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# APS NEWS

The Official Publication of the Auxiliary-powered Sailplane Association, Inc.

Volume XVI Issue # 98

ASA Web Site: <[www.motorglider.org](http://www.motorglider.org)>

May-June 2004

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**Ghost Riders in the Sky:** Pete Williams maneuvers his DG-400 for a formation wing position on Gary Gammal's DG-500M near Minden on a cloudy September afternoon. Photo by Mark Wolfe.



## DG's Story

by Pete Williams

Well it's really not all of the story about DG but it does contain some interesting sidelights and events that have shaped not only founder Wilhelm Dirks (image at left) career but has had a lasting impact on the German sailplane industry. It is my opinion that from the beginning Wilhelm has always been known to the German sailplane industry as "the new boy on the block" since he founded DG in the 70's when Schempp-Hirth, Rolladen Schneider, Schleicher and Glasflugel had been in business for years producing state of the art high performance sailplanes. So what sets DG apart from the other German sailplanes?

But let us start at the beginning. Wilhelm Dirks was born August 17, 1947 in Leer, Germany, a single son of Johann and Irmgard Dirks. Always interested in aeronautical engineering, Dirks started gliding at age 15 and entered Darmstadt University at age 19 where he became a member Germany's famous Akaflieg Darmstadt group. It was here he became involved with the D-37 motorglider which featured an 18 hp retractable wankel engine. Dirks flew the D-37 on its maiden test flight in 1969 and went on to be the team leader that designed the D-38, a 15-meter standard class design that would eventually be produced as the DG-100. In the summer of 1973, Dirks and a businessman named Gerhard Glaser teamed up to form the Glaser-Dirks Flugzeugbau company with Dirks as assistant manager and chief engineer. By 1979 327 DG-100s had been produced, 222 by ELAN in Slovenia. This was followed by the DG-200 15/17 meters (202) which had an improved airfoil. 192 of this ship were produced and today are still a popular 15/17 meter 42.5:1 high performance sailplane. Then came the DG-400 15/17, DG's first production self-launcher with its first flight in January 1981. Designed by Dirks, the DG-400 was similar to the DG-202/200 but the fuselage was a little deeper and wider to accommodate the 43hp air cooled 2-stroke Rotax 505. Engine installation including the mounting layout, retraction and extension system was designed, installed and tested by Walter Binder an independent contractor. *continued on page.....6*

## Letter to Editor

Concerning Crosswind Takeoffs  
Mar-Apr 04 APS NEWS

David Bingham has not mentioned an important procedure which helps with crosswinds although it is mentioned in the DG-800B AFM, sect. 4.5.2.2 which says:

“With a crosswind if there is no wing runner the into lee-wind (down-wind) wing should be on the ground. The drag of the wingtip wheel partly compensates the moment of the wind on the vertical tail. This technique reduces the tendency to turn the glider into the wind.”

This procedure really works, of course it is more effective on grass than on concrete. Additionally full negative flap during the initial take-off roll is helpful. This is not to increase aileron efficiency but to increase the load on the tail wheel. Be sure and lower takeoff flaps prior to rotation. Please publish in the next newsletter.

Wilhelm Dirks, Chief of Design, DG-Flugzeugbau

### Gary Evans Nominated as ASA Director

This is a short Biography of Gary Evans, who has been nominated to the Board of the ASA. Gary replaces Dean Carswell who resigned. Gary Evans retired in 1996 from Abbott Laboratories in Production Management, and now lives in Mesa, AZ with his wife Sandy. His flying background is in hang gliders, ultra lights and he currently flies a DG-808B. His interests are in cross-country soaring and he is working on his diamond altitude. Other interests are motorcycling, ATVing and Scuba diving. Gary gave a talk at the 2003 convention in Dayton on the Solo engine as installed in the DG-808B. His Pilot's Profile is in APS NEWS Jan-Feb 2003 Issue. Email: [garyevans@cableaz.com](mailto:garyevans@cableaz.com). Welcome aboard Gary! *Skip Atwell, President ASA*

**THE ASA WEBSITE IS FULL OF USABLE  
INFO ABOUT MOTORGLIDING INCLUDING BACK  
NEWSLETTERS, BOOKS,  
COMING EVENTS, LINKS AND MORE.  
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<[www.motorglider.org](http://www.motorglider.org)>  
Eric Greenwell-Webmaster**

**PETE Williams Has a New Email  
Address: <[fl18@pyramid.net](mailto:fl18@pyramid.net)>**

## APIS-M NEWS



Robert Mudd, US Dealer for the APIS line of gliders reports “one ready to fly APIS-M with trailer, leaves the factory in June for a customer in Iowa. Three APIS M kits, one with a trailer, leave in a container in September. Two to New York state one to Idaho. There is room in this container for one more possibly two more gliders which would dramatically lower the shipping costs. “

Mudd said “I go to Sun 'N Fun to work the Pipistrel booth, (Pipistrel.si). I expect I'll be licensing the two aircraft we will have on display as they are both sold. One to Florida and the other to Utah. When I fly them I'll write a report for APS NEWS. “

A ready to fly APIS-M delivered to the USA with modest instrumentation, trailer and shipping is about \$70,000 based on \$1.23 to 1 Euro.



### Guide to Self-Launching Sailplane Operation

Eric Greenwell has extensively revised and expanded his previous edition (written over four years ago), with much more material and pictures. This new edition covers more types of powered sailplanes than before, emphasizing common methods and concerns, rather than things specific to only one model. In addition to Eric's experience, this guide reflects the experience of its 12 reviewers from the USA and Europe. It is the most complete guide available today.

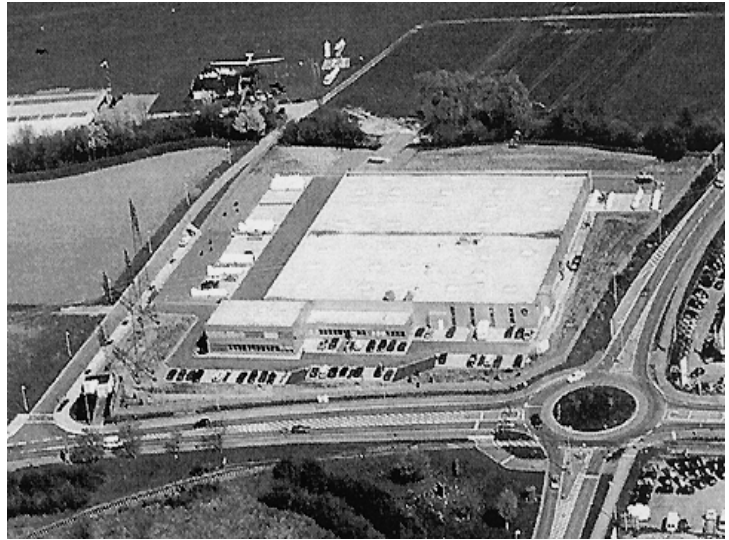
The guide is now available on the ASA web site <<http://www.motorglider.org>> (click to the "Articles On-line" section). A commercially printed version is planned for the future.

DG...continued from page 6.....

In December 1991 the first DG-800A was produced. Designed by DG engineer Axel Lange, the 800A was powered by the Rotax 505A air cooled engine as was the DG-400. The new 800 design was DG's first 18-meter class sailplane and could be ordered with optional 15-meter tips. The wing airfoils designed by L.M.M. Boermans of Delft University were completely new having been wind tunnel tested with drag coefficients equal to or better than the extremely thin HQ wing profile of the DG-600. The 800 series was designed to replace the popular DG-400 with a high performing 50:1 glide ratio. The DG-800 was designed to be an easy to fly sailplane that can be thermalled at slower speeds and still retain a low sink rate. 42 DG-800A's were produced followed by five DG-800B's with water cooled Mid-West 2-stroke engines. This was followed by 203 (800B/808B) with the water cooled SOLO 2625-01 2-stroke engine. It is important to remember that as of the Mid-West engine installation all DG-800B/808B have an in the fuselage engine installation where the muffler must attach and detach from the exhaust manifold during extraction or retraction. This type of engine installation was engineered by Utz Shicke. 56 of the pure sailplane version 800S have been produced for a total of 306 800 versions as of this writing. Next comes the relatively new 2-place DG-1000 designed by DG engineer Sven Lehner forty of which have been delivered. On February 3, 2004 the DG-1000T made its first flight. This is DG's first "Turbo" and is powered by a 28hp 2-stroke engine installed by Martin Wezel. There are other safety improvements that DG offers including the NOAH cockpit escape system. The double-shell safety cockpit in all DG aircraft. The Roger Hook emergency canopy release system. The Piggott Hook that prevents unintentional extension of air brakes. For the future Wilhelm mentioned several new developments and ideas. A new DG-808X8 with no details. A turbo version of the DG-800S and the need to locate a 80hp power plant for a self-launching DG-1000M!!



Yes, DG continues to move forward and much credit must be given to Karl Friedrich Weber (image left) and Gerhard Wolff co-owner who stepped out of nowhere in 1996 and saved DG during a serious financial crisis. Since then Herr Weber has built a new factory designed from the ground up to produce sailplanes. His vision of what a modern sailplane production facility should be is a fact today and as such the DG facility at Bruchsal is the first of its kind in Europe. As of this writing DG has produced 2,014 gliders, 675 of which were motorgliders.



Images counterclockwise starting above:

Aerial of the DG Factory just outside of Bruchsal Germany; Dirks prepares to fly a DG-400; DG-800B/808B; Dirks and the first DG-1000T; DG-100; Dirks and Glaser and an early DG-100.



## **New Base for the Cooperation between DG-Flugzeugbau and AMS-Flight**

For 25 years the two companies DG-Flugzeugbau and AMS-Flight have been cooperating successfully under the names Glaser-Dirks and ELAN-Flight.

Nevertheless it is from time to time necessary to reassess even such a long-lasting cooperation. Due to customer requirements for more flexibility and faster reaction we saw the need to amend our cooperation to manufacture and market of our airplanes more efficiently, while maintaining or even improving quality. With two cooperating companies in two different countries even modern communication techniques couldn't speed things up sufficiently as in the past.

Therefore we decided jointly to rearrange the focus of each company within our joint production program. This means in the future the two-seater DG-1000 will be manufactured exclusively at DG in Bruchsal. The manufacturing of minor subassemblies will continue at AMS-Flight. Two of our workers have already been trained on the fuselage production process by AMS, which will ensure a seamless transfer to Bruchsal. We expect that this change will shorten the overall production time and add flexibility to the delivery schedule. It also allows us to introduce minor and major improvements of the airplane more rapidly into the production.

AMS already produces the two-seater DG-505 in all variants, but will also become responsible for sales and marketing of this airplane in the future. Only sales for Germany will continue to be handled by DG. This is a similar arrangement as for the DG-303. Over 240 DG-500 airplanes have been produced and delivered by AMS without any significant complaint. The production quality of this airplane at AMS absolutely satisfies the quality standard of DG Flugzeugbau.

The motorized self-launching version DG-505MB is also built in Slovenia with a subsequent transfer to Bruchsal for the engine integration. As before, sales and marketing of this variant is handled exclusively by DG Flugzeugbau.

These changes ensure that our customers have to contact only a single manufacturer for all kinds of questions regarding a particular model, with the benefit of a faster response time even on difficult problems. Both DG and AMS-Flight are looking forward for the next 25 years of excellent cooperation.

K.F. Weber, President DG-Flugzeugbau

## ***PILOT PROFILE***



**John Sullivan**

John Sullivan's flying experiences include an airline transport pilot and flight instructor ratings in addition to a glider rating. He is a professional pilot and former owner of a flight school at Pontiac Airport Michigan. He is the owner of Aerial Associates Photography/Sky Pics. In the last 25 years, John has accumulated 14,200 hours of flight time (12,880 in power ships) and photographed over 20,000 sites throughout the United States and Canada. This includes air-to-air photography, large format architectural photography ball parks and recreation centers, real estate land development projects and more. John has also refined the camera system invented by Sid Coale, founder of Sky Pics which has proven to be the ultimate camera for aerial photography.

His first glider solo was in 1977 and he made his first self-launch in a Ventus CM in 1998. John has accumulated 1,320 hours in gliders 600 of which is in self-launchers. His log book contains flights in 15 different models of sailplanes and he currently flies a Ventus CXM self-launcher. John is an ASA director and serves as Secretary. He flies a powered sailplane for convenience and said his most memorable flight was 390 miles in Michigan last summer. John has been an ASA member since 1998.

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### **The ASA 500**

This award recognizes the motorglider pilot with the greatest number of "straight out" 500K flights in a year. Patterned after the Henry Combs Trophy, we hope the ASA 500 Award will encourage more people to participate in the special joys and adventure that straight out distance flying can provide. Experience new territory - escape the boredom of the local rut. No looking back - every mile flown is a mile closer to your goal (even if you don't know what it is). Meet new people at your landing place and amaze them with your stories. And if you fly back the next day, the adventure continues! Details on the ASA Web site under "Competitions & Camps".

## Kempton Izuno's 1,023.47sm Wave Flight in his ASH-26E

*Ed. Notes: This is an abstract of Kempton Izuno's Sierra Nevada Wave Flight on Thursday 25 March, 2004. His record claim (still in progress as of this writing) is for 1023.47 sm done in 8.6 hours for an average speed of 119 mph. Total flight time was 10.3 hours. The claim is for the US National MG Free 3TP record. The USA current record Kemp thinks is in the 700 sm range. Kempton's Route: Started over Minden, flew north to Frenchman's Lake, south to near Cinder Cone (Inyokern area), then back north to Doyle (near Herlong) and finally south to land at California City Airport. CONGRATULATIONS KEMP!*

Kempton's comments on the flight:

"The reason this type of flight was not done sooner are several:

1. This is higher risk flying (cold, sink, cloud coverage, ground handling, etc.) than thermal soaring, so to venture off requires more planning and preparation.
2. The opportunities to do so are fewer than thermal flying, so it takes longer to accumulate experience. As reference, this was only my 5th wave cross country flight ever and I only started doing this exactly 12 months before this flight.
3. Since the opportunities come only a few times a year, one needs to be able to recognize the forecast pattern as far out as possible. For me, that's around 7-10 days out to discern the possibility, then commit at 4-5 days out.
4. Then one must rearrange their life to free up the time. This is the most difficult part for most people and eliminates 99% of those who are interested. I look at Karl Striedieck, Wally Scott, Tom Knauff, Klaus Ohlmann, Hans-Werner Gross, etc. and they all had/have a flexible work schedule to take advantage of super weather. Therefore it is a much more difficult and longer path to gain experience, and hence confidence, in this type of soaring.

My preparations included:

- No solid food for 24 hours before launch
- At least 7 hours of sleep
- Cold weather clothing
- 12-15 hours of Oxygen on board
- On board catheter system that works
- Staying healthy prior to the flight by avoiding getting sick from the bugs my kids brought home from school!

The actual flight itself was straightforward once I found the Carson Valley wave. What made it much easier is that the moisture came in to allow lenticulars and rotor markers throughout the flight (except in the Inyokern area early in the day, but that was expected) and didn't become excessive until later in the day. Thus I basically went along at 90-110 knots indicated most of the time with only a short dalliance in the Topaz Valley in the morning. Comparing the altitude trace from this flight vs. last year's flight and I'd say last year the theme was "Stay close to 18K" whereas this year it was "Get Moving!" Climb rates exceeded 12 knots a number of times. I had expected that the Bishop to Lee Vining and the Topaz Valley to Minden sections would be the two most difficult transitions, but both were absolutely no problem as the lift was well marked. At Mammoth the clouds indicated that I needed to take a 60 degree right turn to stay in wave and sure enough it was there. This falls outside of conventional explanation, so I can only surmise that the wave works over a wider range of angles to the ridge line. There were no thermals used (or found) on this flight.

The most important part of executing this flight was the preparation and thought ahead of time, such that in-flight my job was: 1) Keep the nose down 2) Stay in front of the clouds. 3) Don't get trapped by clouds closing in."

*Kempton Izuno*





DG continued from page 1.....

The DG-400's horizontal and vertical tail surfaces were larger and the fuselage longer. For engine control and instrumentation, the Digital Engine Indicator (DEI) was designed by Utz Shicke. This extremely small and compact display is found in all powered sailplanes produced by DG. 290 DG-400s were produced.

In April of 1983 DG began production of a new standard class ship called the DG-300. A Club and Acro version were also produced. This popular ship is now produced with the designation of DG-303. 503 were produced at this writing. 1987 saw the beginning of production of the 2-place DG-500M designed by Tone Cerin of ELAN. A motorglider version was designed by DG engineer Sven Lehner with wing spans of 17.2 to 20 meters. 242 were produced, nineteen of which were designated DG-505MB and powered by a 63hp Solo 2625 watercooled engine. The others were powered by the liquid cooled 60hp Rotax 535.

Also in 1987 the DG600 and DG-600M began production. This ship was designed by DG engineer Alwin Guntert and had a completely new thin wing profile that had been wind tunnel tested. New profiles were used in the aft fuselage and vertical tail plane as well as the horizontal stabilizer. This ship was designed to race with 15 and 18 meter spans. Wilhelm conducted flight tests for flutter. In Gerhard Glaser's words dated December 1987 "Dear DG-customer, due to well known flutter problems with the new extremely thin (wing) profiles, we decided to exercise extreme flutter analysis to your and our safety and to avoid later flutter problems under any conditions for sure. Therefore we prepared the DG-600 prototype for the most sensitive configuration to stimulate flutter by removing most of the friction in the flapperon control system. Flight tests could not induce flutter at  $V_{ne}$  - 146kts (270.4km/h) so a decision was made to increase the test speed to above 300km/h. Wilhelm's flight test report as of 19 December, 1987 states he took a tow to 3,000 meters and began a dive increasing the airspeed in steps to 300 km/h (160kts).

In his words: "The flutter that occurred at about 300km/h was so heavy a piece of the left wing broke away and the glider turned in a steep circle which I could not stop with opposite control actions. For the first time the new emergency canopy jettison system could be tested. After opening the harness and pulling the red emergency lever, the canopy opened at the front by the spring but stayed on the fuselage by the g-forces. Without difficulties I pushed the canopy and it became blown away by the wind speed. Exit was easy due to the low cockpit walls and in the next moment I hang in my parachute (D Ring attached to fuselage). I am not sure if I would have been successful to open the parachute manually at this high speed. The glider was destroyed on impact." 114 DG-600s were produced, 54 of them with an engine. A fire later destroyed the 600's wing molds. DG story continues on page 3.....



DG-600M..Precursor to the DG-800 Series. Airfoil: Horstmann & Quast  
1st Flight November 11, 1989

## MOTORGLIDER COMPETITION RULES UPDATE

Q. Since Self-Launch by motorgliders will now be permitted in Regional and National contests does this affect the annual motorglider nationals?

A. We shall continue our national contest. This has been a fun meet and we shall continue to travel to new locations. Fredericksburg, TX in 2004.

Q. How are airstarts scored?

A. The use of an engine after launch is a landout. Rule 11.2.2.5 "Scored Landing Point" applies to all gliders. There may be rare cases when the pilot will claim a "Constructive Landout" (Rule 10.10.3)

Q. How will the seeding list handle motorglider pilots who enter regionals and nationals?

A. Seeding has not changed. Motorglider contestants are seeded just as any other pilot when competing in a class that permits motorgliders. Motorgliders can compete in all regional contests and in 18 Meter, Open and Sports Class Nationals.

Q. Can the CD of regionals or nationals deny self-launch of motorglider contestants and specify tow only?

A. Rule 10.6.3 "Self Launch" explains self-launch procedures. This rule is available for regional contests (or on waiver) in 2004. This provision must be approved by the contest organizers and CD. The contest organizers, CD and pilot must all agree that the self-launch can be done safely.

Q. Do you think this turn of events will cause more pilots to enter competition?

A. No, we have been able to compete in the same classes in previous years. There is just an option that will now permit self-launch.

Q. Any other comments you desire to make?

A. There are just a few rule changes that are now used in the Aux-powered Nationals. We fly by FAI National rules, but scoring includes handicaps (no handicaps for Open Class). Exceptions: (1) Team flying permitted (2) Foreign pilots are contestants (3) Previous contest flying or a gold distance badge flight are required (4) Airfield Landing bonus, not "landing out" is rewarded since we ALL have engines Any questions or comments.....Contact Rick Howell , e-mail:

[PatRickHOWELL2@earthlink.net](mailto:PatRickHOWELL2@earthlink.net)  
or 972-245-0830

**2003 ASA 500 Winners****TWISTER FIRST USA Rollout**

Date	Zone	Pilot	Glider	Call Sign	Kilometers and Route
9/13	Western	Mike Parker	ASH 26 E	IC3	591 Tucson, AZ to Dell City, TX
7/14	Western	Steve Dashew	DG 800B	CX	514 Tonopah, NV to Mt. Pleasant, UT
7/14	Western	Mike Parker	ASH 26 E	IC3	514 Tonopah, NV to Mt. Pleasant, UT
5/28	Western	Jim Ketcham	ASH 26 E	JK	1013 Llano, CA, to American Falls, ID

On April 10th, Pacific AeroSport (PAS) at Arlington, Washington, rolled out the first kit-built example of the Twister single-seat aircraft. The Twister, designed by Silence Aircraft of Verl, Germany, and built by DG Flugzeugbau of Bruchsal, Germany, is to be sold in the USA and Canada in fast-build kit form by Pacific AeroSport, LLC. It is equipped with a BRS 1050 ballistic parachute recovery system, attached to a cockpit "safety cell" using technology borrowed from the Formula 1 racing world. The Twister's Jabiru 2200 engine, coupled with electrically retractable landing gear, will provide a 146mph cruise, with a fuel burn of only 3 gph. The carbon fiber and fiberglass structure uses Nomex honeycomb cores for a light and stiff airframe. The wings and tail structure follows DG glider design practice, allowing quick and easy removal for storage in a Cobra trailer. The FAA is in the process of evaluating the Twister fast-build kit for inclusion on the "51%" list, meeting the criteria for Experimental-Amateur built kits. Owner of the first American kit, Mike Friend of Seattle said, "I can hardly wait to fly the airplane for the first time". Chris Klix, owner of PAS said, "The Twister is a sophisticated airplane, using state-of-the-art technology and design features to create a kit that anyone can quickly build into a real attention-getter". The first American kit was assembled in less than two weeks. It is expected to fly in the first week of June. The airplane will be at the 2004 EAA Arlington airshow and 2004 EAA Airventure in Oshkosh, Wisconsin. For more information, visit the Pacific AeroSport web site at [www.pacificaerosport.com](http://www.pacificaerosport.com), or contact: Chris Klix PAC Arlington, WA at (360) 474-9394  
<[Chris@PacificAeroSport.com](mailto:Chris@PacificAeroSport.com)>



Seven days after arriving at PAC the first kit Twister is assembled and sitting on its landing gear.

**Wingtip Vortices**

Since air always moves from high pressure toward low pressure, and the path of least resistance is toward the airplane's wingtips, there is a spanwise movement of air from the bottom of the wing outward from the fuselage around the wingtips. This flow of air results in "spillage" over the wingtips, thereby setting up a whirlpool of air called a "vortex". As the air curls upward around the wingtip it combines with the wing's down wash to form a fast spinning trailing vortex sometimes referred to as "Wake Turbulence". Whenever the wing is producing lift, induced drag occurs, and wingtip vortices are created. These twisters represent an energy loss and are strong enough to flip airplanes that blunder into them. The intensity or strength of the wingtip vortices is directly proportional to the weight of the airplane and inversely proportional to the wingspan and speed of the airplane. The heavier and slower the airplane, the greater the angle of attack and the stronger the wingtip vortices. Therefore, this type airplane will create wingtip vortices with maximum strength occurring during the takeoff, climb, and landing phases of flight. Helicopters also produce wake turbulence three times the diameter of the main rotor whether in hover or not. Sources: FAA Test. com and Air and Space Magazine

*Editor's Notes: To avoid these vortices, the self-launching sailplane pilot should delay launching or landing if power traffic has recently departed or has landed ahead and especially if self-launching from a runway that intersects the runway just used by a departing powered aircraft where there is a possibility the glider will pass through the wake of the departed aircraft. When departing it's a good idea to try to stay under the vortices and turn toward any crosswind component. If landing try to stay higher over the area where vortices are expected as they will tend to drift downwind and become lower to the ground. Calm wind conditions make for lingering vortices. Having experienced these vortices myself while flying a powered aircraft where full opposite controls and massive power application seemed to not help at all, it's a foregone conclusion that wake turbulence can ruin a glider pilot's day in a hurry.*

*Pete Williams*

#### ASA Mission

The Auxiliary-powered Sailplane Association, Inc. was founded in 1988 as a non-profit organization to encourage the design, development and safe use of motorgliders, self-launching and sustainer engine sailplanes.

#### ASA Membership

Membership in ASA is open to anyone interested in powered sailplanes. Write or call: Brian Utley, ASA Membership Chairman, 9541 Virginia Ave. South Bloomington, MN 55438 Pho: 952-941-5683  
E-Mail: <Utleyb@aol.com> USA Dues: \$20-1 yr, \$38-2 yrs, \$55-3 yrs.  
International Dues: \$25-1 yr, \$48-2 yrs, \$70-3 yrs.

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APS NEWS is published Jan/Feb; Mar/Apr; May/June;  
July/Aug; Sept/Oct; Nov/Dec

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PRINTED IN THE U.S.A.

*ASA is a Division of the  
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### FOR SALE//PIK-20E

1979 454hrs TTAF Rotax 501 Oxygen  
Factory Trailer, Parachute \$38,000  
303-790-1907 (CO)

### FOR SALE...PIK 20EIII

1985, 280hrs TTAF 60hrs engine Rotax  
505; all instruments parachute, oxygen,  
Factory PIK Trailer, transponder and more.  
\$37,500 Klaus 435-477-0158 (UT)  
klausbruno@accesswest.com

### FOR SALE Alisport SILENT-IN, #036, 2002

TTAF 35 hrs. TE 2.5 hrs, easy start FADEC engine, forward  
hinged canopy, steerable tail wheel, Microair radio,  
Cambridge 302, gooseneck IPAQ cradle, factory clamshell  
trailer. \$46,000. 727.784.5421 (FL) Email:  
[rogerb@tampabay.rr.com](mailto:rogerb@tampabay.rr.com) Roger Buchanan

### FOR SALE-DG-800B

2000 model .Like new with only 10 flights. NDH.  
All options. 310-337-1510 (CA)

### FOR SALE DG-800A

Low time: 80AF -10 Engine. 15/18M; Winglets, 02,  
Cobra trailer; 1-man rigging; Radio; Instruments incl  
GPS-Nav; Always hangared. Finish is perfect; NDH.  
Pho 330-864-9602 (OH)  
E: <N888DF@aol.com> \$98,000 Firm. Don Fair

### FOR SALE // GROB 109A

1983 TTAF 550, NDH, GPS/Com Ilec Variometer,  
Transponder, Turn Coordinator, Strobes  
\$45,000 602-770-9245 (AZ)



### FOR SALE..... Russia AC-5M

New Engine TTAF 47 TTE 5 /Trailer/ Microair  
B-40/ Colibri/ All Ground handling Equip/\$32,000  
Will Deliver. 972-723-1249 (TX) lbehbum@flash.net  
m-j-j-a s-o