GROWING PAINS

Ultralights enter adolescence and confront authority figures.

BY THOMAS A. HORNE

A year ago the *Pilot* staff reported on the latest phenomenon in general aviation—ultralights. Reader response to this package of articles mirrored the emotional reception that these frail-looking airplanes experienced from the aviation community at large. You either loved ultralights, hated them or strode a middle path, believing that the concept was good but the execution left something to be desired.

Meanwhile, ultralight enthusiasts and manufacturers went their merry way, buying and selling more ultralights in 1981 than ever before. It is estimated conservatively that 50,000 ultralights have been sold in the industry's seven-year history; about one fifth have made it to flying status.

Precise figures do not exist because no impartial organizations have been counting. But the message is clear enough: Ultralights are here to stay. This year's ultralight directory (p. 90) includes 11 more manufacturers than the year before. In the course of our survey for this year's directory, we learned that approximately half of most manufacturers' total sales were in 1981. If the rest of general aviation is in a recessionary slump, the ultralight business is having no part of it.

In 1981, three main design developments took place in the industry.

The first was a continued move away from pure weight-shift control systems. In this type of system, the pilot moves his body to make attitude changes. As in a hang glider, the pi-

QUICKSILVER MX PHOTOGRAPHY BY ART DAVIS

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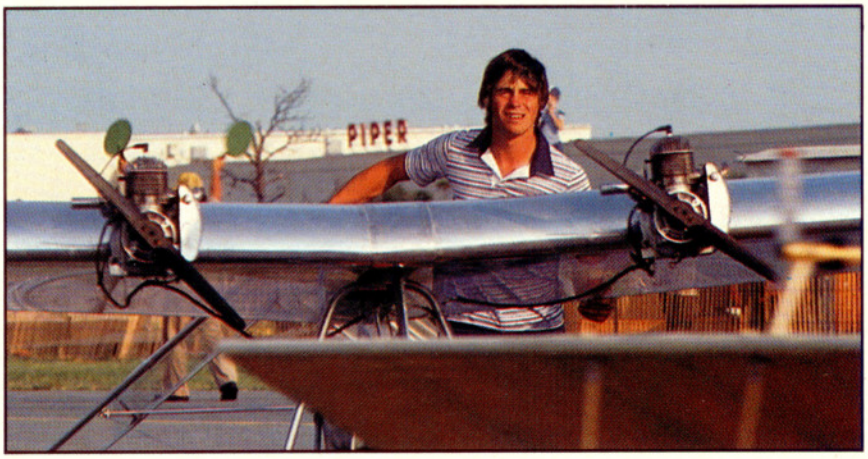
Ultraflight Sales' twin-engine Lazair can be fitted with floats (above). The company's president, Dale Kramer (below), parks his Lazair at the flight line of the Experimental Aircraft Association's annual Sun 'n Fun fly-in at Lakeland, Florida.



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lot's movements change the center of gravity and lift. Pilots evidently find this system difficult to master and prefer conventional, three-axis (ailerons, elevators and rudders) systems. The fact that many ultralight purchasers are licensed pilots helps explain the trend away from weight shift.

There is still a wide array of control systems. Some use a combination of weight shift for pitch control (the pilot moves fore and aft to adjust attitude) with wing-tip rudders for roll control (a wing-tip rudder deflected into the relative wind will cause a yaw-induced turn). Other systems use spoilerons, V-tails and even flaps. But a pure weight-shift control system—the system of the early days—is definitely falling from favor.

A European invention known as the Trike made its debut in 1981. The idea behind the Trike is to transform a hang glider into a powered ultralight by hanging an aluminum frame from the glider's keel tube. The attachment consists of one bolt. The engine is mounted on a pusher configuration, and control is purely by weight shift. Several manufacturers in the United States are now offering Trikes, in one form or another, under various trade names.

These creations ought to be tested more thoroughly than they have been. A Trike's thrust line can change as the pilot shifts his weight. The Trike seems to be a marriage of expediency and a reminder of the early days, when experimentation took precedence over safety.

The first two-place designs—the Weedhopper Two and the Eipper-Formance Doublequick—made their appearance in 1981. Manufacturers and dealers felt that a two-place model would make pilot training easier and safer. But the Federal Aviation Administration's legal worries prevented the first two-place design—the Weedhopper Two—from ever going past the prototype stage.

By law, passengers flying in any airplane must be afforded the protection of the Federal Aviation Regulations. This means that the airplane must be certified as airworthy, and the pilot must be licensed.

The FAA believes that the use of an unregulated two-place design for training or any other purpose is contrary to the intent of the FARs. In the present, unregulated status of ultralight aviation, a two-place model could be occupied by an instructor without an FAA Flight Instructor certificate and a student paying for flight instruction.

There also was suspicion that once two-place versions hit the market, they eventually would fall into the hands of any purchaser, even though the manufacturer's intent might be to limit distribution to dealers for use as trainers only. For now, unregulated two-place designs are on hold.

Rotec Engineering apparently has found the answer for ultralight pilots (those with licenses, that is) who want to fly passengers by certifying its Rally 3 in the Experimental category. This subjects the owner to the same regulations that apply to builders of, say, Quickies or Sonerais. An FAA representative must inspect the airplane before it is flown, an N number is assigned, there is an initial restriction specifying where and for how long the airplane must fly with only the pilot aboard, and the pilot must have an FAA pilot certificate. After the restriction has been complied with, the pilot may fly passengers, but commercial operations are forbidden.

How Rotec intends to use the Rally 3 as a trainer remains to be seen. The Experimental category prohibits flying for compensation, but a loophole could be exploited. The dealer may charge for ground school, then give

Flight Design's Jet Wing ATV (all terrain vehicle) is one of the "Trike" designs—a hang-glider with a pilot's cage and an engine bolted underneath.

ART DAVIS

American Aerolights has designed this flight simulator for training Eagle pilots and dealers.

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flying lessons with a CFI free of charge.

But the two-place issue is one of the lesser challenges to the movement.

On July 27, 1981, the FAA published a notice of proposed rule making (NPRM) to govern the operation of hang gliders and powered ultralights. The popularity of unregulated flight had grown so much, the FAA argued, that, unless the FARs were amended to include these new regulations, the safety of flight would be compromised. In the notice, the FAA cited three near misses: one involved a corporate turboprop and two ultralights; another involved an airliner and an ultralight; and the third, another airliner and two hang gliders.

Prior to the notice, the FAA stayed away from the regulation of hang gliding and ultralight activities. On May 16, 1974, Advisory Circular 60-10 was published, but this consisted only of recommended safe practices for flying hang gliders. The exemplary work of the United States Hang Gliding Association (USHGA) kept these recommendations from escalating into law. The USHGA instituted a program of self-regulation that established pilot-training and certification standards. The organization also supports the Hang Glider Manufacturer's Association, which established airworthiness standards for hang gliders. The FAA was satisfied with the work of these two organizations and impressed with the way hang-gliding accident statistics had gone down. Self-regulation was working, and the sport of hang gliding acquired a new respectability.

By 1980, the atmosphere surrounding unregulated flight changed as ultralights flooded the market. Manufacturers cranked out dozens of different designs, ultralight sales reached unexpected heights, and the industry doubled in size in two years. Competition between manufacturers became intense. Various aviation organizations sought to represent the growing number of ultralight pilots.

The mood was rather like a rambling, sometimes hostile, free-for-all. The pursuit of sales was the overriding concern. Pilot training and airworthiness standards, if they came up at all, received a cool reception. There was little that a room full of ultralight manufacturers could agree on.

In the fall of 1980, at the Experimental Aircraft Association's fly-in at Tullahoma, Tennessee, the Professional Ultralight Manufacturers Association (PUMA) was formed. PUMA's ultimate goal is to establish pilot training, safety and airworthiness standards for ultralights. PUMA's early meetings brought agreement that these standards should be set but little consensus on specifics. From the very start, it was obvious that the ultralight movement would not be able to follow the example set by hang gliding. Many manufacturers would rather spend their energy promoting their products and badmouthing the competition than cooperating to improve industry standards and promote self-regulation.

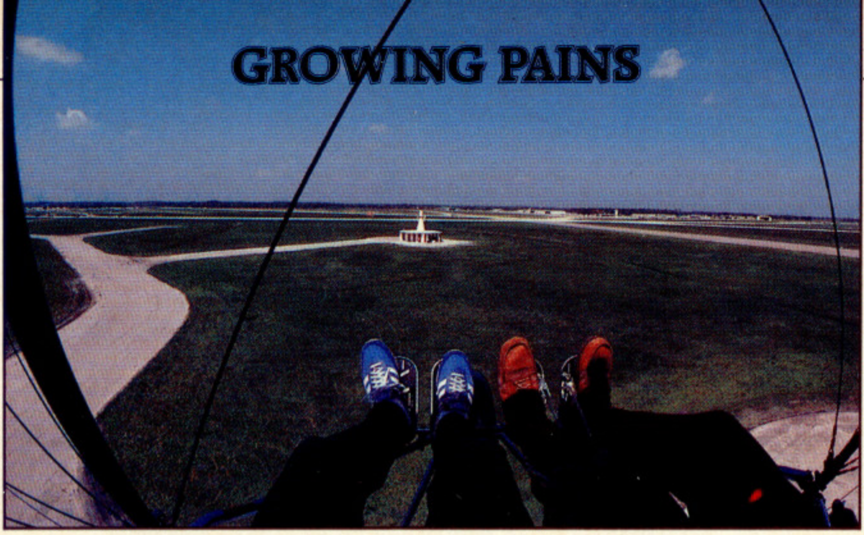
It was in the middle of this disarray that the NPRM was issued. It took no one by surprise, but neither had anyone planned a strategy to deal with it. The initiative passed to the FAA.

The NPRM defined an ultralight as any powered or unpowered flying vehicle meant to carry a single occupant. This vehicle must have an empty weight of 155 pounds or less and a fuel capacity of no more than 2.5 gallons and must not have an airworthiness certificate. Such an airplane, it is proposed, shall not be flown within an airport traffic area, control zone, terminal control area or positive control area without prior permission from air traffic control. Also, ultralights must not be flown over congested areas, between sunset and sunrise or in IFR weather.

The FAA solicits comments from the public whenever a new rule is proposed. For this one, more than 1,600 comments were received. Nearly all the gripes were the same. AOPA, USHGA, EAA and PUMA concurred in their disagreement with the NPRM on many of the same points.

To sum up, practically everyone knowledgeable about ultralights believes that the following changes should be made to the proposal before it becomes law:

- Hang gliders should be excluded from the provisions. The sport already regulates itself adequately, hang gliders have a limited range, and operations usually take place in remote



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The pilot's view from Eipper-Formance's latest model, the Quicksilver Two. The crew has been cleared "direct to the VOR."

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areas where conflict with conventional aircraft is unlikely.

- The hours of operation should be extended. The rules should permit operations from one-half hour before sunrise to one-half hour past sunset. These are the times when the winds are calmest, conditions are best for flying ultralights and there is still enough light to see.
- The maximum fuel capacity should be raised from 2.5 gallons to five gallons. This would allow enough fuel to clear the airport area and return under a moderate headwind. Also, the higher-horsepower engines now used in ultralights require more fuel to provide safe reserves. In the future, engines will become more powerful and burn more fuel. A law that fixes fuel capacity at such a low level makes no allowance for changes in engine technology.
- Operations over congested areas should be allowed, provided an emergency landing can be made without creating a hazard to those on the ground. The proposed rule is unnecessarily restrictive and could lead to an overload of needless enforcement actions. If proper precautions are taken, safety would not be jeopardized. Besides, the landing distances of most ultralights are approximately 100 feet. Given an emergency situation, there are usually many suitable places to land, no matter where the flight is conducted.
- The maximum empty weight should be raised from 155 pounds to at least 220 pounds. In its proposal, the FAA said that 155 pounds is a representative weight for the ultralights currently on the market. This is wrong. All but two weigh more than 155 pounds, and many weigh more than 200 pounds. A law that sets the weight at 155 pounds would put all designs heavier than that in the Experimental category. But most important, structural integrity would be compromised in such a light airplane.

In an effort to save weight, designers would be tempted to make structural members lighter. The lighter these parts are, the less they will be able to withstand the compressive and tensile loads that occur in flight, particularly when the airplane is flying in gusty conditions near its maximum speed. In the event of a crash, the pilot may not have enough protection. The 155-pound weight limit also would eliminate the heaviest group of ultralights—those equipped with floats.

The importance of raising the weight limit was underscored by the fatal crash of an ultralight designed to meet the NPRM's 155-pound guideline, Weedhopper of Utah's JC-35 Rocket. John Chotia, president of Weedhopper and the designer of the Rocket, took a prototype on a tour of the country, giving flight demonstrations. On October 26, 1981, during a press demonstration, the Rocket apparently entered a stall and nosed into the ground from an estimated altitude of 75 feet. Other Rockets are being tested by Weedhopper to determine what went wrong, but no official statements about the cause of the accident have been issued to date. Plans to sell Rockets to the public have been canceled.

Those who witnessed the crash suspect that the Rocket's tail section must have flexed during Chotia's low-speed pass, causing the elevator to stall. There was no evidence of any structural failure of the ultralight or any other pre-impact malfunctions.

This brings up the subject of accident investigations and statistics. No one has been investigating ultralight accidents or keeping track of their numbers. The EAA has begun an investigative effort by sending report forms to all the members of its new ultralight division. The USHGA publishes a yearly summary of accidents that are reported through its voluntary system. A monthly newspaper, *Glider Rider*, also publishes an annual summary of accidents. Certain manufacturers have information on how many of their products crash but often are reluctant to talk about them.

All of these sources of information are inadequate. In many cases, the information contained in the reports is useless. They often are secondhand accounts, newspaper stories that betray an unfamiliarity with aviation or do not have enough detail. Since the reports are voluntary, it is anyone's guess as to how many ultralight accidents happened last year or which types of ultralights crashed the most. The only sources of information on fatalities—PUMA and EAA—are unsure. They say from 30 to 50 ultralight fatalities occurred in 1981. Most fatalities were caused by low-level aerobatics, improper construction techniques, failure to replace damaged parts and adverse wind conditions.

PUMA, still beset by internal troubles, is sticking with its original plans. Half of PUMA's 20 members seem to have dropped out of the organization, primarily over the issue of dealer training.

At a December 1981 meeting, PUMA's 10 active members (American Aerolights, CGS Aviation, Eipper-Formance, Pterodactyl, Rotec Engineering, Ultralight Flight, Vector Aircraft, Kolb, Cuyuna Development and Protopipe Exhaust Systems) agreed to comply with specific airworthiness requirements and pilot-training standards. Airworthiness requirements include the testing of an ultralight's performance, controllability, stability, stall and spin characteristics and load tests of the flight surfaces and landing gear. The pilot-training program educates students in the fundamentals of FAR Part 91, and a CFI must give flight instruction and issue an endorsement before the student may fly without supervision.

By the next PUMA meeting in

March 1982, these members must have complied with these goals. The meeting also will provide an opportunity for PUMA's dissenting members to change their minds. Nonmember manufacturers cannot be bound by what PUMA espouses, but at least the first serious steps toward self-regulation of ultralights finally have begun.

In July 1981, AOPA held a conference with representatives of several aviation organizations—PUMA among them—on ultralight operations at airports. The participants in this conference concluded that:

- If feasible, ultralights should operate from a dedicated area of the airport. This area should be marked and be no closer than 200 feet from the edge of an active runway.
- In single-runway operations, a segment of the runway should be set aside for ultralights.
- A knowledgeable observer should be near the runway to assist the ultralight pilot in maintaining safe separation from other aircraft.
- The traffic pattern should be rectangular, but smaller and 500 feet lower than the standard pattern altitude.

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- When ultralights are operating from a dedicated area of the airport, their patterns must be adjusted to avoid conflicts with the conventional aircraft traffic pattern.
- The airport management should specify all ultralight flight paths and altitudes in the vicinity of the airport.
- A national standard airport marking should be displayed on each airport where ultralights operate regularly.
- Ultralight operations should be included in unicom airport information.
- Ultralight pilots should demonstrate to the airport management a knowledge of airspace regulations and airport operating guidelines as set out in the *Airman's Information Manual.*
- Ultralight pilots should be familiar with local IFR procedures and the nonstandard patterns flown by aircraft operating IFR.

The efforts made by AOPA, EAA and PUMA are steps in the right direction. But at the present pace, even the most dedicated efforts at cleaning house will not be able to keep up with the rapid growth of the sport.

Ironically, the pioneer of self-regulation, the USHGA, has decided to have nothing to do with ultralights; the association's ultralight division is being dissolved.

Unregulated power flight may be in its last days. PUMA's program—even if all 20 members were to fall into line at the March meeting—may have been a case of too little, too late. No one can anticipate what the FAA will decide, but it appears that the federal government will have its say in ultralights. This influence could take the form of operational or equipment regulations.

State and local governments are not idly watching the ultralight phenomenon, either. California's San Diego County has imposed regulations on ultralights already, and Michigan, Illinois and Washington are busy drawing up proposals.

Whatever the eventual regulatory outcome, 1981 will go down as a watershed year in the history of the ultralight movement. It was when ultralights left a complacent world and stepped into the world of politics that was waiting for them all along. □

AIR SAFETY FOUNDATION LAUNCHES ULTRALIGHT PROGRAM

At press time, the AOPA Air Safety Foundation announced the formation of a comprehensive program to standardize the training of ultralight and hang-glider instructors and pilots. The program also calls for registration of ultralight airframes and engines, an accident reporting service and a safety study of all ultralights. The program entered a 90-day research period in March. If the FAA, state governments, ultralight manufacturers and enthusiasts and insurance companies demonstrate adequate support, all aspects of the program will be fully operational by mid-1982.

The Air Safety Foundation holds 72 flight instructor validation and revalidation clinics each year at locations all over the country. Those CFIs who want to give ultralight and hang-gliding instruction may attend an additional day's sessions dealing with the special techniques involved in this type of instruction. Upon completion of the course, the instructor will be issued an ultralight/hang-glider instructor certificate and receive a subscription to a quarterly newsletter dealing with topics of interest to the ultralight instructor.

Those who are not CFIs may attend the session and receive the certificate, provided they have an FAA basic ground instructor (BGI) certificate.

These instructors will then be in a position to administer the foundation's ultralight and hang-glider pilot training program. This program will be designed to ensure that pilots have the necessary knowledge and skills for safe flying before receiving an instructor's endorsement.

A pilot registration program also is proposed. This will allow the foundation to communicate with pilots on safety and operational issues.

The registration of ultralight airframes and engines will serve a similar purpose. For a small biennial fee, the registrant will receive a quarterly safety report, plus safety bulletins to inform owners of accident trends or problems requiring immediate action.

The accident reporting service will operate in conjunction with the pilot-registration program. Each registered pilot will be sent a reporting form. Pilots will be encouraged to report all accidents and incidents they witness. After the data has been tabulated, ASF will send a "feedback" report to all respondents.

The safety study will take on the task of acquiring an ultralight from each manufacturer and of observing nonmechanics as they assemble each ultralight. With the construction approved, the foundation will then fly the ultralights through a series of maneuvers. Finally, operating and maintenance manuals will be written. These manuals will be made available to owners and prospective purchasers.

Future plans include structural testing of each ultralight design.

This ambitious undertaking is the first of its kind. It will provide standardized training, objective product analyses and ultralight accident information that has not existed before. The program appears to have met with enthusiasm among states planning to regulate ultralights. For example, the state of Michigan has indicated that it would withdraw its proposal to regulate ultralights if the foundation's program were implemented. Self-regulation of ultralights may not be a lost cause after all. □

DIRECTORY OF ULTRALIGHT AIRCRAFT

This year's directory of ultralight aircraft lists 45 models, ranging in price from $2,850 for the Striplin Lone Ranger to $6,995 for Mitchell Aircraft's B-10. To the best of our knowledge, this is a complete list of all pre-built and kit-built ultralights on the market. By the time you read this, however, there may be another half-dozen new designs. Such is the nature of the explosive growth of the industry.

Some designs listed here have empty weights greater than 220 pounds, making their "ultralight" status questionable. It seems fairly certain that, if and when regulatory action comes, the upper empty weight limit for classification as an ultralight will be in the neighborhood of this figure.

Plan-built ultralights—those that the purchaser makes from scratch—are not listed. The aircraft that are included are presented without expressed or implied endorsement by AOPA.

Potential purchasers should be cautioned that ultralights vary greatly in handling and performance characteristics, complexity of construction and overall quality and sophistication. —*TAH*

Manufacturer and Model	Powerplant/ Prop Diameter (in)/ Type Drive	Control Method*	Weights Gross/Empty/ Max Pilot (lb)	Wing Area (sq ft)/ Wing Loading (lb/sq ft)	Fuel Capacity Std/Opt (gal)
Advanced Aviation Hi-Nuski Huski	Cuyuna 430, 30 hp/ 36/direct drive	Pitch—weight shift, Roll—spoilerons, rudders	458/190/250	166/2.7	3/—
Advanced Aviation Coyote	Cuyuna 215, 20 hp/ 50/reduction drive	Pitch—weight shift, Roll—spoilerons, rudders	393/175/200	166/2.3	3/—
AeroPlane Marketing Swallow AeroPlane	2 Yamaha, 15 hp ea/ 52/reduction drive	3-axis	550/218/270	136/3.7	3.8/—
Airmass Sunburst	Cuyuna 430R, 30 hp/ 54/reduction drive	3-axis	460/220/240	156/2.9	5/—
American Aerolights Eagle	Cuyuna 215R, 20 hp/ 54/reduction drive	Pitch—weight shift, Roll/yaw—wing-tip rudders	395/165/215	188/2.1	2.5/—
Cascade Ultralites Kasperwing	Xenoah 250, 23 hp/ 54/reduction drive	Pitch—weight shift, Roll—wing-tip rudders	395/160/220	180/2.1	2.5/—
CGS Aviation Easy Riser	Powerhawk 152, 22 hp/ 54/reduction drive	Pitch—weight shift, Roll—wing-tip rudders	425/165/225	170/2.5	2.5/—
CGS Aviation Hawk	Cuyuna 430R, 35 hp/ 58/reduction drive	3-axis	474/220/240	150/3.1	4/—
Delta Sailplane Nomad DS-26B	Mahl 210, 18 hp/ 42/reduction drive	3-axis	423/170/238	147.3/2.8	2.5/—
Delta Sailplane Honcho DS-27A	Lloyd, 26 hp/ 42/reduction drive	3-axis	407/189/203	131.4/3.1	2.5/—
Eastern Ultralights Snoop S82	Cuyuna 430R, 30 hp/ 50/reduction drive	3-axis	538/238/285	165/3.2	3/—
Eipper-Formance Quicksilver	Cuyuna 215, 20 hp/ 52/reduction drive	Pitch—weight shift w/trimvator, Roll—rudder	425/185/220	160/2.7	3.4/—
Eipper-Formance Doublequick	Cuyuna 430, 30 hp/ 52/reduction drive	Pitch—weight shift w/trimvator, Roll—rudder	465/205/240	160/2.9	3.4/—
Eipper-Formance Quicksilver MX	Cuyuna 430, 30 hp/ 52/reduction drive	3-axis w/spoilerons	480/220/240	160/3	3.4/—

NA—not available; NO—not obtained; *3-axis—a yoke controls rudders, ailerons and elevators

Advanced Aviation, Inc., 9145 Kilgore Rd., Orlando, Fla. 32811; 305/298-2920.
AeroPlane Marketing, P.O. Box 833, Sparta, N.J. 07871; 201/627-8466.
Airmass, Inc., Hillside Airport, 16845 Kenneth Rd., Stilwell, Kan. 66085; 913/897-9797.
American Aerolights, 700 Comanche, N.E., Albuquerque, N.M. 87107; 505/344-6366.
Cascade Ultralites, 1750 12th, N.W., Issaquah, Wash. 98027; 206/392-0388.
CGS Aviation, Inc., 4252 Pearl Rd., Cleveland, Ohio 44109; 216/398-5272.
Delta Sailplane Corp., Dept. R, 13161 Sherman Way, N. Hollywood, Calif. 91605; 213/765-0144.
Eastern Ultralights, P.O. Box 424, Chatsworth, N.J. 08019; 609/726-1193.
Eipper-Formance, 1046 Commerce St., San Marcos, Calif. 92069; 714/744-1514.
Goldwing Ltd., Box 1123-G, Westover Field Amador County Airport, Jackson, Calif. 95642; 209/223-0384.
Kolb Company, Rt. 3, Box 38, Phoenixville, Penn. 19460.
Mattison Aircraft Company, 204 Front St., Perry, Kan. 66073; 913/597-5972.
Maxair Sports, P.O. Box 95, Glen Rock, Penn. 17327; 717/235-2107.
Mitchell Aircraft Corp., 1900 S. Newcomb, Portersville, Calif. 93257; 209/781-8100.
Motorized Gliders of Iowa, R.R. 1, Clear Lake, Iowa 50428; 515/357-7161.
Pterodactyl Ltd., P.O. Box 191 G, Watsonville, Calif. 95076; 408/724-2233.
Rotec Engineering, P.O. Box 124, Duncanville, Tex. 75116; 214/298-2505.
Striplin Aircraft Corporation, P.O. Box 2001, Lancaster, Calif. 93539; 805/945-2522.
Teman Aircraft, 10092 Northhampton Ave., Westminster, Calif. 92683; 714/531-2655.
UFM of Kentucky, 2700 Freys Hills Rd., Louisville, Ky. 40222; 502/245-0779.
Ultraflight Sales, Ltd., P.O. Box 370, Port Colbourne, Ontario L3K 1B7, Canada; 416/735-8352.
Ultralight Flight Sales & Distribution, P.O. Box 645, Windsor, Conn. 06095; 203/683-2760.
Ultralite Soaring, Inc., 3411 N.E. 6 Terr., Pompano Beach, Fla. 33064; 305/785-7853.
Vector Aircraft Corp., Turner Falls Airport, Industrial Park Box 304, Turner Falls, Mass. 01376; 413/863-9736.
Waspair Corp., 1881 Enterprise Blvd., W. Sacramento, Calif. 95691; 916/372-5791.
Weedhopper of Utah, 1148 Century Dr., P.O. Box 2253, Ogden, Utah 84404; 801/621-3941.

Pilot's Weight for Performance Data (lb)	Endurance Std/Opt (hr)	Rate of Climb (fpm)	Speeds Cruise/Stall/Never-exceed (kt)	Max Distance Glide Speed (kt)/Glide Ratio	Construction/Set-up Time	Transport	Price Kit/Prebuilt	Manufacturer and Model
170	2/—	800	34 - 39/17/47	30 - 35/6:1	20 - 40 hr/15 - 30 min	Car top	$3,795/—	Advanced Aviation Hi-Nuski Huski
170	2.8/—	450	24 - 30/16 - 17/48	NA/7:1	20 - 40 hr/15 - 30 min	Car top	NA/—	Advanced Aviation Coyote
175	2.8/— (w/rsv)	500 - 600	48 - 52/22/NA	NA	72 hr/10 min	Trailer	$5,475/—	AeroPlane Marketing Swallow AeroPlane
180	3.2/—	800	55/20/60	34/10:1	40 hr/1 hr	Car top	$4,645/$5,145	Airmass Sunburst
160	1.5/— (w/rsv)	550	30/16/56	23/7:1	—/45 min	Car top	—/$4,395	American Aerolights Eagle
165	2/—	650	30 - 35/16/52	20 - 22/10:1	40 hr/30 min	Car top	$4,000/$4,800	Cascade Ultralites Kasperwing
175	2/—	500 - 900	30 - 39/23/48	26 - 30/9:1	125 hr/30 - 45 min	Trailer	$3,343/—	CGS Aviation Easy Riser
185	3.5/—	600 - 1,200 (wing flaps)	35 - 55/28/60	37/10:1	30 hr/20 min	Trailer	$5,350/—	CGS Aviation Hawk
NO	3/—	320	38/22/48	27/14.3:1	120 - 150 hr/—	Trailer	$3,995/—	Delta Sailplane Nomad DS-26B
NO	2.2/—	620	52/23/62	29/13.6:1	120 - 150 hr/—	Trailer	$4,068/—	Delta Sailplane Honcho DS-27A
180	2/—	600	35 - 39/16/48	NO/9:1	30 hr/30 - 45 min	Trailer	$4,490/—	Eastern Ultralights Snoop S82
NO	2.4/— (@ 75%)	450	30/17/48	22/6:1	16 hr/25 min	Car top	$3,595/$3,895	Eipper-Formance Quicksilver
NO	1.5/— (@ 75%)	900	35/18/48	23/6:1	16 hr/25 min	Car top	$3,895/$4,195	Eipper-Formance Doublequick
NO	1.5/— (@ 75%)	800	37/22/48	23/6:1	25 hr/35 min	Car top	$4,595/$4,995	Eipper-Formance Quicksilver MX

Manufacturer and Model	Powerplant/ Prop Diameter (in)/ Type Drive	Control Method*	Weights Gross/Empty/ Max Pilot (lb)	Wing Area (sq ft)/ Wing Loading (lb/sq ft)	Fuel Capacity Std/Opt (gal)
Flight Designs Jet Wing ATV	Kawasaki 440, 31 hp/ 36/direct drive	Pitch—weight shift, Roll—rudders	460/203/235	175/2.6	5/—
Flight Designs FD-1	Kawasaki 440, 31 hp/ 48/reduction drive	3-axis	490/215/250	158/3.1	5/—
Gemini International Hummingbird	2 Gemini Partner K1200, 8 hp ea/ 42/reduction drive	3-axis	415/163/250	157/2.7	1.5/—
Goldwing Ltd. Goldwing	Cuyuna 430D hp/ 36/direct drive	3-axis w/spoilers	515/250/250	128/4	2.5/6
Kolb Flyer	2 Solo, 16 hp ea (derated to 12 hp)/36/direct drive	3-axis	410/185/210	160/2.6	1.7/—
Mattison Aircraft MAC 200 Series	Yamaha, 15 hp/ 48/reduction drive	Pitch—weight shift, Roll—rudder	458/190/250	170/2.7	3/—
Mattison Aircraft MAC 300 Series	Kohler, 30 hp/ 50/reduction drive	3-axis	628/210/400	170/3.7	3/—
Mattison Aircraft MAC 400 Series	Yamaha, 15 hp/ 48/reduction drive	Pitch—weight shift, Roll—rudder	436/165/250	170/2.6	3/—
Maxair Sports Hummer	Xenoah 250, 22 hp/ 36/direct drive	3-axis w/V-tail	435/180/225	130/3.3	5/—
Mitchell Aircraft B-10	Xenoah 250, 22 hp/ 50/reduction drive	3-axis	451/200/230	136/3.3	3.5/5
Mitchell Aircraft U-2	Xenoah 250, 22 hp/ 50/reduction drive	3-axis w/ wing-tip rudders	462/220/230	136/3.3	2/5
Mitchell Aircraft P-38	Cuyuna 430, 30 hp/ 52/reduction drive	3-axis	530/250/250	110/4.8	5/6
Motorized Gliders of Iowa Teratorn	Yamaha KT-100S, 15 hp/ 60/reduction drive	3-axis or weight shift	409/155/235	160/2.5	3.3/—
Pterodactyl Fledgling	Cuyuna 430D, 30 hp/ 36/direct drive	Pitch—weight shift, Roll/yaw—wing-tip rudders	425/165/230	162/2.6	5/—
Pterodactyl Ptraveler	Cuyuna 430D, 30 hp/ 36/direct drive	2-axis, canard stabilator	450/200/220	173/2.6	5/—
Pterodactyl Ascender	Cuyuna 430R, 30 hp/ 54/reduction drive	2-axis, canard stabilator	450/215/220	173/2.6	5/—
Rotec Engineering Rally 2	Solo, 20 hp/ 54/reduction drive	3-axis	376/145/210	155/2.4	3.5/—
Rotec Engineering Rally 2B	Kohler, 20 hp/ 54/reduction drive	3-axis w/spoilerons	491/195/275	155/3.2	3.5/—
Striplin Aircraft Lone Ranger	Xenoah, 20 hp/ 60/reduction drive	3-axis	450/218/NA	154/3	5/—
Striplin Aircraft Sky Ranger	Cuyuna 430D, 40 hp/ 60/reduction drive	3-axis	800/330/440	162/4.9	5/—
Teman Aircraft Mono-Fly	Onan, 22 hp/ 45/direct drive	3-axis	550/260/260	123/4.5	6/9
UFM of Kentucky Easy Riser Aeroplane	Cuyuna 215R, 20 hp/ 50/reduction drive	3-axis	450/170/280	170/2.6	5/—

NA—not available; NO—not obtained; *3-axis—a yoke controls rudders, ailerons and elevators

Pilot's Weight for Performance Data (lb)	Endurance Std/Opt (hr)	Rate of Climb (fpm)	Speeds Cruise/Stall/ Never-exceed (kt)	Max Distance Glide Speed (kt)/Glide Ratio	Construction/ Set-up Time	Transport	Price Kit/ Prebuilt	Manufacturer and Model
185	4/—	700	37 – 45/22/ 65	26/8:1	—/25 min	Car top	—/ $4,350	Flight Designs Jet Wing ATV
225	4/—	1,200	39/17/65	21/12:1	20 hr/ 30 min	Car top	NA/—	Flight Designs FD-1
163	2/—	600	30/16/55	23/11:1	—/ 10 min	Car top	—/ $5,275	Gemini International Hummingbird
170	2/4	600	60/24/70	45/16:1	100 – 150 hr/ 10 – 15 min	Trailer	$3,895/ $4,495	Goldwing Ltd. Goldwing
175	1/—	450	39/15/52	24/10:1	300 hr/10 min	Trailer	$2,950/ —	Kolb Flyer
214	2/—	350	26/13 – 16/ 52	NA/8:1	20 hr/ 15 – 20 min	Car top or trailer	$3,695/ $3,945	Mattison Aircraft MAC 200 Series
214	2/—	650	30/13 – 16/ 52	NA/6:1	30 hr/ 30 – 45 min	Car top or trailer	$4,295/ $4,545	Mattison Aircraft MAC 300 Series
214	2/—	350	26/13 – 16/ 52	NA/8:1	20 hr/ 15 – 20 min	Car top or trailer	$3,495/ $3,745	Mattison Aircraft MAC 400 Series
180	4/—	350 – 400	33/20/48	24/8:1	80 – 100 hr/ 10 min	Trailer	$3,895/ —	Maxair Sports Hummer
180	2/NO (w/rsv)	650	48/21/60	36/15:1	250 – 300 hr/ 15 min	Car top	$4,085/ $6,995	Mitchell Aircraft B-10
200	1/3 (w/rsv)	400	65/32/90	45/20:1	350 – 450 hr/ 15 min	Trailer	$4,390/ —	Mitchell Aircraft U-2
250	2.5/NA (w/rsv)	400	48/28/65	40/6:1	60 – 100 hr/ 15 min	Trailer	$5,190/ —	Mitchell Aircraft P-38
170	3/—	350	17 – 22/14/ 43	23/7:1	18 – 24 hr/ 15 – 20 min	Car top or trailer	$3,495/ $4,295	Motorized Gliders of Iowa Teratorn
230	3/— (w/rsv)	400	35 – 45/23/ 55	22 – 26/9:1	60 hr/ 40 min	Car top	$3,600/ —	Pterodactyl Fledgling
220	3/— (w/rsv)	400	35 – 45/23/ 55	22 – 26/9:1	70 hr/ 45 min	Car top	$3,900/ —	Pterodactyl Ptraveler
220	3/— (w/rsv)	1,000	35 – 45/23/ 55	22 – 26/9:1	75 hr/ 45 min	Car top	$4,200/ —	Pterodactyl Ascender
195	3/—	350	23/10/34	12/7:1	30 hr/ 25 min	Car top	$3,850/ $4,350	Rotec Engineering Rally 2
195	2/—	650	33/14/39	12/7:1	30 hr/ 25 min	Car top	$4,300/ $4,800	Rotec Engineering Rally 2B
170	4/—	550	56/23/74	NA/16:1	200 hr/ 1 hr	Car top or trailer	$2,850/ —	Striplin Aircraft Lone Ranger
170	4/—	550	74/33/96	NA/14:1	200 hr/ 1 hr	Car top or trailer	$4,095/ —	Striplin Aircraft Sky Ranger
170	4.4/6.6	300	30 – 43/17/ 56	24/9:1	80 hr/ 5 min	Trailer	$3,400/ —	Teman Aircraft Mono-Fly
NO	2/—	400	30 – 39/19/ 43	NO/8:1	NO/50 – 60 min	NO	$3,895/ —	UFM of Kentucky Easy Riser Aeroplane

Manufacturer and Model	Powerplant/ Prop Diameter (in)/ Type Drive	Control Method*	Weights Gross/Empty/ Max Pilot (lb)	Wing Area (sq ft)/ Wing Loading (lb/sq ft)	Fuel Capacity Std/Opt (gal)
Ultraflight Sales Lazair	2 Rotax, 9.5 hp ea/ 28/direct drive	3-axis w/ inverted V-tail	425/183/240	142/2.9	2.5/—
Ultralight Flight Mirage	Cuyuna 430RL, 37 hp/ 58/reduction drive	3-axis	500/220/240	149/2.5	4/—
Ultralite Soaring Wizard I	Yamaha KT-100S, 15 hp/ 48/reduction drive	Pitch—weight shift, Roll—rudders	500/167/220	162/3.1	3.2/5.2
Ultralite Soaring Wizard J-2	Yamaha KT-100S, 15 hp/ 48/reduction drive	3-axis or weight shift	500/170/220	162/3.1	3.2/5.2
Ultralite Soaring Wizard J-3	Yamaha KT-100S, 15 hp/ 48/reduction drive	3-axis	500/215/220	162/3.1	3.2/5.2
Vector Aircraft Vector 610	Xenoah 250, 22 hp/ 52/reduction drive	3-axis w/V-tail, spoilerons	450/195/230	154/2.9	5/—
Waspair Corp. Sport	Cuyuna 430R, 30 hp/ 54/reduction drive	2-axis, canard stabilator	465/215/220	175/2.6	5/—
Waspair Corp. Tourer	Cuyuna 430R, 30 hp/ 54/reduction drive	2-axis, canard stabilator	595/225/330	175/3.4	5/—
Weedhopper of Utah Weedhopper C	Chotia, 25 hp/ 44/direct drive	2-axis, rudder, elevator	410/160/220	168/2.4	1/3.5

NA—not available; NO—not obtained; *3-axis—a yoke controls rudders, ailerons and elevators

Pilot's Weight for Performance Data (lb)	Endurance Std/Opt (hr)	Rate of Climb (fpm)	Speeds Cruise/Stall/ Never-exceed (kt)	Max Distance Glide Speed (kt)/Glide Ratio	Construction/ Set-up Time	Transport	Price Kit/ Prebuilt	Manufacturer and Model
185	2/—	400	35/15/49	19/13:1	100 hr/ —	Trailer	$4,200/ —	**Ultraflight Sales Lazair**
160	4/—	1,000	39 - 43/22/ NO	39/9:1	NO/30 min	Car top	$4,595/ —	**Ultralight Flight Mirage**
180	2.5/7.5	450	30/17/65	25/6.5:1	10 hr/ 15 min	Car top or trailer	$3,595/ —	**Ultralite Soaring Wizard I**
180	2.5/7.5	450	30/17/65	25/6.5:1	11 hr/ 15 min	Car top or trailer	$3,695/ —	**Ultralite Soaring Wizard J-2**
180	2.5/7.5	450	30/17/65	25/6.5:1	20 hr/ 15 min	Car top or trailer	$4,050/ —	**Ultralite Soaring Wizard J-3**
200	2.5/—	600	35/23/48	26/8:1	30 hr/ 45 min	Car top	$4,585/ —	**Vector Aircraft Vector 610**
170	2.5 - 3/—	700	39/20/52	36/15:1	40 - 45 hr/ 30 - 45 min	Car top or trailer	$4,295/ $5,245	**Waspair Corp. Sport**
170	2.5 - 3/—	700	39/20/52	36/15:1	40 - 45 hr/ 30 - 45 min	Car top or trailer	$4,395/ $5,345	**Waspair Corp. Tourer**
150	0.8/3	500	26/19/43	24/8:1	8 hr/ 30 min	Car top or trailer	$4,095/ —	**Weedhopper of Utah Weedhopper C**