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Dragonfly—On the Move, Gaining in Popularity!

If Rex Taylor has his way, the Dragonfly will become the official bird of Eloy, Arizona.

By Don Downie

SINCE IT WAS first introduced at Oshkosh in 1980, the Viking Dragonfly has really been on the move. Designed and built by Bob Walters in San Diego, California, the side-by-side, VW-powered canard was an instant success, garnering the Best Design Award from the EAA on its initial showing. The following two years completely altered the lifestyle for the designer and his wife, Ching. So, being a designer at heart and not an executive, Walters retained his sanity and lifestyle by selling the entire package to Rex and Patrick Taylor of Eloy, Arizona. Walters remains as a consultant on the Dragonfly project.

Dragonfly plans formerly were handled by the Viking Aircraft Co. that was established by Walters in 1980. Walters sold the package, including the Dragonfly design and plans, prototype aircraft and a 100,000-word instructional manual to Viking Aircraft Ltd. of Arizona, a Taylor family-held corporation. The prototype that we flew is identical with the first sets of plans sold.

Dragonfly developer Walters recently designed and built a 12.5-foot, 45-pound polyester skiff called Perdido. This initial building project is designed for potential composite aircraft builders to learn to use epoxy and find if they have any allergies to the compounds. Cost is estimated at $300 for the completed skiff. Rex Taylor plans to build one.

More than 17 Dragonflys were flying at the time this article was prepared. These include one aircraft in Canada, one in Germany and probably one in Australia.

Since taking on the Dragonfly project, Rex Taylor has sponsored an annual "Swarming" at Eloy. The late-1983 fly-in/drive-in drew more than 200 builders and their wives. All 47 rooms at the local Motel 6 were sold out for the weekend. There were back-to-back lectures and fabrication demonstrations. Rex, himself, set some sort of record by flying 123 demonstrations with the prototype Dragonfly in just five days.

Rex Taylor has a standing request for any builder approaching his first flight to visit Eloy, Arizona, and "go around the patch" for four or five landings in the prototype at no cost. "I'm not an instructor," he explained, "but I've been doing a lot of checkout work."

Taylor explained that there is one unusual difference between the Dragonfly and so-called conventional aircraft. The canard wing configuration, with the main wheels almost at the nose of the aircraft, can produce a porpoise mode on landing. With the main wheels on its tips, the canard acts like a springboard. Thus, you can hit the main gear and start to bounce at just about the time the tailwheel hits the ground. Taylor assured us that the only way to remedy this unsportsmanlike situation is to apply full power with full back stick. Then, if the porpoising doesn't stop after the first oscillation, plan to go around because each subsequent "gee-whiz" maneuver will get worse.

Viking Aircraft sponsors an annual "swarming" of Dragonfly enthusiasts that fills up town facilities.

Taylor recommends some sailplane experience to get into the habit of flying right down to ground level and then flaring. He reports that pilots with sailplane time adapt much easier to the Dragonfly.

Taylor points out that the best solution to a smooth landing in the Dragonfly is a stabilized approach with the proper aircraft attitude and airspeed well-established on final approach. "Establish a rate of sink of 700 fpm at 70 mph down final and fly the ship right down to the ground," he teaches. "You can make a smooth wheel landing by letting the main tires just touch and then pushing the stick all the way forward. With the elevator control almost on top of the main gear, there's no way you can nose up and get a prop unless you hit an obstruction on the ground."

Heavy jet transports have what is called a "bug speed," a velocity derived from aircraft weight, air density altitude and several other factors. The Dragonfly also has a "bug speed," depending upon how many bugs you have flown through, or rain or anything else that might derogate the lifting efficiency of the canard. Taylor calculates his "bug speed" at about 500 feet on final approach by slowing up the Dragonfly to somewhere under 70 mph indicated, where the rate of sink increases rapidly. Then he adds "bug plus 5–7 mph" and continues his approach. He can see any bug buildup along the leading edge of the main wing from the cockpit.

Taylor points out that prestall turbulence off the canard actually acts as an aerodynamic "stick-shaker" as the center of pressure moves along the chord of the canard when speed is slowed. Later in flight, we searched for this shaking and couldn't notice it, but Taylor said that he was able to pick it up easily.

The Dragonfly is in the forefront of a whole new concept in homebuilt aircraft. Originally, the homebuilder took pride in that he built every part of his craft from scratch. Some builders still do, but the trend has been for the designer to build and test-fly his prototype, then draw up plans and a builder's manual. More recently, specialty shops have fabricated the many hard-to-build components, including engine mounts, canopy hardware, bellcranks and specialized weldments. A further refinement has been introduced by TASK Research, Inc., Santa Paula, California, which has spent six months and more than $50,000 in developing precision molds to produce top quality components for the "Snap" Dragonfly.

The combination of TASK and Taylor is making a myriad of modifications for the Dragonfly. These will enabl-

Dragonfly in flight shows its canard configuration. Note main landing wheels at the tips of the forward wings.

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continued

builder to purchase all the selections of the fuselage and precut foam wing cores on a match-hole tooling concept for easy assembly. This concept was pioneered by Designer John Thorp on the agricultural F-24 and later the T-18 all-metal homebuilt.

So successful has the TASK/Viking effort with the Dragonfly been on the initial go-around that TASK has set up a production facility at Eloy, Arizona, right beside the HAPI Engines and Viking Aircraft. All the companies have not only faith, but a substantial investment in this project.

The Dragonfly concept has several things going for it. Seating is side-by-side both for in-flight companionship and for instructional capability. When flown solo, Taylor adds 50 pounds of lead aft of the seats and reports a severe but controllable aft c.g. condition if the Dragonfly is inadvertently flown with both passenger and ballast.

The canard aircraft is a superbly efficient machine. Fuel consumption is 3.2 gph at speeds between 150–165 mph. In placing second in the 1983 CAFE 400 race, Dick Rutan and Rex covered the 400 miles at 128.03 mph on 8.6 gallons or 45.08 gph. Fuel at $2 per gallon doesn't hurt as much with such economy—and the VW is still designed to use automobile gasoline.

In flight, over the cactus and sage brush of southern Arizona, ringed by brilliant red sandstone hills and topped by billowy cumulus puffs, the Dragonfly seemed completely at home. The ship handles moderate turbulence with ease. All three control axes seem well-balanced. The bungee trim for the elevator is used to establish cruise attitude and again for letdown into the pattern. Rate of roll is excellent and because of the relativity short span (22 feet) there is not the tendency for yawing sometimes found in longer-winged aircraft.

The Dragonfly gives me the impression of an eager cross-country machine; it really doesn't seem suited for shooting touch-and-goes on a clear Sunday afternoon. With its miserly fuel consumption and relatively high cruise speed, this is a machine for going places.

Earlier, Rex Taylor and I pushed the prototype Dragonfly out of his hangar at Eloy on a humid desert morning. The agricultural pilots had already departed and were hard at work debugging cotton fields nearby. The weather was hot and humid, with cumulus clouds already building. The present canopy is hinged on the right side with a heavy latch beside the pilot's left hand. Taylor plans to build his own Dragonfly with the canopy hinged from the front. This arrangement will provide easier access to the cockpit, from either side. As soon as the modification is built and test-flown, optional drawings will be added to the Dragonfly plans package.

A part of Rex Taylor's regular preflight procedure in Arizona, where a variety of bugs can be found in the air, is to rub down the leading edges of both canard and main wing with a rag covered with Lemon Pledge spray wax.

The fuel sytem of the prototype has a 15-gallon fuel tank under the seats and a two-gallon header tank in front of the right seat with a sight-gauge built in. An electric pump similar to those on the old Ercoupe is used to transfer fuel, continuously keeping the header full. The pump makes a loud scream when it attempts to pump from a dry main tank. Taylor con-

Spartan instrument panel features navcom, basic instruments plus engine gauges and switches. Computer at right is left over from race entry.

rs he has a 500-mile range with erve.

Instrumentation is on the left of the panel and in a narrow sub-panel in the center. Right side was fuel gauge in front of the header tank and a velcro-mounted push-button fuel calculator, a leftover from the CAFE 400. Reading from top to bottom, compass, rate of climb, altimeter and airspeed indicator are in the middle of the panel, with engine gauges across the bottom of the left panel. Radio, switches and fuse-holders take up the remainder of the pace. Both master and single ignition switches are safetied. The brake T-handle is at the far left with throttle on the prototype also at the far left. Thus, the prototype is not truly a dual-controlled airplane, but all the flying controls are duplicated on the right side.

The HAPI engine is 1835 cc displacement, has electric starter, 20-amp alternator and mixture control.

I'm sure that many builders may opt for a center-mounted throttle with the short control sticks mounted at the far left and right of the cabin—the arrangement that is common to most side-by-side aircraft. On the prototype, Taylor has extended the center control stick by two inches for more leverage and to cut down on the sensitivity of the stick.

Taylor had put 450 hours on the HAPI engine now in his Dragonfly, though the airframe has an additional 60 hours. His normal cruise speed is 3200 to 3400 rpm, equivalent to 65-70 mph with a VW car on the highway. He estimates 1000 hours between major overhauls. "With care, we will do better than that, but we've never had to major one yet," advised Taylor. A complete HAPI engine factory remanufacture now costs just $850 if you were to furnish the runout HAPI engine. So far, no one has run one out; however, there are many 400–600 hour engines flying.

The original Dragonfly came out with a VW engine that had not been developed by Rex Taylor. Designer Walters felt that builders would opt for a simple powerplant with no alternator and no starter. It was late in 1980 when Walters and Taylor first matched their talents and the original bare-bones, 1600-cc VW was replaced with the 1835-cc HAPI conversion, complete with starter, 20-amp alternator, mixture control and dual ignition. The new power package adds 15 pounds, but most of this is in the accessories. The added 15 hp picks up 10 mph in cruise and 200 fpm in initial rate of climb. The powerplant costs $3395 complete. A turbo-supercharger is not recommended for the Dragonfly.

Taxiing with the main landing gear out at the wingtips is something different. However, visibility is more than adequate and you can easily see the canard tips from the cockpit. The only other canard I've flown in this configuration was Dan Mortensen's AMS/OIL racer. There really is no great difference; just don't plan on putting a wingtip outside a runway light. The small diameter tailwheel rumbles a bit on the oiled gravel taxiways.

Turning on the ground is no problem. Just add throttle and full rudder and you'll turn fairly promptly. It will be interesting to compare the ground handling characteristics of the TASK modification that puts the wheels much closer to the fuselage.

Seats are an integral part of the structure, so adjustments are made by shuttling cushions. Taylor says that he is becoming adept at judging anatomy after the many demos he has flown with the Dragonfly, but the two of us flunked our first attempt. Since I'm 6-foot-2, and long-legged, we started out by taking out all the cushions. That worked fine, but I couldn't see out over the cowling in taxi and takeoff. We tried this lash-up for just once around the field and then replaced both cushions.

My shins were jammed against the sharp corner of the fuel tank. Taylor assured that it would be easy to bevel this tank in construction to give a little more space. In addition, the plans call for moving the seat back two inches. Designer Bob Walters is 6 feet tall and 220 pounds, according to Rex; he must have had a fairly tight fit when flying.

For some reason, the rudder pedals are not directly in front of their respective seats. They are located toward the center of the aircraft by perhaps four or five inches, even though there is room aft of the firewall to extend the rudder linkage. I would expect that this off-center design would be easy to live with in time; but on the first go-around, it presents a nagging inconsistency. Braking is from a T-handle mounted on the left of the instrument panel; brakes are applied to both wheels at the same time.

Thus, steering on the ground is done with rudder and a blast of power. A proposal by TASK to mount the mainwheels on pylons close to the fuselage could provide for differential braking.

Once you're aboard and strapped down, you find that there is a surprising amount of room available. The supine seating always takes some body English to begin with, but things fall into shape in a short period of time.

Side-by-side seating in the Dragonfly puts all people weight near the center of gravity.

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continued

Taylor has a check list and uses it. The items are:

Mag check at 2500 rpm.
Electronic ignition check 2500.
Alternator output okay.
Carb heat.
Elevator trim.
Controls free.
Main fuel valve on.
Canopy latched (marked three different places on the list).

Takeoff roll under ideal conditions is only 450 feet, even with two onboard.

Flying off the runway at Eloy is a pleasure. The oiled runway is 60×390 feet and the tallest obstruction off either end is barrel cactus. The strip is large enough to handle a Learjet; in fact, one landed during our visit, nonstop from Miami to drop off a youngster for the nearby Valloasis school.

Taylor recommends a three-point takeoff. Rudder control is effective almost from the start as the slipstream hits the tail. Because the Dragonfly sits in a full-stall position, there's little to do but stay on the runway and wait for it to fly. Acceleration is good; very good when you consider that thrifty 60-hp engine and 52-inch prop moving a gross weight of 1075 pounds.

Takeoff roll under ideal conditions is 450 feet with the 60-hp, 1835-cc engine. Our desert temperature was a good 20° above normal and the elevation of Eloy is 1530 feet, so we took a little longer roll. When the airspeed picked up to the 45 mph stall speed, the Dragonfly was ready to fly. The canard configuration really doesn't seem to rotate; it sort of levitates with both wings providing lift at the same time. Taylor likes to see the speed build up to 75–80 mph for the best angle of climb. Specifications call for 850 fpm with two aboard under sea level conditions. We were able to come surprisingly close to that figure at density altitude of about 4500 feet.

Rex demonstrated power-on and power-off stalls, stick all the way back, and then asked me to do the same. With full aft stick, full rudder into the turn and opposite aileron, the Dragonfly will not fall off. It was possible to roll from a 45° bank one way to the other and still hold the stick clear back. The nose would nod slightly, but there was no tendency for the ship to drop a wing or flip over on its back.

Two small eight-inch tabs are located near the tip of each elevator surface. These provide an aerodynamic balance and provide light stick loads. Taylor explained that the trim tabs on the canard act to balance loads on the elevators and keep the trailing edge down. The tabs are actually inverted airfoils and produce a balance for hands-off flight in cruise.

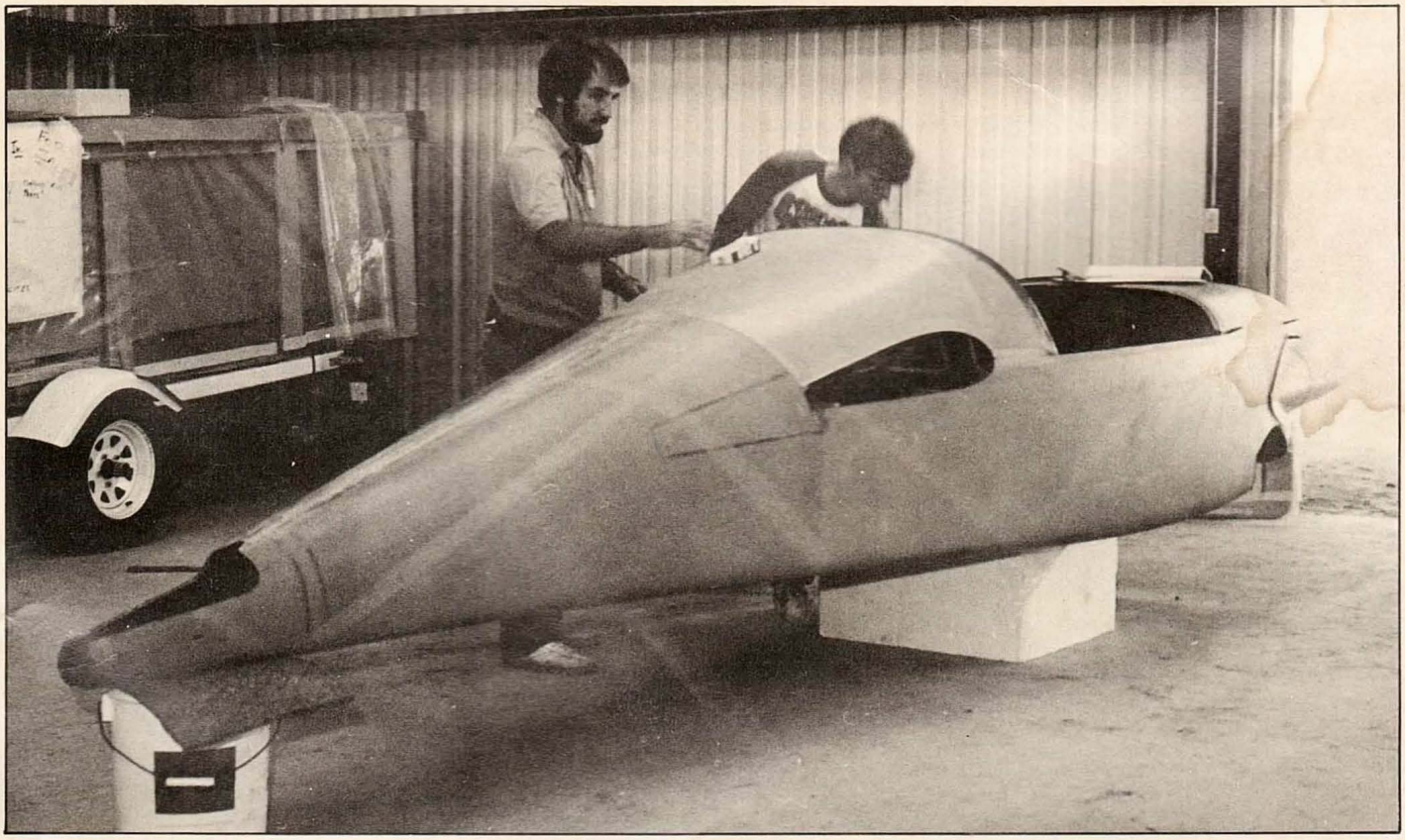
We circled back toward Eloy Airport, admiring the remaining wide open spaces of the desert. As we dropped down into the pattern, Rex had me slow to 80 mph indicated. The 2-inch engine and airspeed instruments located at the left of the panel are fine for the left-seat pilot, but they present a slight challenge for wearers of bifocals in the right seat. We slowed to 70 mph on a wide base leg and Taylor had me check for the subtle stick-shaking of an impending stall. Frankly, I didn't feel it, but I added 5–7

VIKING DRAGONFLY

Specifications and Performance

Engine	HAPI Volkswagen, 1835 cc, 60 hp
Wingspan	22 ft.
Wing area	97 sq. ft.
Wing loading	11 lb./sq. ft.
Power loading	17.9 lb./hp
Seating	2, side-by-side
Empty weight	605 lb.
Useful load	485 lb.
Gross Weight	1075 lb.
Fuel capacity	15 gal.
Cruise speed	165 mph TAS @ 75% power
Stall speed	45 mph
Range	500 s.m. with 30 min. reserve
Rate of climb	850 fpm (dual), 1050 fpm (solo)
Takeoff	500 ft.
Fuel consumption	3.4 gph @ 165 mph, 7500 ft.
Kit price	$10,468 including engine
Information pack	$7.50

Manufacturer:
Viking Aircraft, Ltd.
R.R. 1, Box 1000PP
Eloy, AZ 85231
Phone: (602) 466-7538



Premolded fuselage is assembled by TASK's facility nearby. It can save Dragonfly builders significant time in construction.

I complied and then inched back slowly on the side-stick, reaching for a touchdown as far away as possible. Eventually, the main and tailwheel contacted with a firm thump , with no tendency to porpoise. Rollout was as easy as with any other taildragger.

Seating is side-by-side, which has a lot of advantages for companionship as well as instruction.

I can imagine some interesting experiences with these tip-mounted wheels in landing on a runway with large water puddles or on a muddy dirt strip with soft spots. However, both designer Walters and developer Taylor are the first to point out that the Dragonfly was designed to operate from good-sized, hard-surface runways. The gear modification proposed by TASK certainly will make the Dragonfly handle more like a conventional taildragger on the ground.

Rex has put more than 500 hours on his demonstrator, including many short demonstration flights, and he has still not worn out his original set of tires.

When it came picture-taking time, wife Julia took over the driving of our '76 Cardinal while I utilized our special FAA-approved camera port in the right door. This 7×9-inch opening is more than adequate for the 6×7 Pentax and its 200-mm telephoto lens. Taylor had no trouble flying off our wingtip, circling outside in a left turn while we held between 75–80 mph in increasingly choppy air.

We circled past the desert town of Casa Grande, looking at a checkerboard of green cotton fields and sparse brown desert brush. The main railroad and a pattern of highways cut straight lines on the surface of the earth. When we exhausted the film in two cameras, we "rogered" over the radio and Taylor peeled off back to Eloy and we climbed for smoother air and the routine trip back home to the Los Angeles basin. If we had been in the Dragonfly, the trip might have been just a little faster but a whole lot more economical.

With a certain poetic license, it would be fair to say that Rex Taylor is well on his way to making the Dragonfly the official bird of Eloy, Arizona.

IF WE START almost at the beginning, we find Rex Taylor, age 6, watching a rodeo in Vinita, Oklahoma, where he saw his first biplane land in a nearby pasture. Then came model airplanes and radio-controlled models before he began flying Cubs and gliders at Fremont, California, in the late '40s. Then he built custom radio-controlled aircraft and sold components for radio-control builders with a company named Flite Glas in Fremont.

Taylor says he always wanted to build airplanes but needed a suitable low-cost engine first. Thus HAPI Engines came about. (HAPI stands for Homebuilt Aircraft Products International) with eight different models manufactured for homebuilders. Taylor is a machinist by trade who broke into the business working on racing cams for Chuck Potvin. Today, an average of one HAPI engine is shipped from the Eloy, Arizona, factory every working day.

Taylor's first aircraft engine was delivered in the back seat of a Cessna 185 to Lake Tahoe, California, in a snowstorm. Rex frequently uses his Cessna Cardinal RG with the back seat removed to airlift up to three engines at a time (average weight each is 155 pounds).

As close as Rex Taylor came to designing his own full-sized aircraft was putting lines on paper that looked something like the Cygnet he currently offers. It was all-wood and similar in design to the radio-controlled models he was building at the time.

While Taylor has never designed and built his very own home-built, he has developed an ability to organize and sell. As a result of this, as well as a desire to promote homebuilt aircraft that fit with his HAPI engines, he purchased the plans and production rights for three very different aircraft. All three were designed and built by engineers. Bob Walters, who designed the Dragonfly, and John Corby, "father" of the Starlet, are graduate aeronautical engineers, while Bert Sisler, designer of the Cygnet, is a graduate mechanical engineer and a recently retired airline captain.

All three of Taylor's acquisitions have been flown extensively and improved over the years. All three are relatively easy to build. All have Class I NASAD approval—but that's where the similarities end.

"I want to give the builder an option," Rex explained. "The builder can go for cross-country with the Dragonfly; bush-flying with the semi-STOL Cygnet, or a roll around in the sky with the aerobatic Corby CJ-1.

Ask Taylor what his marketing concept is and he says, "I ask the customers to come out here (to Eloy, Arizona), get their hands on the controls and fly with me. Then, if they don't like what they see, they don't buy the plans or the kit. I have both prototypes here for the Dragonfly and Cygnet and soon will have a Starlet; but since the Starlet is single-place, we'll be rather selective about flying that one." Taylor sells either as a set of plans or as a package that includes prefab components. He says that no contracts are involved.

What about the future of sport flying? (Taylor prefers the term "sport flying" to either homebuilt or experimental.) He feels that the movement is just in its infancy. "If we don't get carried away with kits that do too much for the builder, I can see a fine future. The whole concept of 'builder built' vs. 'builder assembled' is an area where the FAA could pull the rug. I can live with the 51% concept that we have today, and I feel that we should be very careful to maintain that status. I think that the present ultralight popularity will bring new people into the 'real aircraft' field."

As for the future, Taylor plans to refine the three products he has. Reluctantly, he's looking at a tri-geared option for the Cygnet. "I think that is is terrible, but you've gotta go with what the market wants." No changes are contemplated with the Starlet. TASK and Taylor also are working on a landing gear modification for Dragonfly.—*Don Downie*

Rex Taylor, whose HAPI Engines and Viking Dragonfly operations are a natural marriage of interests.