	Maxi I	200	700	625
	78	Maxi II	200	1000	800
	79	Maxi III	200	1150	1000

Manufacturer	Year	Model	Size	Clean Price	Avg. Price
SEAGULL AIRCRAFT	75	Seagull III	220	325	250
	76	Seagull III	220	350	275
	76	Seagull VII	174	600	350
	77	Seahawk	170	725	550
	77	Seahawk	190	700	600
	77	10.5 Meter	—	900	700
	78	Seahawk	170	900	725
	78	Seahawk	190	800	600
	78	10 Meter	—	975	875
	78	10.5 Meter	—	950	900
	79	Seahawk	180	1000	875
	79	11 Meter	—	1300	1100
SKY SPORTS	76	Kestrel A	185	500	350
	76	Kestrel A	220	525	425
	76	Merlin	160	500	375
	77	Bobcat III	Lg	675	600
	77	Merlin	160	600	500
	77	Sirocco I	156	600	475
	77	Sirocco I	175	575	400
	78	Osprey	175	800	675
	78	Sirocco II	164	875	825
	79	Eaglet	191	550	425
	79	Osprey 2	175	900	800
	79	Sirocco III	189	1200	1025
ULTRALITE PRODUCTS	76	Dragonfly Mk. II	174	575	375
	77	Firefly	174	650	500
	77	Dragonfly Mk. II	196	700	550
	78	Spyder	176	850	675
	78	Condor	178	1000	825
	79	Mosquito	166	1400	1200
WILLS WINGS	75	Swallowtail	20-20	300	150
	75	Swallowtail	22-20	225	175
	76	SST	90	600	400
	76	SST	100A	625	450
	76	SST	100B	600	475
	77	SST	100C	750	575
	77	SST	100B	775	550
	77	Universal	100A	650	500
	77	X-C	185	700	650
	78	Alpha	185	950	775
	78	Alpha	215	875	800
	78	X-C	215	950	775
	79	Alpha	185	950	750
	79	Alpha	215	1000	850
	79	Omega	220	1100	950
	79	Omni	187	1125	1025
	79	Raven	209	1175	1075

NOTE: DEALERS! Write to us to participate in the Used Glider Bluebook. We would like to get your input on prices, to better represent all parts of the U.S.

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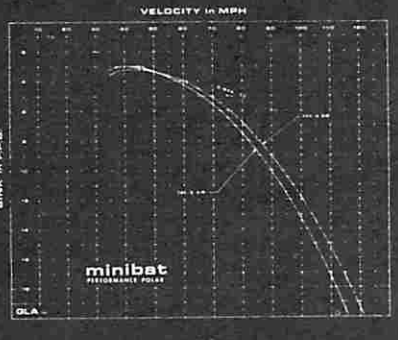
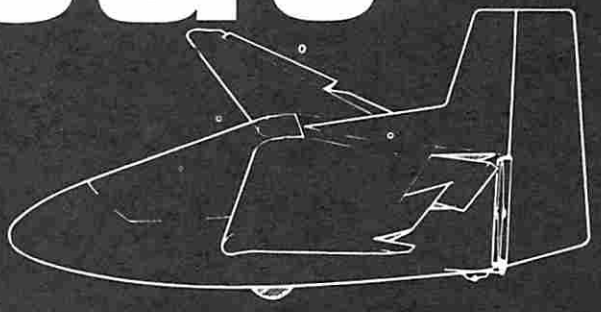
THE minibat





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TECH-PANEL

Here is the first installment of a new column which we expect to become one of our most popular. We are very excited about the potential of this service in aiding pilots who wish to know more about their sport.

We were also delighted that all our advisors thought well enough of the idea to promptly send in their answers to your questions. We hope many of you will continue to be involved. If so write:

WAM TECH-PANEL
P.O. Box 144
Lookout Mtn., TN 37350

A sad note must also preceed the feature. Contributor George Awaliani, suffered a fatal accident when his hang loop failed as he flew his new Maxi at Ellenville. George not only asked some pertinent questions here, but was an energetic contributor to his club and newsletter in his home state of New York.

Ironically, he had also done some hang loop testing on his own, which he reported in his club newsletter.

George will be sorely missed by his friends, and this year by everyone helping in the production of the 1980 Nationals at Ellenville. We felt George would surely have wanted his questions to be answered and seen by all readers.

Dear Tech-panel:

Everyone today is producing quick set-up gliders. All of the gliders incorporate keel sliders except the Raven and Lazor. Since I just purchased a Moyes Maxi Mark IV, I am greatly interested in strength and design.

Question 1. On the quick set-up kite, the center sleeve of the crossbar is done away with and if you grasp the center of one crossbar half you can physically shake the crossbar and SEE that it FLEXES substantially more. Does this set-up give away strength?

Question 2. I have two friends that have Phoenix 6D's. Both have kinked their fore section keels because of the slider mechanism. It seems that ALL keel slider systems would be PRONE to this problem. True or false?

Question 3. It is my opinion that the Wills Wing Raven has the BEST quick set-up in the entire industry. Why didn't the other manufacturers copy the better idea?

George Awaliani
Yonkers, NY

Response to George Awaliani's questions from Mike Meier of Wills Wing, Inc.

Question 1: I cannot answer the question of the relative strength of quick set-up crossbars versus continuous tube crossbars in the general sense; the answer depends upon the design of the quick set-up system and of the crossbar itself. A number of tests have indicated that, all other things being equal, a two piece crossbar is as strong or stronger than a single piece continuous tube crossbar. The bottom line is whether or not the glider will pass the HGMA positive and negative load tests; if it will, then the effective strength of the crossbar would be sufficient.

Questions 2: I have never experimented with a keel slider system except for one system we put on a prototype, so I don't know if the problem of kinking the keel is unavoidable with such systems. One common problem I have observed with many quick set-up systems is that if, during the set-up or breakdown procedure, the pilot allows the rear end of the keel to rise up way above the leading edges, this puts a severe bending stress on the keel just behind the noseplate, and may eventually cause the keel to fail from fatigue at this point.

Question 3. Some manufacturers *have* copied the Raven system. I can't speculate on the thoughts of those who haven't; they may feel they have a better idea.

Response to George Awaliani from Dick Boone of Delta Wing Kites

Quick set mechanisms are not new (I have personally built gliders with them since 1973). The problems and benefits also are not new. There are definite advantages and disadvantages to all types. The logical benefit is the convenience. Set up times have been cut in half, even with the more complex gliders. In 1973 during a timed bet, I set up a glider completely, from a bag to ready to fly in 35 seconds.

The strength of the split cross bar need not be weaker at all. Yes indeed, you can bounce on one side of a split cross bar and achieve more flex. This is caused by the fact the other side of a one piece cross would prevent some of the deflexion by disturbing some of the bending loads. This should be compared to true flight conditions where both cross bars receive a load. In the case of a one piece cross bar one side can actually load up the other side thus becoming weaker. In a split cross bar each side works independently of the other.

With the use of washout tubes on all new gliders, the cross bars now receive a torsional load due to the twisting of the leading edge and cross bar junction. All bracket systems must be designed to handle those loads.

There are two major types of systems — those which have their control bar incorporated (UP, Atlas, etc.) and those who do not (most of the rest). The systems with incorporated control bars seem to be a little faster but have the disadvantage of having the sail flat on the ground and possibly in the dirt.

Of the remaining group the slider systems seem to be easiest to work especially in higher winds. They also seem to lock into place easier. Their disadvantages is that both wings must be spread simultaneously which can be hard with brush or rough ground.

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The last system is bracket system that is not attached to the keel. This system is usually only used when the cross bars are located on top of the keel and leading edges. Thus supporting the cross bar when not completely spread. The advantage of this system is that one can spread each wing independently of the other.

At Delta Wing we use one of each of the systems. Slider for the Phoenix 6D and the unattached system for the Phoenix Lazor. We do this for the convenience of the pilots to optimize set up procedure for their respective models.

Dear Tech-panel,

A question for Mike Meier of Wills Wing, Inc:

In a letter to *Hang Gliding Magazine* you state that carbon fiber replacement parts may not be as strong as the aluminum. Can you be specific as to where the weakness is and what failure mode to expect?

Jim Shumaker
Marima, CA

Response to Jim Shumaker's question from Mike Meier:

I don't believe I said that carbon fiber replacement parts may not be as strong as the aluminum parts, although it's certainly true that they may not be. There are many problems with manufacturing carbon fiber parts, and all kinds of things can go wrong during the process leading to a part which is weaker than intended. This, however, was not my point. My point was that replacing certain parts of a glider with stronger parts may not increase the overall strength of the glider. Normally a glider is designed to a certain strength and for a specific failure mode. Most Wills Wings, for example, are designed so that if a structural failure does occur, it will be the leading edge, just behind the crossbar. Experience shows that this failure mode seems to provide the greatest probability of the pilot surviving the incident. Once you have established the weak point of the glider, there is no point in making any other component significantly stronger, you simply pay an unnecessary penalty in weight. This means that a load just slightly higher than that which will fail the rear leading edge will fail the next weakest component, perhaps the front leading edge, or crossbar, or control bar, or kingpost. If you then replace the leading edge, or perhaps just the rear leading edge with a stronger component, you have only changed the failure mode to a more dangerous mode. You may have even weakened the glider, if the stronger rear leading edge or leading edge which has been substituted causes a higher load to be placed on the rest of the airframe. The basic point is that testing and certifying the strength of replacement components is not enough, in order to establish the improved structural integrity of the glider as a whole, the entire glider must be subjected to the type of testing called for in the HGMA Airworthiness Standards. To my knowledge, no one has documented such testing on a glider fitted with carbon fiber components to date, although Wills Wing is currently working on such a project.

Dear Tech-Panel:

Could you explain the qualities of mylar, how it is attached to the structure, and how and where to get it? Also, how would the Easy Riser airfoil work if retro-fitted to an Icarus IIB?

Tracy Tillman
Manilato, MN

Response from Chuck Slusarczyk of CGS Aircraft, Inc.:

Mylar has been used on quite a few aircraft, noticeably the Catto 15 and Lazair. After a talk with Craig Catto of Catto Aircraft, I found that mylar is best used after the 25 or 30 percent portion of the wing where the surface is less curved. It will sag slightly in cold weather and tighten in hot. One possible bad feature of this material is its poor tear resistance. A small rip or tear will continue to tear until it comes in contact with structure. Catto Aircraft stocks red, yellow, and clear in 48 inch wide rolls and costs approximately $1.00 per foot. Plio bond 20 and some durable sticky tapes are used for adhering.

The Easy Riser rib will work well in the Icarus II but I would highly advise using 1½ inch leading edge tubing instead of the 1 inch it now has. Increasing the leading edge diameter will greatly increase the strength and improve the stall characteristics.

Dear Tech-Panel:

I fly a relatively low twist tight sail glider (185 Electra Floater). I like its flight characteristics (i.e. speed range, flat turning ability) but its low speed roll control suffers. I have heard through rumors that tight sail European gliders have eased this problem a bit by punching holes in the tip area behind max camber. How does this work, and how would I find out if, in fact, it would work on my glider? Since the factory quit research on the model they are no help! I don't know where to contact Tom Price, the designer, so maybe you can help. Also, would a modification of this sort affect its certification? Thank you for any response.

Terry Hackbart

Response from J. C. Brown of Electra Flyer:

The reason some gliders are hard to turn at low speeds is that they tip stall easily. The Floater is pretty resistant to tip stalling. It is hard to turn at low speeds for other reasons; mainly because of its tight, low camber sail, and its stiff airframe, both of which inhibit billow shift. Wing tip holes are intended to help alleviate tip stalls, so it is doubtful that they'll help your Floater. However, you might find an explanation of tip holes interesting.

Stalls occur when a wing's angle of attack gets so high that the airflow separates from the top surface of the wing. Tip stalls occur in turning flight because the inside wing is at a higher angle of attack and consequently stalls first. Some European glider designers have borowed a technique from boat sails in an effort to eliminate tip stalls. What they're doing is punching a series of small holes (approximately one-fourth inch diameter) in the wing tips of their sails. The holes are placed forward of the sail's maximum camber point. This is because separation mainly happens behind the max chamber and the holes need to affect the flow before it reaches that point. The holes are in rows and run at opposing angles. They work like this: At high angles of attack, air "leaks" through from the bottom of the sail. Because of the opposing pattern of the holes, the air flowing through is turbulated. This turbulence stabilizes the boundry layer and helps keep the flow attached to the top surface. Airplane designers use vortex generators for this same purpose; aircraft like the Learjet and Boeing 707 are examples. Whether or not this technique works on hang gliders is still unproven.

Incidentally, R & D on the Floater never stopped. Although the model has been discontinued, it has been refined and redesigned over the last year into the Spirit, which happens to roll quite well at low speed.

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EURO-MARKET

CYCLONE

Manufactured by Chargus, England

By
Jean-Michel Bernasconi

Photo by Hank Syjut

Jean Michel

Photo by Hank Syjut

The best way to introduce the Cyclone to the American flyers is to refer to-the-glider-with-those-little-holes-punched-in-the-sail-! This device seems to interest a lot of people, and I think it's a good idea through this column to describe the glider's characteristics and performances the way I've felt about it in approximately five to six hours airtime.

Manufactured by another English company, CHARGUS, the glider's got a ferocious performance appetite: Aspect ratio 7.2, flat and low twist, pre-formed sail and ribs . . .

Set up and breakdown are relatively easy: Hiway type, one pully system deflexors and enough rigging throughout to make a good pre-flight check definitely worthwhile (twisted thimbles). Aside from the traditional rigging, extra wires are running from the control bar and the heart bolt to the leading edge tips. The glider is coming equipped with enough turnbuckles to offer a good tuning ability.

Take offs and landings are extremely easy, and the glider will feel very "lifty" soon during the take off run.

In flight, along with reasonable pitch pressures, you'll find come really interesting performance and energy retention at high speed which will give you some great penetration abilities.

"Well, what about those little holes and their effect at slow speeds," you'll ask? "Deceiving," I'll answer! I taped those holes on one wing, left the other side alone and couldn't feel any difference on stall speeds, angle of attack acceptance, or stall characteristics. Maybe the holes are at the wrong place? Maybe too small? Anyway, it felt like a gadget to me.

Handling? Once again, the design of the glider has been orientated toward optimal performance with a bit of a trade off on handling and roll response. It offers a lateral lag time but some usable adverse yaw characteristics. I'll explain. After some few hours on the Cyclone, you will learn to use your base tube as the handle bar of your bicycle! And you'll have then the ability of reversing maneuvers relatively rapid. Also thermalling turns will require the pilot to stay on the "high side" of the base tube in order to maintain the same turn radius.

The Cyclone is, and proved so during the world championships, an excellent competition glider, and relatively well finished for its European retail price.

In any case, there is always a trade off, on the Cyclone, it will be toward handling and may be toward a certifiable pitch stability.

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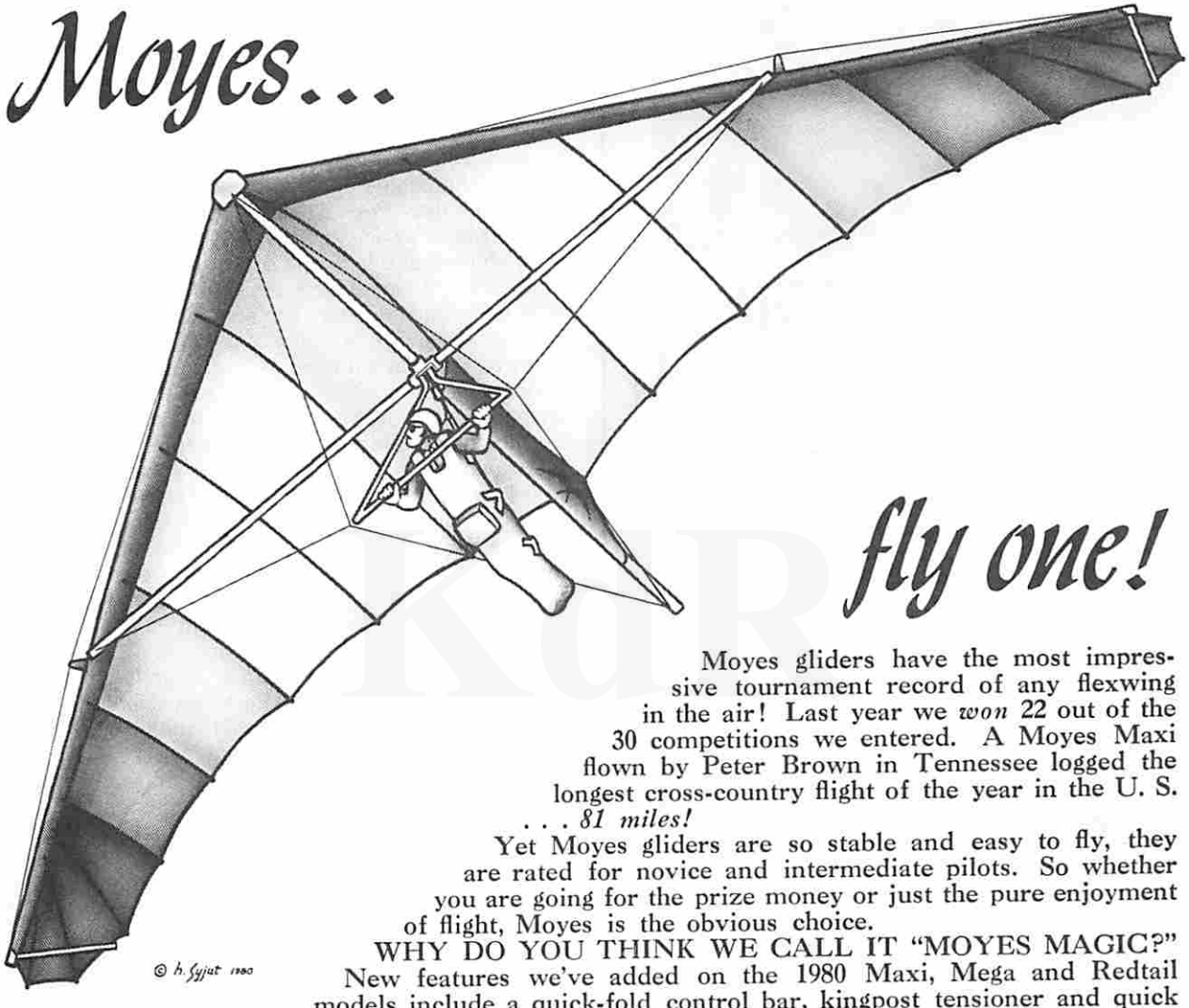

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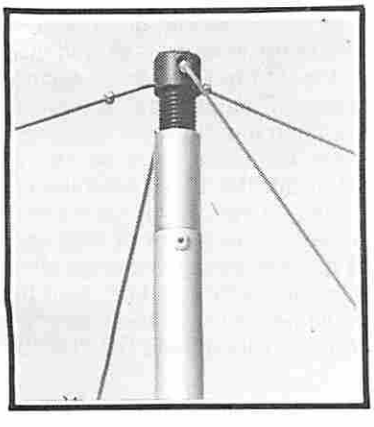

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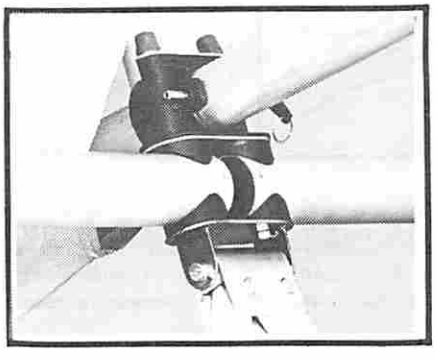

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1980—**CGS POWERHAWK** powered Easy Riser (Joel Mullens) wins "Safety Award" at Sun-n-Fun in Florida.

1980—**CGS POWERHAWK** powered Mitchell Wing (Dick Clawson) wins "Grand Champion" at Porterville, CA.

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Motorized

By CHUCK SLUSARCZYK

Most pilots feel that the best way to break in an engine it to baby it, feed it the best oil, use additives or super lubricants and run it slow for two hours. In fact, it is best to use a poorer grade of oil, no super lubricant, and run it hard, but, not hard enough to over heat. Here's why:

Break-in is actually a honing process where all mating parts of the engine establish smooth compatable surfaces between themselves. Let's take the piston rings and cylinder bore as an example.

If you were to look at a magnified cross section of a piston ring, it would have the appearance of a saw tooth with peaks and valleys. The same is true with the cylinder bore. The bore is not polished mirror smooth and shiny as you mak think. It also has the same saw tooth appearance. A special hone is used to put a diamond shaped pattern of "scratches" on the cylinder wall. During normal operation the lubrication oil separates the piston ring from the cylinder wall. However, during break in it is necessary for the ring to penetrate or rupture this oil film and have its peaks contact the peaks on the cylinder bore. They will actually make minute metal to metal contact. This contact continues to occur until the ring fact and the cylinder wall have established a smooth surface between them. At this point, break-in is considered relatively complete and very little metal-to-metal contact will occur. This is the reason for not using a super oil with a high film strength. High film strength oil prevents this metal-to-metal contact. While the peaks rupture the oil film and contact each other, the valley between the peaks retain a film or oil and prevent a dry condition between piston and cylinder.

The method of breaking-in an engine I use is to mix my fuel slightly rich in oil (approximately 16:1 ratio). I use a #40 weight non-detergent oil and high test gas. *"Install Prop."* After starting engine, allow it to warm up and slowly increase the R.P.M. until the engine is running wide open. Hold it wide open for approximately ½ minute. Then let the engine idle down and run slow for approximately one minute. Repeat this cycle for approximately ten minutes then shut the engine off and let cool. During this cooling down period tighten all bolts and screws while engine is still warm. Do this for a couple times and normally you'll have no problems with bolts getting loose later on. However, don't omit checking screws and bolts for looseness during your pre-flight inspection. Repeat the ten minute cycle for approximately 30 minutes. Then increase the full throttle time to one minute, but keep idle time the same. Repeat this cycle for 30 minutes. Checking bolts, screws as before, next increase full throttle time to 3 minutes while keeping idle time the same. Gradually increase the wide open running until you have a good hour of high speed time on the engine. A quick check of the rings should show them getting shiny. Be sure to adjust your high speed jet if necessary as per your engine instructions. Now use a good grade two cycle oil and GO FLY!!!!!

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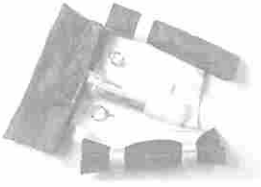

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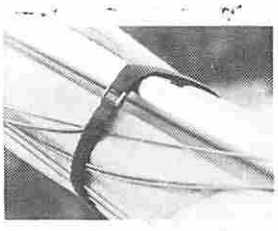

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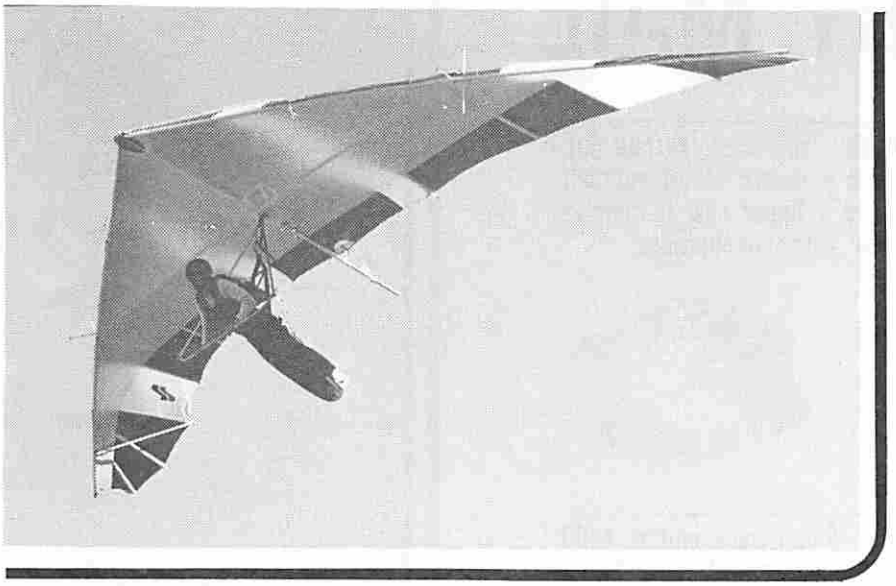

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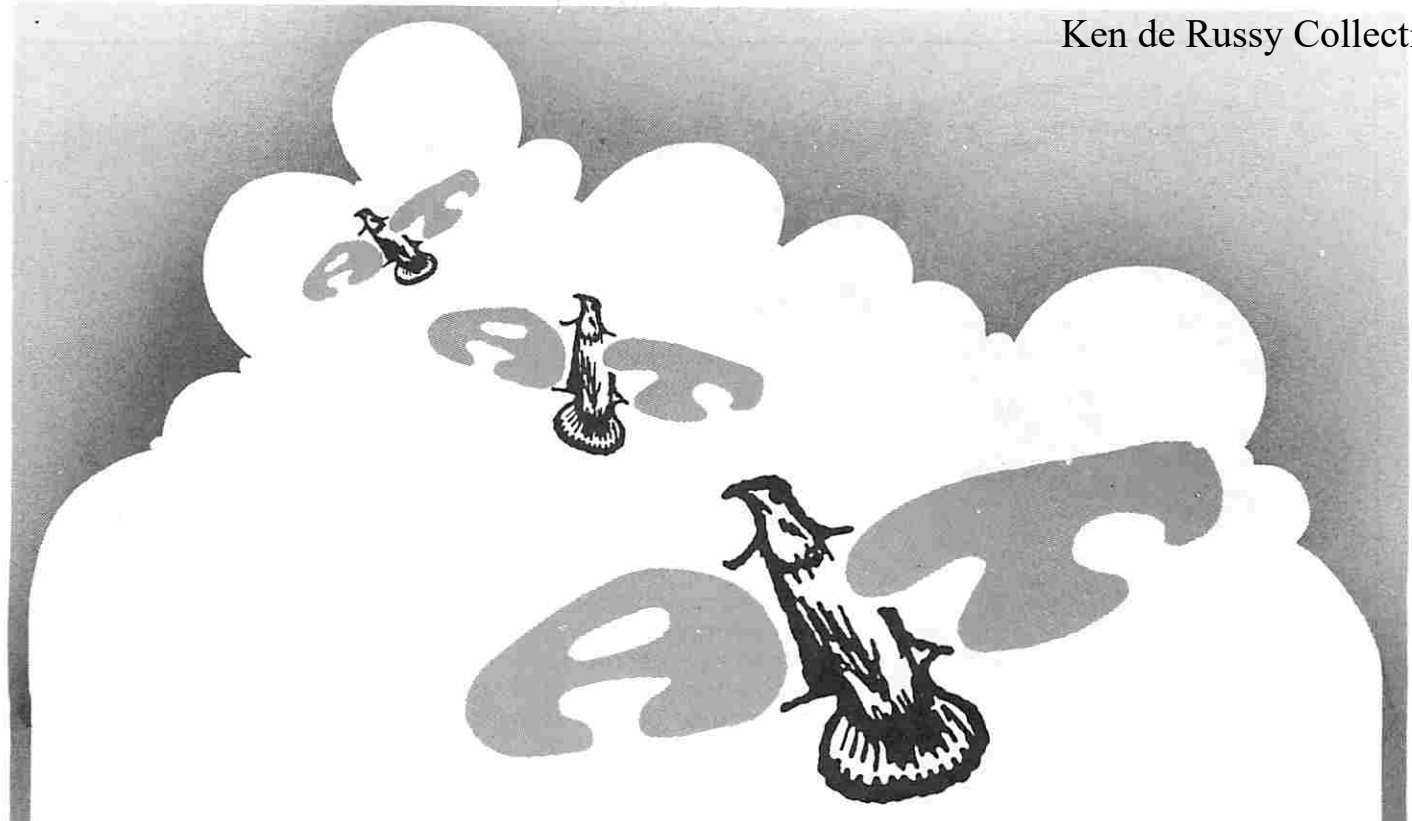

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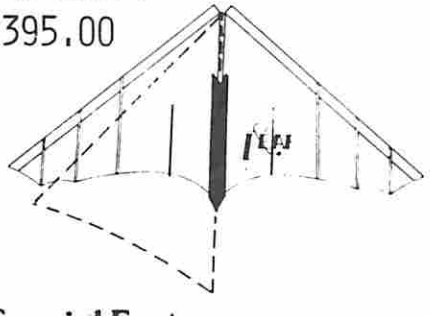

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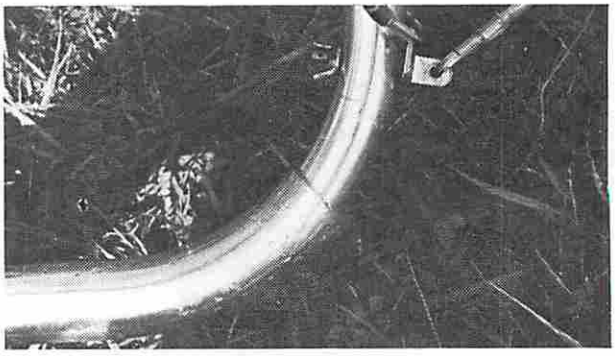

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* Floor to shoulder (inches)
* Floor to inseam
* Floor to kneecap
* Chest, waist, and weight

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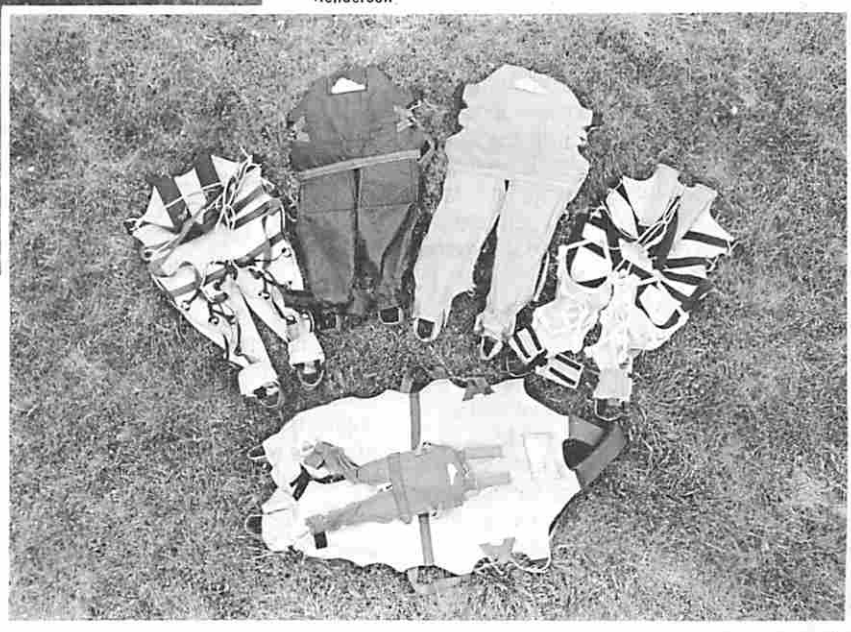

Ken de Russy Collection

EDITORIAL

GLIDER REPORTS

The latest **WAM** has a consumer report about the Atlas, and also a **WAM** glider report about the Moyes Maxi. I am wondering what the difference is, between a consumer report and a glider report?

But my main question concerns the degree of value, integrity, and objectiveness of these kinds of reports. It's a general question, because the other two national publications also usually include articles which seek to give an evaluation of a particular glider per month or a series about most well-known brands.

I have recently flown the new Raven, Atlas, Spirit, Sensor, Mosquito, and others. I started to make a few comments about each, but the more I worked with the idea the more I disliked what I said. It seemed impossible to make the comments both fair, accurate, and objective. While I believed sincerely and fervently that I had discovered the strengths, weaknesses, and idiosyncrasies of each of them, I couldn't be sure how much of my evaluations were influenced by a myriad of external and subjective pressures, such as the glider's reputation, the designers' reputation, the tuning on each particular glider, etc.

It seems to me that in every case, the author is in a dilemma. On the one hand, he wants to be objective and report all of his subjective findings about a particular machine, including the unflattering ones. On the other hand, he "owes a favor" to the company or individual whose glider has been used in the test. And also, every author seems to want to say nothing but good things about any glider. Good things are easier to swallow by the advertisers, the pilots, and the readers. If you read all the "glider-reports," in one sitting, which have been published in the past two years, I guarantee that you would learn very little of value, and nothing that isn't said a hundred times in the advertisements. I think that all of us, as readers, realize this, and feel the same way. The author's intent of "reports about specific gliders" is a seductive idea, but there is a huge gap between what is intended by the author and what is delivered to the reader.

So, what do I suggest? Well, perhaps an elimination altogether of glider reports, because of the fact that they are too similar to advertisements and/or too bland and non-commital. Or else, try to "tell it like it seems," so that there is a ring of honesty and value to the reports. Perhaps no one who hasn't flown at least 70 brands of gliders with the intent of comparing them, each with each other, should be willing to write a report. Perhaps a disclaimer, such as the "opinions of the author are entirely his and are not necessarily an endorsement by this publication," is appropriate. Any change would be worthwhile, including the permanent elimination of such articles.

There is another approach. It is education. Most pilots don't know what to look for in a glider. And while it is true, that I too, have much to learn, I think there are a few generalizations which are true and not universally appreciated. They are as follows:

1. In record-flying, the fact that a glider can attain a relatively high speed is of very little value. Minimum sink speed is used 99 percent of the time, because the glider is flying down-wind, because a straight distance record up-wind is impossible. The minimum sink speed of all rogallos is amazingly similar. In record-flying the rate of minimum sink is the most important quality, providing the pilot also has a sufficiently high degree of controllability. If the glider has a great minimum sink, plus excellent controllability, it will be an excellent thermal machine. So, compromise is vital. For record flying, I recommend as large a glider as possible ,which is controllable in very turbulent air and is not overly tiring to the particular pilot to fly in rough air for five hours.

2. For contests such as the Owens Valley Classic, high-speed is a vital factor, because half of the tasks are elapsed-time-speed races to a pre-set goal. In these tasks, the pilot invariably finds himself at or near the goal, with an excess altitude of 1000 to 5000 feet. It is mandatory to keep altitude in reserve, because there could be unexpected sink or a possible headwind on the last five miles. However, as the pilot nears his goal, it would be wonderful to speed up to any desired speed and achieve a faster time, and also to arrive over the goal with only enough altitude to set up a landing approach. The more the glider can speed up, and still remain an acceptable rate of sink, the better. So, the best choice of glider for the Classic is one which is a compromise between (a) excellent sink-rate,

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(b) controllability, and (c) high-speed-penetration, with a fairly high priority on the latter.

3. For ridge-flying, at cliffs or ridges facing lakes or the ocean, where real thermals are negligible or non-existent, the goal of the vast majority of pilots is to be at the top of the stack. There is little or no turbulence, so controllability is a minor factor. Sink-rate becomes the dominant requirement. And sink-rate is always improved by reducing the wing loading. So, a very large glider is usually desirable. But again it must be remembered that, frequently, the larger the glider, the more tiring it is to turn and to fly, in general. Significant progress has been made, and is still being made, to make very-large-gliders easier and easier to turn. But, at the present time, the relative fast new machines are hard enough to turn with 160 to 180 square feet of sail. When they approach 220 to 250 sq. ft. they might be over-tiring to fly.

4. For safe operation, a high degree of parachutability is extremely desirable. All flights end in a landing. It is sometimes essential to raise the nose and increase the rate of descent to avoid overshooting. To the degree that parachutability is possible. operational safety is increased. Rogallos differ significantly in this ability.

I've noticed that rogallos which have a lot of double-surfaced sail are harder to turn. They feel much more "stiff" in their response in the air. The same thing seems to be true of using stiff-pre-formed battens. But the trend is toward both. The Fledge is a good example. It has an undeniably higher performance without the sacrifice in sink rate, and without exceeding 170 sq. ft. of sail area. It is logical to assume that rogallos will more and more resemble the Fledge in every respect, maybe even including moveable control surfaces. But if they do include moveable control surfaces, they will fall into the rigid-wing classification, and for all practical purposes they will become Fledges. So this poses a real dilemma for the designers as well as the pilots and contest managers. I personally hope that we retain the simplicity and fun of "weight-shift-only" machines, even if it means the sacrifice of a certain degree of performance. Those who want performance with the sacrifice of (a) handling, (b) take-off and landing flexibility, and (c) the feeling exclusively of weight-shift response, can always buy a Fledge or its equivalent. Fortunately, in this regard, designers have already discovered many devices which have greatly increased roll-rate and turning response, such as pulley systems, floating crossbar, deep keel pockets, and others. This progress suggests that one day soon they might give us the performance of the Fledge, without using rudders, and while retaining the weight-shift-control factors.

In conclusion, I would like to stress the need for an increase in knowledge among pilots as to which qualities (in rogallo hang gliders) are the most desirable, for their particular goals. Is it controllability, sink-rate, high top speed, ease of turning, parachuteability, ground handling, set-up time, control-predictability, speed range, or some other factor? The answer is different for every pilot, and depends on the goal the pilot wishes to achieve, whether it be competition in spot-landing contests, competition in the Owens Valley Classic, ridge soaring, recreation, thermal flying, etc. Each pilot must think carefully about his or her goals, because very soon the differences between specialty-machines will become wider and wider, just as these differences have grown in cars. The Indianapolis racers can hardly be compared with the street machines which we park in our garages. The selection of your next glider shouldn't be based on what your friend has, or which brand your local dealer is pushing, or which model is the latest "sensation." or which glider seems to get the highest in the stack. Instead, your selection should be based on your goals, and on personal test flights, made by you, of as many models as possible. With the average glider selling in the range of $1,500, as compared with $500 in 1974, the choice is more important to you personally than it has ever been before.

— George Worthington

It seems we have reached a plateau in glider reporting. **WAM** has been involved with this sort of product evaluation for over a year. And prior to that, I did many reports for **Glider Rider.** Now, **Hang Gliding** is also going to enter this writing arena on a regular basis.

That all three publications have seen the value in this is interesting. Via our Reader Response Cards, we at **WAM** have received more commentary on this topic than any others except Statistics. But more and more, lately, readers seem to be agreeing with George Worthington that a change is needed in the interest of greater impartiality (which leads to more complete education). This, then, is our thrust in introducing objectivity to glider reports.

You will see several significant changes in our style of reporting. Most salient is that our two page articles have expanded to four to six pages for single model. In addition, we've added Hank Syjut's clean artwork in the three view projections. We have heard others of you and added a specifications chart, which includes construction materials. And, we've taken heed from George's criticisms and gone into more depth on various important factors with which a prospective buyer must concern himself. We are also going to look very hard for the bad points as well as the virtues of any design evaluated.

But some defense is in order for the past efforts. Besides being a "start," the positive tone of our reports has been deeply justified by one very positive fact. In my opinion, every single one of the gliders I have reviewed has, indeed, been a very nice machine to fly! I love to fly, and unless I were to feel truly unsafe in a glider, I am apt to enjoy it. Since this was so in all previous reports, it is not surprising that that I had many good things to say about them. It was no hype — I really did like them.

Nevertheless, Worthington echoes what a lot of you have said; That not enough criticism is made; that it is of little value to say all good things because then no information is given to help narrow the purchase decision.

I gulped and thought, "OK, here comes the unadulterated glider report." We are determined, here at **WAM**, to deliver what the reader wishes. So we will pick apart each model and give a thorough examination, the likes of which have never been read before. But you should still expect to see much good as America has succeeded in learning to build quality hang gliders.

We start with the Wills Wing Raven for several reasons. One, my rapport with Wills is sufficient that we can still be on good terms if I criticize the Raven. Their phenomenal success with it reflects an objectivity not found in all companies. Two, I have flown the Raven enough to be fully aware of its capabiilties. And I have flown a large enough number of other brands and models to be able to compare it more widely. Three, the Raven is a glider many people can be interested in, not ultra specialized. This offers greater appeal such that reader comments will be heavy enough to allow us to grade our effectiveness with the new style of reporting.

Please do comment. As stated, our goal here is to serve the reader. We do not wish to bad-mouth or mud-sling, yet we feel the need to dig deeper.

— Dan Johnson

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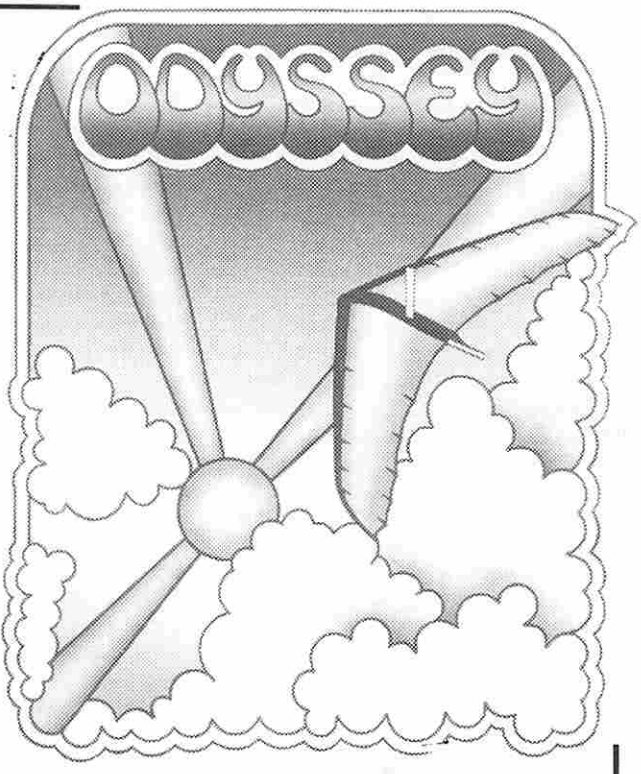

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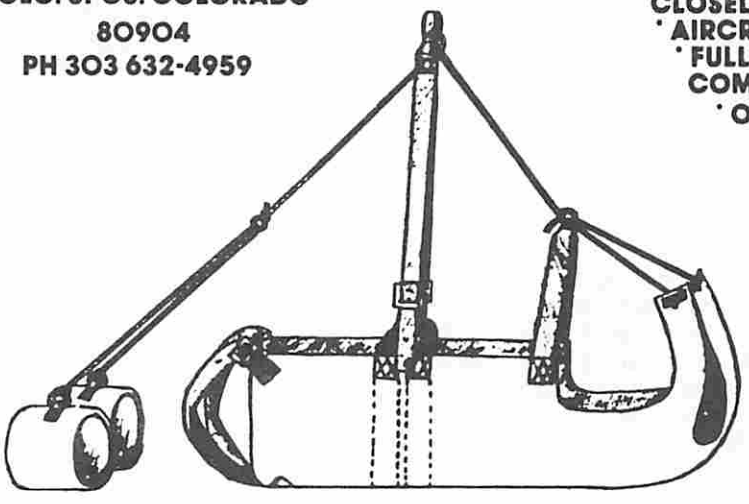

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RAVEN SPECIFICATIONS

Model Number	229	209	179	149
Area	229 ft.²	209 ft.²	179 ft.²	149 ft.²
Span	36.2 ft.	34.5 ft.	31.5 ft.	28.3 ft.
Leading Edge	21 ft.	20 ft.	18.2 ft.	16.5 ft.
Pilot Weight	170 - 230 lbs.	150 - 210 lbs.	115 - 170 lbs.	90 - 140 lbs.
Glider Weight	62 lbs.	58 lbs.	49 lbs.	45 lbs

All Ravens are available in prone, supine and novice configurations. Each is HGMA certified to 1980 standards.

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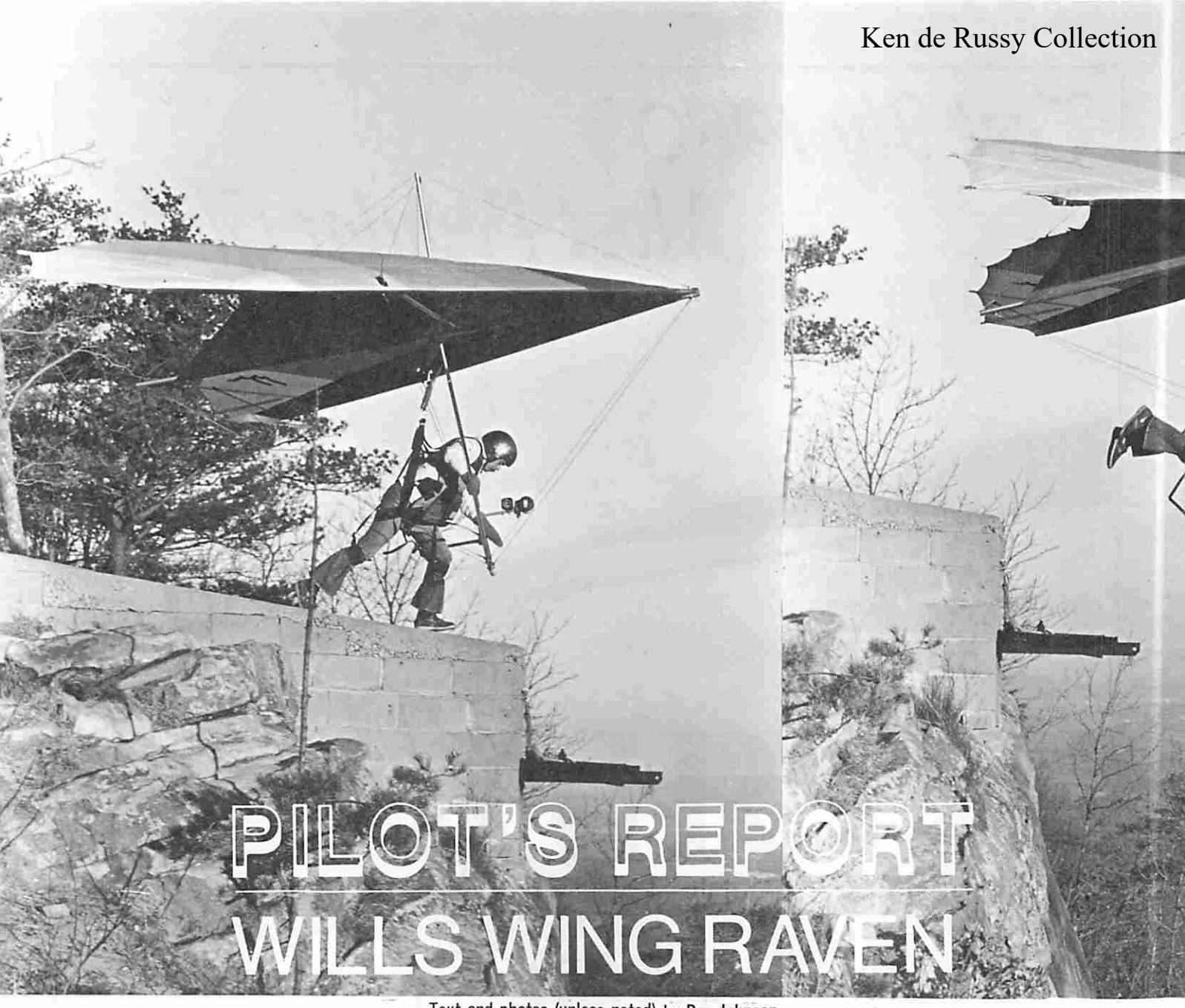

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PILOT'S REPORT
WILLS WING RAVEN

Text and photos (unless noted) by Dan Johnson

Everybody has heard about the Raven. Product comparisons, as well as advertisements, refer frequently to this Wills model in ways like, ". . . handles nearly like a Raven . . . sets up like a Raven . . ." and so on.

Of course, the Wills folks are tickled silly about all this talk. They recall beginning to build a cheap, simple glider suitable to training and first purchases. Yet now, eights months after its introduction, they have recorded several of the best months of business Wills Wing has ever had (in over seven years). The Raven is now the only glider Wills makes.

It did not turn out to be a cheap trainer, but in recent Wills tradition, it has everything "trick" or deluxe, and carries no options. Learning from their Alpha. Omega, and Omni models, the best characteristics of each was transfused into the Raven so successfully that the predecessors were retired. The argument from the factory is that the Raven can perform better in each category of specialization than the prior models, while also offering superb all-round performance and handling. What may be so surprizing is that Wills convinced many buyers of these qualities as the winter approached, in fact, breaking their all time sales records in January and again in February, two very uncommon months.

I have some very warm feelings chronicled in my logbook, which were earned on a Raven. My longest duration, my highest altitude gain, my greatest distance, and my most satisfying soaring flight yet were all while piloting a Raven. These accomplishments were split evenly between the 209 (square footage) and the 229. Of the two I am partial to the 229, even tho I barely make the weight range when fully loaded and ready to clip in. It is very satisfying to achieve the top-of-the-stack position, and in two outings, the 229 has placed me solidly above Maxis, Megas, Atlases, and Fledges, all known for superior sink rate performances. Both experiences were in thermal air combined with marginal ridge lift at an inland mountain site.

Not everyone chooses a Raven, however, and some perfectly sound reasons exist. To many expert pilots, the Raven is an intermediate ship. To them the fast roll rate and very light pressures are the only reason they wish to fly one. The Raven has only a fair glide at maximum speed,

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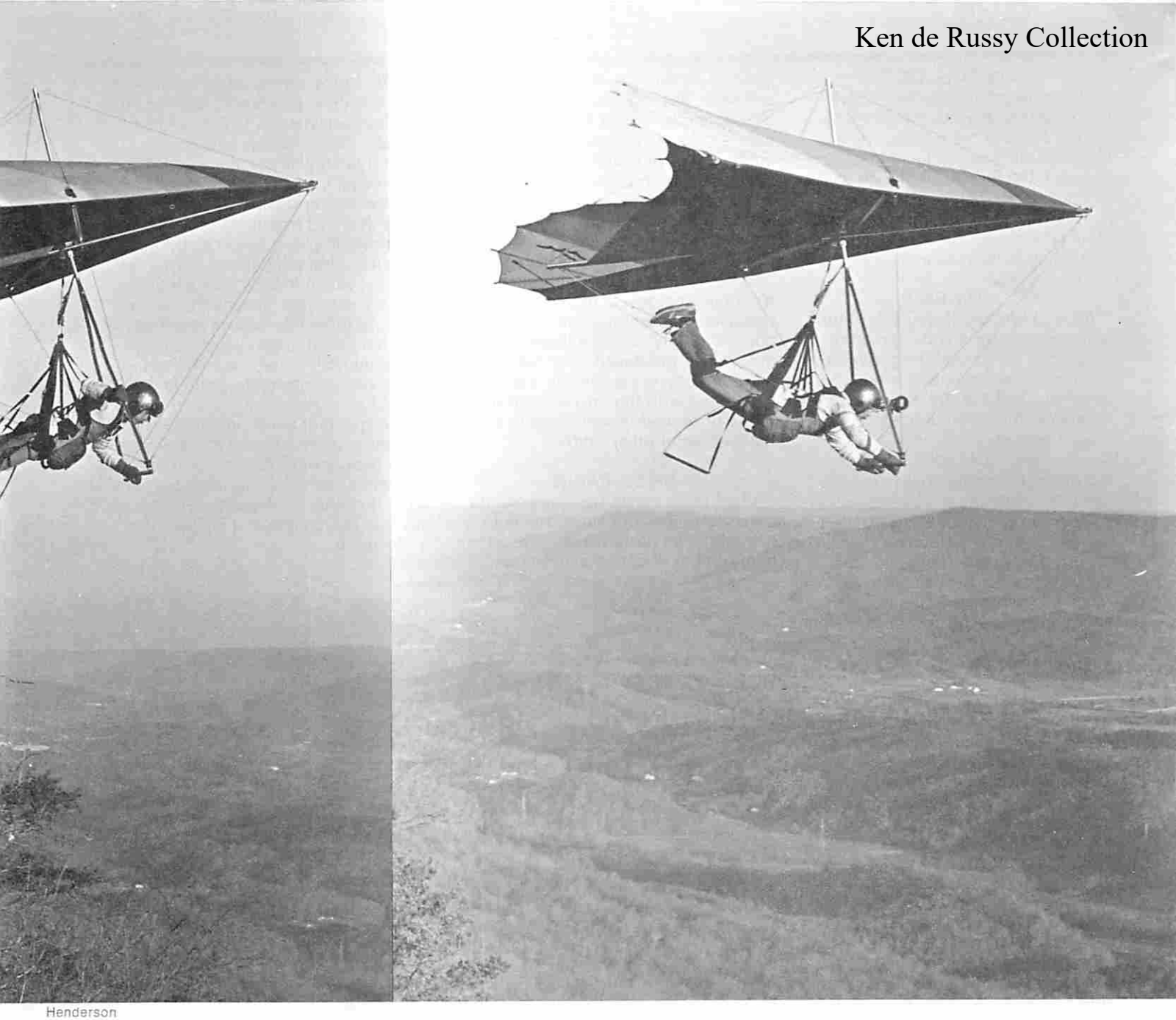
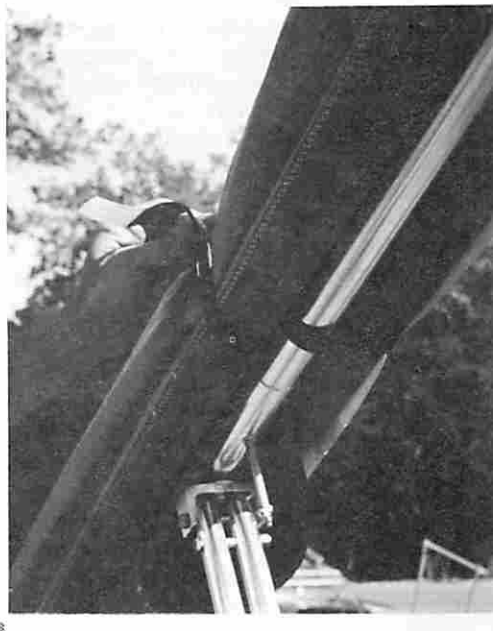


Henderson

so many conclude it is not a superior cross country ship. Others argue that to require such light wing loadings in order to develop maximum sink rate performance, is a form of "cheating" which can turn back on you if the wind picks up, or if you exit a thermal deeply behind the ridge.

Some intermediate pilots don't care for the delicate touch of a Raven, opting for mellower handling ships of similar performance, like the Maxi III. Smaller pilots find the weight of a Raven too great, or its static balance too tail heavy, especially if they test flew a larger model which could offer that tempting sink rate. Ground handling a big wing can definitely be tedious in some wind conditions.

I have sometimes wished I could "turn off" the easy rolling rate of the Raven when approaching for a landing at fields which have resident turbulence. While it will recover instantly from any attitude, it will also begin a turn any time a wind gust or shear bumps your body an inch or two off dead center. This characteristic is only disturbing near the ground, though, and at anything over 200 feet off the deck, I could hardly ask for more in the way of response. Airborne in a 229 Raven, even when bucking headwinds and choppy thermals, I remain totally at ease, with fingertip control. And after seeing films of the torture a Raven receives in certification, I am totally confident that no matter which way the wind may knock me, I shall have adequate control and structural integrity to come out smelling like the proverbial rose.



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CONTROLLABILITY

Only one other ship that I have flown can compare to the ultimate control I find in the Raven. The English EMU had fineness in control to match the Raven, but did so with 70 less square feet of wing. I can scratch closer to the cliffs of Lookout Mountain in a Raven that I would feel safe doing in most other crafts.

SINK RATE

Again, I feel the Raven offers the best sink rate for a wide spread of conditions if you load it lightly. My optimum top-of-the-pack wing loading calculates to 1.034 lbs/ft². By current standards, this is quite light.

TOP SPEED

I was able to move out in my favorite 229 Raven at over 45 miles an hour (as shown on a Hall Meter), and feel I have an effective penetration speed of over 35 mph. When I recently flew the Moyes Mega II, I felt I had 6-10 miles per hour more in useful penetration speed. Many other ships will also exceed the Raven in this category.

EASE OF TURNING

As with control, I have discovered no match from about eightly different models I have flown. Unlike controllability, by which we mean precision and positiveness of handling, ease of turning relates to bar pressures and roll/yaw coordination. "Ease" is pratically defined by a Raven, and its coordination is excellent, though equalled by a few other designs, one of which is the now-discontinued Omega. There are no tricks in Raven handling at all, perhaps excepting the sudden reaction of the glider to pilot input.

PARACHUTEABILITY

If the Raven is full stalled, the nose will drop sharply, but considering that, the Raven exhibits good parachuting qualities.

I have found a relationship to this characteristic with take off and landing ease. And the Raven does both near-the-ground functions with no tricks or problems. The tail heaviness leaves quickly on the take-off run, and helps utilize the proper "filled sail launch" technique. Landings do not require any exacting timing, but do demand that once you push out on flare, that you stay committed, leaving the bar full out till all momentum stops.

CONTROL PREDICTABILITY

When you think of the motion you wish to have occur in a Raven, you have only to act, not wait. The Raven exhibits no lag, like the Olympus, nor stiffness, like the Atlas or Mega, and seems hardly to wait for billow shift before it heads the way you've pointed. I have heard some pilots claim the Raven does not offer pitch coordination to roll input but this has not been my experience.

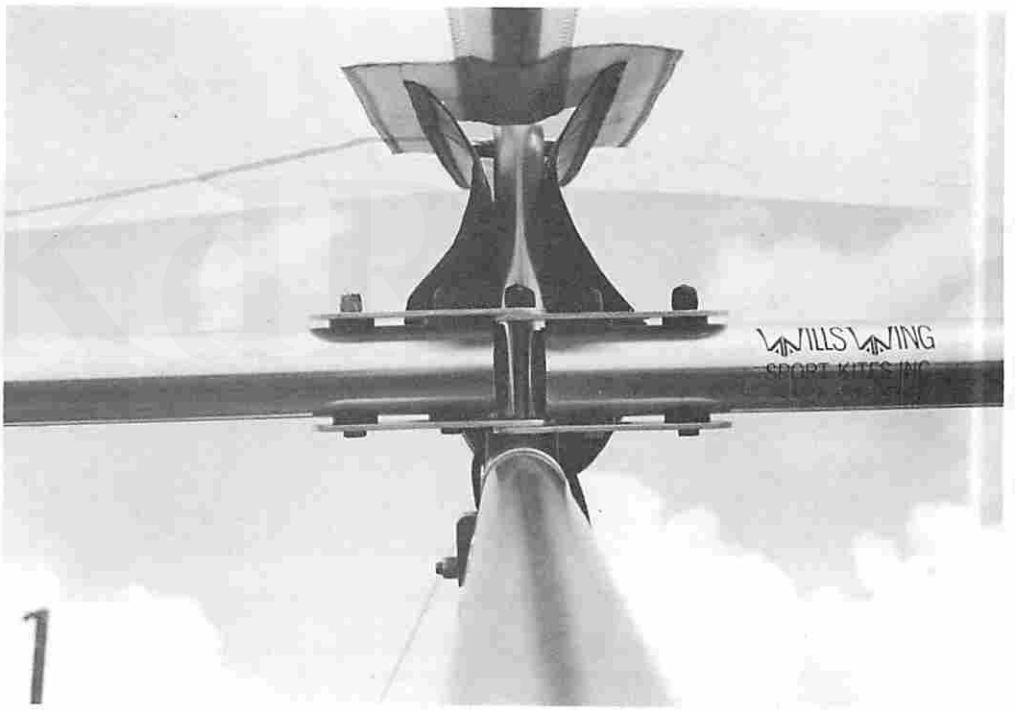
At increased speed, bar pulled back to full arm extension, the Raven "wanders." That light roll pressure works against you at high speeds, requiring a lot of steadiness from the pilot. But only in this fully accelerated mode does the Raven offer less predictability in its control. I am less concerned with the proximity of other pilots or ground obstructions in a Raven than in other crafts.

SPEED RANGE

I feel there exists two components here. One is useful speed range to gain optimum performance. The other is maximum effective penetration speed. In the former, the Raven offers a very wide speed range, working quite well at near stall up to accelerated speeds. The ultra low speed roll control is only 50 percent as good as an Omega, but is still way ahead of any non-floater design I have flown.

The Raven's maximum effective penetration speed is perfectly adequate, dropping slowly as you fly a model which lowers your wing loading. At these speeds the Raven's glide performance decays significantly, which may catch you behind a ridge. But, eliminating that one instance, I feel very comfortable, even in a 229, should wind speed increase.

The speed range is not wide enough though to permit the best wing-overs. Here energy retention is important, and while the Raven accelerates very well, it cannot hold energy as well as, say, the Moyes Mega, a Fledge, or a Mosquito.



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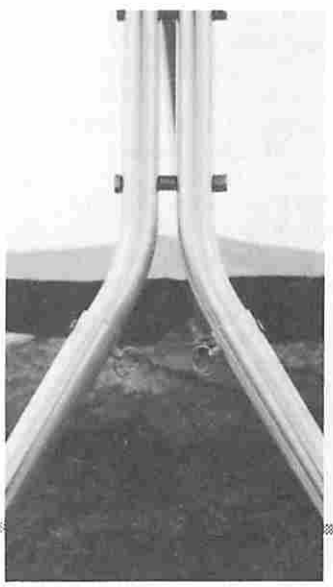

Raven specifications

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RAVEN	229	209	179	149
Area	229 ft²	209 ft²	179 ft²	149 ft²
Span	36.2 ft.	34.5 ft.	31.5 ft.	28.3 ft.
Nose Angle	115°	115°	115°	115°
Billow	1°	1°	1°	1°
Aspect Ratio	5.7	5.7	5.5	5.4
Weight	62 lbs.	58 lbs.	49 lbs.	45 lbs.
Leading edge	21 ft.	20 ft.	18.2 ft.	16.5 ft.
front	2" x .049	1-3/4" x .058	1-3/4" x .049	?
rear	2" x .049	1-3/4" x .049	1-3/4" x .049	?
Keel	13.5 ft. 1-1/2 x .049	12.6 ft. 1-1/2" x .049	12.3 ft. 1-1/2" x .049	11.5 ft. ?
X-Spar	1-7/8" x .058	1-3/4" x .058	1-3/4" x .049	?
Control Bar				
height	5.25 ft.	5.25 ft.	5.25 ft. or 4.7 ft.	4.7 ft.
width	5.5 ft.	5.5 ft.	5.5 ft. or 5 ft.	5 ft.
base	1-1/8 x .058	1-1/8 x .058	1-1/8 x .058	?
leg	1-1/8" x .058 w/ 1" x .035	1-1/8" x .058 w/ 1" x .035	1-1/8" x .058 w/ 1" x .035	? ?
Wires	3/32" x 1/8" PVC 7 x 7 Stainless	3/32" x 1/8" PVC 7 x 7 Stainless	3/32" x 1/8" PVC 7 x 7 Stainless	3/32" x 1/8" PVC 7 x 7 Stainless

STALL CHARACTERISTICS

The Raven shows a fairly sharp stall, breaking clean and without dropping a wing. I have stalled the model in turns as well as straight ahead, and find it very predictable. A slow movement outward produces a very mild stall, but one which still breaks, that is, no mush. With a rapid movement, forward motion can be halted after which the nose will pitch down quickly to 20-30 degrees below the horizon. I like these qualities for a full stall landing, but as stated, you must then keep the bar out to prevent the nose from falling through.

On a medium stall, I removed my hands at the point of stall. This produced one secondary stall followed by a gentle oscillation to stable flight, very satisfactory.

GROUND HANDLING

The Ravens, especially the big one, can be a handful in a windy landing area. I find it best to unclip the luff line right after I disconnect my harness, which eases carrying the glider with nose held low. Pilots of smaller stature may wish to add control bar padding as the Wills bar is large and wide, though nothing as difficult as the old six foot X-C bar.

SET-UP

See the Tech-Panel column in this issue for more info on Raven set-up, but it is enough to say that it is very simple and clean. I, too, find it the best I have used, with one glaring problem area. Attaching the control bar can be a major hassle if you do it hastily. The glider bag has a nice pouch to store the collapsible and always attached bar. But, when extracting it, if you allow the wires to tangle, it can cause delays of 20-30 minutes to figure it out. This has frustrated many pilots, though I have had no further trouble since I learned my lesson, and now go slowly through this part. The bar legs slide on over a "yolk" and that is simple enough though not as contemporary as other systems which use straight bars for all three tubes.

Once past the bar, the Raven is fast and easy, even pleasant to erect. The rear tensioner works well; the crossbar mounting is clean and easy plus looking very brute; the batten bungies all have pull strings, and the metal tip battens lock in easily, with the bungie threaded through a ball. The defined tip plugs in simply, though you must insert a safety ring. At a relaxed pace I can set up easily in 8-10 minutes, fast enough for me.

PURCHASE COST, LONGEVITY, AND RESALEABILITY

The Raven went to $1425.00 for all sizes in mid-April, but represents a very good value at that price. No charge is made for any options as there are none. The Novice version has no extra cost, and will cost nothing to convert to a standard Raven.

This last "option" may make the Raven a best buy for a beginner, as he or she can buy a Novice model in their size, fly it till comfortable and then convert it, to fly it for years more. In days of $1500 gliders, a customer may not be able to afford a starter glider, then trading up to an intermediate.

Raven resaleability is an unknown quality as it is still new. But its all-round capabilities plus generous performance with simple lines should keep it in good demand when used, in my opinion.

Delivery time, as of May 1980, was 8 weeks, a bit long, but well worth the wait. No one in the industry offers more reliable back-up service. □

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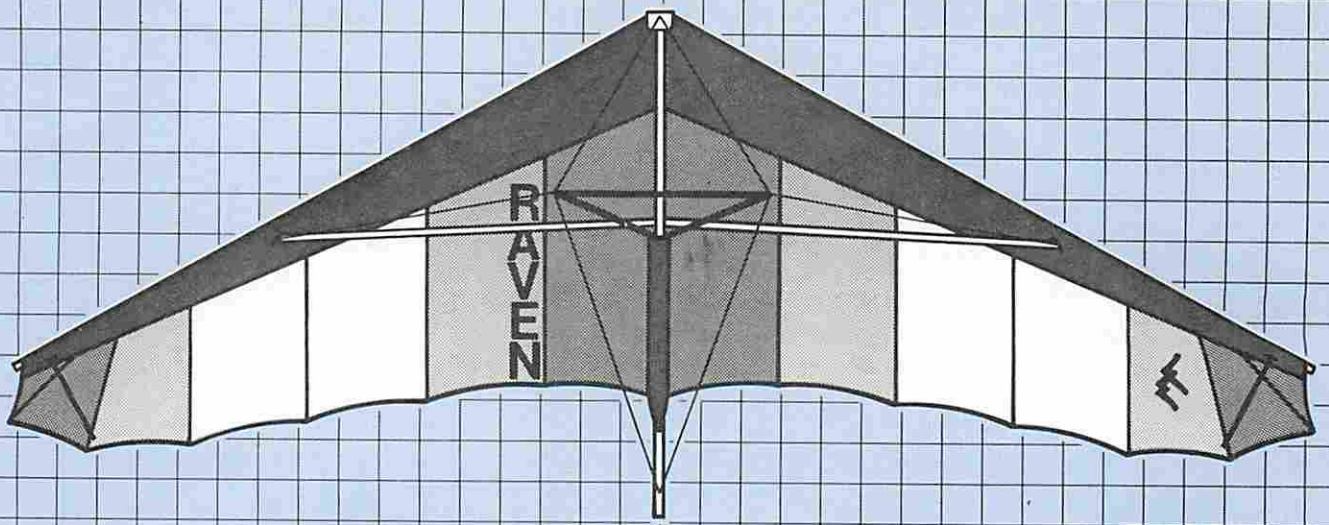
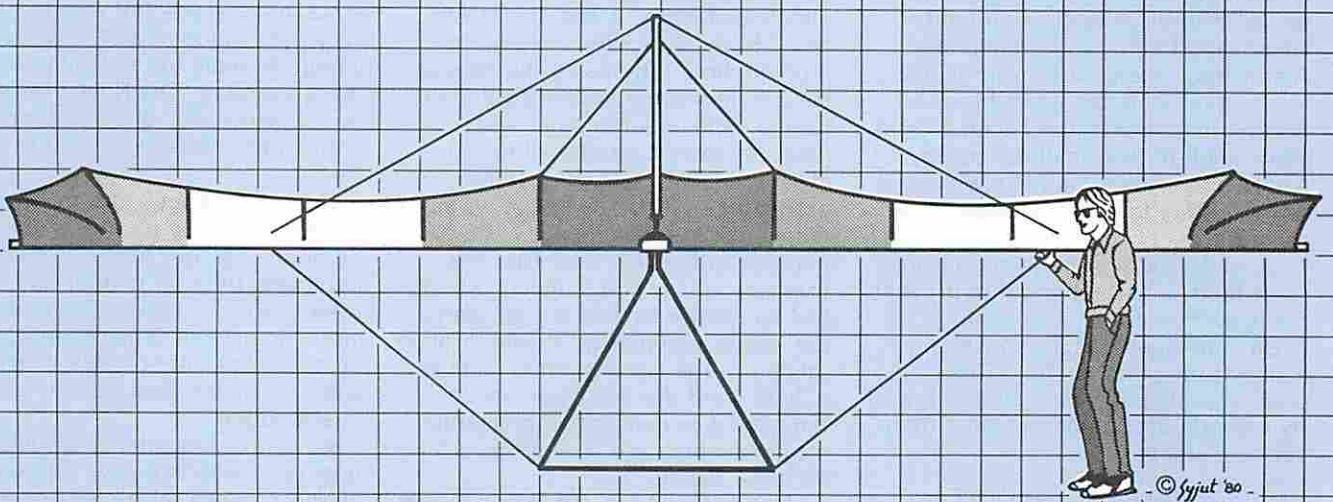


RAVEN



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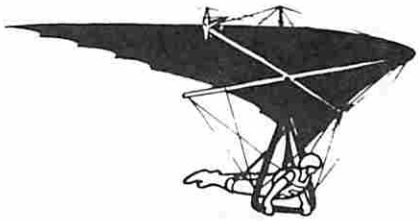
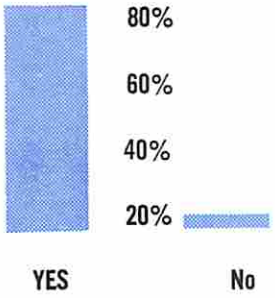
HANG GLIDING STATISTICS

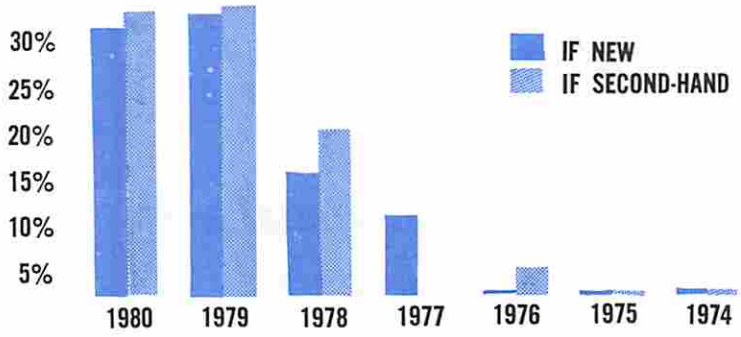
By Dan Johnson



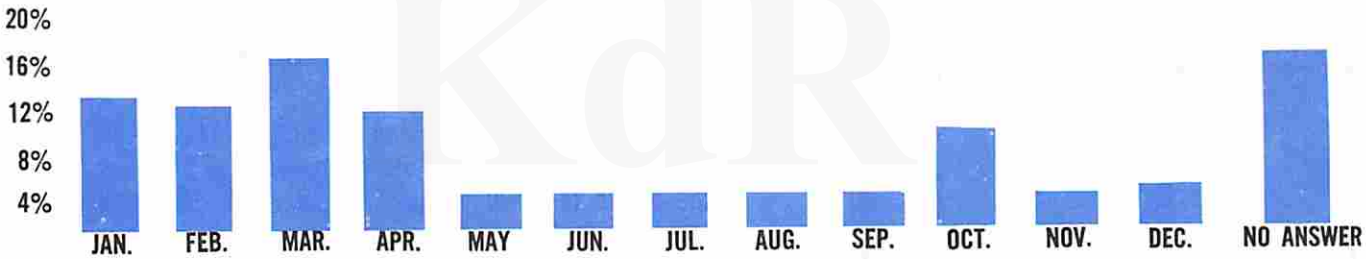
QUESTION: Did you buy your current glider brand new?



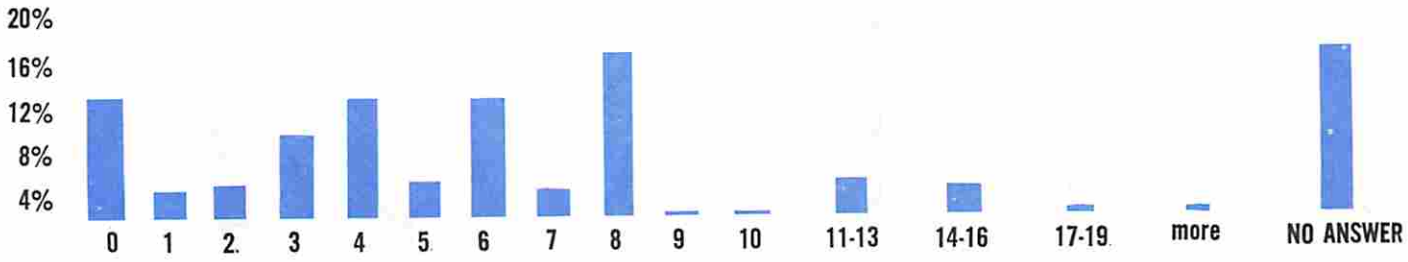
QUESTION: In what year was it purchased?



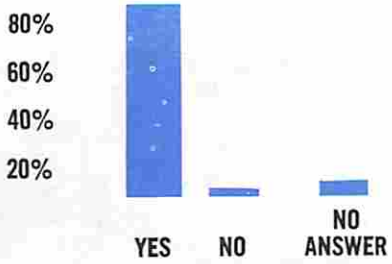
QUESTION: In what month was your order placed?



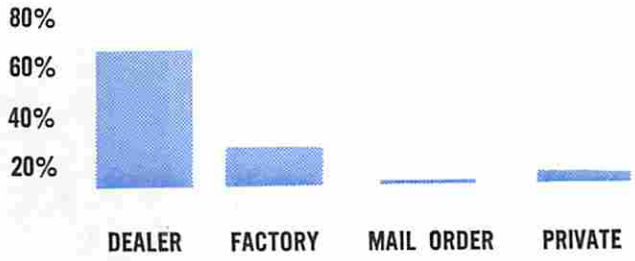
QUESTION: How many weeks did you wait for delivery?



QUESTION: Was your glider what you ordered (satisfied)?



QUESTION: From whom did you buy it?



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Congratulations to Eric Raymond who became the happy owner of the coveted "Cheetah" trophy for being the "fastest cat in the sky" at the 1979 Great Race. An ordinary trophy just wouldn't do!

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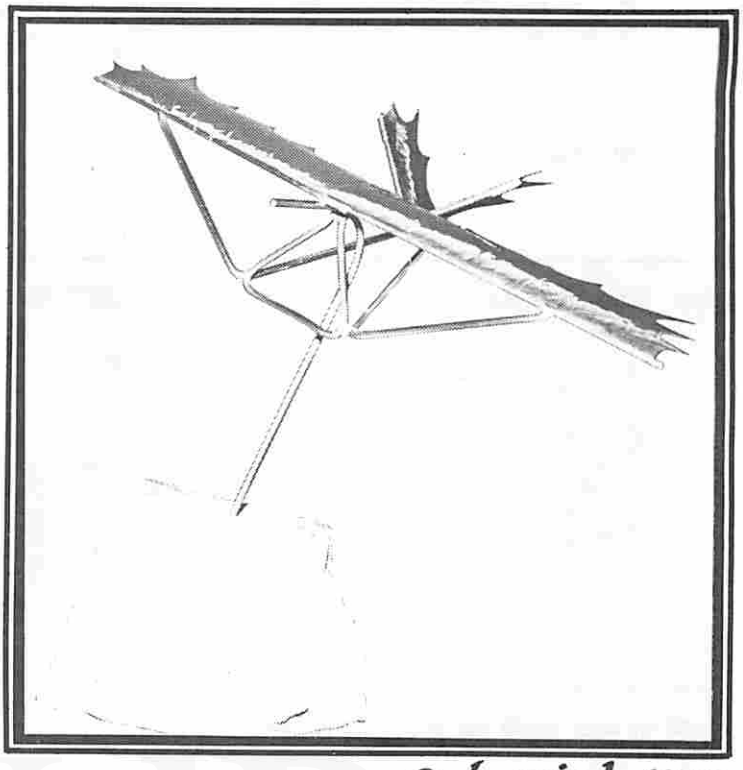

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ATTENTION
Writers, Photographers

WAM is looking for articles and photos.

Got a really nice shot we might use in the magazine or a color slide suitable for a cover?

Or do you have something of interest about which to write?

We will consider all submissions and return all originals if requested.

Send to:

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Whole Air Magazine
Box 144
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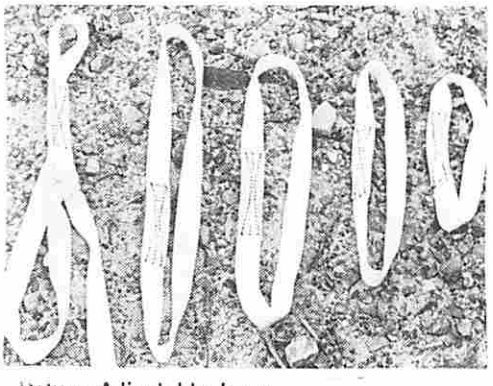
Crystal's deluxe line, all tested to 20 G's! Will fit all bar/harness combinations. Adjustaloop — 9" to 22" hang range tested to 4,000 pounds. 9", 12", 15", 18" fixed length loops tested to 5000 pounds.



____	A	Deluxe Adjustable Loop	$ 7.00
____	B	18 inch Standard Loop	$ 4.00
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____	E	9 inch Standard Loop	$ 3.00

CRYSTAL accessoaries

ORDER FORM ON PAGE 42

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THE NEW CGS FALCONS

STANDARD FEATURES:

Standard features on both Falcon models include: cover bag, negative deflexers, floating tips, quick set-up and CGS high quality hardware. Applied leading edges are standard on the Falcon 8. Breakdown frame and dual rigging are optional.

FALCON 8

With lightness in mind, the Falcon 8 has been developed for the pilot that wants an easy to fly, L/D ship. Using the same basic frame and large keel pocket from last year's Falcon 5.5, CGS has improved the sail and cambering technique. The result is, easy set-up launching and landing, light bar pressure, and performance that will put you ahead. The high speed ability combined with a beefier frame makes the Falcon 8 a much safer thermal or high wind ship that won't wear you out.

$1100.00

OUTSTANDING!

FALCON 5 PLUS

The Falcon 5 "Plus" has many of the appealing characteristics of the original Falcon 5 ... with a plus. The "plus" is a raised keel pocket and floating tips for a positive attitude. The Falcon 5 "Plus" has a wide range of tuneability. A good beginner can fly safely while an advanced pilot will find the tighter profile gives easy, light handling with quick response. The Falcon 5 "Plus" has low stall speed for floating, but good penetration when needed, even under a light loading. A design that has proven successful for three years, proves better now. Falcon 5 "Plus."

$1025.00

FALCON 5 OWNERS

If you presently own a Falcon 5, ask about our conversion option to a Falcon 5 "Plus."

CGS AIRCRAFT

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NEW YORK S^I^T^E^S

Photo By Mankowich

ELLENVILLES SOARING RIDGE

by Robert Chapel

Nestled in the Shawagunk Valley, three miles east of the town of Ellenville, N. Y., just off Route 52, you will find the host site for the 1980 National Hang Glider Championship. It is one of the most popular sites on the East coast, it is also one of the best soaring ridges. This is not said out of prejudice, as it is my home site, but as a proven fact, as many of our country's best pilots have made it a point to come up here and experience some really excellent ridge and thermal soaring. It is not uncommon for a pilot to find himself two to three thousand feet above launch in over glassy smooth wonder winds, or to ride one of our house thermals to four or five thousand AGL, and slip over the backside of this mountain for an X-C trek.

The geography of this mountain lends itself to producing a wide variety of conditions. You can find anything from very calm,stable conditions to tremendously strong, unstable or high wind conditions. One day you may find smooth ridge soaring, and the next day experience a thermal playground in the sky. It all

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has to do with the unique terrain of this mountain. It actually is composed of three distinct ridges, each one producing its own air characteristics. At the base of this mountain you will find an open valley composed of large flat fields, a country club, and the town of Ellenville itself. This valley truly works overtime producing thermals, winter and summer, they are abundant. It also provides a pilot with unlimited landing possibilities. The three distinct ridges help to break loose any forming thermals, and direct them skywards to the awaiting pilot at an amazing rate. Even in the winter months I have experienced 1000 fpm thermals, which are like flying in tropical air, their cores are so warm. So this mountain definitely provides you with the means to get high.

There are four launch points on this mountain. The highest elevation launch, 1100 AGL, is also the most popular, and is commonly referred to as "The Knob." This launch faces predominately west-northwest, but also takes a west southwest wind well. It is a sloping knoll which drops off sharply after about fifty feet. It is a cleared knoll which allows the winds to pass over it smothly and undisturbed. The other three launches are located at lower levels, off the main road, Route 52, which winds down around the mountain. We have a SW launch at 875 AGL, which is a semi cliff launch, needing a wireman in anything other than light winds. Also there is a W-NW launch at 800 AGL, and a ramp launch at 600 AGL, which is NW. But for now I will dwell on our most popular launch. "The Knob." It is reached by means of a winding dirt road, which is accessible by means of a pickup or van. It also may be reached by way of a footpath which is a fifteen minute walk up. It's just enough of a grade to get your heart to pumping. Atop of the mountain, adjoining the launch, is the set-up area, which is a level 3500 sq. ft. area, and can accommodate twenty to thirty gliders at a time.

TURKEY HILL

Site: Turkey Hill — near town of Newton, New Jersey.
Approximate Vertical: 125 (200 ft.)
Approximate Angle: 30°
Direction: (NNW)
Rating: Hang 1-3
How to get there: GEORGE WASHINGTON BRIDGE to Route 80 into Route 15 North to Lafayette. Then onto Route 94 South till you hit Route 206 South through NEWTON. After Newton (outskirts), look for Route 94 and the VFW hall on your right. A side reference is DON BOSCO COLLEGE which is located across from TURKEY HILL. For parking use the VFW hall lot.

NOTAMS: Bring a waiver and put it into the farmer's mail box. This site can be tricky during angulated winds especially if they come in from the left side. The top take off near the trees is the steeper one but has a drawback, two trees right after take-off which you must thread your way through. LZ is huge and almost hazardless but for one large tree near the bottom. Good training area for Class 1 and 2 polishing their skills. The Class 3 notation above is only to serve as warning that when the winds are blowing hard and from the left and you're taking off through the aforementioned trees, you had better know what you're doing.

LEATHER HILL

Site: Leather Hill — Dover Plains, New York.
Approximate Vertical: 500 feet.
Direction: NW
Rating: Hang 2-4.
How to get there: Take Route 22 North to the town of Dover. Park, which is on your right as you head north, is approximately one mile north of the Harlem Valley (Wingdale) Psychiatric Center. Approximately a 20 minute "walk-up."

Note: The access, ridge, and landing area are owned by the town of Dover and under the regulation of the Town Board.

Site Regulations:

(1) All non-resident pilots (pilots not living in the town of Dover) will fly Leather Hill only when accompanied by a resident pilot.

(2) All pilots will be *full* members in the U.S.H.G.A., hold a rating of Intermediate or Advanced and will be able to supply proof of this to *any* person requesting it.

(3) Novice pilots may fly under the supervision of an advanced pilot.

Note: If these rules are followed, there should be no problem keeping this site open for everyone to use. Remember, this site can be closed down *by the Town* if there are *any* infractions of the rules.

Who to contact: There are three "resident pilots" who can be contacted so that arrangements can be made to fly. Please try to keep all calls between the hours of 8:00 a.m. and 9:00 p.m.

Jim Wise	(914) 877-3319
Rich Dwy	(914) 832-6763
George Weigel	(914) 855-1139

MATTITUCK

Site: Mattituck, near tow of Mattituck, Long Island, New York.
Who to call: V. Matassa (516/681-8738)
Approximate Vertical: 180.
Approximate Angle: 40.
Direction: NW
Rating: Hang 3-4.
How to get there: Head East on Long Island Expressway. Get off at very last exit and follow Route 52 towards Riverhead. Observe Burger King after you pass a traffic circle. Shortly after Burger King, look for NORTHVILLE TPKE. and make a left on the the turnpike. Follow this road to the end, it will merge into SOUND Avenue. Take a right onto Sound Avenue and after a few miles keep an eye out for BERGEN ROAD. Make a left onto Bergen and after a sharp right get ready to turn left onto a dirt road marked by a deserted farm house and an iron gate. Flying area is at the end of this dirt road. Park there and read the sign describing the rules of the road (ridge).

NOTAMS: This is the best site on Long Island. It is leased from the farmer by Vinnie Matassa, who is in control of the charter membership that flies this site for a yearly fee. Guests may fly there at a cost of $10 which includes 10 consecutive days rights. If the site is crowded on any given day, the charter members have the right of way. Charter members are limited to 35 people. The ridge consists of dune type slope at about a 40 degree incline. Best soaring can be achieved when wind is NW at about 18-22 mph. On week ends traffic gets fairly heavy in the air and close adherance to ridge rules is recommended. LZ is a fairly narrow strip of beach along the bottom of the ridge, and is especially narrow during high tide. Ridge is about a mile long and if you've got a good glider capable of shooting some gaps, you can go father than that. Air currents are generally smooth owing to the water that precedes the ridge.

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MONTANA S^I^T^E^S

By Dan Gravage

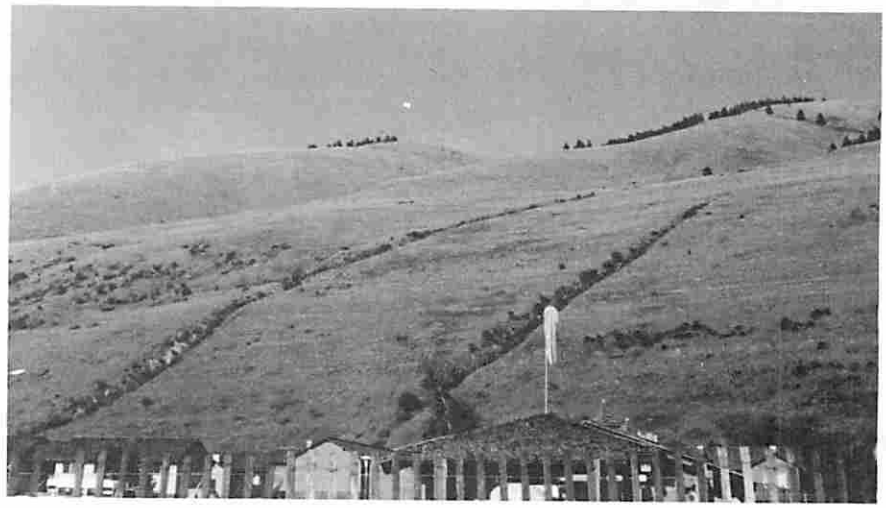
Welcome to Montana, the Big Sky Country, and what's more perfectly suited for flying than big skies? We though it was time to let a little more be known about the sites we fly. Some may fear an influx of foreign flyers, but with traveling becoming more expensive each year, I see no real threat of being invaded. Most locals are more than happy to show off their sites.

And speaking of sites, there's enough to fill the whole magazine, but to save the editor some editing, I'll just list the more popular sites, starting with probably the best known, Mt. Sentinal in Missoula. It's located on the University of Montana campus, with the landing area at the University golf course and 2,000 ft. of vertical grassy hillside. The locals are spoiled.

Even tho I know there is flying around Kalispell, I was unable to contact anyone in that area for more info. Over in the Butte-Anaconda area there are lots of great sites with plenty of cross-country potential. Down here in Livingston, (second windiest city in the country) there's always a soarable site. Bozeman pilots usually fly here, unless Felix Canyon north of Bozeman in the Bridgers is cookin'. Billings pilots travel down to Dayton, Wyoming to fly, but are negotiating a site a little closer to home on the Rims.

As I mentioned there are so many places to fly, some have only been flown a few times. Like the Beartooth Highway south of Red Lodge, or Sheep Mountain, Eight Mile, Mt. Ellis, etc., etc. You'll just have to come see and fly them yourself. Maybe we'll even show you some top-secret stuff.

So grab your diver, throw it on the van, and come on out. Just get in touch with anyone listed, and enjoy some BIG SKY-IN' OUT!



Mt. Sentinal — Missoula
photo taken from landing area

MT. SENTINAL

Site:
Mt. Sentinal, Missoula
Direction:
West 270°
Rating required:
Hang III with USHGA insurance (strictly enforced)
Clubs, organizations ,or persons to contact:
Any club member, one is usually found at the landing area
Fees to pay:
None
What conditions for
a) gliding:
0-10 mph from 260-045°
b) soarable:
12 and up from 270-090° and in thermals
Flying season:
April or May thru October. Best soaring in spring and fall
Transportation necessary:
Steep hill at top requires 4-wheel drive
Glider set-up area capacity:
Unlimited
Landing field
a) distance from launch:
approximately one mile
b) size:
Golf course
c) obstructions:
Trees, golfers
Launch
a) elevation:
5,200 ASL
b) vertical descent:
1,960 feet.
Special notes on site:
Rules for flying posted on bulletin board in landing area, anyone violating rules will have charges brought against them by University of Montana. Direct contact with Airport flight control via radio at launch.

JOHNSON'S

Site:
Johnson's, Livingston
Direction:
West 270°
Rating required:
Hang II
Clubs, organizations, or persons to contact:
Dan Gravage, Barney Hallin
Fees to pay:
None
What conditions for
a) gliding:
0-12 mph
b) soaring:

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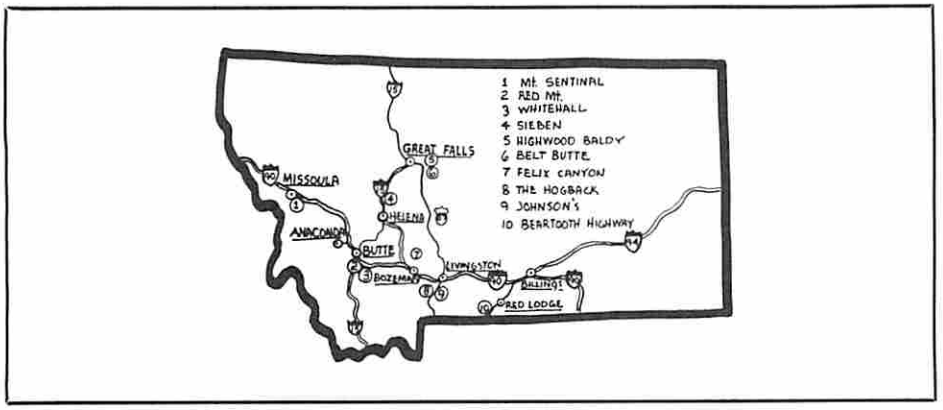


15-25 mph and in thermals
Flying season:
May thru October.
Transportation necessary:
Two-wheel drive
Glider set-up area capacity:
Unlimited
Landing field
a) Distance from launch:
One-half mile
b) size:
Unlimited
c) obstructions:
None
Launch
a) elevation:
6,000 ASL
b) vertical descent:
1,200 feet
Special notes on site:
1,200 feet of steep, grassy slope with big thermals. Ten minutes from campgrounds. Within four miles of all other sites in the Valley.

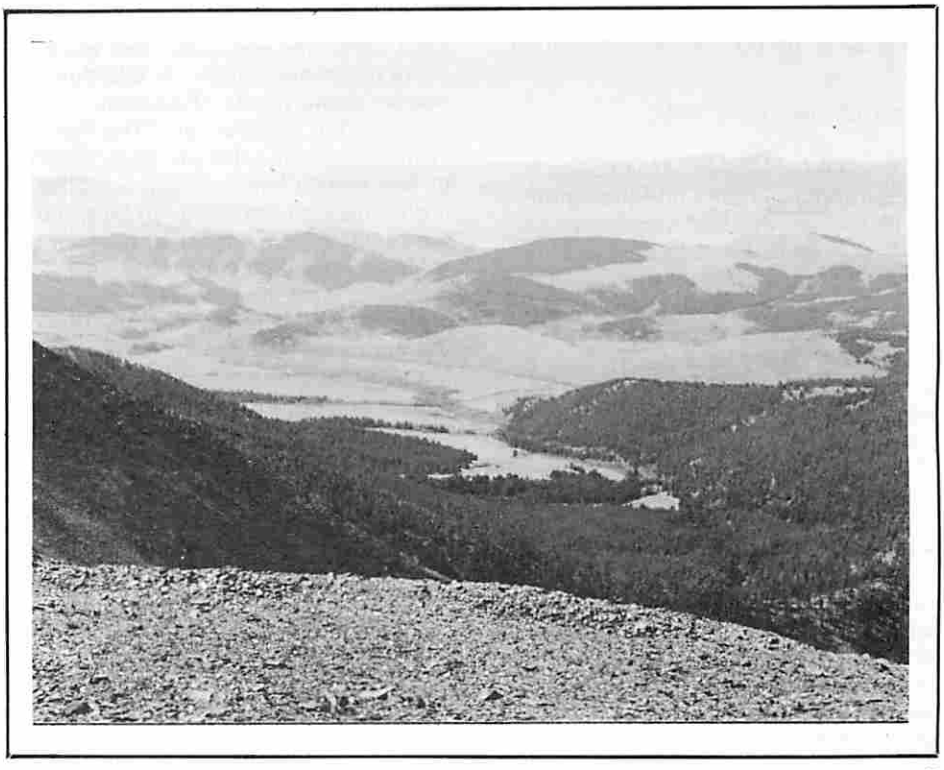
b) size:
Unlimited
c) obstructions:
fences on south side
Launch
a) elevation:
5,400 ASL
b) vertical descent:
300 and 500 ft. North
300 and 800 ft. South
Special notes on site:
Three and one-half mile ridge, with one end being 1,400 ft. higher than launch, so 1,800 - 2,000 ft. gains a daily occurence. Soarable very often. 4,000 ft. gains and 5 mile filghts.

RED MOUNTAIN

Site:
Red Mountain, Butte
Direction:
West 270°
Rating required
Hang IV
Clubs, organizations or persons to contact:
Dennis Sitton —
Anaconda — 563-2758
Fred Darland — Butte — 494-3778
Fees to pay:
None
What conditions for
a) gliding:
5 mph to make landing area
b) 15 mph and up
Don't fly when wind is from South
Flying season
Late June thru mid-October
Transportation necessary:
4 wheel drive
Glider set-up area capacity:
25 gliders
Landing field
a) distance from launch:
6 miles
b) size:
Unlimited
c) obstructions:
none (watch for bears)
Launch
a) elevation:
10,000 ASL
b) vertical descent:
3,100 feet.
Special notes on site:
High altitude take-off — run hard!
7,000 ft. gains and 15 mile flights.

THE HOGBACK

Site:
The Hogback, Livingston
Direction:
North, South
Rating Required:
Hang II
Clubs, organizations, or persons to contact:
Dan Gravage — 222-1559
Barney Hallin — 222-1780
Fees to pay:
None
What conditions for
a) gliding:
0-12 mph
b) soaring:
15-25 mph and in thermals
Flying season:
Year around, best in Spring
Transportation necessary:
Fifteen minute hike (easy)
Glider set-up area capacity:
6-8 north, 3-4 south
Landing field
a) distance from launch:
one-fourth mile — north and south



Red Mountain in the Highlands South of Butte, Mountain.
Photo taken from launch. Landing approximately 4-5 miles away.

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TOWING SECTION

introduction to the tow winch

by Ed Quirk

The use of a winch to tow a hang glider has been growing steadily since its introduction at Cypress Gardens several years ago. The idea of using a winch to obtain altitude is not new. The Germans used a simple form of the winch in the early 1900's to tow up sail planes. The tow winch used in hang gliding today has evolved from these sail plane origins.

With the ever increasing use of the tow winch it became apparent that there was a lack of information available to the pilot considering this form of launch. Harry Robb, U.S.G.H.A. Director at Large, realized this problem and set forth compiling information. The results produced a manual that covers, in depth, the operation of a tow winch for both water and land towing. The second edition has just been completed and he has consented to let WAM *run a series of articles covering the material in his* TOW WINCH MANUAL.

Copyright by Harry Robb

This *TOW WINCH MANUAL* has been in preparation since the summer of 1978 when the first version was written in an attempt to organize the small amount of information available into a written document for analysis and evaluation. The project was launched initially by a desire also to determine the value of the winch to boat tow launch hang gliding competition. At about the same time, after serving as ground crew for a sailplane pilot in a Competition Meet, the use of the tow winch in an automotive tow vehicle became an item of equal importance in the research. At this time, the tow winch was being used in Florida by only a few people, and only in boat tow launch hang gliding which has been popular for water ski shows and in competition for seven years.

In attempting to coordinate the Manual to assure reasonable accuracy of its information and recommendations, it soon became apparent that no "one best way" of operating the tow winch and instructing Pilots on the flight techniques best suited to the winch had yet evolved in the summer of 1978. When the various people then using the tow winch were able to study the ideas and words on paper in the first version of this Manual, their written comments began to reveal the "better way" of operating the winch and flying behind it.

The *TOW WINCH MANUAL* is a basic Manual only for use of the tow winch in sport flying as an aid in training tow winch operators and tow vehicle drivers, and for indoctrinating Pilots in successfully flying with the winch behind any type of tow vehicle. Even so, this Manual cannot be considered the absolute "last word" in its recommendation. In addition, ponder some words of caution contained in the Manual. "The Tow Winch does not solve all the problems of tow launch hang gliding, nor does it eliminate all the risks. In fact, the introduction of mechanical devices to solve any problem can create new problems with the increased probability of failure or malfunction of the additional equipment." This Manual can only present the best known current information, which can be accepted for what it is — better than nothing at all. As more experience is gained by more people in operation of the tow winch, more definitive procedures will evolve and can be committed to written instructions that are safe.

Although the tow winch is not considered advantageous in hang gliding competition for Flight Tasks in restricted areas of benefit to the pleasure of spectators who may pay admission to the Meet, it can be used for gaining the higher altitudes desired for soaring for Duration Flight Tasks and Cross Country when included in a Competition Meet. If tentative plans for use of the tow winch in a Duration Flight Task in the 7th World Open at Cypress Gardens are accomplished, its value in certain types of competition will have been validated.

1. GENERAL

The Tow Winch is a drum-reel mechanism approximately 3 feet (1 meter) in length and 1½ feet (½ meter) in diameter, containing up to 3000 feet (900 meters) of ¼ inch (6mm) polypropylene tow line with a tensile strength of about 1200 pounds (540 kg). The rotation of the drum-reel is controlled by an adjustable pressure, hydraulic-actuated disc brake which can be operated automatically at pre-set hydraulic pressures of approximately 110-330 pounds (50-150 kg), with a manual override, to unreel and extend the tow line from the drum-reel during towed hang glider flight from launch to release.

The Tow Winch is designed to add to the safety of tow launch hang gliding by controlling dangerous hang glider and tow line stress which can be generated by an excessive angle of attack of the hang glider during climb, by strong and variable wind velocity and wind shears, by sudden abnormal lift in the thermals and updrafts into clouds, and other such hazards in the flight environment. It can also provide protection against a most serious source of dangerous stress — excess speed of the tow vehicle when operated by an inexperienced or negligent tow vehicle driver.

However, the Tow Winch is much more complicated than a simple tow line safety release mechanism, and must be properly adjusted, carefully maintained, and inspected and tested before each period of use in order to prevent additional risks from use of the Tow Winch itself. In addition, the Tow Winch Operator must be knowledgeable in the mechanical operation of the equipment, as well as all the techniques for its use in safe towing operations.

With normal safety precautions, the Tow winch can expand the safe use of the longer tow lines necessary for attaining the normal minimum altitudes of approximately 2000 feet (600 meters) used by sailplanes for release from the airplane tow line for free flight in thermalling and cloud updraft conditions. Our boat tow launch over water, and automotive tow launch over land can be just as safe as the airplane and ground winch tow launch used by the sail planes.

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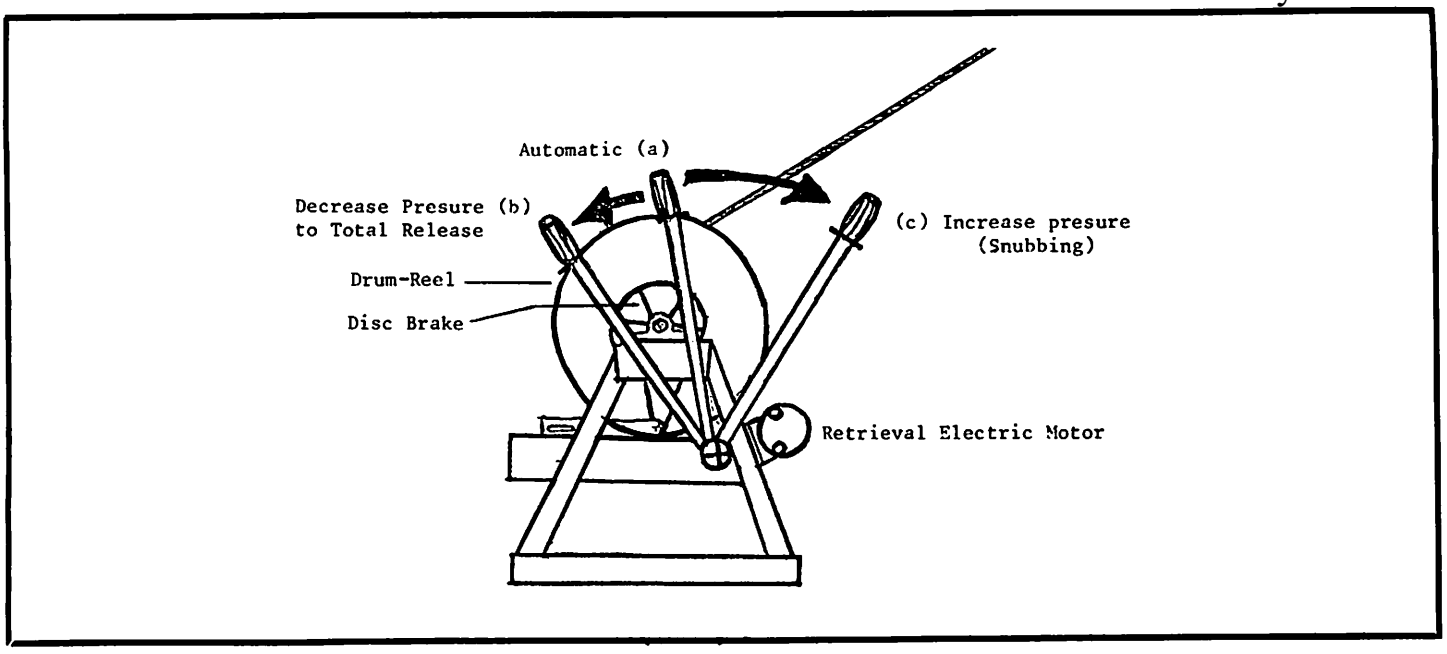


2. BASIC COMPONENTS OF THE TOW WINCH

The basic components of the tow winch which control hang glider tow launch and the retrieval of the tow line after the pilot releases his hang glider from the tow line for free flight are shown and identified in Figure 1, and are discussed in this section.

1. DRUM-REEL does not require any operator manipulation during the towing operation since it represents a danger while it is moving. The rotation of the drum-reel is controlled by the disc brake.
2. DISC BRAKE located on one end of the drum-reel shaft, and is activated by an adjustable-pressure hydraulic cylinder.
3. TWO CONTROL HANDLE determines the mode of operation of the Drum-Reel.
   a) Automatic operation of the drum-reel against the pre-set hydraulic pressure on the disc brake occurs in the vertical position of the Tow Control Handle.

      The adjustable hydraulic pressure for the disc brake is controlled by a spring, and adjusted by a bolt easily reached by the Operator.
   b) Hydraulic pressure on the disc brake is gradually decreased by the Winch Operator as he pulls the Tow Control Handle back toward the Operator to the rear limit Release Position, which disengages the Automatic Operation and allows the drum-reel to "free Wheel" without any brake control. This position is used at all times when not towing in order to relieve hydraulic pressure on the system.
   c) Hydraulic pressure on the disc brake is increased by the Winch Operator as he pushes the Tow Control Handle forward away from the Operator, to the front limit Snub Position. This position enables the hang glider to exert a greater pressure on the tow line before the brake allows the drum to rotate and to unreel the tow line. This operation is called "Snubbing."

      The amount of the increase of hydraulic pressure activated by a Control Rod is limited by the adjustment of a Snub Bolt.
4. RETRIEVAL ELECTRIC MOTOR operates on a 12V DC battery in the tow vehicle, or on a separate battery to rotate the drum-reel in the reverse direction of its rotation during towing operations, for retrieval of the tow line after the hang glider release. The motor is activated by a switch in the top end of the Tow Control Handle, or at another convenient location.
5. RE-WIND LEVEL GUIDE distributes the tow line evently across the face of the drum-reel during tow line retrieval operation. It may be manually operated, or electrically operated.

3. ADVANTAGE OF THE TOW LINE WINCH

The Tow Winch does not solve all the problems of tow launch hang gliding, nor does it eliminate all the risks. In fact, the introduction of mechanical devices to solve any problem can create new problems with the increased probability of failure or malfunction of the additional equipment.

Nevertheless, the tow winch does offer relatively safe relief from the sudden unpredictable and dangerous stresses on the hang glider and the tow line which is the most serious problem in tow launch hang gliding. In addition, the tow winch provides a most convenient means of stowing the extra long tow line after its release by the hang glider pilot, to avoid the possibility of damage from other boats in the area during the return of the tow boat to the launch point. In land tow launch, it prevents abrasion to the tow line dragging on the ground during return to the launch point.

In preparation for launch, positioning of an extremely long tow line in a straight line with the direction of planned launch take-off is nearly impossible in wind-blown or tidal water, causing an extreme curve in the tow line which can pull the hang glider off course on take-off and cause an abort. Even though this problem is not encountered in land tow, the tow which saves time by eliminating the placement of the tow line. When the tow vehicle is close to the Pilot, information on the launch tow and the flight course pattern can easily be exchanged.

However, the advantages of the tow which can be realized only by using a conscientious, knowledgeable winch operator will assure that the winch is carefully maintained, properly adjusted, and is inspected and tested before each period of use in order to prevent additional risks from use of the winch itself. He then must know that it is operated safely.

In the next issue we will cover the launch procedures used for water and land towing. TIGHT LINES!

Ken de Russy Collection

CRYSTAL accessoaries

ORDER FORM

REQUIRED ORDER INFORMATION

Name _____

Address _____

_____ Zip _____

Qty.	Description

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 _____

Merchandise total _____

Tennessee residents,
add 6.25% sales tax _____

Handling/Shipping
95c minimum, or
5% of total order _____

(extra packaging charge, $1.50 on Supergrip and Helmets)

TOTAL _____

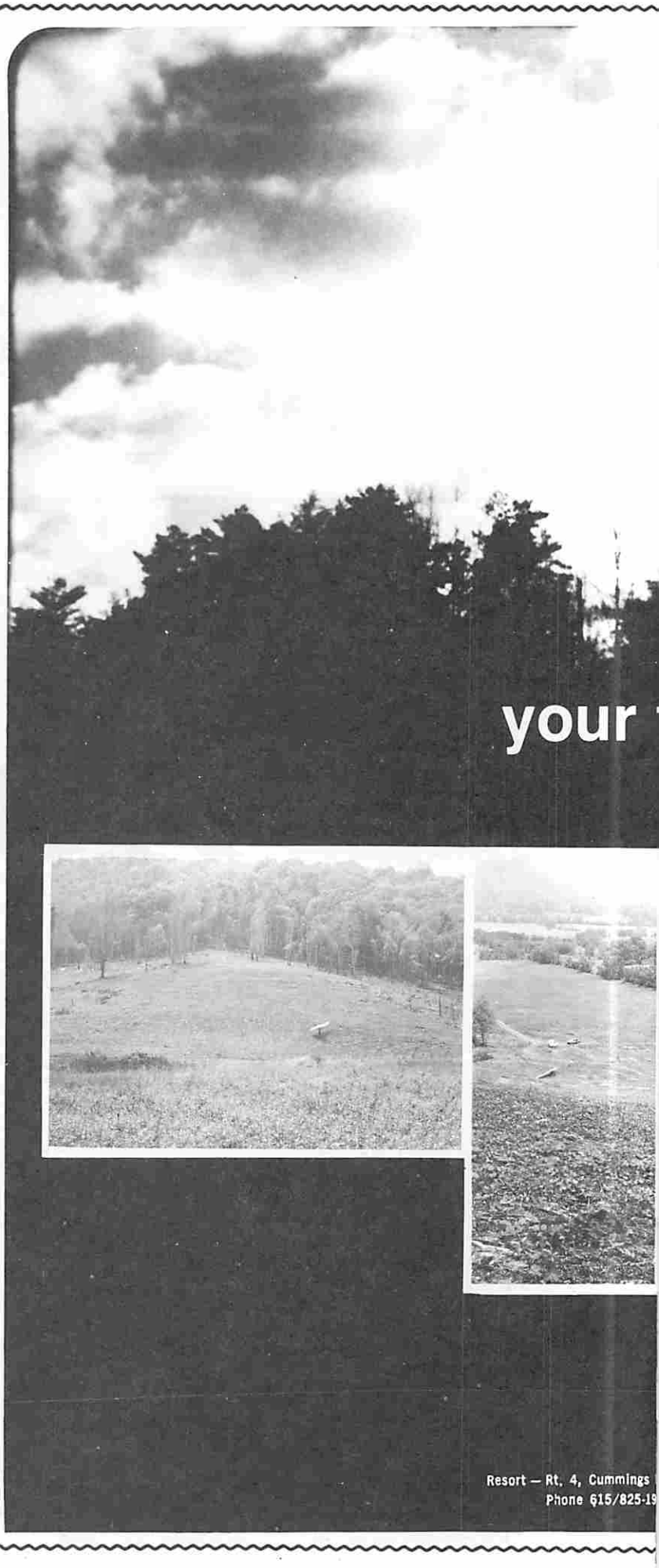
Amount Enclosed _____

COD _____

(COD orders will involve COD charges)

MAKE SURE FUNDS WILL NOT FALL OUT!

CRYSTAL
Box 144
Lookout Mtn., TN 37350



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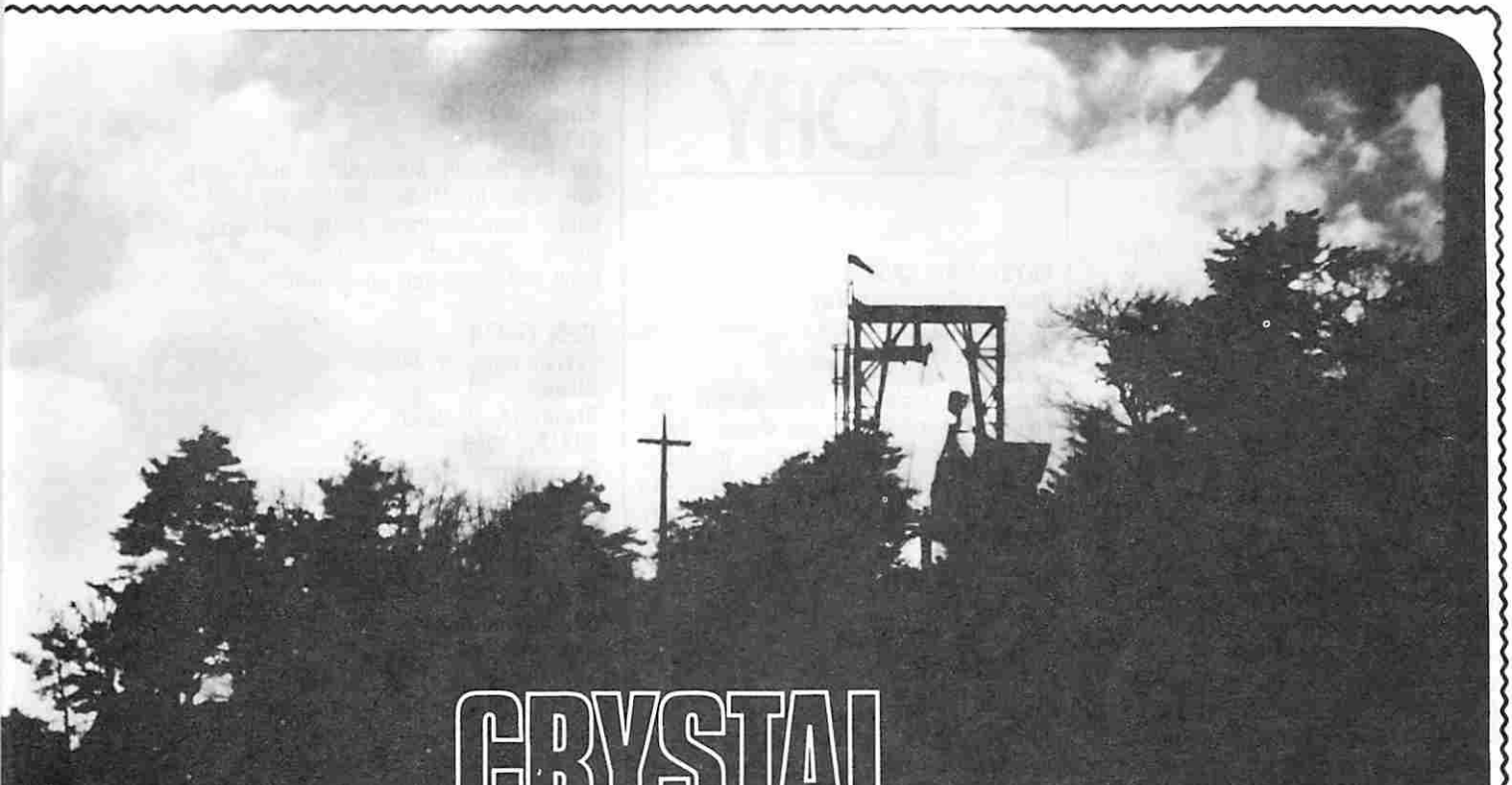


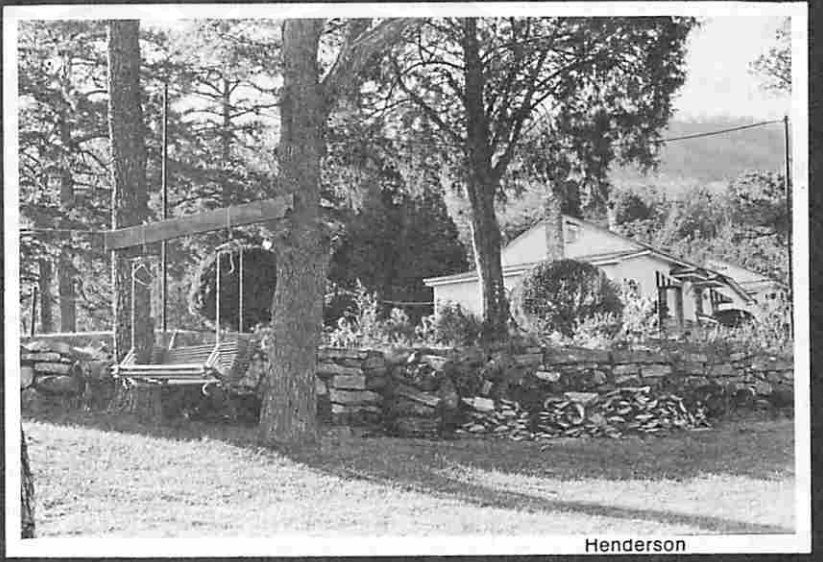
CRYSTAL...

training and staying place.

If you want to learn hang gliding, CRYSTAL is the place. To the left, you see our new 180 foot training hill. We've cleaned it smooth and re-grown a soft ground cover. This expansive hill has a gentle slope (easy climb), and it is the highest Beginner hill around. That means longer, safer flights. Of course, we provide all the easy-to-fly equipment and professional instructors.

To the right is the Staying Place. "CASMO" is the regular flyer lodging choice for many reasons: Waterbeds (and regular ones); pilot comaraderie; close to all the sites; clean, unique rooms; a cool pool; gifts and munchies. That's only the beginning of the list.

You'll have to visit CRYSTAL to get the whole picture. Come fly with us!



Henderson

CRYSTAL FLIGHT RESORT

Hwy, Chattanooga, TN 37409,
95 9-2 daily

CRYSTAL AIR SPORT MOTEL

Motel – 4328 Cummings Hwy., Chattanooga, TN 37409
Phone 615/821-2546 daily

Photo by Doug Barnette

Ken de Russy Collection

WAM DIRECTORY

We still wish to invite all dealerships who realize the value of advertising to send in their names and information, for the Directory to place in front of our thousands of readers. Many of these pilots have told us that they didn't know such and so dealership sold a brand in which they were interested. Others found a place to take lessons much closer to home than they thought possible. All in all, the **WAM** Directory is a top reference source, and none others like it exist.

The reader will also have a source list for where the **Whole Air Magazine** can be bought, as all our dealers become retailers of the new 1980 magazine. We encourage all readers to patronize these shops. They are serious places of business, interested in serving the needs of the pilot.

EASTERN

ECO-FLIGHT HANG GLIDERS
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Visit our shop in the Frankfort area, Hang Gliding Capital of Michigan. USHGA Certified instruction. Wills Wing, Seagull, Bennett, Moyes, UFM, with other brands available.

FRIGATE AIRCRAFT INC.
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Towing and motorized, accessories, instruction, service, and sales. Dealer for Manta, Electra Flyer, Wills Wing, Ultralight Products, Eipper, Flight Designs, and Soarmaster.

AERIAL TECHNIQUES
Route 209
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Distributors for: Seagull, Moyes and Highster. Dealers for most other major manufacturers. USHGA instruction from beginner through advanced. Complete inventory of gliders, instruments, accessories and replacement parts.

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Factory trained dealer for the revolutionary Eagle. Most other major brands also available. Gliders in stock and trades are accepted.

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Learn to fly safely over soft sand dunes through gentle Atlantic breezes. Beginner, Novice packages and ratings available daily. Complete inventory of new gliders, accessories and parts in stock.

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Beginning to advanced tow and winch lessons. Learn to fly by towing. Motorized lessons. Parts, Repairs, Service. Dealing Manta, Moyes, Wills, Seagull, Soarmaster, Pterodactyl, UFM and Odyssey. Catalog — $2.00

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For the Detroit Metropolitan area, visit our shop in Milan. Dealer for major glider manufacturers, parts and accessories. Certified instructors. Tow systems and motorized equipment.

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In stock, complete parts, accessories, Airframe shop and sail loft. Distributors for: Wills Wing, Seagull, Electra Flyer, Golden Prone Harnesses, Odyssey 'Chutes. USHGA certified school.

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Ken de Russy Collection

WE THINK YOU SHOULD KNOW SOME IMPORTANT INFORMATION ABOUT EMERGENCY PARACHUTES.

What's important about an emergency descent parachute? Do you know? You should, if you are going to spend $300-400.00 on one.

While size is important, a great lack of knowledge exists about size. But, did you know that no one can measure the diameter of a 'chute with a ruler?

It's a complicated thing, but basically the only way to find diameter on current 'chutes is by mathematically calculating **backwards** from the known area (in square feet).

Look at it this way. The **Sky Sports 'Chute** has 452 square feet of area. This works out to 24 feet of diameter. Some other 'chutes advertise 24 feet, but don't even come close to our area of fabric. And just like with gliders having much larger area, 'chutes of greater area let you down more slowly.

Some other areas of importance are the size and weight of the contained 'chute, the filling time, the optimal areas of "fullness", and the one-hand deployment system. The **Sky Sports 'Chute** puts all these points together in a tri-conical shape which can handle the stress while inflating **fast**, yet gives the greatest drag area to let you down easy.

$340. Retail

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MORE FOR YOUR $$

The original more-for-your-money wallet; $7.95. And, for one more buck, a hidden pocket (for more money, of course!).

For credit cards, checkbook, money, photos, & more—one more place to put it: the Organizer $12.95.

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What's more, they're all hand-crafted in 100% nylon (durable, washable, water-resistant) with velcro closures. And, they're so trim and lightweight that they contour to your body!

Who could ask for more? You could. Ask for any of six great colors: royal blue, tan, rust, navy, red, or black.

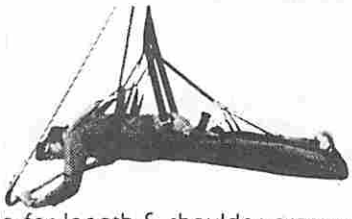
Get more for your money from:

duncan
Box 33441-Y, Seattle, WA 98133

Golden Sky Sails, Inc.

Introduces

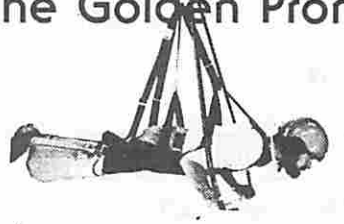
The Golden Cocoon



* Adjustable for length & shoulder pressure.
* Spreader Bars to eliminate hip & foot pressure.
* Positive retention back & thigh straps.

The Golden Cocoon $135.00

The Golden Prone



* Tested to 6,000 lbs.
* Super simple.
* Comfortable.

The Golden Prone $75.00

ORDER FROM:
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572 Orchard Street
Golden, Colorado
80401

DEALER INFORMATION UPON REQUEST

Reader Inquiry Card No. 22

Ken de Russy Collection

AERO FLOAT FLIGHTS

ONE OF THE MIDWEST'S LARGEST POWERED ULTRALIGHT DEALERS AND MANUFACTURERS.

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KITE TUBING

TUBING SEAMLESS DRAWN

BRIGHT DIP ANODIZED

1⅝" x .058" x 12' (2-19 LENGTHS)	$1.38/FT.
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3/32", 7x7 COATED STAINLESS STEEL $ .21/FT.

FREE WHOLESALE CATALOGUE.

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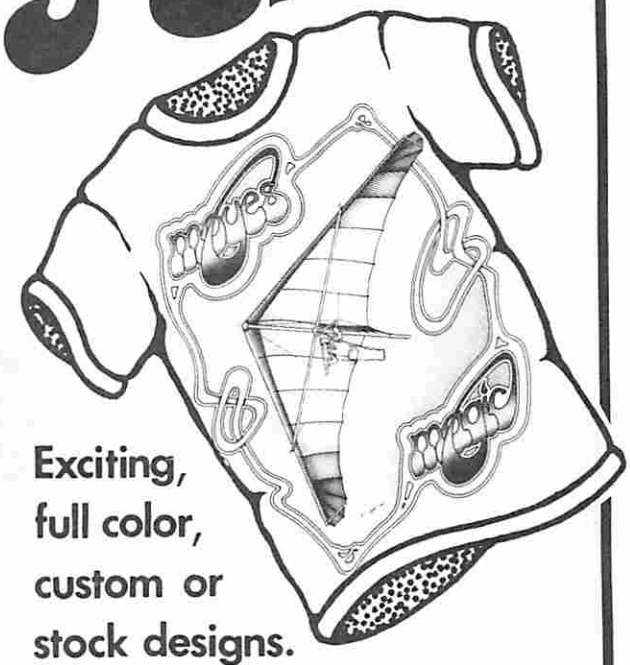

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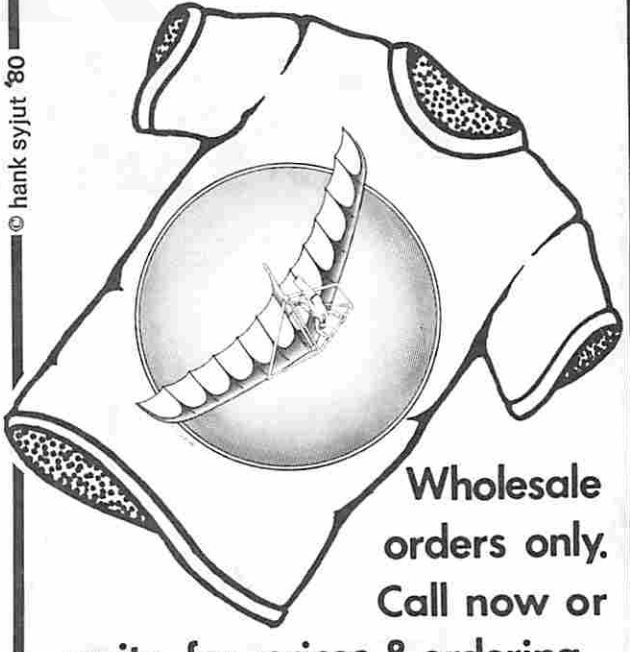

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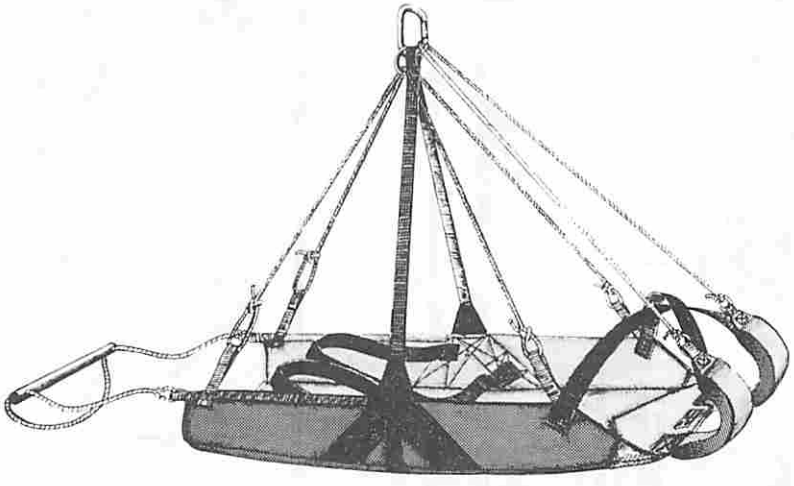
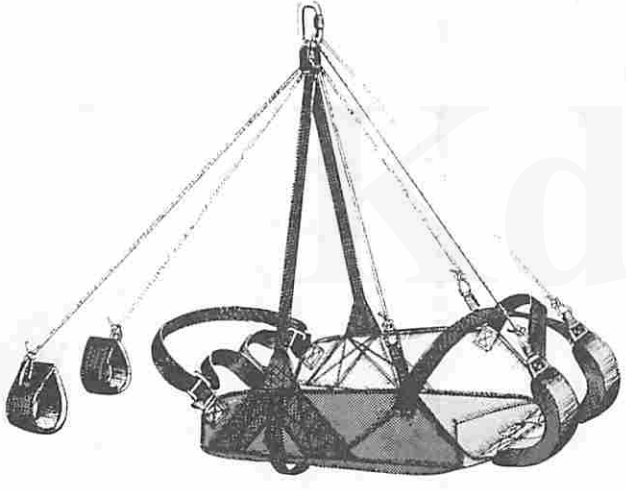
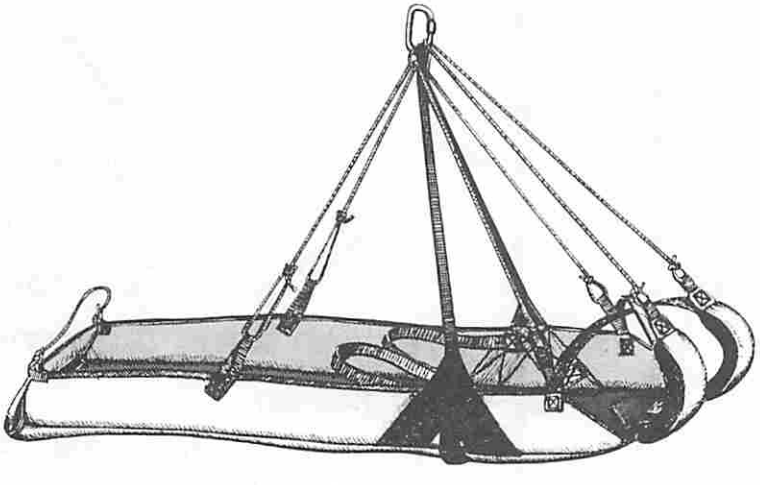
MANUFACTURED BY FLIGHT DESIGNS



STIRRUP



KNEE HANGER



COCOON

ON SALE NOW IN THE EAST

EASTERN DISTRIBUTION BY
CRYSTAL AIR SPORTS

In stock now, the entire line of styles from Flight Designs, known for comfortable harnesses.

Isn't it also comforting to know they're all tested to 8 G's? With full wrap-around support.

Two color bibs, all reasonably priced at $100, $105, and $139.

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Call, or write on your letterhead to Crystal Air Sports, Rt. 4, Cummings Highway, Chattanooga, TN 37409.

Receive customary dealer prices as when ordering from the factory, only receive them faster and at less cost.

Ken de Russy Collection

Classified Advertising

WAM Classifieds offer the lowest cost per word in the industry. And they do bring results. In the very first two issues of **WAM Classifieds,** ten gliders were sold! Since about 19 were listed, this represents over 50 percent sales in just two issues!

Just for an example, a longer reading ad costs about $7-9. If you wish to keep it short $4-6 may sell your glider or equipment. Also, here's a way you can find something you need that another pilot wants to sell. Give **WAM Classifieds** a try.

- ✓ 20¢ per word.
- ✓ First order pre-paid. If multiple runs desired, indicate number of times; you will be billed for all insertions after the first.
- ✓ P.O. Boxes, phone numbers, prices, make and model, and each line of a mailing address considered one word.
- ✓ Zip codes free, minimum order $3.00.
- ✓ Deadline is last day of month preceeding cover date (Example: May/June **WAM** equals April 30th).
- ✓ Send to: **WAM Classifieds**
  Box 144
  Lookout Mountain, TN 37350

FRAUDULENT POSSESSION

Seagull Aircraft Inc. requests informa information leading to the whereabouts of Mr. Charles Clark. Mr. Clark is in possession of three Seagull gliders obtained through fraudl obtained through fraudulent means. He is believed to be traveling to California from Oklahoma.

GLIDER DESCRIPTIONS

SSH 200, Serial # 9417: white sail with a red, orange, yellow right tip, triple deflexors.
10 Meter, Serial # 9367: yellow with orange leading edge pockets and keel pocket.
11 Meter, Serial # 9463: gold with dark brown leading edge pockets, soaring windows

Seagull Aircraft 805/684-8331

1979 US Lancer 190 -- Large Lancer in demo shape. All gold sail with black keel pocket. Extra deflexors included. Super-strong. Never any significant damage. $1000. Call Gary at (404) 820-9269 evenings after the soaring.

1979 Wills Wing Omni 187. Superb handling. Great performance. Split panels. New condition, $1025. Call Denny at 404/820-9738.

Phoenix 8 Regular -- Excellent condition, flown mainly at Warren Dunes, Michigan. Must sell for $ 650.00. Chicago, IL; call Bob Woycheese (312) 781-9805. Evenings at (312) 582-3648

BRAND NEW BARGAIN !!

1979 (October) Sky Sports Osprey 2 -- 175 sq. ft. for pilot 125-170. Excellent glide, precise handling in a Hang 2+ ship. Rainbow sail. Never flown except test-flights. $850. firm, complete. 615/825-1995, ask for Dan.

Electra Flyer Floater 205 -- Completely re-tuned by owner for better-than-factory performance. Excellent choice for pilot 150-195 pounds. All white sail with purple tip shading. Quick set up, no deflexors. Bargain at $975. 29 hrs. airtime. Call 615/825-1995 -- Crystal.

CGS Falcon 5+, 190 sq. ft. with keel pocket. White sail with orange, red, purple tips. Very good condition, excellent for beginner to intermediate. $650. Call 615/821-1134, ask for Bruce.

1980 Ultralight Products Firefely 2B -- 175 sq. ft. for pilot 125-170 lbs. Beginner/Intermediate Floater. Beautiful glider in a blue, purple sail. Quick set-up, impeccable hardware. Never flown except test-flight. $1075. with bag. 615/825-1995, ask for Dan.

BEGINNER MOYES

1980 Moyes Stingray -- Brand new Moyes for beginner/intermediate pilots. Replaces the Midi in excellent floater performance with light handling. For pilots 125-200. Colorful sail. Never flown except testing and dealer demo. List $1275. plus freight. Special at $1095., complete. 615/825-1995 -- Crystal.

Cloudbase Spaghetti harness. Total comfort for flight or sleep. For pilot 6 ft. + or - 2" and 160 lbs. + or - 10 lbs. $95. Call Denny at 404/820-9738

WANTED!!!

Used Gemini Power Systems. Must be willing to ship at your expense for pre-purchase inspection. Returned at your expense if abused or heavily worn. Shipping cost returned if in good, usable shape. Here's a top chance to get out of that system you decided not to use. Call Crystal at 615/825-1995.

WANTED -- USED

Got an SST sail (100U or 100B or 90) in good shape. No frame parts wanted. Will pay for sail, regardless of colors if usable. Contact Tom at 615/825-1995 days from 9 till 2 (EDT).

1977 Colver Audio-Visual Variometer. Good condition. Never been pegged down. $95. Call Denny at 404/820-9738.

ATTENTION LADY FLYERS!!
APPLY NOW

Positions available now at Crystal's Job Corps at the Flyer's Hostel. Barter work for lodging. Good deal, great flying, fine friends. Check it out now! Write or call Shari at 615/821-2546; 4328 Cummings Hwy., Chattanooga TN, 37409.

POSITIONS AVAILABLE NOW

Sales Person (Clothing, jewelry); Office Clerk; Lifeguard (seasonal); Chamber Maid; Gardener/Groundskeeper. All at Crystal Air Sport Motel.

1979 US Lancer 175 -- for pilot 130-175 lbs. Orange and gold sail, demo flown only by dealership. Brought to Chatt. for glider report in WAC. 12 hrs. airtime. $875. firm. 615/825-1995 -- Crystal.

Falcon 8 - 21 foot. Brand new. Excellent condition, never crashed. Rainbow sail, wrinkle-free. No sail flutters. 130-165 lb. pilot. $800. Call Chris at 404/820-9269.

1978 Seagull Ten Meter. Well cared for. Never stunched. Been very, very good to me. $895. Call when we're home at 404/820-9738.

SUB-DEALERSHIPS

Crystal Air Sports is now accepting inquiries for sub-dealerships in the states of Tennessee, Alabama, Georgia, and Kentucky. Call 615/825-1995, and ask for Dan Johnson, if you are serious about selling Wills Wing, Seagull, Sky Sports, and accessories from many companies including Crystal and Flight Designs. We will be offering group advertising as part of the sub-dealership program. Standard factory discounts and in-stock merchandise available. Genuine inquiries inquiries only, please.

Ken de Russy Collection

PRODUCT LINES

Chattanooga, TN — Summer's here! It's been hot in Chattanooga and rainy in Southern California, so for awhile us "Easterners" are getting the good flying jump on you "Westerners." Hot not only relates to the thermometer, but to one's variometer. Tennessee has logged an incredible bunch of flights this Spring, with April having been the biggee. **Glider Rider** has a feature article planned to tell ya all about it, so we won't double up, but a short summary may whet your appetite. **Chris Starbuck** (Floater) set a new Eastern altitude gain mark of 8200 feet over the top of Lookout Mountain, eclipsing his 7260 foot mark of only a week prior. This was near the time **Hank Syjut** and **Rod Gay** (Alpha 245) went over a mile above Lookout tandem. We reported this here last time, and this issue's cover helps transmit the feeling. **Vince Ahles,** (Maxi) one-time continental duration record holder (ten and one-half hours), went a new distance from McCarty's Bluff traveling interstate 45 miles to Fort Payne, Alabama. And in my opinion the flight of Most Record this year in Chattanooga is **Ted Liston's** (Raven) amazing trek from east-facing Whitwell, over hill, dale, river, and darn few landing areas, to touch-down at Crystal, some 20 miles away. Oh, twenty miles is not so far, perhaps, but, after being the only one to get well up at Whitwell, he stayed over 5000 feet above launch the entire trip and incredibly, Lookout was also soarable at the time. Matter of fact, all four primary sites in Chattanooga enjoyed soaring that day. Ted was T-shirt clad, and had to land due to freezing hands. Had he only known, he might have traveled the 20 miles to Crystal, cruised to Lookout, 12 miles down ridge, and then to Fort Payne himself for total of about 75 miles. Maybe soon!?! Anyway, hearty congrats to all pilots. Incidentally, Ted reports getting 18 hours logged, all after work, in April. Huh! If you can't go 20 plus miles or gain at least 3000 feet around here anymore, our pilots give you that cloudstruck grin and say, "well . . . maybe you'll do better next try . . ." Anyone else having a bonanza of flying? Let us know. In the industry . . . **CGS Aviation** plans to begin development of their own wing for power application. Recognized as Number One in ultralight power, Slusarczyk and team can be expected to do a powerful job. We'll keep ya posted. They may also have a swell place to dc prototype work, as Chuck is reviewing an opportunity to lease a whole airport, complete with sailplane activity. Pretty exciting. If it goes thru, he may hold a special fly-in, an old-time, Wright Brothers, sort of get together. Write 'em and get more poop. Up New Hampshire way, **Odyssey, Inc.** continues a busy trade in their accessory line. But they also move some gliders, acting as distributors for Sunbird, Wills, and Sensor. Dave Aguilar is excited about the latter, and may try to provide us with a Sensor 210E for our new style Pilot Report. He also says the Raven-like breakdown on the Nova II is real nice. Speaking of Ravens, **Wills** can't seem to catch up with a still rapid sales pace on their only model. So, to keep imaginative, they have been developing a line of quality accessories. It's described real well on their Back Cover ad. They are also working on glider ideas, besides the earlier "Boomer." Nothing is certain yet, however. **Seagull** began advertising their **Sierra** which is right now in certification proceedings. Tom Peghiny and aides have been putting in long hours on this design since last year, and now have the 180 size in the final stages. It has a shifting crossbar with umbrella folding system (crosstubes stay attached to the leading edge). They've promised one to be available for a Pilot Report, and we're excited over a new entry from the Carpinteria manufacturer. **Aerial Techniques'** backyard site will be the national focus in just a few months, as the 1980 Nat's arrive in September. In this issue, Bruce Chapel reports on the site, see pages 36 and 37. **Aerial** also has a **parachute seminar** planned for June 14 and 15. It includes deployment practicing and re-pack info . . . don't miss it! **Sky Sports** is cranking up the wheels of production on their **Humbug** with twin Gemini power. We reported this was the Hummer last time, and in error. That design is also being marketed, but Ed Vickery and crew are making a reality of Klaus Hill's last effort. While we're on new design efforts, another word is in order on **US Moyes'** new **Mega MK2.** I was able to log an hour and a half in this new Supership, to prove, yes, it can outsink a Maxi. It also has a very wide useful speed range, showing a clean sail when fully pulled in. Hardware and general craftsmanship is excellent on this $1995 glider Contact them for details, but models are arriving and deliveries are being made. **Ultralight Products** will be heading East for a sales tour, with **Pete Brock** and **Gene Blythe** doing some traveling. Look for them showing off the Mosquito as well as the rest of the line. Last word is the promise of an article in the July/August **WAM** covering **GLA's New Minibat sailplane.** They've completed very satisfactory test flights on the ship and have begun production. This 23 to 1 full aerobatic, $3500 ship comes complete in 25 pieces which take only 40-60 hours to build. Check their ad on page 13 and write for a sharp brochure and info pack. Got news or opinions? Send them to: Product Lines, Box 144, Lookout Mountain, TN 37350.

Ken de Russy Collection

DELTA WING PROUDLY PRESENTS

LAZOR II

Phoenix Lazor Fact Sheet 1980

Model	155	175	195
Leading Edge	17'3"	18'3"	19'
Root cord	7'8"	8'	8'9"
Tip cord	4'	4'3"	4'3"
Area	156 ft²	173 ft²	196 ft²
Span	30'4"	32'2"	34'
Nose Angle	130	130	130
Recommended Pilot Weight	120-160	150-190	180-220

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Features: Quick set up, applied leading edge pocket, breakdown type III control bar, shipping size 12', fixed nose camber, internal droops, elliptical tips, floating cross bar

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