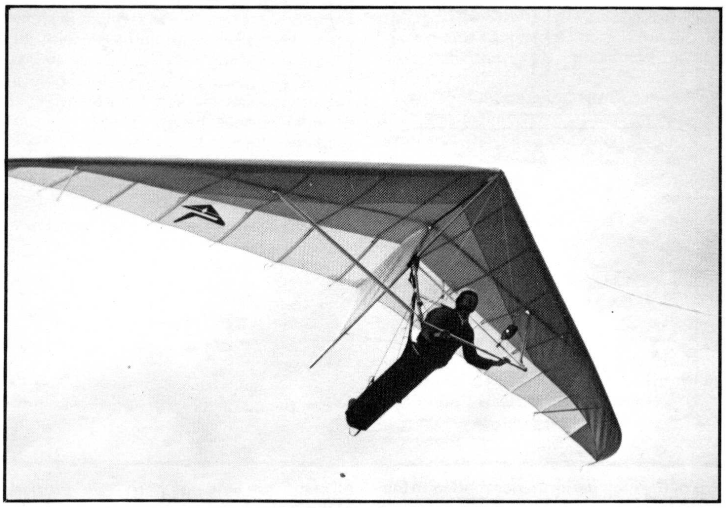
NEW INNOVATION REPORT



DAWN

Author Paul Burns flies the Progressive Aircraft Dawn for designer-turned-photographer, Richard Boone. Photo taken at Torrey Pines, California.

THE FIRST TIME I saw a Dawn was on a visit to the Progressive Aircraft factory in Simi Valley, California. Its appearance on the ground led me to immediately assume that with its high aspect ratio and small area, the Dawn would be fast in overall performance and have a high stall speed. I imagined the Dawn would be spirally unstable, difficult to coordinate in turns and weight at least eighty pounds.

Funny how appearances can deceive, for I soon discovered the Dawn suffers from none of the problems I had anticipated.

The Dawn 155 supplied by Pro Air for evaluation had been set-up and test flown by designer, Dick Boone, prior to my arrival at Torrey Pines. As soarable conditions existed, I donned my harness and helmet, and hooked in; a quick static check and I moved toward launch. I was immediately impressed with the Dawn's ease in ground handling (balance is excellent — the struts transmit a solid feel on the ground). Self-launching in fifteen mile an hour winds was no problem.

Once in the air I realized that although the appearance of the Dawn on the ground is "different," its response to control is conventional; smooth, stable and predictable.

To my surprise, the most difficulty I encountered in my first hour was in maintaining proper airspeed of 17-18 mph. At this speed the sound made by the glider is almost inaudible, prompting one to fly a bit fast. It took me a couple of hours flying to realize the low speed capabilities of the Dawn and adjust my airspeed accordingly.

At first I thought the Dawn's roll response was stiff. After adjusting my airspeed, I found the roll response to be quicker, with less bar pressure required than my first impressions had indicated. The Dawn is light in response and quick in initiation, and does not suffer from the yaw instability common to many high aspect wings.

Coordination in turns is straight forward and a minimum of pilot input is required to complete turns.

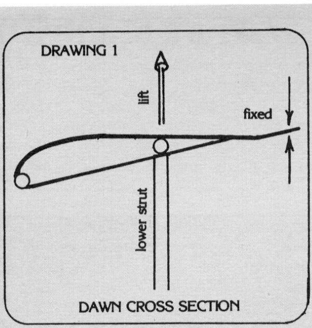
The Dawn remains comfortably yaw stable throughout the speed range. Even at top speed, the glider has no tendency to "tip-walk." Yet turns can be accomplished with a minimum of effort.

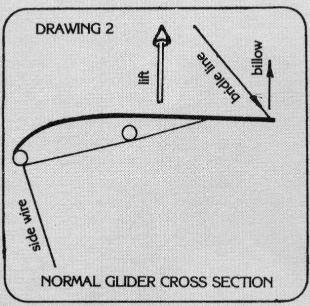
The Dawn has a two-position frame setting on the control bar base tube. The outside position allows additional dihedral, resulting in more roll stable flight characteristics. The inside position provides a slightly spirally unstable machine; in this setting, turn initiation is a bit quicker, but some "high siding" may be required to keep the bank angle constant.

Bar pressure in pitch is very comfortable at low airspeeds; pressure increases with airspeed. At top speed, the Dawn exhibits an impressive positive pitching tendency. At speeds slower than "trim," the bar pressure also increases. To push the Dawn to a stall, a substantial effort is required to overcome this bar pressure, providing a stall warning feedback to the pilot.

Intentionally pushing the wing to a stall reveals a mild "break" as a quick recovery ensues. A stall in a turn will result in an increased sink rate, although turn radius remained virtually unchanged. Relaxation of bar pressure allows the Dawn to quickly recover flying speed.

Continuing my first flight in the smooth ridge lift, the Dawn illustrated an excellent sink rate. The wing can be held at a very low bank angle allowing for efficient soaring turns. Although operating at a higher wingloading (1.6 lbs/ft^2), the Dawn was capable of matching sink rate with the





D A W N

STRUCTURE & STABILITY

A Statement from the Designer

AT FIRST GLANCE the main difference is that the Dawn has side struts instead of side wires and top rigging. The struts would not be possible if not for the Dawn's totally new structure.

There is one way to explain the Dawn's structure. It is a rigid wing. Like a rigid wing flight loads are located around a central structural spar; in the Dawn's case the cross-spar. This difference is shown in drawing number 1 and 2.

The Dawn's structure prevents high loading due to sail billow. This same structure along with fixed upper and lower surface battens holds the trailing edge thus eliminating the need for bridle lines. On positive loads the lower surface battens keep the sail from billowing up. Under negative and stability loads the upper surface battens place the loads on the cross-spar. Rigid lower surface battens further help to support the trailing edge reflex.

Another difference from the normal glider is the location of the side strut. The loads being located on the cross-spar allow the struts to attach to the cross-spar about four feet inwards from the leading edge/cross-spar junction. This allow a much shorter strut length, thus making them much stronger than any previous design. In our testing, the strutted version was actually stronger than a kingpost version.

A normal glider gets its stability from its bridle reflex lines and fixed tips. During normal gliding trim flight, none of these stability devices are working. Their stbility is found with a function of air speed and/or sail blow-down.

In many cases, such as pitch-overs (tumbling), you might have a considerable rotational force before your stability features come into play. The Dawn's center section stability is operating at all speeds causing a more pitch dampened glider.

best of the high performance models in the air that day.

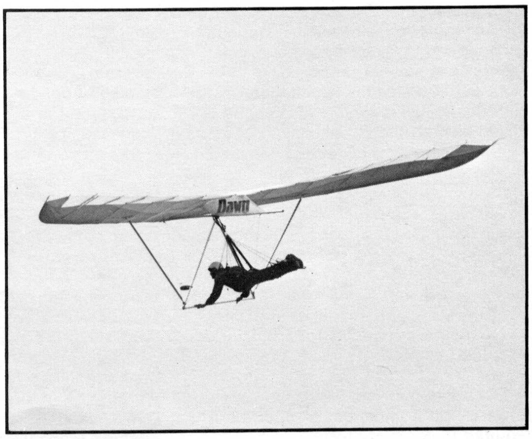
Informal glide comparisons were performed at Torrey Pines over a three mile course. The Dawn appeared to keep pace with the Ducks and Comets, but seemed to be rather at a disadvantage when matched against the new HP or Sensor 510VG.

I soon had the opportunity to fly the Dawn at Elsinore, California, a mountain site. Flying in thermal conditions, the Dawn displays a sink rate that does not seem to deteriorate appreciably at steeper bank angles. Although the Dawn has a high aspect ratio, it will perform 360° turns in a small diameter due to its slow flight speeds. With some practice the Dawn is both quick in initiation and light on bar pressure. Gliding between thermals, the Dawn's wide speed range allows excellent maintenance of altitude and very good glide performance. The Dawn transmits a solid feel, even in the turbulence associated with a convergence condition. The Dawn felt very comfortable in its stability, never scary.

When landing the Dawn, the procedure is the same as with conventional designs. Following a straight final approach into the wind with airspeed at best L/D or slightly faster, level in ground effect. Bleed off speed to trim, and flare with hands on the down tubes.

The Dawn is surprisingly easy to land. In fact, this area of operation may illuminate this glider's most outstanding quality. I regard the Dawn's landing characteristics to be on a par with many single surface designs. Over the course of this evaluation, I completed twenty flights. All of my own landings were "safe" (no part of the glider touched the ground). Several other advanced rated pilots demonstrated landings of equal quality, most of these on their introductory flights.

Unexpectedly, set-up procedures for the Dawn are not much different than conventional designs, but reference to the owner's manual is advisable for the first few efforts. The Dawn can be set up by one person in fifteen minutes. The control bar assembles with a bolt at the base tube/down tube junction. Stand the glider in the control bar and attach the front flying wires at the nose with a pip pin. Spread the wings only enough to remove the ribs and struts that are rolled inside the sail. Now, spread the wings to full extension. Reaching through the keel pocket from the rear, attach the cross-spar pull-back wire to the channel with a pip pin. Attach the struts, making sure they are in the proper position (some rotation of the wing may be required here for proper alignment). The struts are marked right or left on the top side. Next insert and attach the fiberglass tips. Starting with the No. 1 rib, install the upper surface ribs, proceeding from keel to tip. Then, install the lower surface ribs and secure the wash-out struts. Moving to the rear of the glider, reach through the keel pocket and pivot the keel post to vertical; attach the rear support string, positioning it into the keel sail grommet and secure with the safety ring. Attach the king post to the cross-spar with the pip pin, and close



Paul Burns pilots the Dawn, as we view the unorthodox design from the left quarter. Unusual in appearance with struts and no kingpost or upper rigging, the wing carries other more subtle differences as well.

the bottom surface access. Finally, insert the nose rib, check the hang loop, perform a thorough pre-flight, and you are ready to go.

Air frame components for the Dawn are fabricated from 6061-T6 anodized tubing. All plates and brackets are stainless steel except for the nose plate which is made from ¼" anodized aluminum. All frame members are equipped with lathe-turned Delron end plugs. The front section leading edges are 1⅝" X .049 X 6 feet. The rear section leading edges are 1¾" X .049 X 11' 7¼ inches. The keel is 1½" X .049 X 10 feet; cross-spar is 1¾" X .049 X 10' 8 inches, sleeved.

The struts are of a composite construction with ¾" X .058 aluminum tubing serving as the inner sleeve. The outer sleeve material is a ⅞" X 2¼" X .049 aluminum extrusion in a symmetrical airfoil shape. This assembly is pop riveted together for rigidity. The assembly mounts to the control frame and cross-spar with clevis pins and safeties.

The control bar down tubes are 1⅛" X .058 X 63" with 3 foot innersleeves. The base tube is 1⅛" X .058 X 64 inches, also innersleeved.

BOX SCORES

PROGRESSIVE AIRCRAFT CO. DAWN

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

GENERAL CHARACTERISTICS	
Set-up Times/Ease	5
Ground Handling	5
Static Balance	5
Frame Hardware/Finish	4
Sail Quality/Craftsmanship	4

FLIGHT CHARACTERISTICS	
Handling — Low Air Speeds	4
Handling — High Air Speeds	4
Bar Pressure — Roll	4
Bar Pressure — Pitch	3
Roll Control Initiation	4
Roll Reversal (45° to 45 °)	4
Yaw Stability	5
Turn Coordination	5
Speed Range	4
Sink Rate Performance	5
Glide Angle Performance	4

LANDING CHARACTERISTICS	
Flare Authority	5
Parachutability	4
Directional Control at Mush Speeds	4

TECHNICAL SPECIFICATIONS — DAWN 155	
Sail Area	147 ft^2
Root Chord Length	7' 2"
Nose Angle	130°
Pilot Weight Range	150-200 pounds
Leading Edges	16' 6"
Wing Span	33' 4"
Weight	63 pounds
Hang Rating Required	III-V

NOTE: Evaluators hook-in weight is 175 pounds, with a wing loading of 1.6 lbs/ft^2

Stall Speed at 16 mph — Top Speed at 47 mph

The front to rear flying wires are 3/32" coated stainless steel cable and are the only wires visible on the Dawn in its flying configuration.

Sail construction is a chordwise layout. All Dawn top surfaces are available in white only. The bottom surface and leading edge pockets can be ordered in any color, including spectrum cloth. The sail on the glider flown in this evaluation started life with a few wrinkles. These were "ironed out" through minor tuning and thereafter the sail remained "clean" throughout the speed range.

In flight, the trailing edge of the Dawn takes on a distinctive appearance. Most observers will be of the opinion that this design has "lots of twist," and the several degrees of dihedral in the frame is one reason. Another can be found in the shape of the leading edges. Comets and similar designs use leading edge pre-loads to limit twist. No pre-load is used on the Dawn's leading edges, and they remain nearly straight in flight. This accounts for the unusual appearance.

Although the Dawn is strikingly different in looks, I found it to be both strong and stable, an opinion reinforced by HGMA Certification compliance. In-flight operation and handling of this design are "conventional" in every way; set-up and break-down are only slightly different, and can be performed in a comparable length of time to other double surface gliders.

Of the many advanced pilots introduced to the Dawn throughout the course of this evaluation, some loved it. . .some were not so impressed. Some comments heard from pilots inspecting the Dawn for the first time were enthusiastically positive; on the other hand, a fair percentage were basically negative in their attitudes and comments. For the record, the pilots that had an opportunity to fly the Dawn in the best conditions with the longest flights were the most impressed with this new concept. Those flying in poor conditions with short flights were not overly excited. All in all, the comment most ofter heard from pilots upon landing the Dawn was something like, "Nice little glider!"

Personally, I enjoyed flying this new "machine" very much. I consider the Dawn to be easy to fly, strong, stable and efficient. Aesthetically, the Dawn is unique, and to me, appealing. Structurally, the Dawn is equally unique, and may signal the start of a new era in high strength/low drag designs of the future. The Dawn is the first design in years to break through the surface tension of industry design conformity. It may prove to be the catalyst that elevates hang gliding into the thermal of more aircraft-oriented enlightenment.

Credit goes to Progressive Aircraft Company and designer, Dick Boone, for having the courage and ambition to dare to be different.

Only time — or perhaps in this case more accurately stated, "airtime" — can prove or disprove the success of this innovative design. §