HANG GLIDING'S FUTURE:
SI[illegible] TOWING AND
RI[illegible] EVELOPMENTS

WHOLE AIR

The Magazine of Hang Gliding and Ultralight Soaring

March 1985 — $2.50 (Can. $3.25)

ISSUE
NO. 40
(1st in 1985)

VISION PIREP
INTERMEDIATE GLIDER RECAP

STILL THE ONE TO CATCH

photo by Pork *Stew Smith* *Rich Pfeiffer*

We can say the proof is in the winning, but we believe the Sensors real success comes with its climb rate and glide in marginal conditions. The 160 VG Sensor flown by Rich Pfeiffer remained aloft at the US Nationals when other strong competitors who were tuned for speed went down. Pfeiffer's lead over the next place was 6%, the largest spacing in the top 13 places. A total asset, the VG allows instant adjustment of roll rate and handling to match changing conditions with the desired maneuverability. The Sensor's highly developed VG makes greater performance not only possible, but easier to handle.

"This glider performs the best and it's easy to fly! Bar pressures and roll rate are no problem. The VG lets you fly it any way you want. It's perfect."
—Jon Lindburg, San Diego, CA

"To win major competitions a pilot needs the best performance available, with the ability to execute in all conditions. The VG gives the 510 top L/D performance while allowing the glider to thermal efficiently, even when good handling is mandatory. Other gliders may be able to perform equally at their specialty, but in world class competition and a variety of conditions the Sensor proves to be superior."
—Rich Pfeiffer, Santa Ana

"I have flown with many excellent pilots on state of the art equipment. The certified Sensor 510 160 VG has the best climb rate especially in light conditions, and the best L/D and sink rate in the 30 mph range. With the VG system, I can select the best wing tension to launch, fly and land easily, which gives me the safety and confidence I need to maximize the existing conditions."
—Stu Smith, Grandfather Mt., N.C.

"It out sinks everything, has a wider speed range, and the sail stays clean going flat out."
—Bill Liscomb, Leucadia, CA

"On my second flight with the 510 I pulled off 45 miles. I especially want to commend you on building a glider with an ingenious design and real integrity. The quality of workmanship and the sail work is the finest I have ever seen. I feel very confident and safe flying the Sensor."
—Jerry Nielsen, Washington D.C.

"The sink rate is absolutely amazing; it simply can't be touched. As for glide, I swear it's at least what your figures indicate. The wing simply surpasses all of my wildest expectations. Heres to your insight, sweat and perserverance."
—Bob Hofer, Fort Smith, Ark.

IMMEDIATE DELIVERY

Recently, at the time of its HGMA certification, the Sensor 160 VG underwent improvements to its leading edges and upper surface air foil. The new 510 incorporates *extended half ribs* to the double surface line, a wrap around *nose fairing*, improved shape on the mylar leading edge inserts, a better supported upper surface root section with a close rib spacing of 1.3 ft (.4 meters) and higher leading edge sail tension. The new *wing shape* of the Sensor combined with the new aluminum faired tubes adds up to a performance gain that's a pleasure to fly.

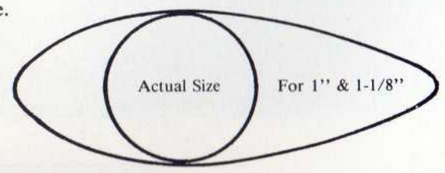
HGMA CERTIFIED*
SPECIFICATIONS - SENSOR 510 — 160 V.G.

Span	34.8 ft	10.6 m
Area	161 ft squ	14.96 m squ
Aspect ratio	7.52	
Empty Wt.	66 lbs	29.9 Kg
Hook-in Wt.	145-255 lbs	65-102 Kg
Ideal Hook-in Wt.	175 lbs	80 Kg

*Includes new aluminum fairings, extended half ribs, Kevlar trailing edge and Variable Geometry.

Recommended skill level: Advanced.

Our new certified aluminum faired tubing. Fits most all Sensors made.



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WHOLE AIR

ISSUE NO. 40, VOLUME NO. 8, NO. 1, 1985

PILOT REPORTS:

PILOTS PERSPECTIVE:

COMING NEXT ISSUE:

Hang Gliding in Russia
Tour of La Mouette of France
Magic III Pilot Report
Soaring In India
The Hang Plane Revealed

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FEATURES:

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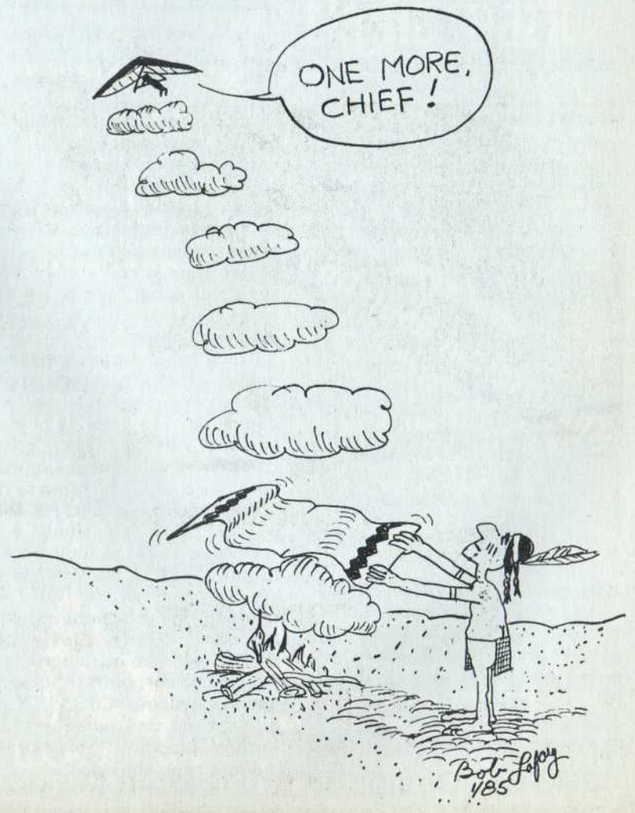

Cartoon by Bob Lafay

Volume 8, No. 1, 1985
ISSUE NO. 40

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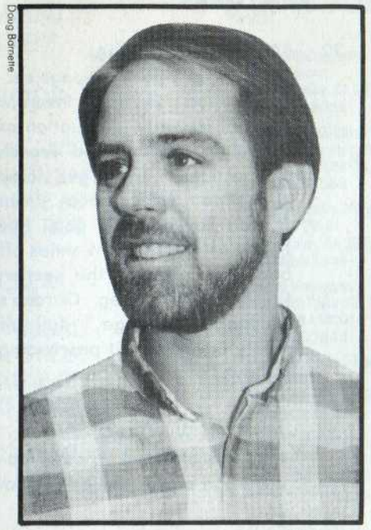
Published By
Whole Air, Inc.

Cover Photo
Rich Grigsby

On The Cover:
Richard Boone, designer of Pro Air's Dawn, flies his new Dawn Comp for Rich Grigsby's camera as the sun sets at Torrey Pines.

Publisher's Column


Doug Barnette

A WHOLE NEW ACT

ALL FORMER READERS will easily note fundamental changes in the looks of this *Whole Air*, but the changes are deeper than just the outside appearance.

The paper on which this is written is called "electrabrite," a brand name for an especially high grade of very white newsprint paper. It is a good bit less expensive, lighter in weight, and comes from a roll rather than from sheets of paper. We can print many more *Whole Airs* this way, faster, and mail them at reduced cost, sooner.

You'll also note the enhancing quality of what's called "spot color" inside. We see this as just the beginning. The color is obvious, but you may have to check a bit more carefully to tell that we've increased our page count.

This growth is expected to continue as we work on some upcoming special sections, including a first one for the 1985 U. S. Nationals in Chelan, Washington. *Whole Air* will be working in coordination with the Cloudbase Country Club, sponsor of the '85 event, so as to better promote this important contest. In so doing, besides helping CCC, USHGA, our advertisers, and ourselves, we'll be further spreading the good word of modern hang gliding.

In addition you'll notice new layouts for the news pages, and more of those pages. Since we will cut our time at our printer from two or three *weeks* to one *day* (!), we will be able to present news faster than any other hang gliding publication anywhere. Our new foreign readers will also enjoy this, so we are informed by our European contacts.

Still another thing that you might notice (though not yet) is material aimed at a growing contingent of foreign pilots. You will notice it by our May or June issue, we expect, as we print some articles you won't be able to read ... because they are written in another language. (We'll provide translations of course.) Our business contacts in Europe have been researching our overseas involvement and beginning this spring or summer we'll start an experiment to more fully test and understand that immense market.

What you cannot notice is that 10,000 other pilots also have a copy of the new *Whole Air*. You may not care about this too much, but our advertisers sure do, and so do we. Many of you receiving a copy have never seen a *Whole Air* or *Hang Gliding* before.

This much wider distribution *will* be good for our business (many new subscribers) and good for our advertisers (more readers for their ads ... for lower costs per person). But fellow flying folks, this is good for you and our sport as well. Believe it! Getting new people in this sport is good for almost everybody. Schools will work with more students. So your old glider will eventually find a new owner. And the manufacturers can then try to sell you a shiny new superwing. USHGA will get new members out of it all, which will help pay bills, hire new office help, generate more donations for World Teams, help amortize insurance costs. And on and on ...

Surely you see the logic, and the value in this?

We're able to make all these great-sounding changes because we've merged with the company which publishes the *Western Flyer* and the *Sport Flyer*. The details are presented in the *Industry News* section. But with this concerted effort by so much added talent, the proverbial sky is *Whole Air's* limit.

REACHING NEW PILOTS

Whole Air will now be read, not only by virtually every hang glider pilot in the USA, but by sailplane pilots, private pilots, ultralight pilots, airline pilots, homebuilt pilots, student pilots, balloon pilots, sky divers, and by a growing number of foreign pilots. In addition, *Whole Air* continues to distribute some 3,000 copies to over 500 newsstands worldwide.

All this sums up to more exposure for our sport than we have ever delivered. We think *Whole Air* will now present hang gliding to its largest American audience in modern times. With what this sport has to offer in 1985, growth simply must follow.

THANKS TO NEW FRIENDS

Thanks go to Dave Sclair and his group up here in Tacoma, Washington, for being open and willing to enter into an agreement with us to attempt these grand plans. And for being willing to confirm his interest and ideas by putting real dollars and good sense on the line ... and his dozen employees on the job of helping us produce and market *Whole Air* like never before.

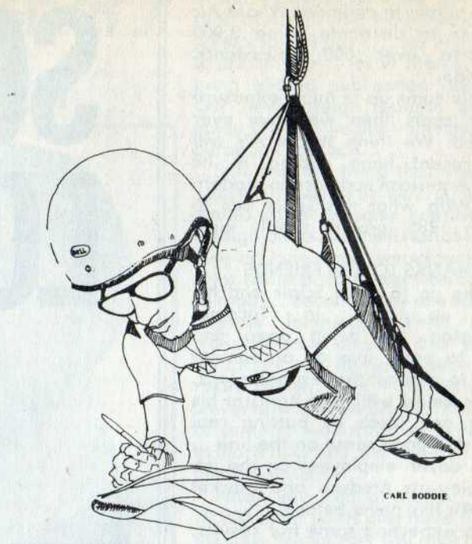
We're expecting some hot results, friends. Stay with us and see. We'll be arriving on a new schedule, aiming the bulk of our issues at the more active summer months. Our current schedule will have us producing issues titled March, May, June, July, August, and October. These will be mailed at the end of the previous month, and represent the six issues per year that you paid for ... plus you'll receive a special Christmas newsletter to keep you current during those slower months in our sport. We have always thought this type of publishing schedule would be more efficient, but until now our small staff simply could not get all the work done.

So, as the season gets underway, show your copy of *Whole Air* to someone who doesn't yet fly, and help them understand why we love it so. Plus, stay tuned to this page. Next issue we'll tell you even more about exciting additional plans and developments ahead.

More foreign interaction. Some super incentives for you, clubs, and dealers to help us further widen our distribution and hang gliding's appeal. Easier ways to contact us for news. New bargains in small classified ads. Special editorial sections. Faster, more timely news delivery.

I guess you can tell we're excited. Are you?!

Thanks,
Dan Johnson



FORUM

Spirally Unstable Dawn?

Dear Editor;

After reading the Dec-JAN '85 issue of *Whole Air*, I've come to the conclusion that the pilot report on the "Dawn" by Paul Burns is incomplete.

It's incomplete because after explaining how having the control bar base tube in the inside position causes a, "slightly spirally unstable machine..." the author failed to ask those other pilots who were "basically negative" if they noticed the same thing.

We could have learned a great deal more about that glider, both positive and negative from those pilots.

But above all, I did not like how the author discounted those other pilots because of their negative feelings about the new Dawn.

Those pilots could know a lot and they could save someone from buying a second class glider and save someone's life.

ARTHUR NEWMAN
Gaithersburg, MD

Reply from Paul Burns

Dear Mr. Newman;

Thanks for your comments. Your concern for your fellow pilots is commendable. You have pointed out the need for a definition of terminology, which should clear up any misunderstanding regarding the Dawn evaluation.

The term used in the evaluation "spirally unstable" refers to a *quality of handling*. It is not a description of the overall stability of the glider. Positioning the control bar on the outside setting, provides a more roll stable Dawn by adding a few degrees of dihedral to the frame. On this setting, more pilot effort is required to roll into a turn than to roll out. By moving to the inside setting, a slight anhedral condition is achieved, creating a "slightly spirally unstable" handling characteristic. In this setting, the Dawn requires less effort to initiate a turn than it does to return to straight and level flight.

Pilot preference is the main factor in determining which is the "best" option. However, conditions also play a roll. A pilot might prefer to use the dihedral setting in ridge lift conditions when flat turns are the key in optimizing sink rate performance. This same pilot might choose the inside setting for thermal conditions when turn initiation time is critical.

Regarding the negative comments made by some pilots while inspecting the Dawn on the ground: Unfortunately it seems that a large percentage of these pilots suffer from a pre-conceived notion that any design unconventional enough to dispose of a kingpost must be unsafe, HGMA certified or not. Of those pilots who voiced doubts about the design, only one accepted an offer of a demo flight. Upon landing, this same skeptical pilot described the Dawn as a "nice little glider."

Only one pilot voiced a negative opinion after flying the Dawn. This 200 pound pilot flew the 150 square foot Dawn at Torrey Pines in a diminishing condition late in the day. Only two landing zones are available to the Torrey pilot. One can land on top of the cliffs, or on the beach, 300 feet below. Any pilot who has hiked up the cliff from the beach with a hang glider can tell you that it's no fun at all. Therefore any pilot scratching at or below the top will understandably feel a bit anxious. The pilot did manage a great landing on top after a ten minute flight. Combining a high wing loading with marginal conditions is cause enough to make a pilot uncomfortable. Throw in unfamiliarity with the glider and this pilot's comment, "That wasn't very much fun," is quite understandable. For this reason I discounted his comment, feeling it to be directed toward the circumstances rather than the design.

I would like to add that I believe no pilot, including myself, can fully determine the handling or performance qualities of any glider in just one flight. My personal goal is a minimum of fifteen hours of flight time on each design in varying conditions.

One thing you can be sure of, Mr. Newman, no glider of questionable strength or safety will appear in an evaluation by Paul Burns. The Progressive Aircraft Dawn is a first class, state-of-the-art hang glider. The HGMA certificate of compliance substantiates this claim, and places the Dawn in the same airworthiness category as the Comet or the Duck.

All gliders suffer from one major liability, one component that can ultimately determine the safety, or the danger, of any glider...the pilot.

PAUL BURNS
Lake Elsinore, CA

Knocking Out the Lockout

Dear Editor:

In the December *Hang Gliding*, I noticed that Mike King is aware of and attempting to grapple with the cons of skyting, especially the myth that center of mass bridles prevent "normal lockouts". This is a false idea that even the inventor Donnell Hewett attempted to point out, which I'm paraphrasing, that the skyting bridle will in fact cause adverse control pressures once the bridle touches any bottom flying wire. What has been missed by many advocates and participants (including me) is that the pilots themselves can precipitate a lockout by freezing (going rigid on the bar; also known as an advanced case of white knuckle syndrome) if the glider is tracking off to some angle not in alignment with the tow forces.

"Freezing" puts the most vulnerable pilots at risk, i.e., the novice and intermediate pilot who might become scared when an unexpected gust (or poor take off technique) yaws the glider away from his preferred flight path. Startled, he tightens up, trusting that the "bridle will steer him out of trouble", and waits too many beats while the glider is rolled into a classic lock-out. Then the (usually) too strong "weak" link finally breaks and the glider is pitched over, stalled, into a slipping diving turn.

The cause of the lockout is virtually the same for both a standard skyting bridle and the old reinforced control bar system, if the pilot freezes. The tow rope simply pulls the control bar out from under the Hang Glider!

If, in spite of this advisory, you find yourself going into a lockout, here are some remedies. (1) Never use a weak link stronger that 50% of your total flying weight. And (2) never, ever depend for your safety on any advice, device, or system when skyting except your own informed good sense. (3) "If you are in a lockout, never stop fighting to recover from it, by pulling in on the control bar and weight shifting toward the tow vehicle, until you wake up in the hospital!" Dave Broyles, circa 1978.

I sincerely hope you don't exceed 1; implement 2 and never need 3!

WARREN RICHARDSON
Grand Prairie, TX

Case Dismissed

Dear Editor:

How could you do it? How could you print such an opinion-biased report such as Bruce Case's flight report on his own glider? We all hear the same BS all the time at all of our flying sites, so why print it? When I read a magazine, that is my least favorite kind of article to see. Give me a break.

I personally think the HP is the best wing WW has ever built, and I did strongly consider buying one, but in the smooth ridge and small thermal lift at Torrey Pines, and Sinsor has a definite advantage.

I really enjoyed Aero Test 1 and would like to see that as a regular feature. One correction is in order. The article referred to in *Hang Gliding* magazine contained data by Tom Price, not Chris Price. I flew an ASG-21 with an airspeed indicator on the control bar, and an anamometer head on 50 feet of wire below me. I radioed the speeds to Tom who then made the famous chart.

BILL LISCOMB
Solana Beach, CA

Dangerous Aircraft-Type Landings

Dear Editor:

Rodney Nicholson's article on Dangerous Landing Approaches in the October issue contains a lot of good information on the figure 8 approach, which is a valuable landing technique.

Unfortunately, the article contains a lot of misinformation about the aircraft-type approach, which is an equally valuable technique.

It would be a shame if a new pilot failed to master the aircraft-type approach because of this very one-sided article.

Yes, Rodney's approach was dangerous, because he made several mistakes. This is not the pattern's fault.

Figure 2 shows a glider flying rectangles around the landing field. This is NOT an aircraft-type approach. Figure 4 shows a long, straight final glide, low over the trees. This is NOT an aircraft-type approach, as flown by a hang glider or a sailplane.

Three guidelines I learned as a sailplane pilot have served me well in hang gliding. First, do not place obstacles between yourself and the landing field. In figure 1, point E, downwind from the field and behind the trees, is a terrible place to be. Second, when in the pattern, don't turn your back on the field. It's difficult to judge your angle to the field when flying from C toward E. Third, when low, the most difficult place to land is on the spot directly below you. Point B, low and directly upwind from the spot, isn't much better. Also, from figure 1, Whitwell field, in the wind direction indicated, appears better suited to a right-handed pattern that to the left-handed pattern shown. With a right-handed pattern, you avoid flying over the trees, you avoid the turbulence associated with the trees, the wires are lower than the trees, and you get to fly a crosswind leg and a final leg, both over the field, which makes the field seem longer.

An aircraft-type pattern starts with your arrival at the Initial Point, or IP. The IP is located off to the side of the field and about crosswind from the spot, or crosswind and upwind. Arrival at the IP signals your intention to land. If two or more gliders arrive at the IP at the same time and altitude, they space themselves out, and one follows the other around the pattern. I have seen five sailplanes in the pattern at the same time, and all were able to land safely because each knew what the other was doing. Heaven help two or more hang glider pilots who need to land at the same time, all by doing figure 8s over the end of the field.

Lastly, I object to the rigid tone of the article. Statements such as "The Absolute Rule..." and "No Exceptions to the Rule..." do more harm than good. In flying, as in life, there are always exceptions. As pilots, we should strive to remain alert and flexible. We are never relieved of our obligation to keep *thinking*. I know I'll have to keep thinking if somebody cuts me off by hogging the entire landing field with his manic figure 8s, because he read somewhere that that's all he ever needed to know about landing.

JON JAMES

ADVERTISER'S INDEX

SAFETY NEWS

CONSUMER ADVISORY... Delta Wing Light Dream 165 and 185

All owners of Light Dream 165 and 185 models delivered prior to February, 1985 are asked by the company to check the pivot bolt on the floating crossbar assembly to see that the safety ring above the locking hex nut is indeed in place.

To accomplish this, slip the protective cover past the hinge plates and take a look. If the small safety ring is not present, please notify Delta Wing as to the model and the serial number. A new bolt, hex nut, and safety ring will be exchanged for the old hardware at no cost to the owner.

For further explanation on this advisory procedure, contact Delta Wing by phoning 818/787-6600.

INDUSTRY NEWS

Wills Gives Free USHGA Membership

In an effort to promote growth in the sport of hang gliding, and to support the United States Hang Gliding Association, Wills Wing has announced a new Free USHGA Membership Program.

Wills Wing will purchase a one year USHGA membership for any new pilot coming into the sport of hang gliding if that student pilot buys a new Wills Wing Skyhawk from any authorized Wills Wing dealer.

Contact your local dealer for details on this program.

Two Major Eastern Retailers To Combine Businesses

CHATTANOOGA, TENN. — Owners of two major American hang gliding retailers located in this eastern capital of the aviation sport have announced the agreement to join forces on January 25, 1985.

In the fall of 1984, operators Dan Johnson and Tom Phillips of Crystal Air Sports initiated the merger with Matt Taber, director of Lookout Mtn Flight Park of Georgia. Negotiations with the owners and stockholders of each company were completed just prior to the '84 Christmas holidays. It is anticipated that full transfer of assets will be accomplished by March, 1985.

Johnson, also publisher of *Whole Air* magazine commented, "After lengthy discussions on the future of the retail business in hang gliding, Phillips and I agreed to go ahead with a plan to consolidate the two stores, having met with Lookout Mtn Flight Park owners and finding them equally receptive." The hang gliding market had changed to a point where it was considered prudent to end the competition and pool efforts.

"Lookout Mtn Flight Park has the superior advanced flying site, and Crystal Air Sports was far easier to move," explained Phillips. By relocating Crystal's inventory and joining it with Lookout's stock, the great number of pilots frequenting the Chattanooga area will be assured of the finest state-of-the-art equipment and services on the east coast.

Described by officials as an "Investment Acquisition," the consolidation will eventually buy out Johnson's majority share of Crystal Air Sports, and Tom Phillips will be the only Crystal personnel to remain with the Lookout Mtn-based organization.

"After ten years in the retail end of hang gliding, I finally elected to put all my efforts with *Whole Air* magazine," said Johnson. He continued, "Some exciting new plans for the magazine will consume even a greater sum of my time. And since the magazine will soon be moving from the Chattanooga area, my decision to exit retailing was made quite firm."

This move is sure to further improve services and inventory available to the many eastern pilots visiting Chattanooga. Plus the extra income will permit an increase in new developments. Taber announced, "Now we will all really be able to concentrate on serving the pilot, both experienced and the new student. The enlarged revenues will allow us to reach out even further, as Lookout and Crystal have each had substantial advertising budgets. These expenditures can now work toward common goals."

Phillips, Crystal's co-owner and store manager for the last five years, said, "This represents new opportunity for me and for the future of my involvement with the sport of hang gliding. The association with Lookout assures continuation of a profitable enterprise. After years of heated competition with Lookout, I feel we can serve the flying community like never before." Phillips is already working at the Lookout site which will make for a smooth transition in March.

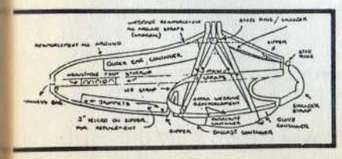
Besides Taber, the Crystal/Lookout consolidation was approved by other Lookout Mtn Flight Park stockholders, Tracy Knauss (publisher of *Glider Rider*, Bill Bennett (owner of Delta Wing Gliders), and Charlotte Murcheson. Murcheson's share will eventually be bought out as the deal is completed.

"As we've now answered all the tricky questions of such a move, everyone seems pleased with the outcome," felt Johnson. "The move is sure to benefit the flying community."

Customers of Crystal Air Sports will find the doors closed as the moving process begins. The famous Crystal Simulator will be taken down and put in storage. "Lookout just doesn't have the location for it at this time," explained Taber. Rights to the Simulator are not part of the acquisition.

Those seeking additional information on this business agreement are invited to call personnel from either company at 404/398-3541.

Bennett's Delta Wing Introduces "Airstream" Integral Harness



Logically introduced over the cold winter months, Bill Bennett's Delta Wing Gliders has entered the integral harness market with their "Airstream" model.

Company spokesman, Luigi Chiarani said, "Our new "Airstream" harness is selling very well already, and we have a backorder of some 25 units (in mid-February)." Introductory retail price of the Airstream is $250, and the company offers a money back guarantee.

The totally enclosed harness features internal glider coverbag storage area, faired parachute and ballast containers, heavy reinforcements and webbing used liberally, plus adjustable foot stirrup. The zippered leg opening "doors" are attached via velcro fasteners so that in the unlikely event of a zipper freeze-up, the pilot can simply tear open the velcro to extend his or her legs. To protect the sophisticated harness from degradation from sunlight, a rucksack-type carry bag comes with the harness and is stored in its tail section.

For more information on the Airstream, contact Delta Wing at Box 483, Van Nuys, CA 91408, or phone 818/787-6600.

Hawk Airsports Donates "Team USA" Windsocks

In support of the USA's 1985 World Team, Hawk Airports of Knoxville, Tennessee has donated windsocks labeled "Team USA."

Proprietor Bruce Hawk of the Knoxville hang gliding center has been building and marketing his deluxe windsocks for years in both the hang glider and ultralight industries.

As support and funds for this year's World Team continues to accumulate, Hawk's donation is appreciated by the team members, who collectively say, "Thanks, Bruce!"

Wills To Offer 1985 X-C and Contest Contingency Awards

Wills Wing has announced the following cash contingency prizes for 1985:

(To be eligible pilots must be flying a Wills Wing glider which they have purchased. Cross Country flights must be adequately documented.)

$3,000 — To the winner of the SPORTING CLASS at the 1985 Nationals. (No pilot who is, or has ever been, ranked in the top 15 pilots in the USHGA ranking system is eligible for the Sporting Class Award.)

$2,000 — To the winner of the WORLD CLASS at the 1985 Nationals.

$2,000 — To the pilot who makes the longest cross country flight (straight line by great circle method) in the U.S. in 1985.

Ultralight Soaring Software Introduces Streamliner Harness

Eric Raymond's Ultralight Soaring Software announced the introduction of a new harness design for the company. The low-drag "Streamliner" harness is constructed with the same high quality materials and construction techniques used in the "Raymond Cocoon."

The Streamliner fully encloses the pilot's body in a smooth, tapered sheath. The suspension lines are enclosed within a dorsal fin on the back of the harness, such that only one main suspension point is visible. Entry and exit from the Streamliner is accomplished through zippered landing gear doors on the front of the harness. For launch and landing the bulk of the harness is behind the pilot, thus eliminating the problem of the harness interfering with the launch or landing run.

The Streamliner incorporates an adjustable foot support bar, a faired parachute container (with safety locks), two faired glove pockets that are accessible in flight, and a large internal storage area that provides a convenient, drag-free storage spot for the glider cover bag.

The company claims the new harness has been tested to "skydiving standards." It is available in five stock sizes to ensure a good fit to all pilots. Introductory price is $260., and all sales are being handled by the factory directly to customer.

For more information write Eric Raymond at 33274 Baldwin Blvd., Lake Elsinore, CA 92330, or phone 714/678-3931.

Whole Air Merges With Northwest Flyer, Inc.

Doug Bourne

CHATTANOOGA, TENN. — An agreement has been negotiated for *Whole Air* magazine to merge with Northwest Flyer, Inc., of Tacoma, Washington, through the vehicle of a newly formed corporation.

Whole Air magazine is the largest independent hang gliding publication in the United States, with subscribers in over 40 countries. The Magazine of Hang Gliding and Ultralight Soaring is soon ready to enter its eighth year of publishing. It was founded in Chattanooga, Tennessee, and has been based in this eastern capital of hang gliding since its premier issue in May of 1978.

Northwest Flyer Inc., publishes *Western Flyer*, a 26-year-old, bi-weekly newspaper for general aviation, and *Sport Flyer*, a monthly newspaper serving all aspects of sport aviation. *Sport Flyer* represents a recent name change from *Ultralight Flyer*, which was founded in 1980.

Beginning with the March 1985 issue (no. 40), *Whole Air* will be produced in Tacoma. *Whole Air* Publisher Dan Johnson explained, "The name stays the same, as will the pure hang gliding content. What we've done here is to join forces with a much larger publishing group that will allow us to make some impressive strides with *Whole Air*."

Whole Air will *double* circulation (to about 10,000 copies per issue) soon after the merger is completed. "We will reach pilots and other interested persons in many new locations, and will generally market the sport of hang gliding on a much wider scale than has ever been done before in the United States," Johnson reported. Following the expansion *Whole Air* will emerge as "America's Largest Hang Gliding Magazine." Some of the expansion will include further distribution in foreign countries as well.

"We're delighted to take on *Whole Air* magazine," said *Western Flyer* Publisher, Dave Sclair. "We will also value Dan Johnson's broad aviation and publishing background in our other aviation newspapers." He continued, "Our newly christened *Sport Flyer* covers hang gliding in addition to ultralight aircraft, homebuilt aircraft, kitplanes, sky diving, hot air ballooning, and more. Johnson will write for this paper and our *Western Flyer* title and in addition, will continue to manage and edit *Whole Air*." Except for the planned expansion of circulation, *Whole Air* will remain essentially as it has been for its seven year history.

Whole Air Editor Starr Tays has been retained by Chattanooga Coin Co., publisher of *Coin Wholesaler*. Owner Louis Revels says, "Ms. Tays will be working on special projects in addition to being an art design consultant." Tays has already begun employment for the Chattanooga-based coinage periodical.

"It's a bit tough to end such a good relationship as Starr and I have developed over these seven years," said Johnson, "but we've both gained a lot of valuable experience." Tays, who has been with *Whole Air* since its first issue, has also participated as part owner of the hang gliding magazine.

Further information on the *Whole Air*/Northwest Flyer Inc., merger may be obtained by writing *Whole Air* at P.O. Box 98786, Tacoma, WA 98498-0786, or the former address of Box 144, Lookout Mtn., TN 37350, or by phoning 206/588-1743.

Delta Wing Hosts World Team Night and Parachute Seminar

On March 27th, at 7:30 PM, Delta Wing will be hosting a "Meet the Team Night" and a parachute seminar for the World Team.

An exciting and entertaining program is planned for the evening. Pilots are encouraged to bring their harnesses and parachutes for a simulation of the deployment sequence. Subsequently those parachutes will be repacked by a U. S. World Team member for $15. If pilots can show a valid USHGA card, a $2 discount will be honored.

For more information, contact Delta Wing Gliders at Box 483, Van Nuys, CA 91408, or call 818/787-6600.

HEDO-Lift Aids In Storing Gliders

From Kroeger Imports comes an aid for those who need to hoist their hang glider up to the ceiling for storage. The device was originally designed for use in a similar application with windsurfers and surfboards.

The Hedo-Lift fastens to any ceiling, and uses its thirteen foot straps as an easy and safe way to raise and lower your hang glider from car roof to the overhead storage position. The company boasts that it is easy to install and to use.

The holder features safety clamps that automatically lock straps in place. All metal hardware parts are made from zinc plated steel. The lift contains all installation hardware and mounting instructions. Suggested retail is $39.50.

For more information, contact Kroeger Imports at P. O. Box 4178, San Clemente, CA 92672, or phone 714/492-8676.

Southern Nevada Soaring Supplies Offers 3-Ring Releases For Towing

Southern Nevada Soaring Supplies has designed a 3-ring release and bridle for use in towing. The device comes complete with harness and glider attachments. No extra hardware must be added.

The release and harness attachment is constructed of two inch nylon webbing. The bridle is made of quarter inch polypropolene rope. All eyelets are fitted with quarter inch thimbles to reduce wear and extend the lift of the bridle.

The complete bridle retails for $45.00, which includes postage and handling. The three-ring release by itself is $35.00.

For more information contact Rolla Manning at Box 238, Logandale, NV 89021.

CLUB NEWS

Tennessee Tree Toppers Begin "Great Glider Giveaway"

Excerpted from the TTT's Branches Newsletter — Ever heard the story about the little boy in the candy store? Hold that thought. Ever dreamed about a ten minute run through that great hang glider warehouse in the sky, grabbing the very best of everything as you go? Hold that thought.

Behold!! The Great TTT (Tennessee Tree Topper club) Glider Giveaway. No, this is not a bunch of bull and you need to read this because it could change your outlook on flying gliders, or at least owning one.

Let me tell you a story. The TTT needs a clubhouse on the Hensons Gap flying site. We've talked about it again and again, and now we're doing something about it, as well as helping USHGA and the World Team at the same time. This is not one of those "rah, rah" articles asking for a donation with nothing in return. We may be asking for a $20 donation, *but* in return, you'll receive a raffle ticket. At the Mayhem annual fly-in (May 25-27, 1985), the TTT will hold the drawing for the Great Glider Giveaway. This will take place in three drawings actually, increasing your chances of winning.

The third place drawing, done first, will be for a vario of your choice from the bottom to top of the line. Second place will be for the harness of your choice, again with cost being no object. Not bad for a $20 donation, eh? By the way, only 500 tickets will be sold, worldwide, so you've a good chance to win.

You'll notice the best has been saved for last. If you are the holder of the third ticket drawn, you will be the Grand Prize Winner. You will be the proud new owner of a new state-of-the-art flex wing glider of your choice. Yes, you read it right, but that is not all. The holder of this ticket will *also* get a new harness of their choice, a new vario, a new cross country bag, a new helmet, and a new 40-channel C.B. radio.

If you donate $20 each, that means one chance each for the goodies. This is a lot better odds than the Publisher's Clearinghouse. Remember, only 500 tickets will be sold. To help out our national organization, the TTT will donate $1.00 to the USHGA and World Team per each ticket sold.

Time's a-wastin'. Send your donation today to the Tennessee Tree Toppers, Box 136, Lookout Mtn., TN 37350. If you need more information before you send your money, write the same address, but act quickly. Only 500 tickets will be sold; when they're gone, that's it. (A buy-out has been offered for anyone who merely wants cash, rather than the hang gliding equipment.)

INTERNATIONAL NEWS

French Aero Towing Championship Scheduled

On the 13th and 14th of July 1985, the first official aero towing championships will be organized near the headquarters of La Mouette in Dijon, France. The meet will be a french national championship but foreign pilots will be welcome as wind dummies and observers in a move to further validate the contest.

The 14th of July is also the french national anniversary of the french revolution. The event will accordingly also have fireworks, a buffet, tandem rides, and the like.

Organizers reason that aero towing will concentrate the activities at the same place thus encouraging participation by families and spectators who would have experienced difficulties getting to a mountain launch site. It is hoped that this event will spark future contests via aero towing as they can thus be organized in flat areas of greater population. The social aspects can thereby be accented.

Rules for the contest stipulate that a triangle or out and return speed run will be used unless the wind is too strong, in which event open distance will be called. Cameras will be used for control of turn points. Restarting is allowed if the landing is done at the landing area or if the pilot comes back to the launch site on his own. Photos will also be used to prove release, which release must be below 400 meters (about 1300 feet). The start time is released time plus a bonus if the release is done at a lower altitude.

The championship will be a practice event for the organizers who will then organize an international contest every year. Prize money is expected to be easier to obtain with the greater versatility offered by aero towing launches.

For more information on this charter event, contact La Mouette (Gliders) at 1, rue de la Petite Fin, 21121 Fontaine les Dijon, France, or phone 80/56-66-47.

Visions Being Built Under License In England, France, and Australia

1984 marked the start of a successful program for Pacific Windcraft of Salinas, California. The American builder of the intermediate double surface Vision hang glider began under-license manufacturing programs in England with the re-organized HiWay company, and in France with Avia Sud, a large school now involved in manufacturing. Recently a newer arrangement was tentatively reached with an Australian outfit.

Owner Jean-Michel Bernasconi reports, "These new markets further stabilized our position in the industry, and gave us access to a broader range of manufacturing technologies and materials."

For more information about Pacific Windcraft's overseas developments, contact the factory at Box 4384, Salinas, CA 93912, or by calling 408/422-2299.

PEOPLE IN THE NEWS

Writer/Pilot Wins Gray Prize for 1984

W. A. Roecker of Leucadia, California is the winner of the Gray Prize for the best hang gliding journalism of 1984. Roecker, who sometimes writes under the pseudonym of "Pork," authored the story and provided the cover shot and pictures dealing with the U. S. Nationals in the November issue of *Hang Gliding* magazine, for which he was awarded the $250 prize. Previously the recipient of awards for fiction and poetry, the Gray Prize was Roecker's first for journalism and photography.

A hang glider pilot for ten years, Roecker previously taught creative writing and English at the universities of Oregon and Arizona. In 1973 he was awarded an NEA grant of $5,000 for poetry writing. In addition to three books of poetry, Roecker published an anthology of short stories, and his articles on hang gliding have appeared since 1976 in *Hang Gliding*, *San Diego Magazine*, *North American Review* and other magazines and journals. His stories and photos on sportfishing have been printed in *Western Saltwater Fisherman*, *South Coast Sportfishing*, and similar magazines.

The Gray Prize is awarded yearly by photographer Bettina Gray of Rancho Santa Fe, California for journalistic excellence in the sport of hang gliding. Previous winners include Stan Abbott, Editor of the British Hang Gliding Ass'n magazine, *Wings!*, and Wallace White, writing for *The New Yorker*.

Soaring For The Lord

NAGS HEAD, NC — In an effort to promote *The Book*, the (CBN) Christian Broadcasting Network's new version of the *Bible*, CBN contacted Kitty Hawk Kites for technical assistance in filming a television commercial with a hang gliding sequence.

Lawrence Battaile, a hang IV pilot, twice champion of Kitty Hawk's Hang Gliding Spectacular, and an instructor for the North Carolina school, was chosen for by CBN to fly for a film crew at Ravens Roost and Bear Den Mountains, two good flying sites in the Blue Ridge Mountains.

And so it goes that as two youths sit quietly reading *The Book*, what should appear in the sky but a hang glider with *The Book* painted on its wings.

Kushner Flies For State of Virginia

RICHMOND, VA — Virginia Governor Charles S. Robb presented Lori Kushner with a $1,000 check for her winning entry in the first Virginia Vacation Photography Contest. The 1984 contest was the first to be co-sponsored by Kodak and a state government. In addition to the check, the Governor presented a signed copy of the Virginia Division of tourism's new poster (see photo).

Ms. Kushner, a native of Fort Johnson, New York, has lived in Virginia for the past 4½ years. She stated photography as a hobby eight years ago when her parents gave her an instamatic camera. "I expanded from there and became the family photographer," Ms. Kushner said. She is now a graduate student in clinical psychology at Virginia Commonwealth University.

The winning photo was a family project from Ms. Kushner. The subject of the picture — a hang glider soaring over the famous Monticello home of Thomas Jefferson in Charlottsville — is her husband Brad. He had launched his Raven 229 from nearby Brown's Mountain on a marginally soarable day last summer. Lori was perched on the hillside about 250 feet below launch at the time.

The poster, which uses the headline, "VIRGINIA: Exciting Times Every Time," is printed in full color, and will be translated into several languages for worldwide distribution.

Those who wish a copy of the large-format poster may write to the Virginia Department of Tourism, 202 N. Ninth St., Suite 500, Richmond, VA 23219. Expect 4-6 weeks delivery time.

CALENDAR

13th Annual Cochrane Meet Scheduled

Organizers have set dates for the 13th Annual Cochrane Meet as June 22 & 23, 1985. The format for the competition will once again be cross-country flying and target landing. The meet is open to all levels of pilot skills.

A Can. $30.00 entry fee includes registration, trophies for Level II, III, and IV top placing pilots, a dinner, and retrieval from X-C flights as well as from the bottom landing area.

On Friday night, June 21st, a unique contest will award a prize for the best "Tall Tale." Included in the story must be the phrase, "There I was, and I thought I was going to die!" The story, which may be true or false, will be delivered through a public address microphone, and judged by a panel of impartial judges.

For more information on this long established event, contact Willi Muller at Box 4063, Postal Station 'C', Calgary, Alberta, Canada T2T-5M9, or by calling 403/250-2343 (Calgary), or 403/932-6760 (Cochrane).

Fort Funston Air Race Announced For Early May

San Francisco Windsports, the organizers of the annual Fort Funston Air Race, have announced that the 1985 edition of the Air Race will be held May 3-5.

Some $3,000 in cash and prizes are slated for winners in one of the two classes. The Professional Class entry fee will be $100, and the Sporting Class entry fee will be $25.

To obtain an entry form and a race packet, send $5 to F.F.A.R., c/o San Francisco Windsports, 3620 Wawona, San Francisco, CA 94116, or contact Walt Nielsen at 415/753-8828.

5th Annual Marina Beach Steeple Chase

The Marina Beach Steeple Chase sponsored by Kitty Hawk Kites-West will take place over the weekend of April 26-28. As with past years, the main event will be a 12 mile out and return race along the sand ridge on the Monterey Bay.

The fastest time from launch to finish line will be the winner. Winning times in the past have been about 20 minutes, when conditions permitted a straight dash. However, if the days are marginal pilots may re-launch and fly or carry their glider as far as necessary to cover the course.

This year some peripheral events will also be held, such as: a target landing competition, hang glider "dog fighting," a comedy flying act, aero towing, a biplane aerobatic routine, a wind surfing across the Bay race, an ultralight exhibition, and a barbeque.

Some exceptional prizes have been generated for the 1985 event. Grand Prize will be a two week trip to Hawaii for two people, with airfare and accommodations included, *plus* $300 in cash and a trophy. Second Prize will be $600 in cash and a trophy. Third Prize will be $300 in cash and a trophy. Prizes will also be offered for 4th and 5th Places, for Last Place, and will include a Sportsmanship Award, Spot Landing Prizes, a Target Landing Champion Award, and a Rookie of the Year Trophy. The last (non-cash) prizes are being sponsored by the Marina Rotary, the Coastal Condors club, Pacific Windcraft, Kitty Hawk Kites, Wills Wing, and Delta Wing.

The entry fee is $35 with USHGA Hang III required, or $20 for the spot landing contest only for which only USHGA Hang II is required.

Transportation and accommodation discounts can be arranged through World Wide Travel by phoning 408/758-9313. More information on the 1985 Steeple Chase is available through Kitty Hawk-West, P. O. Box 828, Marina, CA 93933, or by calling 408/384-2622.

X-C Tow Pilots Association Formed; Has First Meet

The Cross Country Tow Pilots Association was formed in 1984 for the express purpose of promoting cross country hang gliding in the midwest via land towing.

The group has been towing successfully with center of mass bridles for two years and numerous cross country flights have been logged up to 40 miles. Steve Schultz, the Association's secretary speculates, "A 100 mile flight is only a matter of catching the right conditions. Our average release from tow is 2,000 feet and the highest has been 2,750 feet." They further report that altitude gains of 8,000 feet have been recorded.

Their First Annual Tow Meet has been scheduled for Memorial Day weekend (May 25-27) and will take place in Burlington, Wisconsin. The contest will be open to non-members and competition will be held on an individual and team basis. Skill level requirements will be either prior tow experience or USHGA Hang III qualifications. If weather permits, the tasks will be cross country.

More information and registration forms can be obtained by writing Steve Schultz, 8435 Spring St., Racine, WI 53406.

1985 Grouse Mtn Meet Scheduled

The Grouse Mtn Flying Team has set the dates for the Eighth Annual Grouse Mountain World Invitational Hang Gliding Championships.

Harvey Blackmore and the Grouse Mtn Flying Team have set the days for competition at the popular and well established contest in Surrey, British Columbia, Canada as July 24 to 28, 1985. A mandatory pilot's meeting will be held July 23rd. Those interested in aerobatic flying may also be interested to know that the Grouse Mtn Flying Team is also investigating their hosting an aerobatic contest sometime during 1985. The Canadian meet usually has separate events for men and women, and the 1985 event is no exception. Organizers are guaranteeing prize monies at $5,000 for the men's competition, with entry fees set at Can. $200.00 (about U.S. $150). An invitation is required to compete.

For such invitation, pilots should send a brief flying resume and competition summary with their current address to the Grouse Mtn Flying Team, 5690 - 176A St., Surrey, B.C., Canada V3S-4H1, or phone calls may be directed to 604/574-7431.

Kitty Hawk-West Summer Calendar

The following dates have been announced for Kitty Hawk Kites-West in Marina, California:

APRIL 26-29 — Marina Steeple Chase; MAY 18 — Parachute Clinic; MAY 25-27 — Rating/Mountain Clinic; JUNE 15 — Parachute Clinic; JUNE 22-30 — Owens Valley X-C Tour; JULY 27-28 — Rating/Mountain Clinic; AUGUST 10-18 — Hawaiian Flying Tour; AUGUST 24 — Parachute Clinic; AUG 31-SEPT 8 — Owens Valley X-C Tour.

For more information on these events, contact Kitty Hawk-West at Box 828, Marina, CA 93933, or call 408/384-2622.

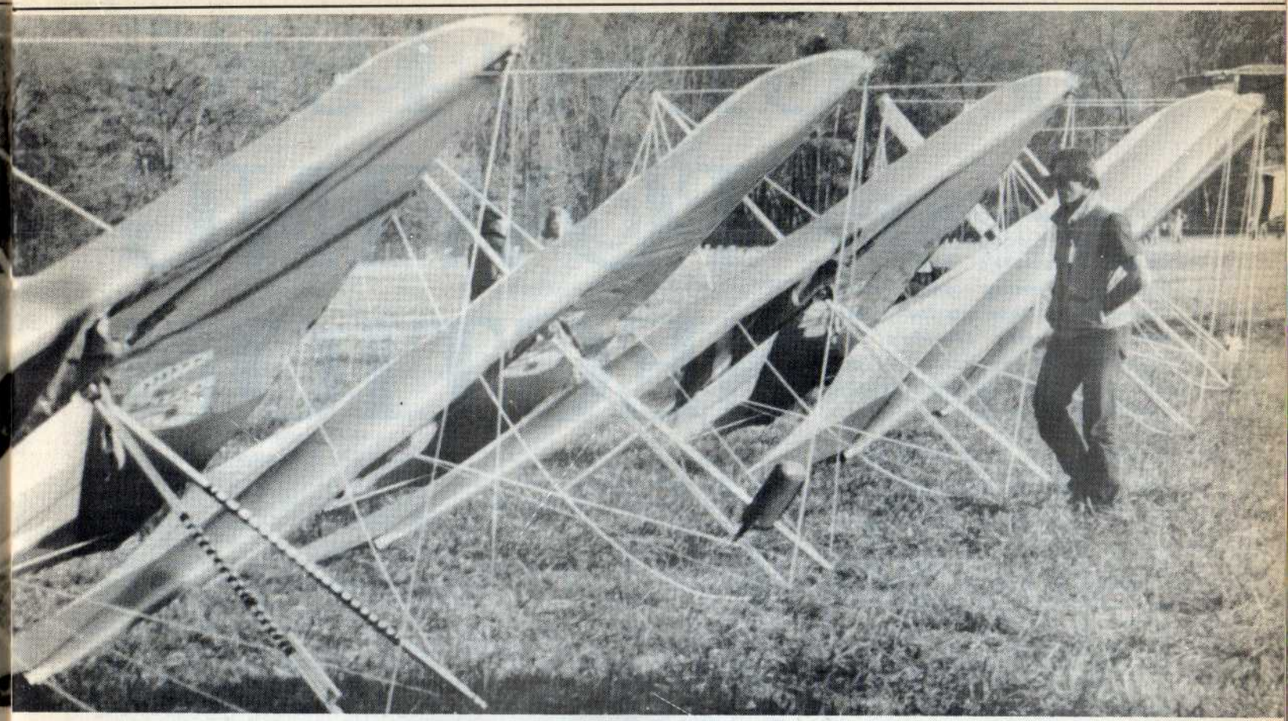
X-C Pilots Association Announces Two Major Meets

The Cross Country Pilot's Association, representing some 360 members, has announced two summer '85 contests which remember some influential Owens Valley names in their titles.

The George Worthington Memorial Open is scheduled for June 26th through July 2nd, 1985. All pilots with the advanced skill level are invited on a first come/first served basis. Any design of aircraft foot-launching is eligible; no roll-off is permitted, though wheels or skid(s) are allowed for landing. Pilots must provide their own transportation.

The Don Partridge Memorial Classic is slated for July 4th through July 10th, 1985. This meet will take the top twenty pilots from the George Worthington Memorial Open, and the top five pilots from the 1984 Owens contest. Criteria are the same as for the Worthington Open.

For each meet, the entry fees are $125 plus current XCPA and USHGA membership required. For additional information to include the mid-January XCPA Newsletter, write Meet Director Rick Masters at the XCPA address of Box 458, Independence, CA 93526. The open date for filing your interest was February 21st.



British F.A.I. representative Noel Whittall gives a whimsical look at hang gliding's future involvement with the Olympics/text and photo by Noel Whittall

1985 AND ON

... LOOKING AHEAD

Occasionally, for just the odd millisecond or so, I think that it may be quite pleasant to play golf. These moments of mental weakness usually strike sometime after the third consecutive weekend of unflyable weather, and I get over them very quickly. However, while enjoying a particularly pleasant summer soaring day above the eighth and ninth fairways of a local course, I allowed my mind to grapple with a couple of the great imponderables of like, both connected with the Royal and Ancient sport of golf. The first great mystery is explaining what collective madness seizes golfers when selecting the pants they wear on the course. Just why do they choose patterns which seem to have been computer designed to holler defiance at the colors of nature? There's material for a good thesis in there somewhere!

The other problem is that of the manner by which we come to decide on the limitations of the development of sporting equipment. It has taken the golfers a couple of centuries or more to finalize the size and weight of the ball so that it is hard enough to hit and easy enough to lost. Yes, Golfers, who on the evidence generally provided by their choice of legwear are quite irrational, have amicably settled on artificial limitations on their equipment. It is quite possible to produce a golf ball which will travel further than those now in use, in response to a given swipe from a golf bat, but they do not. Such a ball is termed 'illegal' and is not allowed.

If all this seems rather remote from the problems of the Hang Gliding World, bear with me just a little longer .... there are similarities, I promise you. Cast your minds back to a meeting in Oslo last summer, when the representatives of all the countries active in the sport recommended that we should apply for Olympic status. If we are granted it, we will have to decide on some limitations rather rapidly, so that 'Olympic' tasks can be established and 'Olympic' gliders agreed upon. What a job that will all be. What's the betting that the Olympian ideal of international harmony is tested to the limit during that process! Sure, it will all take some time, and we probably won't get in until the 1990's but it is interesting to contemplate.

The concept becomes more interesting as our gliders develop, and judging from movements in the UK and elsewhere, 1985 will be a year of considerable development. the British manufacturing base is consolidating, and rapidly turning into the "Big Boys" and the others. The Big Boys are now Airwave, with the all-conquering "Magic" range, and Solar Wings, maker of the Typhoon series. Airwave's excellent sales record both at home and worldwide, has made the Isle-of-Wight based company comfortably prosperous, while Solar have also a record of solid sales performance. Between them these two are soaking up any available design and development talent and are both looking for expansion. Solar are being particularly aggressive, and having attracted a considerable injection of venture capital from a large finance house, are all out for growth. Recent recruits are one-time American Cup individual champion Graham Slater, league flier Jes Flynn who had much experience on Hiway's Excalibur (a Sensor-like glider), plus Ralph Bygott, a sail expert from the Yorkshire firm of Goldmarque. No announcements yet about new models from either company, but it can't be very long now.

Solar are more interested in power than are Airwave, and over here 'power' is rapidly coming to mean the 'Trike' format. The hotshot trikes can now reach airspeeds into the 80 mph range, and military applications are obvious. It could well be prudent for a company to be well set up to tender competitively if there are army contracts to be had. On the civilian side, these powerful trikes offer the promise of practical aero-towing (not that 80 mph is desirable for that!) and it is towing which will probably be the catalyst for the next major reaction in development. Generally speaking, the British pilot needs to have a shoulder-portable wing which can be easily carried up and ground-handled on our smooth but breezy hills. Flexwings are fine for this: The Fledge begins to be a problem, while Mitchell wings and other rigids virtually don't exist because they're too much hassle. However, once we start flying by being towed from the flatlands, the picture immediately changes. By flying from a fixed base, there is the chance of keeping the glider in a shed on site, and portability is no longer quite such a prize. Some very respected British pilots have been playing with a Mitchell recently, while others have spent quite some time experimenting with veneered foam construction. Those rigid wings *will* arrive, and fairly soon now. Once that happens it is only a matter of time before the pilot is enclosed and 20:1 glide angles will be easily achieved. That is the point at which we will have achieved the ultimate breakthrough: we will have .... wait for it .....(fanfare) ..... re-invented the sailplane!

Which brings us back to the golfball problem. Do we restrict performance artificially in the interests of cheapness and portability, or do we let nature take its course? I am quite happy to argue either way to keep the debate going, and I really enjoy being around to see what happens!

SPECIAL 1985 TOWING SECTION

The three-part section on towing begins with Skyting Inventor Donnell Hewett's analysis of Shoulder Towing and French Connections; then go for a 54½ mile ride with Florida's tow expert Ray Foley; and finally look into towing safety with Skyting veteran Doug Gordon.

If you have been reading WHOLE AIR very long, you know that the practice of towing hang gliders is becoming more and more common. Furthermore, almost all of this increase in towing activity has been associated with the "center-of-mass" towing concept. Considering the problems associated with some center - of - mass bridle designs (See WHOLE AIR, July/August 1983.), it is not surprising that more and more interest and efforts are being channeled toward simplifying center-of-mass bridles in order to make them more convenient and more reliable.

As an example of this trend toward simplified "center-of mass" bridle systems, consider the Thevenot-Skyline Aerotow System described extensively in WHOLE AIR, March 1984. It's hard to imagine a simpler bridle system: just attach the towline directly to the pilot's shoulder straps.

Wow! Why didn't anybody think of this earlier? Or are there problems associated with this design which have not been publicized? Why do Thevenot and Skyline insist that a French Connection be used with this bridle? Because Thevenot is French? Or is there another reason? Is shoulder towing only good for aerotowing or could it be used just as effectively in land towing and water towing? In short, what are the advantages and limitations associated with shoulder towing and the French Connection?

This article attempts to answer these and other questions associated with this form of towing hang gliders.

The importance of center-of-mass (CM) towing has been emphasized from the beginning of the skyting technique of towing hang gliders. (See WHOLE AIR March/April 1982.) In retrospect it is easy to see why center-of-mass towing is essential for safe towing and why body towing is a closer approximation to CM towing than is heart-bolt (keel) towing.

You see, a hang glider is not one object but two: (1) the glider itself and (2) the pilot. So the center-of-mass of a hang glider system is not located within a solid object but rather in the empty air about one or two feet above the suspended pilot. (See Fig. 1.) There is nothing physically there except possibly the flexible hang strap of the pilot's harness. It is impossible, therefore, to attach the towline to the true CM of the pilot-glider system.

And if you try to approximate CM towing by attaching the towline to the suspension straps, the tow force will bend the straps and change the system's geometry. Besides, as the tow

SHOULDER TOWING and FRENCH CONNECTIONS

Text and artwork by Donnell Hewett

angle changes and the pilot shifts his weight, you have the problem of how to pass the towline through the pilot without cutting off his head or drilling a hole through his chest.

Fig. 2 shows what happens when the towline is attached above or below the system's CM. If you try to tow from the glider's CM (the heart bolt), you will tend to force the system to rotate nose down. At takeoff this could cause a crash and in the air it could cause a tuck and tumble. Not too good!

And if you try to tow from the pilot's CM (his tummy), you will tend to force the system to rotate nose up. This could cause a whip stall or structural failure. Again not good!

By the way, notice what happens when the glider gets turned sideways to the towline. Fig. 2 then shows that the system rolls toward the towline when glider towing and away from the towline when body towing. Body towing, therefore, can produce the dreaded LOCKOUT! Oh, my! Not good!

Nevertheless most of the system's weight is in the pilot (170 lbs) and not the glider (60 lbs), so the pilot is much closer to the system's CM than is the glider. This means that the same towline force will produce less pitching or rolling tendency when applied to the pilot than when applied to the glider. In other words, body towing is a closer approximation to CM towing than is glider towing. So if I had to make a choice between body towing and glider towing, I'd take body towing any day.

Up to now we have been talking about body towing from the pilot's center-of-mass (i.e. his "tummy"). The situation is a little different when the attachment point is the pilot's shoulders. Fig. 3 shows what happens when this is the case.

During takeoff (or any other time that the tow force is essentially horizontal - such as when aerotowing) the situation is very similar to that of tummy towing as described previously. In other words, there will be a strong pitch up tendency when towing straight and a roll out (lockout) tendency when the glider gets turned crossways. Things don't sound too good, do they?

But then, not everything is identical for shoulder towing as for tummy towing. The "pull" on the pilot is different and the transverse flight characteristics are different. For example, the shoulder "pull" essentially forces the pilot into prone position (even on takeoff) while the tummy "pull" lets him stay erect if he so chooses. And if the glider gets turned sideways, the transverse "pull" on the pilot's

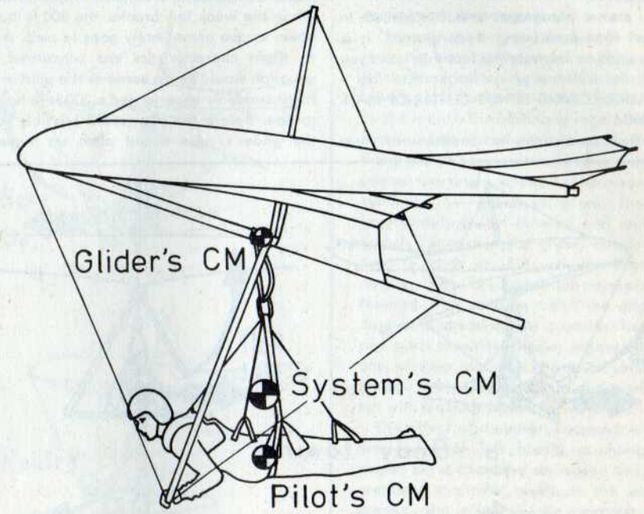


Fig. 1. Centers of Mass

shoulders causes his body both to rotate and to shift sideways, rather than just to shift sideways as in tummy towing. Ouch, things sound even worse than ever!

But shoulder towing has one other significant difference from tummy towing: in shoulder towing, the situation never stays the same. Namely, when the glider pitches up because of the above mentioned reasons, or when the glider climbs to a higher elevation than the tow vehicle, then the situation changes to that in Fig. 3B. Can you believe it? Instead of the catastrophic whip stall, lockout tendency, we find the pilot-glider system in an ideal neutral, CM situation! Look, the towline force is directed straight through the pilot's shoulders to the system's center-of-mass! There is neither a pitch up nor a pitch down tendency - in effect, we have true CM towing! Hey, this is great! I wonder what towing angle would produce the above situation? Say, 15 degrees? That's just about right for the early, critical climb out situation!

But alas, the situation is more complex than this. It turns out that the proper towing angle for the towline thrust to pass through the system's CM depends upon the tension itself. So a sudden change in towline tension ALWAYS has some kind of effect upon glider trim and pitching tendencies.

For example, suppose you are aerotowing with everything trimmed out perfectly. The towline tension is just right to rotate the pilot-glider system nose high just enough for the towline thrust to pass right through the system's CM. (Remember that in center-of-mass towing the two forces combine with gravity to produce an artificial gravity which is tilted. And since the pilot-glider system flys in this artificial gravity, a towed glider will always trim out with its nose higher than normal relative to the natural horizon. The stronger the towing force, the more the artificial gravity is tilted, and the higher the nose flies under trim conditions.)

So there you are aerotowing with everything essentially ideal. Then suddenly the tug hits a gust of wind and slows down. The tension goes slack for a while and your glider drops its nose to the free flight trim position. Then as the tug leaves the gust and speeds up, you suddenly hit the same gust and slow down. The towline tension immediately increases dramatically and you, being in the position illustrated in Feb. 3A, experience a strong pitch up rotation. This slows the glider even more, etc., etc.

If the pitch up is violent enough you may

break the weak link, go into a whip stall, and then tuck and tumble. If it is not that violent, you may be able to get the nose down by pulling yourself through the control bar (aided considerably by the strong towline tension). If this happens just as the nose overshoots the towing trim position and when the wind gust stops, then suddenly you are going to find everything reversed and you will experience a strong pitch down tendency. Even if this doesn't result in a tuck and tumble, I'd still say it's about time for you to get off the tow. Don't you agree? Well, even if you don't, I'll bet the tug pilot does!

The above paragraph is not intended to suggest that aerotowing is dangerous, it is simply used to illustrate the fact that - and you would do well never to forget this fact - SHOULDER TOWING IS NOT CENTER-OF-MASS TOWING!

Fig. 3c illustrates this fact another way. Here

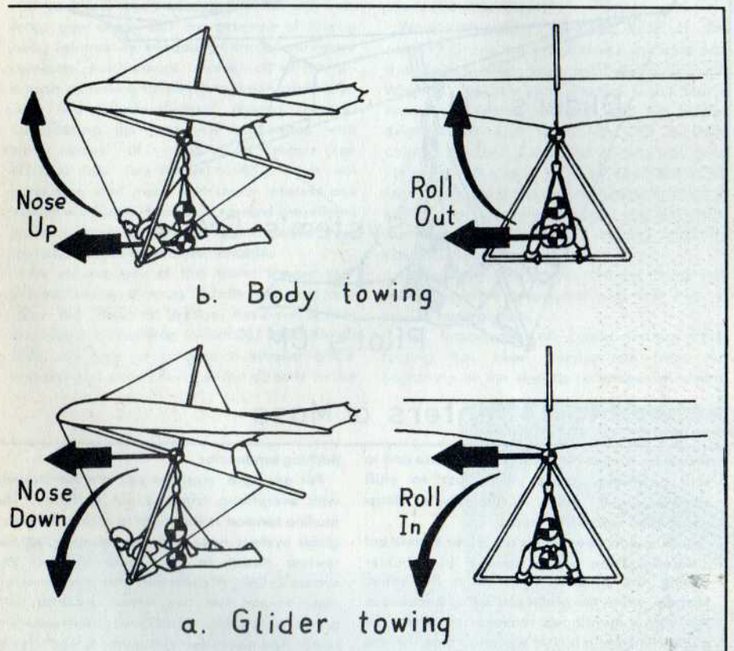


Fig. 2. Rotation Tendencies

the glider is topping out while being land or water towed. You can see that there is a strong nose down tendency, but you can't appreciate just how much unless we introduce some numbers. Without going through the mathematics, let us just say that calculations show that if the glider is topping out at a moderate 60 degree angle with a very moderate 100 pound tension, then under trim conditions the towline tension would be producing a nose down torque of about 150 ft-lb. In order to counteract this nose down tendency, the pilot would have to fly with the control bar pushed forward about 9 inches more than normal. Since the takeoff situation is reversed, the control bar on takeoff had to be pulled back about 3 inches. This means that when should towing, the TRIM position of the control bar can vary by as much as a foot or more. (In true center-of-mass towing, the trim position does not vary at all.)

Now imagine what would happen if you were topping out and the weak link broke. With a 200 pound weak link, the towline would be producing a nose down torque of more than 300 ft-lb, and under trim conditions you would be pushing out even more than before. (Actually you would not be "pushing" on the control bar, you would simply by flying - hands off if you like - with the bar more than 9 inches forward.) When the weak link breaks, the 300 ft-lb nose down torque immediately goes to zero. As far as flight characteristics are concerned, the situation would be the same as if a pilot in free flight suddenly experienced a 300 ft-lb nose up torque. Before the pilot could possibly react, the glider's nose would pitch up violently, possibly causing a whip stall with the resulting tuck and tumble. NOT GOOD!

Notice also that we've been assuming that the pilot's harness has a rope between his shoulders and his suspension point to prevent his shoulders from being pulled downward past the normal prone position. Imagine what would happen if he were flying without such a limiter. He would have the full towline tension (from 50 to 200 pounds) pulling him down into - or possibly through - the control bar. If you don't like flying your hang glider with your body upside down and through the control bar, I suggest that you use a prone limiting line when you should tow!

From the above discussion I think you can see that there are certain dangers associated with shoulder towing which are, in general, different from those of tummy towing. But both shoulder towing and tummy towing are forms of body towing, and as such they are expected to have certain characteristics in common. Undoubtedly some of the known dangers of body towing will also plague shoulder towing, so it seems wise to review some of the known body towing dangers.

In my opinion, the greatest danger of body towing is the pitch-up tendency which occurs under certain conditions, particularly during takeoff. At least one pilot has been linked because of this pitch-up tendency. Several other pilots have narrowly missed death when the top release of a regular skyting bridle released and the bottom release remained attached to the pilot's body. Although not intending to "tummy tow" these pilots suddenly found themselves doing so - and with catastrophic results.

The common scenario is as follows: There is a sudden increase in the towline force on the body of the pilot. Since this force occurs below the center-of-mass of the pilot-glider system, there is a corresponding sudden pitch-up tendency on the glider. As the glider climbs into a whip stall attitude, the pilot tries to pull the nose down by thrusting his body forward. Meanwhile the forces are building up so great that the weak link (or something else if there is no weak link) breaks. Without the thrust of the towline, the glider rapidly looses speed as it climbs higher until eventually it finds itself essentially motionless, in free flight, with its nose pointed almost straight up. As the glider starts sliding backwards through the air, the forces cause the nose to drop rapidly and the glider goes into a tuck. Frequently the nose down rotation of the glider is so violent that it passes the vertically downward position, turns upside down, and begins tumbling. The pilot usually slams into the glider's structural members breaking one or more of its tubes. Even if the pilot is still conscious and has a parachute, it is difficult for him to deploy it because of the tumbling and spinning of the glider. Depending upon the altitude and other conditions, the broken glider either slams into the ground or spins into the ground like a maple leaf. Usually the pilot is either killed or seriously injured.

Although the above scenario has never been reported for a shoulder towing pilot and although it is unlikely to occur under normal shoulder towing conditions (considering the force analysis just completed in the previous section), there is still the possibility that it could happen. You should be aware of this fact should you decide to shoulder too.

In fact, not only have I received no shoulder towing accident reports of the above type, I have received no shoulder towing accident reports of any kind. Either shoulder towing is rare, its accidents are rare, or the reporting of its accidents is rare. But even if shoulder towing is really safe, it appears to me that there are certain potential dangers associated with it - dangers beyond those normally associated with true center - of - mass skyting. Most of these potential dangers are a result of violating Skyting Criterion No. 5 - the slow transitions requirement. (See WHOLE AIR July/August 1982).

Besides the dangers already mentioned, imagine what would happen if a shoulder towing pilot is not quite ready to takeoff when the vehicle starts. (It can happen, folks!) Since the towline is attached above the pilot's CM, there is a good chance he will be pulled off balance through the control bar, falling nose down into the ground just before the glider does the same. (Maybe this is why some shoulder towing pilots take off in the prone position.)

When land towing, if the towline passes THROUGH the control bar to the pilot's shoulders, he can run into control problems at high tow angles when he needs to push the base tube forward past his shoulders.

On the other hand, if the towline passes UNDER the control bar, the pilot can have control problems on takeoff or during early climb-out. In fact, this last condition could be fatal. If you think it is hard to keep the glider's nose down with a normal skyting bridle, where only 2/3 of the line tension is pushing up on the control bar from a bridle attached to your waist, imagine the effect when 100% of the towline force is pushing up from a line attached to your shoulders. I doubt that even an experienced Hang 5 pilot could safely foot launch with the system rigged like this. And even if he could get airborne, he would not be able to pull the base tube any lower than his should height. In essence he would have little or no control of the glider either on takeoff or during early flight.

From the above discussion of the dangers and potential problems associated with shoulder towing, it would appear that shoulder towing is totally impractical. But don't underestimate the ingenuity of creative individuals. As the saying goes, "Where there's a will, there's a way!"

There are at least two successful shoulder towing systems which have been reported so far in the literature. Mike Lake, of Norwich, England, describes a shoulder towing system in the SKYTING Newsletter No. 22, which solves the problems associated with towline interference by passing the towline both over and under the control bar in such a manner that it behaves like it is over when it needs to be over and like it is under when it needs to be under. The Gerard Thevenot, of France, introduced a shoulder towing system to the U.S.A. as one of the components of the Skyline Aerotow System (WHOLE AIR March 1984) which passed the towline through the control bar and utilizes a French Connection as part of the glider control system (more about this later).

Of the two systems, Thevenot's has received the widest publicity and the largest amount of testing - even to the point of commercialization. All the reports indicate that the system is well proven and extremely forgiving (although not foolproof). (SEE WHOLE AIR June/July 1984.) On the other hand, Lake's design holds the greatest potential for surface (land or water) towing. This is because Thevenot's bridle is simply one component of a complete system - an air towing system. When air towing, the towline angle remains forever essentially horizontal (at least it BETTER remain that way), so there is never any tendency for the towline to interfere with the control bar's movement. But if this bridle were used in land towing, as the towing angle increased, the towline would interfere with control bar movement as mentioned previously.

The Lake bridle, on the other hand, solves most of the problems associated with varying tow angles (but not all). It eliminates the control bar interference problems, but not the control problems due to the non-CM characteristics of shoulder towing. What the Lake bridle needs, in my opinion is the French Connection.

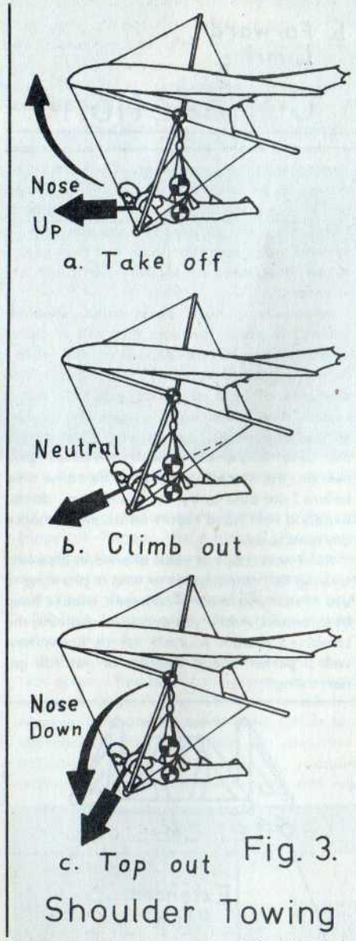


Fig. 3. Shoulder Towing

The French Connection is a mechanical device which is inserted between the pilot's hand point and his harness. It is illustrated in Fig. 4 and operates as follows:

The unit is attached to the keel of the hang glider and adjusted so that when in level flight the pilot can move forward or backward within the limits imposed by the size of the device. Outside these limits the pilot's point of suspension remains fixed and he swings back and forth essentially the same as when suspended normally. But inside these limits the point of suspension moves with the pilot. Instead of having to swing in an arc and having to raise his center-of-gravity, the pilot can move freely back and forth with essentially no effort. (See Fig.5.) In effect, the device allows the pilot to effortlessly retrim his glider to any desired flight speed (within the limits of the device). From the pilot's point of view, the French Connection acts much like "power steering" and allows him the same control of his glider with much less effort than normal - or more control with the same effort.

Now you can see why the French Connection is highly recommended for shoulder towing. Since shoulder towing is NOT center-of-mass towing, one needs the extra control afforded by the French Connection to regain the control that was lost. For example, suppose the pilot is flying in trim for a certain towline tension, at a certain tow angle, and at a certain speed when suddenly the tension increases. The pilot is immediately pulled forward and without the French Connection the glider would certainly tend to pitch up. But with the French Connection, the pilot's suspension point also moves forward. This tries to make the glider pitch down and speed up. As a result, the pitch up and pitch down tendencies essentially cancel one another out and the pilot simply finds himself flying faster with the glider still in trim but with his body farther forward.

The effect of a sudden decrease in towline tension (weak link break), a changing tow angle, or a changing air speed (wind gust) produces a similar result: IF the weak link breaks, the effect is the opposite of that described above. The pilot who was being pulled forward suddenly falls backward and the glider tries to pitch down. But the French Connection allows the hang point to move backward with the pilot, producing a nose up tendency. Again the two effects cancel one another to a large extent and the glider remains under control.

If a wind gust pitches the glider's nose up (changing the tow angle), the increased drag slows down the glider and the pilot is pulled forward. Since the hang point moves with the pilot, it too moves forward, putting more weight on the nose, trying to bring it back down where it belongs.

And if a sudden head wind hits the glider, then the glider slows down and the pilot is pulled forward. But since the hang point moves with him, the glider is retrimmed to fly at the faster speed.

All of these examples illustrate that, to a large extent, the French Connection allows the system to be self-correcting. I say "allows" instead of "makes" because an inexperienced pilot can cancel out this self-correcting tendency. For example, in the first illustration, if the pilot holds on to the control bar and does not allow himself to be pulled forward by the increasing towline tension, then his trim position will never move, and the glider will pitch up the same as if no French Connection were present.

We have not discussed the "double" French

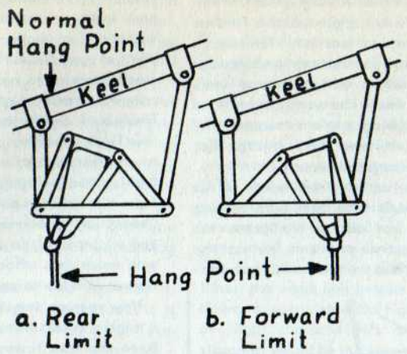


Fig. 4. French Connection

Connection, where the pilot not only moves freely back and forth but also from side to side. But the result is essentially the same: more control for the same amount of effort and a tendency toward self-correcting the problems associated with towline variations. Let me illustrate this with one example: We have already mentioned that if the glider gets turned crossways to the towline, the sideways pull on the pilot, below the CM of the pilot-glider system, will try to roll the glider away from tow into a lockout. (i.e. a pull to the left induces a roll to the right.) But look what happens with a Double French Connection. (Refer to Fig. 5b to see how the pilot moves from side to side in this case.) If the tow force is to the left, not only does the pilot move to the left but SO DOES THE HANG POINT. This puts more weight on the left wing, causing the glider to roll left. Once again the French Connection tends to cancel out the adverse control effects of body towing by producing a left roll to counteract the inherent right roll tendency.

In conclusion, I would like to say that body towing - particularly shoulder towing - has a promising future not only in aerotowing but also in surface towing. Although it is not nearly as close to center-of-mass towing as standard skyting, with the proper precautions (including the use of a French Connection and/or a Lake bridle) it appears to be a viable alternative to true CM towing. At least two shoulder towing systems are in operation today and each seems to be adequate in its own particular environment.

Personally I have never tried shoulder towing. (I prefer systems that are a closer approximation to true CM towing.) But when I do get around to trying it, I think I'll combine elements of both of these systems. (Yes, I realize that combining the elements of two successful systems.) Specifically, I plan to use the Lake Bridle along with a French Connection. But since it is going to be some time before I am able to try out this system, do not expect a first hand report on its performance any time soon.

As of now, I do not know of anyone else who is using this combination or who is planning to use it; so if you know of someone, please keep us informed. And if you decide to evaluate the combined system yourself, let us know how well it performs and whether or not you got hurt trying it.

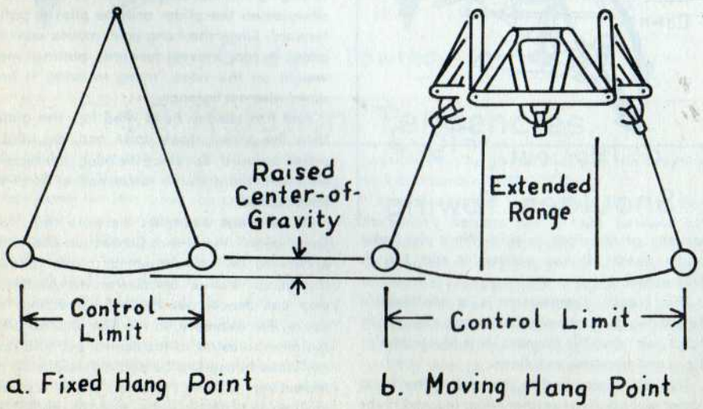


Fig. 5. Control Movements

FROM THE TOW LOG #4

Account by Ray Foley / photos by Dell Foley

Our flying site is located in the town of Lake Wales, Florida, and is probably the best site in Florida due to what sailplane pilots describe as "the ridge" which they fly north and south. On good days many sailplanes, on trips from Auburndale to Sebring, stop by and work thermals with us and the experience is awesome.

Our launch method is boat tow with friction winch and we pop-start with releases mounted on our control bars. Some of us fly prone, some supine. We have not had a tow accident in six years of flying here. We work hard to preserve our site. Our tows are from 800 to 1,200 feet and usually four to 10 flyers participate.

From the Log - September 2, 1984

The weekend was coming to a close with a fast moving thunderstorm approaching Lake Wales. I had been pulling boat duty all day and it was my turn to fly. At about 2:30 the boat crew towed me to 1,000 feet. When I pulled the release handle on my old conventional control bar, the glider was in lift from the leading edge of the storm and it quickly rose to 2,500 feet where things got rough.

Looking upward two sailplanes were racing north; and much higher I saw Rob Bass, who had been up a couple of hours, flying in a canyon of the cumulo-nimbus.

Due to the fallout and conditions worsening by the minute, I elected to fly downwind and land at the airport, about 4 miles to the west, hoping that Bass would follow. Enroute, a fiberglass sailplane (ASW 20) passed me to land at the airport. A small pond behind the airport showed signs of high winds which convinced me to fly further away from the storm.

Luckily a last-chance thermal was encountered and I hung on for dear life as my Comet 2 spiraled upward. While I climbed to 4,000 feet I decided to race away from the storm as it was closing on me again.

At 10 miles out, near Lake Garfield, with the storm slowly falling behind I decided to fly as far as possible because the weekend was almost over and home was up ahead another 50 miles. At 15 miles out I saw my pickup pull off to the side of Highway 60 and my spirits soared, since I knew my wife Dell was following.

Crossing the town of Bartow at 4,000 feet and further on at Mulberry, it was thrilling to work up from low occasionally and passing by many old cross country landing sites. The lift I engaged in was from strong thermals, building large cumulus clouds, spaced far apart, Therefore, my objective was to gain as much altitude as fast as possible then fly as flat as possible hoping to connect with the next thermal.

My harness, a copy of the old Sky Sports supine, was very comfortable and it enabled me to sit up while working rough lift where attention and control - input strength was most demanding. It also allowed me to lean back and flatten out completely on my back to reduce drag on the long glides to the next thermal.

I was ecstatic when up ahead was Seffner - Valrico Road where Steve Moyes landed years ago when he set the Florida XC record at 34 miles. The field where Steve landed was presently host to the annual Brandon Balloon Festival.

A crowd of around 1,000 was below as I drifted over its east fringe in a light thermal, turning as flat as possible at 700 feet. The thought of landing there was disheartening. I forced myself to think of the excitement of landing with a crowd of 1,000 people motivated by an aviation event. It can't be all bad!

Hanging on over the Festival working small thermals going nowhere was beautiful, but my heart was at *Cloud Base*.

With the cumulus now diminishing because of the advancing time, I resentfully resigned myself to landing. I began concentrating on landing in the crowded field where the balloons were setting up in the southeast corner. One last search around the field and over the highest concentration of people, the thermal blast I had been searching for happened. Banking hard I knew it was my ticket to happiness. My mind was reeling, "Good bye people - hang on Foley." My Comet carried me to a beautifully developing cumulus at 4,800 feet.

My next glide carried to 10 miles to the east fringe of Tampa. The ominous, threatening sounds of the city were unnerving and landing areas were more scarce. A seagull circling over 40th Street showed me lift which carried me to 1,300 feet. Further west were patches of green among all the houses.

With an alternate small landing area, should sink occur, I headed for the green, arriving at an elementary school at 17th Street and Buffalo Avenue, bordered by power lines. Lift on final approach to the small field put me into a position where conventional landing techniques would risk me flirting with high voltage. Pushing the bar full out, "mushing" to 30 feet, then pulling in to a medium dive, leveling into ground effect with still too much energy and little room to spare, gave me a final moment of fright. But, the energy diminished and a full flare 2-step landing ended a nice flight home (at 54.5 miles).

While answering 50 questions, about 10 minutes elapsed and then my pickup turned the corner.

P.S. Thanks for towing my boat home safely Jody Sizemore and Brian Jackson!

P.S.S. I learned that Rob Bass did fly to the west away from the storm, but landed in the fallout slightly damaging his glider in a wild one.

SKYTING CHALLENGE

Text and photos by Doug Gordon

Fourteen years ago at the dawn of our sport, many people were taking to hang gliding with the same reckless abandon they now take to windsurfing. Back in those days of garage-made standards and self-taught enthusiasts there were many accidents and injuries. Largely as a result of this, a national organization was formed to bring into focus the goals and aspirations of the participants and increase safety nationwide. Students were to be rated, instructors certified, and gliders made airworthy.

The sport of hang gliding (almost properly named sky-sailing at the time sky-sailing) was new. The pilots entering it were virtually all pioneers exploring new facets of flying and glider design. The spirit of comraderie among fellow pilots was, and still is, high in this small but nationwide adventure. New ideas were seized upon and picked apart at every opportunity to advance the science. Over the past fourteen years, and especially over the last five, glider design has improved to the point where some insurance companies now say that hang gliding is safer than snow skiing.

In 1980 a physics professor by the name of Donnell Hewett put forth an analysis of a new system for getting our heavier-than-air gliders into the sky, which one day may very well be viewed from an historical vantage to be just as important as all glider design improvements combined. Certainly center of mass (skyting) or partial center of mass (one release line at pilot) could within twenty years become the dominant form of getting hang gliders into the air. It's not simply a question of who is or who is not interested in towing. The relevant question is what percentage of potential pilots across the United States live close to mountains and what percentage live near an open field or body of water. The answer, of course, is that the majority of people live nowhere near mountains. This does not mean, however, that skyting will replace foot-launching. It should not and will not. What it will do is add an excellent supplement to our sport. It is the key - along with the newly approved FAA exemption for air-to-air ultralight towing - which now allows anyone living anywhere in the country to become a hang gliding enthusiast.

Towing must be made safe. History shows us that once a technology has been devised, and information about it freely disseminated to a population, it is then impossible to take back. This is especially true of skyting because the cost factor for a skyting system is incredibly low. As with most technologies, strength and simplicity are the keys to safety - strength for obvious reasons, simplicity because as you increase the number of factors arithmatically, the number of possible outcomes increases exponentially by square.

For skyting we need a revival of that early spirit of picking up the ball and running with it. We all need to work together to develop it safely. What we don't need is resistance to change and bureaucratic knee-jerk reactions. Obviously, many pilots live in mountainless states. Consider the pilots who reside in Nebraska, South and North Dakota, Oklahoma, Kansas, Iowa, Louisiana, East Texas, Florida, Minnesota, and many other states. They may have no mountains, or may just be a few hundred feet high, or may be five hours distant. These pilots may wish to tow as soon as they feel it's safe to do so because skyting solves all these problems. More importantly, if we set a high rating to tow, then how are pilots from these mountainless states going to get from hang zero to hang 3 without skyting?

In the petition for exemption from FAR 91.17 (which was just recently approved), Dennis Pagen states the case quite clearly. He writes:

"The real safety enhancement comes with hang gliding instruction. Once a student achieved a certain skill level he can be towed aloft in increasingly higher altitudes and practice flight patterns and landing approaches in a gradual manner. This will overcome the current problem with hang gliding instruction in many areas where students often have to graduate from a training hill of 100 feet or less to the next available size mountain of 1,000 feet or more. This is a serious drawback of hang gliding instruction that can be corrected with single place or two place towing.

For a similar reason, hang gliding training will be more thorough. Currently, weather plays a major role in the conduction of hang gliding lessons. The winds must blow right for the training hill which does not occur often enough in many areas. A student often loses patience or the training is not as complete as it could be if succeeding days offered ideal conditions. This problem will be solved with towing training, for a great many flights can be achieved in a short time during morning or evening calm periods since there will be no need to wait for the winds, or to carry or drive the hang glider back up the hill.

Another enhancement of safety that the exemption will foster is the everyday recreational operation of hang gliders by experienced pilots. The most dangerous period of operation of a hang glider is during windy (soarable) conditions while launching. The presence of trees in the east and powerful thermals rising up the mountain face in the west increase these dangers. Towing up in the middle of a valley and flying over to the mountain when ridge soaring or using thermals over flat ground will avoid this danger (thermals tend to be less vigorous when they lift from a valley floor). The problem of launching in a crosswind will also be eliminated with a towing system since hang gliding launch sites are limited in the directions they face while a tow operation can turn into the wind for taking off. Competition will likewise be safer, for pilots will not be induced to launch in adverse conditions and will be more spread out as in sailplane competitions.

In the preceeding statement, Dennis was referring to aero, not land towing. However, I think the points he made were valid for both forms; perhaps more so for land. Nearly all traditional (paid) teaching in hang gliding is for first-day beginners through hang 2. Once a student attains the hang 2 level and begins mountain flying, he generally will join the local club and practice to gain the higher ratings. This is why the USHGA certifies basic instructors to rate hang I and hang II, and observers to rate hang III and hang IV. I certainly don't believe that Dennis Pagan is in favor of teaching first-day and hang I students to fly using partial center of mass aero towing.

I believe that the answer to the towing dilemma is to devise a system which is safe for hang I and hand II under supervision. What we could do is educate pilots through publications and books on the best methods to date. We could start certifying skyting instructors at every ICP (Instructor Certification Program). We could start making extensive use of lists during pre-flight like they do in every other form of aviation. We could start a tradition of the flight director being the unconditional boss at launch; if someone doesn't meet his skyting criteria list, he doesn't fly.

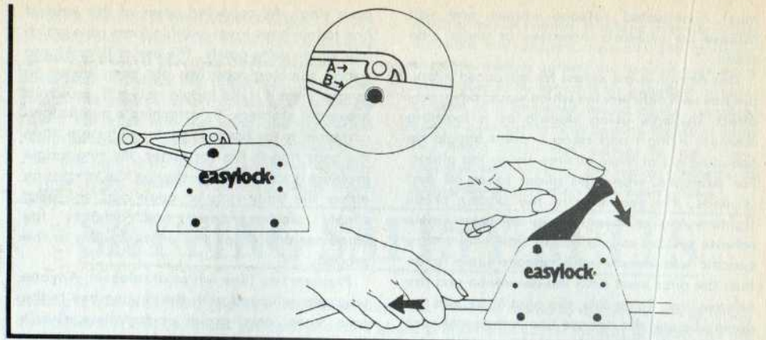
What we don't need at this point in time is another factor which would lead to dissatisfaction of pilots and a drop in USHGA membership renewals. Whatever rules are best for land towing, they must be agreeable to the vast majority of pilots on a voluntary basis because these pilots see these rules to be in their own best interest.

Pilots should understand the inherent danger in towing. There are more variables, therefore the number of possible consequences is greater. Most of the reported accidents in towing recently have happened to hang I and hang II pilots, but this statistical reality does not encompass the fact that the majority of accidents occur due to a lack of supervision, not rating. There is a lack of supervision because there are only a few people across the entire country who know enough about the frontier knowledge in skyting to be able to teach it safely.

In discussing a particular skyting design, it is just as important to attach a value to the human element as it is to attach values to strength and reliability. By human element, I mean the ability of even an intelligent person to make an error in the installation or function of a component, or in personal performance caused by a particular design.

Central to the factors of both reliability and the human element is complexity. As has already been stated, the simpler the design, the less variables to go wrong. There is a design which I believe is state of the art for teaching hang gliding because of its simplicity of design, strength, and reliability. I cannot, however, recommend it for recreational use because of deficits relating to the human element. Under proper supervision, it is a safe system to use for hang I-in-training. In order to understand how this system came about, it is first necessary to briefly review the evolution of skyting bridle systems.

There have been four major skyting system designs since skyting was introduced four years ago. These are the double release, the triple release, the apex release, and the threaded release systems. There are many variations for these designs reviewed, so far, in the 32 *Skyting* newletters printed to date.



The first system invented involved two releases. One was at or near the pilot, the other at or near the center of mass of the glider. In addition, each release had an automatic release line going out to and attaching just beyond the apex ring. This first design solved the problems of being able to release at any tow angle with just a flick of the wrist and also releasing the skyting bridle so it would not be in the way upon landing. Its inherent problem, of course, is complexity. With its two extra auto release lines and two releases, one could write a book on the number of factors which could go wrong. Since this design was first invented, it was constantly refined until it became the triple release.

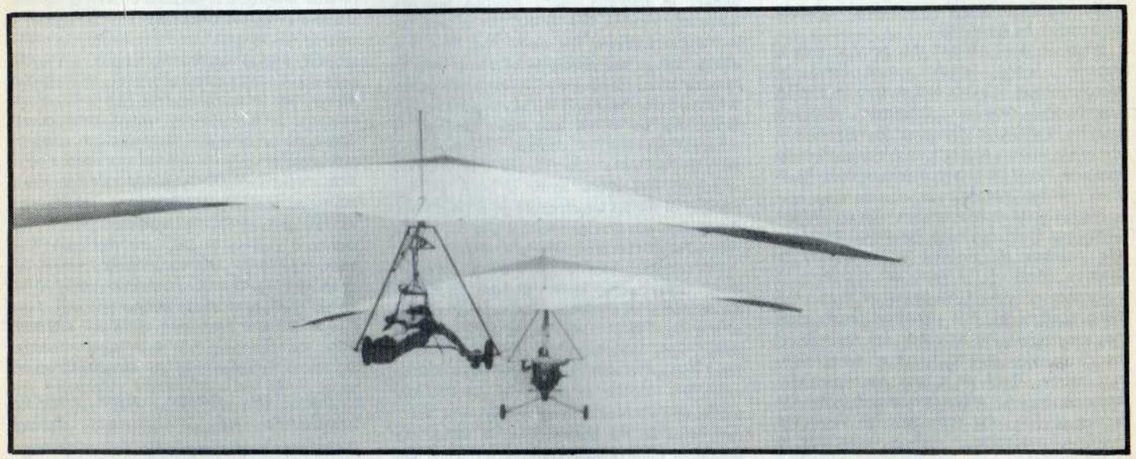
The second system design, the triple release, does away with many of the problems associated with a double release, but does so at the expense of added complexity which, in itself, adds more possible outcomes. I don't have enough room in the scope of this article to write the number of pages to describe the pluses and minuses of these two systems, so I'll just focus on the bottom line: In either the double or triple release systems, if the pull line or either of the auto release lines are adjusted too long, the bridle may fail to release. If the pull line, or either of the auto release lines, are too short they may cause a premature release. Changing pilots or harnesses will normally require that the pull and auto release lines be specifically readjusted. If either of the auto release lines should become broken or untied, the bridle may fail to release. If either becomes twisted or tangles, or if it snags with the ground in some way during takeoff, the bridle may prematurely release. It is my opinion that these types of automatic release systems are complex to the point of reduced reliability, especially when the human element is taken into account.

The third system design, which is currently the major system in use and is the safest design so far devised for recreational use, if the standard skyting bridle with the apex ring being the large ring on a single three-ring quick release. This apex release system is the safest because it has a single release at the end of the tow line which does not interfere with the workings of the skyting bridle. Moreover, a three-ring quick release is the

(Opposite page and here) Students of Arizona's Doug Gordon learn safely by skyting. (Above) Doug Gordon highly advises the threaded bridle release (see text).

most time-tested release known and will release as pressure increases or under side loads.

This design is the safest for advanced pilots, but has two deficiencies which would adversely affect students using skyting as a learning method: Hang I and Hang II pilots should be spending all of their airtime flying the glider. For example, when the glider takes off and ascends, the geometry of the skyting bridle tightens the release line in an apex single release system so one has to start with a very specific slackness in the release line. To do this, the pilot must hold the downtube and the release line. To do this, the pilot must hold the downtube and the release line in the same spot for each flight. If the pilot needs to release at a low tow angle close to the ground (the critical area), he will have to momentarily let go of one downtube to pull enough slack out of the release line for the release to open. Further,



upon release, the skyting bridle stays attached to the glider. An experienced pilot will wrap it around a side flying wire. A less experienced pilot will just try to fly and let it dangle below the glider. Upon landing, it could easily catch on something and result in a quick nosedive. These two problems are of little consequence to an advanced pilot but would have a profound effect in a learning situation.

The fourth system design, a specific variation of the threaded bridle release, is state of the art for using skyting as a teaching technique. With the threaded release system, the skyting bridle is also the release line -- it simply threads through the system and falls to the ground. To release it takes just a flick of the wrist at any two angle as long as the proper marine quality sheet stopper is used (see inset). There are three problems normally associated with a threaded release system. These are: 1) the line tangling as it threads through the rings, 2) the line whipping around and hitting the pilot at release, and 3) the line catching on a wire and/or control bar immediately after release. In the new variation threaded system, these three problems have been virtually eliminated for two reasons each. The solutions are as follows:

Problem one (line tangle on either apex or body ring): All reported cases of this kind of line tangle have involved thin 5 mm rope which will tangle quite easily. The use of 10 or 11 mm perlon climbing rope has not been known to tangle. Even if it did tangle, this still would not present a problem. By attaching a non-locking carabiner to the harness center web strap, then the body ring to the carabiner, the ring tangle problem is solved. If the skyting line tangles on either the body ring or apex ring, the pilot simply reaches down and unhooks the carabiner and drops the entire system to the ground.

Problem two (line whips at release): Anyone who gets whipped with the skyting line in the face, knee, arm, groin, or anywhere else is flying a hang glider at or near stall speed at release time. Since the accident reports compiled by Doug Hildreth every year indicate that more accidents occur because of flying too slow than all other reasons combined, I tell my students that I consider this effect a fine incentive to keep that bar pulled in. No one gets whipped with a skyting line if he maintains proper airspeed at release. I am constantly, purposely, and redundantly reminding my students to keep their speed up. I have the launch director do the same, (see Skyting Safety Rules B:1 through 7). Moreover, in the skyting class we use voice-activated two-way radios so that communication between student and instructor is constant and instantaneous.

Problem three (skyting line catching on a wire or control bar): To prevent the line from catching on a wire, the instructor/driver will slow the pull vehicle down if the student does not keep the glider directly behind the pull direction. In addition, the instructor will speak over the voice-activated radio telling the student to shift his weight. To prevent the skyting line from tangling on the control bar, this is accomplished by 1)not topping out, i.e., tow angle is not to exceed 45 degrees, 2) skyting with the bridle through the center of the control bar, not under the basetube, and 3) pulling in hard just prior to release for airspeed (pilot's chest is through control bar).

In teaching hang gliding by towing, I do not mean to indicate that skyting is as safe as foot-launch instruction. It is not, and probably never will be, since there are more variables involved. I do think a skyting system has been developed which brings the safety level well within the acceptable range. I have spoken a lot in the article about the elements of skyting that relate to safety. Let me say, on a personal note, that when I am out at the skyting field, I don't think about lines tangling with this threaded system -- I know it works properly. However, I am concerned that someone will forget to pull in first before release, and consequently stall, but then again I'm also concerned about stalls in the foot-launch class.

Most advanced pilots who have tried skyting are convinced that a hang III rating or better is needed to tow because they need their advanced skills in order to skyte safely, having skyted on their Comets or other floating crossbar gliders. If one does not already know by now, the difference between skyting with a non-floating crossbar and floating crossbar is like night and day. The difference between skyting with just about any glider and a Seagull Seahawk Trainer is even another order of magnitude easier. Those Seahawks just don't want to turn and they have an incredibly low minimum glying speed; as long as they're in line with the wind/vehicle pull direction, they gently go straight up hands off. As soon as the student is comfortable with skyting on a Seahawk, I put him on Delta Wings' Light Dream. Besides, having a small, easy to handle control bar and light weight, the 165 model has the option of a lock-down crossbar which, in my opinion, is essential for skyting. To my knowledge, the Light Dream 165 is the only glider currently produced with that feature which makes it the only modern glider available for skyting instruction.

Skyting is primarily for teaching, getting the feel for towing, and recreational flight up to hang III. Advanced pilots don't need to skyte. They can tow using a single release at the pilot's shoulders which does away with many of the problems associated with a skyting system. In fact, a single release at the pilot negates the adverse yaw skyting effect on a floating crossbar glider. Be aware, however, that this kind of towing does require advanced skills and a French connection does help to control the glider in its resulting out-of-trim condition. This is because a single release point on the pilot does not take into account the center of mass of the glider and can result in significant pitch problems. The aero towing people have been using this system for nearly four years with fine results.

The opinions of people in the hang gliding community in terms of what level of proficiency a pilot should be allowed to skyte run the full gamut. There are those who believe in a minimum Hang III, some are for Hang II, some for Hang I, and there are those who believe a person can learn how to hang glide by skyting from day one. I'm about the middle of the road on this one. My opinion is that a Hang I level is necessary to skyte safely. I think that most instructors would agree that there is a vast difference between a person who has never picked up a hang glider and a person who has three days of experience in their abilities to fly, land, and adjust air speed, and most important, in their confidence in doing so. Even flat, mountainless states have some small rolling hills or sand dunes. It should not be too hard to get a couple of days experience first. The reason I don't think a first-day person should tow is because there are just too many variables for the beginner pilot to remember at the same time.

For example, when someone is taught any physical skill, whether it is hang gliding, tennis, golf, or skiing, behavioral responses must be added one, or at most, two at a time. Even athletes cannot remember to do more than two physical actions at the same time if they have never done either before. Transferring what one knows in one's mind to the fingertips for the first time is not an easy matter for anyone. That's why a good instructor will start beginners low on the trainer hill and let them work their way higher at their own pace. A student should be quite comfortable at a specific level before going higher. A first-day beginner on the shallow end of a trainer hill has more than ten things to think of as he jogs down the slope for take-off the first time. Add to this a tow force of 100 pounds, a release, all the skyting safety rules, and the psychological effect of being pulled by all those horses, and it becomes obvious why learning from day one by towing is just too much for most people. If there is enough time, energy, and the proper equipment, it might be possible to teach first-day people to skyte safely if they were being towed aloft by a boat over a lake, since water is a much safer medium. This method, however, would not be cost effective from a business point of view due to the time element per flight. Even land or aero towing (if it were safe for first-day beginners) would not be cost effective for them because it takes so long between each tow, and students require so many short-hop flights to get the feel of the glider and skyting.

Skyting has solved the problem of getting pilots from the small trainer hill to mountain flying and does this in any wind direction or no wind at all. It now appears the problem of getting pilots from no experience to Hang I is solved. Recently in Europe a rather unique system was popularized which works without hills or towing, in any wind direction, or with no wind at all. What they have done is develop a device which is mounted on the back of a flat bed truck in which the glider fits, and which limits the glider's axis rotations. They simply point the truck into the wind and accelerate until air speed is attained. Flight simulator is not the right word since the pilot is actually flying. Flight limitor would be much more descriptive. Of course, this type of system does not take into account take-offs and landings, but nevertheless getting the feel for a glider by being able to fly for such an extended amount of time as a beginner would almost certainly qualify a person for low skyting flights. If what I've heard about this system is true, then, together with skyting, the major problems of hang gliding instruction have been solved.

SKYTING SAFETY RULES

Skyting is a form of hang gliding in which the glider and pilot are towed to altitude in a way which distributes the towline forces between pilot and glider proportional to the masses of each. The net effect is that two-thirds of the pull is on the pilot and one-third on the glider. The three factors of towline tension are vehicle speed, wind speed, and glider pitch. These three factors are reflected as one figure on the tension gauge dial which the two vehicle driver reads as he tows. If the tension increases too much, the driver lets up on the gas. A weak link is employed on the line as a fail safe.

THE EIGHT SKYTING CRITERIA ELEMENTS:

1. ***Constant Direction:*** Skyter sidesteps glider directly behind vehicle pull direction (into wind).
2. ***Constant Tension:*** Vehicle driver watches tension dial for constant pull.
3. ***Proportional Distribution:*** Skyting bridle solves this as mentioned above.
4. ***Attachment Points:*** The keel ring and body ring should be located as close as possible to the center or masses of the glider and pilot, respectively (i.e., control bar bracket; waist of pilot).
5. ***Slow Transitions:*** Use 300 feet of elastic towline (100% nylon) to stretch in order to guarantee that the towline tension always varies slowly.
6. ***Reliable Release:*** Three ring releases work even as tension increases.
7. ***Weak Link:*** This is essential for towing so G-forces cannot build up under *any* circumstances. Remember "Murphy's Law;" 200-pound test maximum.
8. ***Safe Learning Method:*** Become expert in low and high winds at a *low* altitude before flying higher. Don't teach beginners hang gliding by towing.

Skyting Safety Rules

A. ***Connections:***

1. Hook up - hang check - helmut on tight.
2. Rope straight to vehicle - hook up bridle release.
3. Hand into ripcord - topline clear of helmet.
4. Pilot pulls back for tight line and sidesteps in line with vehicle-wind.
5. Launch director rechecks hook in/bridle/release/towline/wind direction.

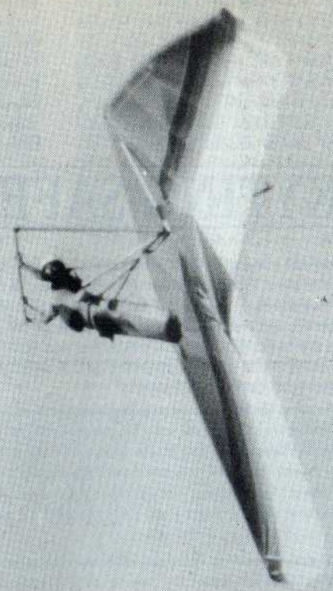
B. ***Verbal to Pilot by Launch Director:***

1. Keep the nose positively loaded (up).
2. Keep wings level as you run.
3. Pull in as you lift off. As you go higher pull in harder! (Wind gradient).
4. Keep glider directly behind vehicle.
5. Try to relax and think air speed (i.e., pull in).
6. Pull in, *then* release (your body should be through control bar as you release).
7. Keep bar pulled in for a moment to pick up air speed after release.

Basic Safety Concepts:

1. ***Do not push out at any time while glider is under tow!***
2. Launch director signals driver to start (hand signal or radio).
3. Always hold downtubes for takes-offs and landings (within 50 feet of ground).
4. No turns within 50 feet of ground - watch windsock.
5. Fly faster as you near the ground - 20 feet (wind gradient).
6. Relax - make small, smooth control inputs.
7. Think air speed - keep that bar pulled in.
8. If you want to go higher, simply pull in less hard.
9. Do not practice flying skills while under tow. Keep glider behind vehicle and in constant two force. (Skyting is a necessary evil to gain altitude only.)
10. The idea is to be able to release or at least to slacken towline the instant the pilot wants to, therefore:

A. Do not tow up past a 45 degree angle (if vehicle stops, towline slackens).
B. Keep glider behind vehicle (by pulling in pilot slackens towline).
11. Even if weak link or towline breaks, pilot still must release his end!
12. Towline touches glider wire - do not release yet (possible tangle).
13. Do not take your hands off the downtubes until you have released and are free flying.
14. Launch director is unconditionally the boss. If a pilot does not meet his skyting criteria list, then he doesn't fly.
15. Use wheels! Walk glider back - saves bad take-offs/landings.
16. If release won't release or line tangles, use voice-activated *radio* to signal driver. Driver's radio set "push to talk"/antenna outside vehicle.
17. ***Have fun!***



PACIFIC WINDCRAFT'S VISION

Paul Burns begins 1985 with a Pilot Report on the double surface intermediate from Salinas/photos by the author

A phone call to the factory finalized final arrangements for delivery of a Vision for this evaluation. A conversation with designer Jean-Michel Bernasconi accomplished this, but also raised a question in my mind over the classification of the Vision. Is it an Intermediate or a High Performance glider?

The Vision is a product of a unique design theory. The goal was to design and build a glider with intermediate handling qualities and control pressures, a low stall speed (for easy take-offs and forgiving landings), a neutral static balance (for low effort ground handling), with an enclosed crossbar (to attain double-surfaced performance and speed range), and keep the weight under sixty pounds. Quite a task!

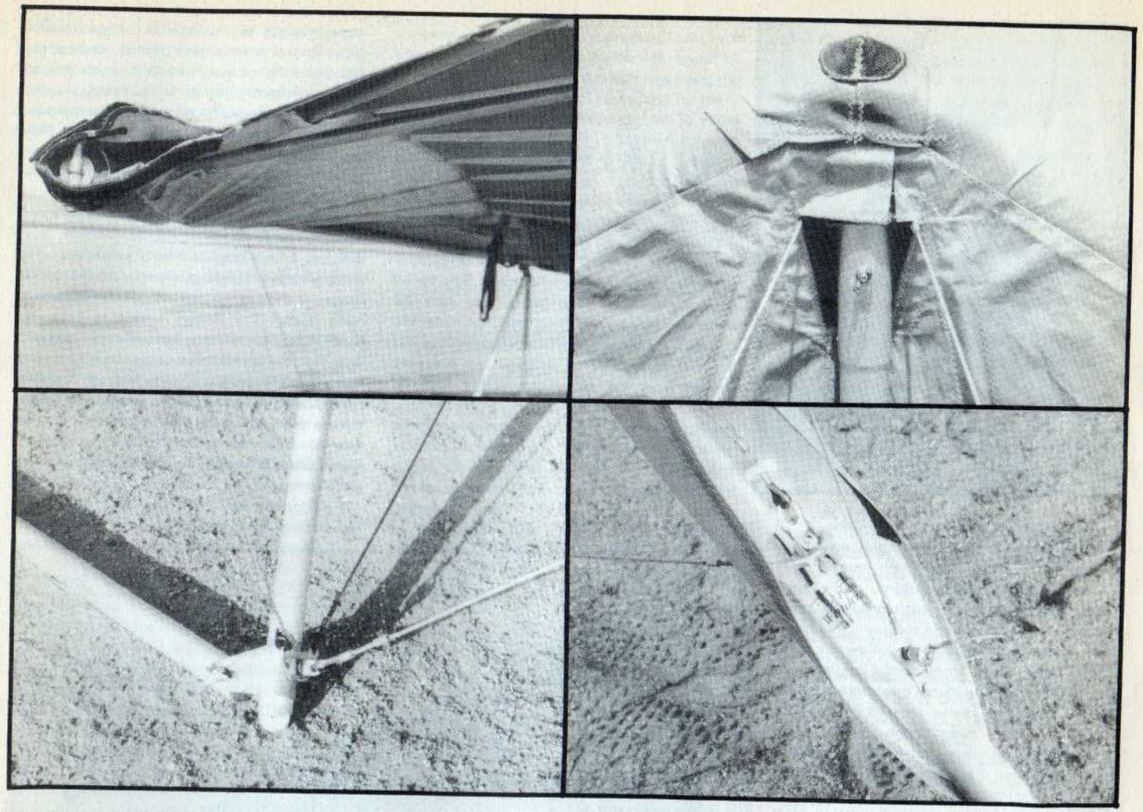
Picking up the V-18 (Vision 18) in person at the factory in Salinas, California gave me the opportunity to inspect the facility and meet the "crew." I was impressed by the obvious

BOX SCORES

PACIFIC WINDCRAFT'S VISION

(1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent)

GENERAL CHARACTERISTICS	
Set up Time/Ease	4
Ground Handling	5
Static Balance	5
FLIGHT CHARACTERISTICS	
Bar Pressure — Roll	5
Bar Pressure — Pitch	5
Roll Control Initiation	5
Roll Reversal (45° to 45°)	5
Yaw Stability	4
Turn Coordination	4
Speed Range	5
Sink Rate Performance	4
Glide Angle Performance	4
LANDING CHARACTERISTICS	
Flare Authority	5
Parachuteability	5
Directional Control at Mush Speed	5
VISION SPEED RANGES	
Vision 18 (57 lbs) — 175 lb pilot = 1.3 lbs/ft² wingloading	
Stall Speed - Loose	15 MPH
- Medium	16 MPH
- Tight	17 MPH
Top Speed - Loose	37 MPH
- Medium	38 MPH
- Tight	40 MPH
Suggested Retail Price	$2,600.00



organization of the shop, and felt a strong sense of professionalism projected by the craftspeople who are Pacific Windcraft. The gliders I inspected at the shop all displayed excellent sailwork with lots of reinforcement points. The overall first impression is one of quality.

Although the Vision is available in three sizes -- V-16 (148 square feet), V-18 (174 sq.ft.), V-20 (194 sq. ft.) -- all the flying performed throughout the course of this evaluation was done on the V-18 size.

My first flight on the Vision was at "Edward's Bowl" above Lake Elsinore, California. This take-off site is slightly under 3,000 feet MSL with a vertical drop of 1,500 feet to the landing zone. On this day, light winds created sustainable ridge lift, and a good lapse rate generated some mild thermals up to 4,500 feet MSL.

Although a slight crosswind was causing some turbulence on launch, take-off in the 15 MPH winds was uneventful. Once airborne the Vision climbed easily through the somewhat trashy air, demonstrating a comfortable level of stability. When a control correction was required due to turbulence, the Vision responded quickly with light control pressures in both pitch and roll. Upon encountering a thermal, the Vision pilot can roll into the lift with little effort. A slight addition of pitch control trims speed through turns. This glider demonstrates very good turn coordination.

(Above) Detail views of the Vision. (Below) The Vision planform.

Three-sixty turns can be held at low bank angles as slow flight speeds allow circles of small diameter. The swivel tips provide a near-zero time lag in roll control response, allowing the Vision pilot to effectively work light lift with confidence, even close to the hill.

While climbing in weak thermals, the Vision demonstrates an impressive sink rate, even at 35-45– bank angles. Light control bar pressures and quick control response allows the Vision pilot to work even small, punchy thermals effectively. This is a case where great handling characteristics increase the glider's overall performance capability.

Some informal glide comparisons were made over a two and a half mile course while flying the Vision at Torrey Pines. The V-18 displayed performance comparable with the Comet and Duck models, but was at a disadvantage when matched against a Sensor 510 VG or the HP. The sink rate on the Vision in pure ridge lift is very good, and the low stall speed allows the pilot to take advantage of even the lightest conditions.

Repeated take-off and landing practice in light conditions at Torrey Pines brought out more of the Vision's favorable qualities. Its neutral static balance and moderate weight provide excellent ground handling and self-launching qualities. I was able to cliff launch the Vision in winds to 18 MPH with little effort or assistance. Of course, a wire assist is always

recommended for safety in higher winds.

Landing the Vision is remarkably easy for a double-surfaced glider. As with many single-surfaced intermediate designs, the Vision seems most forgiving in such areas as steep descents, flare timing, and crosswind landings. Slow speed flight capabilities allow for quite steep, yet easily controlled landing approaches. Should the Vision pilot flare a bit too soon, this design seems less likely to shoot skywards, like many high performance "bladewings." In crosswind landings of 10-12 MPH, the Vision displayed no tendency to tip stall or drop a tip.

A three-way airframe configuration is a standard feature on the Vision. A three hole tang mounted on the keel near the nose plate is used to adjust the crossbar tension. This enables the pilot to custom tune the Vision to suit various conditions. The loose setting provides quick control response with light control pressures, an advantage in light thermals. The middle setting allows a slightly wider speed range with a barely noticeable increase in bar pressure. This setting is good in moderate conditions. The tight setting improves the glide performance and speed range (40 MPH), but at a price. On this setting, the roll control becomes more sluggish as control pressures increase, creating an overall stiffness in handling.

The V-18 flown for this evaluation came equipped with a "Bernasconi Connection," which attaches the hang strap to the faired kingpost at a point well above the keel. This attachment point gives the pilot a mechanical advantage over control bar pressure. The "Connection" achieves this nicely, as bar pressure is light even at top speed. One drawback with this system was apparent, in that no center of gravity adjustment is possible at the hang strap itself. Changing the crossbar tension by adjustment of the three-hole tang also affects the hands-off trim of the glider. No hang strap C/G adjustment means the pilot must instead overcome some bar pressure to achieve minimum sink speed or best glide performance (this particular glider tended to trim fast throughout the range of adjustment). Although the effort needed to attain proper airspeed was minimal, it was a bit annoying.

Set-up procedure for the Vision is similar to many of the more common glider types, and is covered in detail in the Owner's Manual. Also covered in the manual are tuning tips, a trouble-shooting guide, scheduled and guaranteed maintenance charts and log, plus tips on flying and transporting the Vision.

Pacific Windcraft distinguishes itself within the industry by making a number of guarantees. First is a *guaranteed* delivery date for all gliders. This delivery date may not be amazingly fast, as Pacific Windcraft limits the quantity produced in pursuit of quality, but the date is guaranteed in writing. . .a welcome change from the vagueness in this area too common in the industry. Through its dealers, Pacific Windcraft provides guaranteed glider maintenance inspections; one very six months. These inspections are performed by the dealer free of charge. Should any problems exist as a result of normal use or wear (including damaged batten pockets and replacement of worn, torn, or otherwise unserviceable grommets or attachment points), the factory will make the necessary repairs, again free of charge. If factory repair is necessary, Pacific Windcraft will cover all related expenses, including freight and handling charges. This guarantee does not extend to damage caused by crashing or rough treatment and mishandling.

Conformity to the previously mentioned design criteria of intermediate take-off, landing, and handling qualities, combined with double-surfaced glide performance and speed range, distinguishes the Vision as a unique hang glider. This design seems to have effectively bridged the gap between the "trainer" and high performance models. It is forgiving enough for the novice pilot to feel comfortable while flying, yet has enough "growing room" to take a pilot from the learning stages all the way to advanced soaring and cross-country flying. For this reason, the Vision represents an excellent value.

Is it an Intermediate? Is it a high performance glider? It's both!

PACIFIC WINDCRAFT VISION

SPECIFICATIONS:

Model Identification	V-16	V-18	V-20
Leading Edge	16.6'	17.6'	18.4'
Area	148 SQ FT	174 SQ FT	194 SQ FT
Aspect Ratio	5.7	5.7	5.5
Nose Angle	122°	122°	122°
Span	29'	31'	31.8'
Pilot Weight Range	95-140 LBS	115-195 LBS	160-240 LBS
Weight Including Bag	51 LBS	57 LBS	61 LBS
Breakdown Length	12'	12'	12'
Recommended Pilot Rating	II-V	II-V	II-V

INTERMEDIATE GLIDER RECAP

Summarizing the nation's fine intermediate gliders flown throughout 1984/evaluation by Paul Burns

All throughout 1984 *Whole Air* ran a series of intermediate glider reports. Here is a recap of that series. In that series, a positive point of view was taken, although negative points were apparent in the box scores. Some box scores have been changed in retrospect in order to keep the scores in perspective. It is suggested that the values for sink rate and glide performance be discounted, as they were assigned primarily through judgment, not through actual comparisons between all five designs. Suffice it to say that the level of performance demonstrated by this category of hang gliders is very competitive.

When drawing conclusions from these scores, please remember that the values were assigned by one person, and therefore must reflect an opinion. Due to the individualistic nature of hang gliding, the assigned values represent the qualities which best suit my personal flying "style." Characteristics which are unfavorable to one pilot may be considered advantageous to another. The type of sites flown and prevailing conditions should weigh heavily in choosing one design over another.

All five designs are stable and strong, demonstrating a high level of technology and craftsmanship. Their compliance to HGMA certification criteria not only insures these qualities, but also dictates a standard for flight and handling characteristics. The result is large scale equality among the designs. Therefore, a prospective buyer should always fly before buying. Use the evaluation information to narrow your choices. Most importantly, use your right as a consumer and shop around. Competition in the marketplace draws a fine line in the price area, with a high/low span of about $300.00. If you are about to spend a sizeable chunk of your hard-earned money, be sure your purchase fits your style and the conditions which predominate in your area.

Keeping all this in mind, here are the evaluation recaps:

MOYES MARS

PLUS: Impressive roll control authority at mush speed; excellent in light thermal conditions; light bar pressure and light handling qualities; tow capability.

MINUS: Narrow speed range; glide angle performance degrades at high speed; slightly yaw unstable at higher speeds.

LIGHT DREAM

PLUS: Exceptional low speed handling; very light bar pressure; quick response; excellent performance in light wind or light lift.

MINUS: Narrow speed range; difficult ground handling in stronger winds (tends to nose up).

GEMINI

PLUS: Excels for soaring in light thermals; excellent turn coordination; light bar pressure in roll; quick response; good static balance.

MINUS: Narrow speed range.

SKYHAWK

PLUS: Excellent performance and speed range; impressive turn coordination and yaw stability; very strong frame.

MINUS: Rather heavy bar pressure; tail heavy static balance; difficult ground handling in stronger winds (tends to nose up).

BREEZ

PLUS: Outstanding overall performance; excellent static balance; easy to ground handle.

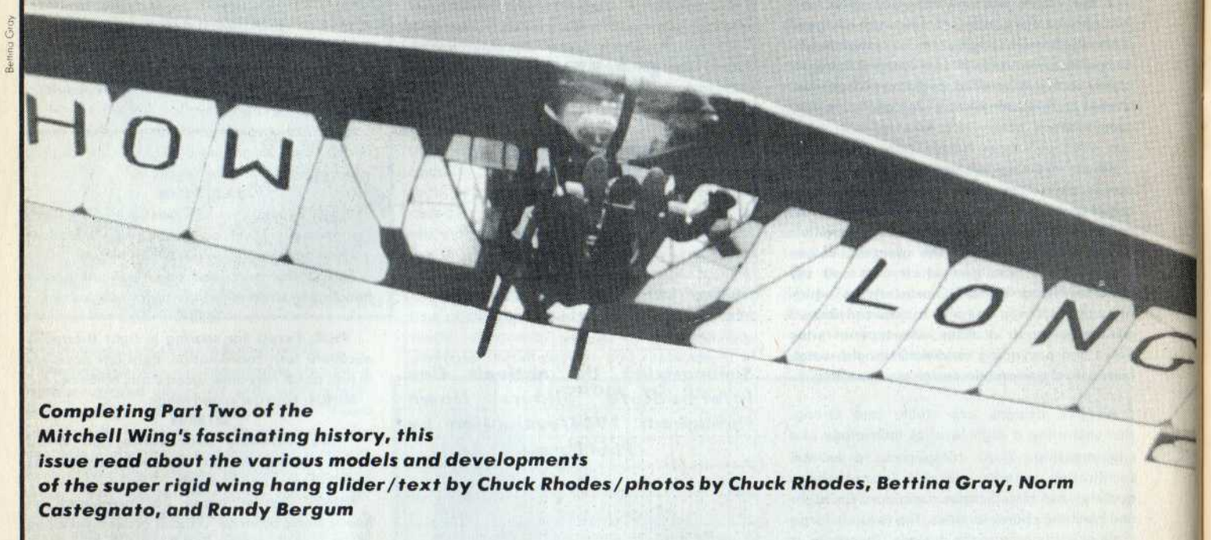
MINUS: Some adverse yaw at low speeds.

INTERMEDIATE CLASS GLIDER EVALUATION BOX SCORES

(1 = Poor; 2 = Fair; 3 = Good; 4 = Very Good; 5 = Excellent)

	MARS	LIGHT DREAM	GEMINI	SKYHAWK	BREEZ
GENERAL CHARACTERISTICS					
Set up time and ease	5	4	4	5	5
Ground handling	5	4	4	3	5
Static balance	5	4	4	3	5
Frame hardware and finish	4	4	4	5	4
Sail quality and craftsmanship	4	4	4	5	4
FLIGHT CHARACTERISTICS					
Handling — low air speeds	5	5	5	4	5
Handling — high air speeds	4	4	4	5	5
Bar pressure — roll	5	5	5	4	5
Bar pressure — pitch	4	4	5	4	5
Roll control initiation	5	5	5	4	5
Roll reversal — 45° to 45°	5	5	5	4	5
Yaw stability	4	5	5	5	4
Turn coordination	4	4	5	5	5
Speed range	3	3	3	5	4
Sink rate performance	5	4	5	5	5
Glide angle performance	3	3	3	4	4
LANDING CHARACTERISTICS					
Flare authority	5	4	4	5	4
Parachuteability	4	5	5	4	4
Directional control — mush speeds	5	5	5	4	3
SPEED RANGE	17-33 MPH	16-33 MPH	17-33 MPH	17-38 MPH	17-37 MPH
SUGGESTED RETAIL PRICE	$1650-$1700	$1595	$1595-$1695	$1775	$1695-$1895

MITCHELL WING LEGACY



Bettina Gray

Completing Part Two of the Mitchell Wing's fascinating history, this issue read about the various models and developments of the super rigid wing hang glider/text by Chuck Rhodes/photos by Chuck Rhodes, Bettina Gray, Norm Castegnato, and Randy Bergum

Randy Bergum

The best features of the Mitchell Wings, Horten Wings, Kasper Wings and others yet to come will be brought together in the super flying foot launched sailplanes of the 90's. Flex-wings will always be around for their great ease in flying and convenience, Prone U-2's and the likes will offer outstanding performance to others that wish to remain out in the elements, wind in their face, enjoying the crisp high altitude air. Other unique designs will come and go and in the final analysis one thing is certain, it's going to be a fascinating next 5-10 years in the sport.

The January issue introduced us to the history of the famous Mitchell Wings and some of the names who first dared fly one.

IN LAST ISSUE

From Howard Long's first effort at convincing Don Mitchell to build him a scaled-down version of his three-hundred-pound flying wing glider ... to Steve Patmont's transition from Icarus IIs covered the early years of Mitchell Wing flight experiences.

In this issue, Rhodes will get us into the nitty gritty of the amazing wings themselves. Included are descriptions of variations of the wings, specifications, flight accounts, and more.

THE MITCHELL WING

At present there are three main versions of the Mitchell Wing hang glider or foot-launched sailplane: the standard B-10 which has been around since the beginning; Howard Long's Sky Ski, a second version of his original prototype; and the latest arrival and brain child of Tim Morley, the Prone Mitchell Wing. It is important to note here that the much-talked-about Morley/Mitchell U-2 is still in the final construction phase, if not completed by the time this article is published. Also, as of now it has never been flown. The wing Morley used to perform his original flight testing of the prone flying set-up he invented for the Mitchell Wing was his standard B-10. Using this wing to test and prove the feasibility of Prone Mitchell Wing flying, Morley quickly realized that the pilot not trained in full three-axis controlled aircraft flying could make a much easier transformation to the high performance aircraft. Now a level IV flex wing pilot with a few hours in a Fledgling could fly a prone M-Wing using his or her existing skills and not have to worry about a joy stick actuated three-axis control system.

THE STANDARD B-10

Before we go any further on the Prone M-Wing, it is important to learn more about the B-10, its performance capabilities, advantages, and disadvantages. The Mitchell B-10 Foot Launched Sailplane today is basically the same as it was in Brad White's heyday, a 34 foot span, approx. 132 square feet of wing area, swept tapered wing, three-axis controlled, D-Tube, cantilevered, foot launched sailplane. Constructed of aircraft spruce, aircraft grade epoxy glues, heat shrunk and doped dacron covering, and using 4130 Chromemolly steel for the hang cage, it resembles a giant model R/C glider. The control stick is attached to a control mixer box located on the aft side of the D-Tube above and forward of the pilots head. Although the stick comes out of the bottom of the wing with the pilot sitting supine below the wing, control movement is identical to a standard joy stick operated sailplane where the stick is located between the knees.

Rudder control is achieved by utilizing a twist grip on the forward left hang tube. Twist left for left rudder and right for right rudder. Pulling the twist grip back deploys both rudders simultaneously for a dive brake effect.

Very few of the foot launched wings have spoilers although some builders are installing them for three reasons: a more efficient L/D reduction for landing in those tight landing areas, they greatly increase sink rate which helps during those tremendous cloud suck situations, and used differentially with a twist grip like the rudders, they provide a back up control system to the rudders. Actually, with spoilers, the B-10 has four independent control systems. These are: (1) Elevons via the stick, and weight shift. (2) Weight shift and rudders only. (3) Weight shift and spoilers only. (4) No weight shift and full 3-axis control. This is a real confidence builder! Think of the poor fledgling pilot who loses rudder control, and this has happened more than once. He has no back up system!

George Worthington lost rudder control while flying his M-Wing at Torrey Pines when one of his rudder control cables became too slack after a glue block holding the cable housing in placed failed. He resorted to using the elevons and weight shift, flew around for 15 minutes making left and right 180° turns to check out the wings' flying characteristics without rudder control and then made an uneventful landing.

To launch, the pilot lifts the weight of the wing on his shoulder via two crisscrossed straps attached to the fore and aft ends of the hang tubes. Holding the nose in a neutral angle of attack with both hands either pushing down on the forward section of the hang tubes or allowing the nose to rise as necessary, the pilot checks to ensure that the wings are level. The stick is locked by a bungee cord to the right hand tube so that the elevons are in approximately a 15° up position. The bungee cord allows the pilot to move the stick and elevons while ground handling to assist the rudders in maintaining level wing position if needed. With the left hand on the left twist grip controlling the rudders, the pilot surges forward as soon as the wing begins to exert a strong tendency to lift and the hang tubes are pulling up strongly on the pilot's arm pits, he allows the nose to rotate while continuing to run. The wing will swoop off and away from launch while the pilot makes minor weight shift changes to maintain good airspeed.

Once airborne and stable with good airspeed, the pilots feet are kicked up on the foot rest, the seat is adjusted, stick released and full three-axis controlled flying fun begins. For those of you that are wondering how the pilot is prevented from falling out of the wing while hanging from his arm pits on take off, the seat is slack but still between the pilots legs. Also, the parachute harness is clipped into straps attached to each hang tube. This way you cannot fall out!

(Opposite page) An overlay of photos has the vintage Mitchell Wing belonging to Dr. Howard Long overflying a more recent version piloted by author Chuck Rhodes. (Right) Tim Morley, developer of the prone Mitchell Wing with designer Don Mitchell, takes a hang check in the supplemental weight shift configuration. Note Morley's harness attaches to the rotating shaft/elevon activating mechanism.

The B-10 flying in this configuration gives around a 14 or 15:1 L/D at approximately 32-35 mph. Best sink rate speed appears to be in the 26-27 mph. range and stall speed in open air is around 20 mph. The amazing thing is that when the stick is pushed full forward and airspeed climbs to 55 mph, the L/D is still significantly higher then any flex-wing going at 45-50 mph. The wing does not dive steeply at high speeds, it simply accelerates to the higher speed but with a much shallower dive than a flex-wing would be doing at a comparable airspeed. This means you get a much better L/D maintenance during high speed runs.

Think of the implications of this when cross country flying! You are cruising at 35-38 mph, your L/D drops but is still decent enough to watch the miles quickly zoom behind you. Perhaps you encounter a 45 mph head wind? With a top speed approaching 60 you can still maintain forward progress. This is another great confidence builder when flying in areas where high winds may be encountered such as the Owens Valley. Read George Worthington's account in his book, "In Search Of World Records", about launching the M-Wing at Cerro Gordo in the Owens when the winds were hitting 50 mph. Not only did he penetrate out, he ended up getting a 30 mile flight that day!

Probably the greatest advantage of the M-Wing speed range is when heavy, (1000 fpm down), sink is encountered. Being able to accelerate to 50-55 mph and still maintain a better glide ratio through this kind of sink will not only get you out of it quicker but you will leave the sink area much higher than any double surface flex-wing would after encountering the same conditions.

O.K., it flies fast and has a great L/D. What about sink rate? The double surface flex-wings have a slight margin here but we're not flying M-Wings for sink rate contests. On any half decent thermal day, the M-Wing will get up just as high, and then leave the flex-wing far behind over a cross country course. A perfect example of this was when I flew my M-Wing at Mingus Mountain, Arizona on Memorial Day 1983. Launching an hour or more after all the flex-wings launched, ten of us flew to Phoenix with three of us making it all the way to Shav-

Butte, the Phoenix hang gliding site. The M-Wing not only caught up to everyone else flying flex-wings, it beat all of them to Phoenix except Rik Fritz. Rik and I arrived at Shaw Butte at the same time. The incredible thing about that though, was that Rik arrived about 850' above the LZ. The M-Wing arrived 10,500' above the LZ. Considering the fact that we were all at least 14,500 ASL 18-20 miles back, some of the flex-wings were 1000 feet higher than the M-Wing at that point, and the wing still arrived at Shaw Butte 9650 feet higher than any flex-wing, the performance capabilities of the M-Wing were dramatically demonstrated to the hang gliding world!

As you can see, the B-10 is no slouch and with a few tricks up our sleeve yet to come, it will be an even greater performer. Its primary disadvantage is that a pilot really needs to be experienced in sailplane or powered aircraft flying where full three-axis control is used, to learn to fly the M-Wing safely. My 50 hours in the Icarus V gave me a great advantage in being familiar with rudder/weight shift for pitch control type flying, yet once I unhooked that stick, it was a whole different story. The months of mental preparation for that moment helped but I still found myself overcontrolling at first. Once the initial feeling for pitch sensitivity of the stick, proper back pressure needed in turns, and amount of rudder to apply for roll initiation, it all becomes easy. For the pilot not experienced in this type of flying however, it may seem so absolutely foreign that a great degree of discomfort is experienced trying to learn this totally new form of flying. Tim Morley experienced this and thus set about making the Prone M-Wing as the means to provide the wing and its performance to those hang glider pilots who had no experience with hang tube and three-axis flying.

THE PRONE MITCHELL WING

Now, lets look at the advantages of the Prone Mitchell Wing over the B-10 and its disadvantages. At this time we are discussing the Mitchell B-10 with the prone set up that Tim Morley devised. We will discuss the U-2 later.

Weight: The standard B-10 hang cage weights around 15-25 lbs depending on building technique. The Prone M-Wing control bar and attachment brackets offer a good weight reduction, being around 10 pounds. With this set up a 65-70 pound M-Wing is entirely possible.

Launching: Tim described launching to be as easy as his Wills Wing Duck 180 and using the standard triangular control bar with Fledgling style twist grips for rudder control, to be identical to launching a flex-wing or Fledgling. Actually, the excellent static balance of the B-10, due to having less sweep than the Fledgling, makes it easier to pick up, ground handle, and run with. Using the control bar set up the Prone M-Wing can be picked up by one individual whereas the standard B-10 is difficult to lift without an assistant.

Flying: Imagine yourself flying your favorite flex-wing. It's a strong thermal day and though you rejoice at the lift, subconsciously the turbulence has you wishing there was an easier way. Then as suddenly as you entered the thermal, you are over the falls and being sucked into a canyon of no return, praying out loud for lift and hopelessly wishing for a few more point of L/D and about 30 more mph.

Now picture your hands on rudder control twist grips as your right wing suddenly jolts upward in strong lift. Cranking your right twist grip, the right rudder opens as you slightly shift your weight forward and to the right. Thanking yourself for the goggles protecting your eyes from the wind blast while cruising, the rudders and elevons effortlessly roll you into the core. Round and round, higher and higher you go laughing at all the muscling you used to do on your flex-wing as you watch several others thermalling up with you. Suddenly you fall out and the vario pegs down at 1000 fpm-plus. Rapidly pulling your weight forward your airspeed climbs to 60 mph. Five minutes later you're climbing out again hoping those flex-wing pilots 3000 feet below and two miles back make it across that canyon!

This is the kind of outstanding performance the Prone M-Wing can offer. L/D, speed, and much less pilot energy expenditure over a cross country course. Definitely advantageous in many ways when long, turbulent, high altitude cross country flights are the order for the day. Like any other flying machine though, the pilot will still have to watch his low end air speed to prevent stalling and possibly spinning. The U-2 should have less tendency to do this as we shall see.

One important note on spinning however is that normal aircraft spin recovery technique does not include the use of ailerons, as they may aggravate the spin more than help recover from it. More testing is needed in the Prone M-Wing in spin recovery as the tendency for most flex-wing pilots would be to pull their body forward correctly, but to also swing their body towards the high side of the control bar. Doing this would actuate the elevons causing up elevon on the high wing and down elevon on the low wing. This is because the pilots harness is attached to a rotating shaft which is in turn attached through a push rod and bell crank to the elevons. When the pilot swings his weight from side to side, the shaft rotates and the elevons act as ailerons. Since this may or may not help the wing recover from a spin, potential Prone M-Wing pilots need to be aware of trying to keep those elevons neutral during recovery until more testing is done.

Otherwise, the Prone B-10 will be very similar in performance to the standard B-10. The standard B-10 will probably remain more comfortable during a long flight though, since full 3-axis control requires very little physical effort. Also, nothing beats the supine position for extended comfort during those long cross country flights.

Landing: Tim ended up putting several layers of 6 oz. glass reinforcement on the nose of his B-10 after damaging it on landing. He stated that the aft crossed landing wires giving the control bar maximum rigidity, prevented the glider from getting a sufficient enough flare to avoid dropping the nose on landing. We must also wonder how much timing the flare has to do with landing well? My standard B-10 experience has shown that the slightly higher landing speed of a M-Wing requires a good strong flare timed at the proper moment. Otherwise, the C.G. gets out in front of the pilot and just like todays double surface flex-wings, the nose drops.

THE U-2

Alas, the time has come to discuss the Morley/Mitchell U-2. Tim Morley and Don Mitchell desired to improve the L/D, top end speed, and decrease any stall/spin tendency of the Prone Mitchell Wing. Don decided to go with a semi-composite (fiberglass and wood) construction and utilize his famous U-2 wing. The performance specs for the Mitchell U-2 Ultralight compared to the motorized B-10 ultralight indicate a dramatic performance increase for the U-2. The motorized U-2 is listed as having a 25:1 L/D/ vs. the 15:1 L/D for the B-10. Additionally, the top end speed of the motorized U-2 is much higher than the B-10. The reader must realize though, that the U-2 ultralight also sports a totally enclosed cockpit which gives a tremendous drag reduction over the B-10. The Prone U-2 will not have this feature so a 25:1 L/D will most likely not be achievable. However, the characteristics of the

Chuck Rhodes gets the inside view from the Sky Ski

Norm Castegnato

U-2 airfoil which makes it a more laminar flow type airfoil and a more efficient flying wing, should give the Prone U-2 a good performance increase over the standard open cockpit B-10 or the Prone B-10.

In order to increase the stability of the Prone U-2 over the standard B-10, Morley and Mitchell decided to add washout twist to the wing which the standard B-10's do not have. They are also supposedly increasing the cord length of the elevons for quicker roll response and are washing them out to 10 degrees. These two variations should greatly reduce any stall/spin tendency of the Prone U-2. Last, but not least, Don is considering using leading edge slots on the outboard wing panels to provide a significant increase in high energy air flowing over the upper wing surface at low speeds and high angles of attack. If these work as planned, the overall stall speed of the Prone U-2 should decrease making for easier landings and the wing should be very difficult to spin. The Prone U-2 sporting this configuration should offer outstanding performance, perhaps in the 18:1/20:1 range with a high degree of stability.

Morley states that the control bar setup is hopefully going to be structured so that the fore and aft rigging cables are unnecessary thus further decreasing drag. Mitchell is also contemplating working out some sort of skid to protect the nose of the glider in case it is dropped on landing. Launching,, flying, and landing the U-2 should be identical to the Prone B-10 but with the advantages of all the extra performance.

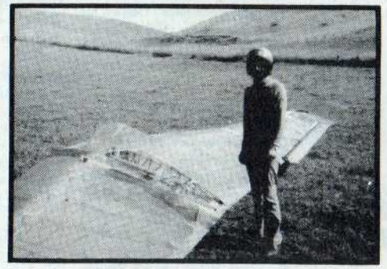
Several potential disadvantages of the Prone U-2 should be noted however. First it is a rigid wing with all the usual portability, increased fragility, and repair difficulties. Hopefully, when production U-2's arrive, dealers will be well trained in composite/wood aircraft building technology so as to provide a speedy and airworthy maintenance and repair service. We also should not forget that the prototype has not been flown as of this writing (SEPT. '84) so the time from now until production U-2's are available may be somewhat lengthy. Morley is a highly motivated individual and in spite of his injuries will be doing all he can to complete testing and get production going.

Additionally, pilots should be prepared to pay more for a U-2 to cover higher production costs. Mitchell Aircraft Company with all their jigs, experience, and tools, still takes about 200 man hours to complete a standard B-10. My guess is that the Prone U-2 will also take as long or longer at first and hence production costs will be more than those encountered in building today's flex-wing gliders.

Regardless of cost however, the performance of the wing should more than justify the higher cost of the wing. Also, when you look at the longevity of this type of aircraft construction compared to flex-wings, the pilot is getting a lot more for his money. My Standard B-10; Mitchell Wing 3, has been flying since 1977, flew all those Owens Valley flights with George Worthington, and is still in good airworthy shape. I cannot think of any flex-wing that has near the airtime and years of flying on it and is still in such good shape and fully airworthy.

Until flight testing is done we will not know how vulnerable the U-2 will be to damage on a blown landing. If Don gets the nose skid or other similar protective system built to protect the nose, the worry about "breaking it in" will disappear. How will the control bar be protected from damage? We don't know yet. We do know that both Mitchell and Morley are acutely aware of these potential problems and are working hard to develop a simple but effective system to protect the U-2.

So, all we have to do now is watch and wait. Hopefully Rich Pfeiffer, who reportedly will be doing the initial flight testing, will be flying the



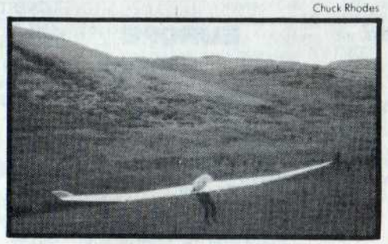
Prone U-2 soon and some real flight performance data will be coming in. We are also anxious to fly a standard B-10 next to the Prone U-2 for comparison studies. Since Rich is much lighter than myself, we will probably get 160-pound Randy Bergum and his 37' span, 3 degree washout, B-10 to do the testing. Randy has to hurry and finish building it though as he is 80% completed now.

THE SKY SKI

As we await the Prone U-2, a very interesting project has been going on up in Marina, California. Norm Castegnato, a local hang

(Above) Howard Long and Sky Ski with Kasper tips. (Below) Norm Castegnato flies the Kasper Sky Ski.

Chuck Rhodes



glider pilot and Mitchell B-10 ultralight and foot launched pilot, was able to attain Howard Long's Sky Ski for experimentation. The Sky Ski is a standard B-10 except the pilot sits supine up inside the wing with his upper body and head protruding into a lexan bubble canopy. Looking very similar to the original Mitchell wing prototype its main difference is that the wings do not fold up in the center like the prototype. Also it has drag rudders which work in conjunction with differential spoilers. The prototype had no rudders.

Dr. Long first experimented with the Sky Ski for a while back in 1978 but quit flying it after he had experienced a "wild, overcontrolling ride off the 1000-foot-high Pleasanton, California ridge". He claimed it was extremely pitch sensitive, yawed excessively and landed like a jet. It was fast! Norm decided that he would like to experiment with the Sky Ski and also found it to be very pitch sensitive and difficult to land due to its excessive speed and apparent high stall speed. Howard Long kept telling Norm to build Kasper Wing tips for the wing as he also has a motorized B-10 with Kasper Wing Tips. He claimed the tips greatly increased stability and allowed a slower flying speed.

Castegnato enlisted the help of Art Siorda, a talented artist and custom Gold Wing ultralight builder to sculpt some really slick looking Kasper tips out of foam. Upon fiberglassing the beautifully contoured tips and mounting them to the Sky Ski, Castegnato and Long went test flying. On June 3, 1984 at Ed Levin Park, they both made a number of ground skimming flights in 5-20 mph gusty wind conditions.

Dr. Long stated after flying the wing, "This tired, rusty old man, effortlessly controlled the newly stable Sky Ski in such trash they stopped basic training." He additionally stated that he felt, "the Kasper Tips reduced pitch sensitivity about 50%, stall speed around 4 mph and stabilized yaw and roll. Turns coordinated automatically with the Kasper Tips". Castegnato also made several nice flights and noted a similar increase in stability.

The Sky Ski with the Kasper tips is important to us is two main ways. First, getting the pilot up into the wing is the ultimate in drag reduction. Like the Horten Wings and the original Mitchell Prototype, the Sky Ski does this. If you ever saw the prototype fly you can remember the incredible glide that it had. Some say as high as 18:1. The lack of rudders on the prototype helped reduce drag somewhat but having most of the pilot up in the wing was certainly the largest drag reduction factor. Second, adding the Kasper Wing tips may be another great breakthrough, increasing effective span and stability at the same time, thus yielding higher performance and a greater safety margin. When Castegnato gets the Sky Ski ready for high flights, my bet is that it may even give the Prone U-2 a run for its money.

SUMMARY

In summary I see the Sky Ski as an indication of the ultimate foot launched sailplane of the future. The pilots of these exotic super ships will be up inside the wing laying in a semi-prone position with a bubble canopy over their head and back. The wings will span 40-42 feet and beyond and will be constructed using high-tech composite technology and good ole aircraft spruce, still the best material to use when rigidity and excellent weight to strength ratio is needed. These materials will allow the ultimate in great strength and lightness so necessary to achieve a practical foot-launched sailplane. L/D's of 25:1 or greater, top-end speeds of 80 mph, very stable at slow thermalling speeds, foot-launchable, auto and aero towable, will describe the performance standard of the wings of tomorrow.

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All new high density 3/16" Neoprene II. Lighter weight, more warmth. New colors: Lycra Spandex Silver and Royal Blue. Solid colors — $25 plus shipping. All seams glued and sewn with one year guarantee. Ozark Mountain Hang Gliders, P.O. Box 5091, Little Rock, AR 72205, or call 501/224-2186 or 501/851-4359. Dealer inquiries invited.
35, BTFN(12/70)

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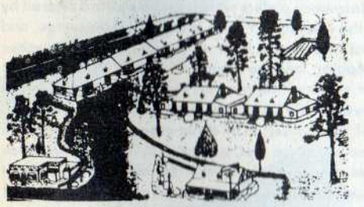
Instructors for Kitty Hawk Kites — East & West. Can train and certify. Direct applications to Steve Wendt at Kitty Hawk Kites — East, P.O. Box 340, Nags Head, NC 27959, or to Jim Johns, P.O. Box 828, Marina, CA 93933.
39B, 40B(7/80)



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CRYSTAL AIR SPORT MOTEL — Male/Female HELP WANTED: 15 hrs./wk. Exchange for lodging in Original Flyers Bunkhaus. Call or write Chuck or Shari, 4328 Cummings Hwy., Chattanooga, TN 37409, 615/821-2546. Home of SKY GEAR, Apparel & Accessories. Also, vacationing? Private Rustic Rooms. Waterbeds, Video Movies, Color TV, Pool.
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BTFN(14/15)

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San Francisco Windsports (formerly Hang Glider Equipment Co.). For All Your Hang Gliding Needs. 3620 Wawona, San Francisco, CA 94116; 415/753-8828.
37B, BTFN(3/00)

COMET 185
1981 Comet 185. High Performance. Low Price. 615/454-9563 nights; 615/455-1984 days. Erik Ringnes, 1300 Cedar Ln., #J-6, Tullahoma, TN 37388.
39, 40-41B(4/80)

ACREAGE & TRAILER
Hang Glide from your own 6 acres, with trailer. 2 bedrooms. Reasonable. Call 404/398-3023.
40, 41

185 X-C
185 Wills Wing XC, mint condition, used only 60 hours — $350. Call Dan at 714/545-7506 (SoCal area).
40

TRIKE
28 hp Lloyd, test flown only, new condition — $1,200, or will trade for clean large double surface diver. Call 619/723-0426.
40

QUICK RELEASE

Quick release carabiner — $24.95. THERMAL, 19431 Business Center Drive 41, Northridge, CA 91324.
40-45

DUCKS 160 & 180
Ducks 160 & 180. Both good condition. Both white, green, blue, yellow. Must sell; need cash. $1,100 & $1,000 respectively. Call Dana at 602/231-0153.
40-42

COMET 135
COMET 135, 1981 model. Red, yellow, orange. Good condition. Nice glider for a small pilot — $600. O.B.O. Call John, Memphis, TN at 901/452-8459 after 5 PM CST.
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SAIL REPAIRS
Grommets replaced; reinforcing; rips; batten pockets; specialty work, all types. Call or write for estimates. 315/687-3724, Jay Gianforte, Rt. 173, Chittenango, NY 13037.
40-43

RAVEN 209
RAVEN 209 — less than 5 hrs., red, orange, gold, yellow, white. Fairings. Excellent condition — $700. Call 615/693-7278.
40, 41&42B (3/40)

WANTED: USED EQUIPMENT
WANTED: USED HANG GLIDING EQUIPMENT: GLIDERS, INSTRUMENTS, PARACHUTES, ETC. SAN FRANCISCO WINDSPORTS, 3620 Wawona, S.F., CA 94116; 415/753-8828.
37B, BTFN(4/80)

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33, BTFN(11/65)

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31, BTFN(11/9/20)

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160 Olympus 1979 Rainbow 12' breakdown. Will ship. Very good condition. $450 O.B.O. Med. spaghetti harness, very good condition — $50. 502/781-4786.
39, 40

COMET 185
Comet 185. Very clean, rainbow, white sail with red leading edges. New cover bag. Atlanta area — $1,100. 404/445-1365.
39, 40

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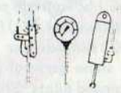

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  Lightweight, small, strong
  Internal pulley for smooth rope movement.
  Nickle plated **$35.** With 5/16 bridle and rings **$42.**
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PRODUCT LINES

TACOMA, WASH. — If you're a regular reader of this column (as almost everyone is), you should note right off that we usually come from CHATTANOOGA, TENN. But *Whole Air* has a new home these days (see "Publisher's Column" and "Industry News"). Plus as you can note by the appearance of our news pages, we're making changes. These will also affect this column, but not in any way that will make "Product Lines" less popular. It's all part of a strong drive to extend the limits of our *distribution envelope*. Anyway.....lessee what poop we've got for you this time. ***Howe & Bainbridge*** has stopped selling cloth to the hang glider manufacturers. Actually their concern began with powered ultralights, instigated by lawsuits (what's new?) naming Howe & Bainbridge. H & B didn't go out of their way to notify any of their regular hang gliding customers, but when a new order came in, they answered saying, "Sorry, Charlie Hang Gliding Manufacturer, we won't sell you a single yard." Other suppliers still want the industry's business, but not H & B. In other negative news resulting from powered ultralights, the NTSB ***(National Transportation Safety Board)*** has recommended more stringent regulations from FAA. Seems they looked into 70 ultralight accidents, all of which were powered ul's, and most of which were fatalities. They summed up that deeper control than F.A.R. Part 103 is needed. Our DC correspondent says this will provide ultralight opponents (of which there are many) with more ammo to increase the regulatory environment. That we careful hang glider pilots are not dying in droves has little impact. *Expect more regs in 12-24 months.* Among information relative to accident statistics, ***Director Russ Locke*** had some thoughts on the pilot population. You may have read Russ' summary of the USHGA Questionnaire responses. He also tried some extrapolation from those numbers in an attempt to say how many pilots really are out there. He reasons that speculation on how many gliders were produced by each manufacturer over the last eight years (very few older than that are still flying) allows us to back-track calculate. Using other surveyed information from a reasonably large sample group Russ made this sort of mental equation: ***IF*** Wills delivered 5,000 units in 8 years, and *IF* they really have 28% of the existing owned-glider(s) market, and *IF* indeed each pilot now owns 1.76 gliders, *then* 10,146 total pilots would exist. We sort of want to nod, "yes" and say we feel this figure is entirely possible, as we've guesstimated just under 10,000 flyers ourselves. Also, *if* Russ' figure of 26.1 hours each per year is reliable, *then* US pilots flew over *a quarter of a million (264,811) hours* in 1984. Given 8 total fatalities, hang gliding had 3.02 fatalities per 100,000 hours flown. Just for some comparison, here's some general aviation figures recently released by the AOPA. Total licensed pilots: 570,807 (student pilot permits omitted). Total general aviation fatalities: 1,041 (in 556 accidents). Total hours flown: 35,200,000. General aviation pilots thus recorded 2.96 fatalities per 100,000 hours flown, making hang gliding very nearly as safe as general aviation. But the average cost of a single engine airplane was $67,500! Wow, eh? We'll leave it to some calculator wizard to figure how much *safer* we are by the dollar. Gives us reason to think hang gliders are really a very inexpensive way to get airtime. On glider prices, ***Pacific Windcraft's*** affiliate company, ***Skylines, Ltd*** is causing an average price drop by importing french gliders for U. S. consumption. The dollar's amazing strength is making the diver gear from Europe a stunning bargain. After bringing in aero tugs in 1984, the Salinas folks are now going to widen the line to include ***La Mouette's*** Atlas 85 and Profil. The Atlas is an intermediate with what's billed as the biggest production run ever, some 6,000 units they claim. The Profil (pronounced Pro-FEEyuh) is their hot, double surface glider. A large version of this successful competition glider is used on the Cosmos aero tug. Retail price for the Atlas 85 is $1,395 and $1,995 on the Profil. Dealers are given an excellent margin as well, further attesting to that strength of the dollar versus the french franc. For those worried over the purchase of a foreign glider, Skylines guarantees rapid delivery now and complete spare parts inventorying for at least the next three years. They'll be stocking inventory in both Salinas and Chattanooga locations which should mean faster, cheaper delivery. Skylines/La Mouette are getting some great coverage in the April issue of an old magazine with a new name. *Glider Rider* is becoming *Glider Rider's* ***Ultralight Flying***. Their first issue under the new banner will have a cover story on trikes and the article will include a write up on the aero tug. It represents more coverage for our sport. On trike info, ***Flight Designs*** *is finally no more.* The last of any and all equipment still stocked by factory-direct-selling parent company Pioneer Int'l was sold lock, stock, and barrel to an Oklahoma pilot named *Kent Officer*. The buy allegedly included not only the remaining JetWing trikes, but all the hang glider gear. We haven't been able to reach Officer to-date, but next issue we'll try to tell you what he's gonna do with all that stuff. Though some hang gliding businessmen are crying the blues, it's not a universal noise. Pacific Windcraft/Skylines (mentioned above) claim '84 was a very good year and they carried a good backorder log into 1985. Bob Trampenau at ***Seedwings*** is also expecting another record-breaking year. His early '85 back order is also excellent, and his expanded operation is functioning very satisfactorily. We're busy with development of a story on Trampenau ...look for it in May or June. The Santa Barbara company slowly built up their business based on a very solid reputation for high quality, high performing gliders. Today, Seedwings must be regarded as one of the *major manufacturers* in America. Bob has a new high performance project which may be named the 511. But the details are so far from *cast in bronze*, that any real info will hatta wait till another installment. We'll have a Burns PiRep on the Sensor for you to read later on, too. Another "little guy" who is making steady progress is *Dick Boone's* ***Progressive Aircraft***, whose Dawn is going quite well. In the year since its introduction, they've added two extra sizes: a 135 and a 175 square footer. This spring they've given dealers a chance at a greater cut of the pie, plus Boone is nearing initial release of his competition model, the ***Dawn Comp.*** Pro Air points out that they feel the regular Dawn is one of the market's easier handling high performance gliders which can be easily mastered by Hang III pilots. Overall, the growth of Pacific Windcraft, Seedwings, and Pro Air changes a trend of a few years back. In the late '70's, the number of manufacturers was dropping, and the biggies — Wills, UP, and Bennett — were gaining a larger share of the market. Now, UP is in a financial stress period, and the three "little guys" are putting a stronger foot forward to get their share of the market. In all three cases, these firms have decided not to expand too much too fast, a temptation when things look good. Russ Locke's figures, however, show Wills, UP and Bennett account for 61% of the existing owned-glider estimations. We don't hear a great deal about dealerships doing well these days, though some certainly are. One of these is *Greg Black's* ***Mountain Wings*** in Kerhonkson, NY. After what they call a "very successful '84 season," they're planning for an even bigger '85. Enough so that owner Black is seeking more staff (hear that you unemployed hang gliding professionals?). They figure to need instructors, tow tug pilots, and people to work on a cable simulator they're apparently building. Greg and wife Judy are trying to keep employment in the family, as they're expecting a new pilot by summer. Since Jr. Black may not be able to pull his weight for a few years though, they'll be leaving the aero towing to 300-tug-flight veteran Paul Voight. The air tow operation takes place at a 3800 foot strip just two miles down ridge from the well-known Ellenville soaring site, which itself is four miles down ridge from Mtn. Wings' shop. That about wraps it for March 85. Got news or opinions?

(NOTE NEW ADDRESS!!) Send 'em to "Product Lines," Box 98786, Tacoma, WA 98498-0786.