

# THE POTENTIAL OF HOMEBUILDING FROM KITS IN WORLD SOARING

by Paul A. Schweizer, Elmira, New York, USA

Presented at the XXII OSTIV Congress, Uvalde, Texas, USA (1991)

## Introduction

Looking back over the gliding and soaring movement, since Lilienthal first flew his glider 100 years ago, it is apparent that homebuilding of gliders and sailplanes played a part in world gliding and soaring.

The early glider experimenters, such as: Lilienthal, Cayley, Montgomery, Chanute and the Wrights, were really "homebuilders" since they built their crafts in their home workshops. This was also true of the glider movement in Europe and the U.S. until the '30s when manufactured gliders and sailplanes became more available.

The homebuilt gliders of this early period were mainly

made from drawings, where the builder had to: round up all the material needed, make his own jigs and fixtures and then spend the time to build the complete glider or sailplane. In the U.S. the idea of a "kit" approach developed where all material was supplied—often some of the more difficult parts, together with drawings and instructions. This was first tried in 1929 by the Mead Co., when it sold kits for its Rhone Ranger primary glider. A "complete" kit cost \$85, or it could be bought in 6 units to spread out the costs.

In 1938 the Bowlus company developed its Baby Albatross, an intermediate sailplane, which was available at the start as a complete kit for \$385, and as a simplified kit for \$175. The Baby had good soaring

performance and so became very popular. Woody Brown broke the U.S. distance record with a flight of almost 300 miles in a Baby. Other kits available included the Briegleb BG-6 and BG-7.

### Popularity of Kits in the U.S. from 1955 to 1975

There was not much sailplane manufacturing immediately after World War II, for most European countries were recovering from the war, and in the U.S. the availability of surplus U.S. military training gliders, at very low prices, discouraged manufacturers from starting up. Schweizer Aircraft made kit versions of the 1-19 and 2-22 gliders but only sold a small quantity of them.

As production slowly started here, and abroad, the prices were relatively high and a need developed in the early '50s for lower priced intermediate sailplanes. To reduce the cost, U.S. manufacturers made their sailplanes in kit form.

The Briegleb Sailplane Corp offered the BG-12 single place high performance sailplane in various kit forms and a good number of these were completed. Stan Hall offered drawings for his Cherokee II intermediate all-wood sailplane that could be built with the tools that most everybody had at home.

Schweizer Aircraft Corp, unable to sell enough 1-23s at a price of about \$4,000 to permit it to continue production, decided to produce the 1-26, a lower priced inter-

mediate sailplane. They offered a complete sailplane for \$2,250 or a kit for \$1,499. It was an all metal design with some fabric covering. The kit (see Figure 1) supplied the most difficult parts and assemblies, all the material and a very complete manual.

Schreder started his line of HP kits which were very popular. Also produced during this period were kits by Backstrom, Laister, Marske, Maupin, Miller and others.

### What Was Learned from 20 years Experience in the U.S

The experience with home building during the 1955-1975 period varied greatly. A homebuilder that just takes on the project to save money is usually not successful, unless he likes to work with his hands, gets satisfaction from seeing his sailplane evolve from his own handiwork, and is not discouraged by the 500 to 1000 hours (or more) of work that it might take to complete. It is better for the person who does not meet these conditions to get a "moonlighting" job so he can earn the necessary funds to buy a used or new sailplane.

Building a sailplane from scratch to ones own design, is a task that requires engineering knowledge and a great amount of time and dedication. As a result, the number of such projects that are completed is very small. On the other hand, if qualified engineers and designers are involved, there is the opportunity to develop new designs and technology which would not be

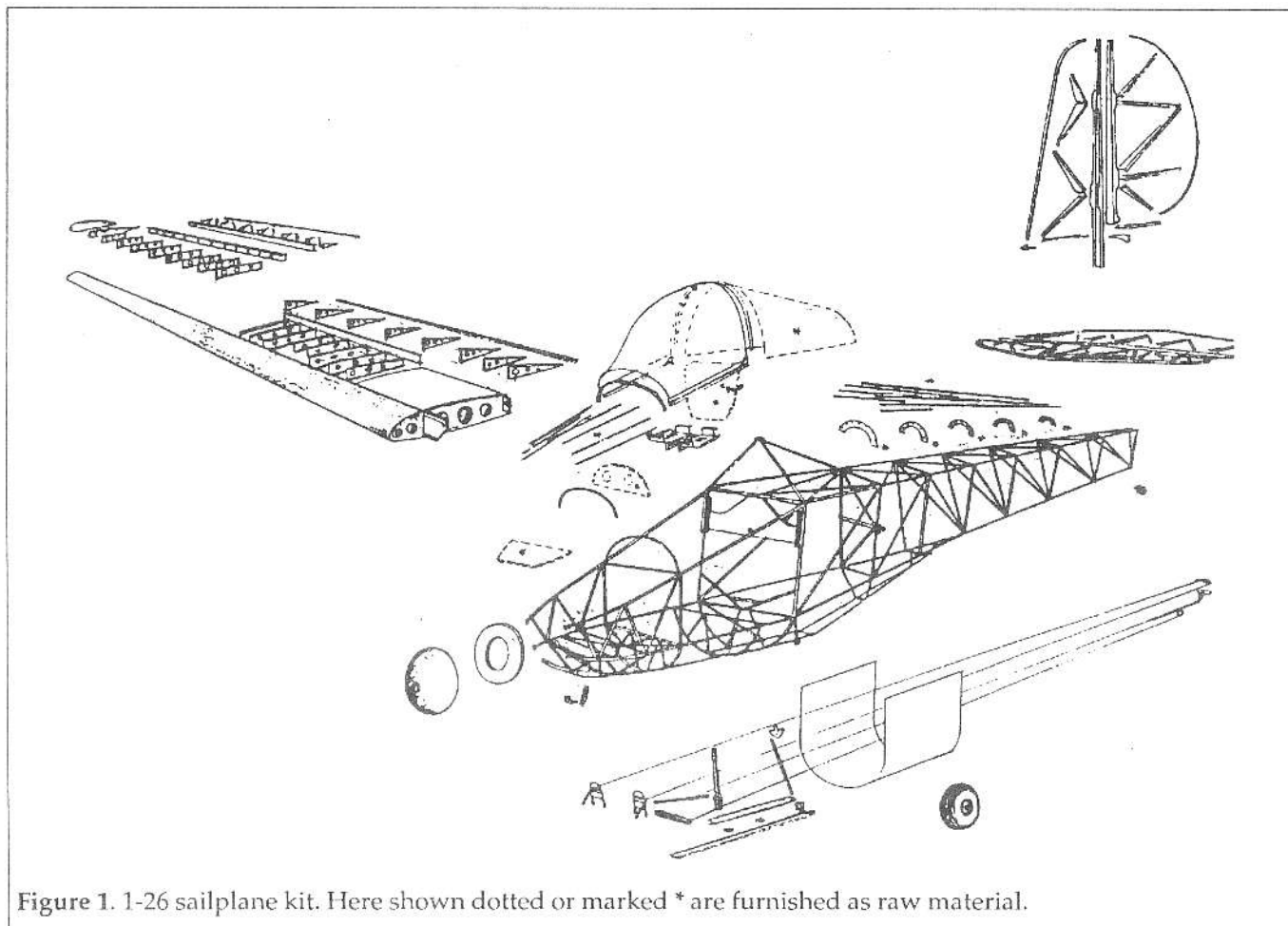


Figure 1. 1-26 sailplane kit. Here shown dotted or marked \* are furnished as raw material.

financially possible for a manufacturer. Groups such as the Akafleigs in Germany are ideal for such projects and have been active since the start of soaring.

Building from plans will take a lot of time including the problem of locating all the material, making the jigs, and building the complete sailplane and, as a result, many of this type never get finished. However, where a more complete kit is supplied, there is a much greater chance of success.

The number of sailplanes that were started from these three types of homebuilding projects during this period is large, but the number that were not completed is disappointing. Stan Hall says that on his Cherokee project, he sold 300 sets of plans and his estimate of the number that were completed was about 120.

Table I shows the number of gliders and sailplanes that were built from drawings or kits in the U.S. where there were 4 or more built. It is difficult to get this type of information since the FAA often lists the homebuilts under the name of the builder rather than the manufacturer. As a result, I have had to base some data on estimates of the designer/manufacturer or someone familiar with the project. It is evident that the percentage of completed units that were built from drawings is low. On the other hand, those built from kits have a much better completion record. The Bowlus Baby Albatross sales totaled 176 kits and about 76, or about 43%, were completed. This low percentage no doubt was due to the advent of World War II, soon after the kits were sold. Of the 204 1-26 kits sold all were completed except one which never was started. Schreder sold 453 kits for the various Airmate HP designs that he developed. He estimates that 228 of them were completed and 205 of them are still flying.

The philosophy behind the 1-26 kit had four features: (1) Be FAA approved; (2) Supply the most difficult assemblies; (3) Supply all the parts and materials; (4) Supply a complete manual, so that two people using their spare time could assemble one in a year.

This formula worked out well, since all the kits were completed but one. A factor that helps the completion percentage of this type of more complete kit, is that it costs more, and due to the buyer's larger investment in it, he is more apt to complete it, or sell it to someone that will. So the more complete a kit is, the greater the chances are that it will be completed. A happy balance would be required between the degree of completion and the price, in order for the kit to sell well.

### Growth of Homebuilt Airplanes From Kits

Paul Poberezny, a former military pilot, who started his flying in primary gliders in the early thirties, had an idea that the way to get more people into flying was to encourage homebuilding of airplanes. The Post WWII aviation boom was fading in the 1950s owing to the production airplanes being too expensive, and there being very limited choice of the types available. Poberezny felt that there was a need for a homebuilt aircraft movement in the U.S. and he organized the Experimental Aircraft Association. The movement caught on and started a very fast growth, by tying in

homebuilding with those interested in: Classic and antique aircraft, aerobatics, ultralights, and historic military aircraft. He established an annual EAA Convention, now generally known as "Oshkosh", that has become one of the world's top aviation events.

The homebuilding part of EAA, which is its basic activity, has steadily grown. Where the original homebuilt aircraft were simple and were usually built from drawings, many of the present homebuilt aircraft have become very sophisticated and many are available in kits in which the molded and more difficult parts are supplied. This simplifies the work that had to be done and reduced the time required to complete the aircraft, but the cost increases for this type of kit. Such kit assembly is done within the FAA requirement that the builder has to do at least 51% of the work on a homebuilt aircraft.

Poberezny, now Chairman of the Board of EAA which now has over 120,000 members, recently gave me the following figures on homebuilding activity.

There are approximately 14,000 registered homebuilt aircraft in the U.S., and this is being added to each year. In 1990 about 1,000 units were added, while the production of new personal airplanes that year by the U.S. aircraft industry totaled only 1,144. So it is quite possible that in a short time the number of homebuilts will exceed the number of manufactured airplanes produced. There are over 200 different types of aircraft available for homebuilding as kits of drawing and instruction, or kits which supply material, parts or some assemblies. Of the 200 kits, Poberezny says that 40 are very successful and reputable. He estimates that 75% of the units completed are built from these three types of kits while the balance are original designs.

The price of kits vary from under \$1,000 to over \$50,000. The simplest Glasair II, a 200 plus mph composite airplane sells for \$17,000, while the most complete version of the Glasair III sells for \$33,500, but without engine, propeller or instruments. The Kit Fox, a Cub look-a-like, costs from \$13,755 to \$18,255 including engine and propeller. Over 1,000 of these kits have been sold.

The big attraction of the homebuilts is that you have a much larger choice of airplanes and the cost is much lower than that of a completed airplane. There does not seem to be much concern about the lack of full FAA certification that you would have with a manufactured airplane, for the safety record has been fairly good. Most homebuilders wait to see that a design proves itself before buying.

### Homebuilding Around the World

The success of the EAA efforts in the U.S. has caused homebuilding to start growing around the world. Of the many EAA Chapters, 7 are located in Canada and 16 are located in other foreign countries. With aircraft prices increasing all over the world, homebuilding from kits offers an answer to the cost problem. It will also result in more options for the soaring enthusiasts as well as to increase the number of private owners in many countries where club-owned equipment is now the only type available. In some countries, homebuilding of airplanes

TABLE 1  
Number of Sailplane Kits Sold and Completed as of 7/29/91

<u>Type .</u>	<u># Of Drg Sold</u>	<u># Of Kits Sold</u>	<u>Est # units Completed</u>	<u>Estimated # Still Flying</u>
Bowlus Baby Alby	-	176	72	6
Backstrom Plank	50	-	16	1
Briegleb BG-6	62	67	45	4
BG-7	35	20	7	3
BG-12	-	261	60	77
BG-12/16	-	87	55	5
Duster	400	125	30	2
Hall Cherokee	300	-	100	12
Laister LP-49	-	46	22	15
Marske Pioneer	95	23	19	14
Maupin Woodstock	545	-	?	25
Maupin Windrose	225	-	10	7
Maupin Carbon Drg	110	-	3	2
Monnett Monerai	-	365	100	75
Miller Tern	140	-	?	36
Schreder HP-10	-	9	9	5
HP-11	-	78	45	31
HP-14	-	113	45	40
RS-15	-	47	35	34
HP-16	-	24	18	15
HP-18	-	180	84	80
Schweizer 1-19	-	12	12 (50)*	6
2-22	-	41	41 (238)*	25
1-26	-	204	203 (689)*	155
2-33	-	19	19 (575)*	14
Totals	1962	1897	1050	689

\* denotes total # of kits and completed sailplanes built.

and sailplanes from kits will create a new activity that has many benefits, particularly in countries where there is no aircraft industry, since it can bring experience in aircraft construction.

Unfortunately, there are few sailplane kits available at the present time. The ideal project with which to start popularizing homebuilding sailplanes is the World Class sailplane. It is doubtful that the cost goals for this sailplane can be achieved, but a kit version could substantially reduce the costs and hopefully make it possible to exceed these goals. So, adaptability as a kit should be an important factor in evaluating the World Class prototypes.

Kits would be very helpful in getting many more of these sailplanes around the world so that one-design class competition in these World Class sailplanes could begin at an earlier date.

### What the U.S. is Doing About Homebuilding

Homebuilding in the U.S tapered off in the 70's due to the availability of lower priced foreign sailplanes, and to the many used sailplanes that became available as an increasing number of pilots "moved up" to higher performance sailplanes.

A major factor in the great reduction of airplane and sailplane manufacturers in the U.S. is the very high cost of product liability insurance. Producing kits for homebuilders tends to lower the risk, and as a result, many kit manufacturers go without product liability insurance.

Efforts to renew interest in homebuilding sailplanes started again in 1979 when the SSA sponsored a National Homebuilders Workshop at Harris Hill and as a result, the Sailplane Homebuilders Association was formed in 1980. The SHA has yearly workshops in the East and West of the U.S. to encourage homebuilding and to review the progress in kits like the Monerai sailplane. At the present time, however, the number of sailplanes that are completed each year is very low. In order to counteract this the SHA has been holding design contests to encourage new designs that homebuilders could build. In 1991 the contest is for "a light, single place, unpowered sailplane suitable for car, winch and air tow, with emphasis on reduced cost, building time, and operating costs. Performance is to be comparable to a light 1-26."

It is hoped that this contest will result in prototypes being built of the top finishers and that, in time, kits will follow. There is also growing interest in the SHA, in seeing the World Class Sailplane being available in kit form. It is expected that these two contests will play an important part in reviving the growth of homebuilding in the U.S.

### Conclusions

It looks like the time for homebuilding and kits has come again which should be good news for soaring enthusiasts all over the world. Past experience has shown that the greatest potential is for new technology kits that simplify assembly and still keep the cost as low as possible.

There are a number of benefits to the soaring world that will result from promoting homebuilding and kits:

1. The most obvious benefit of homebuilding and kits, in this period of fast escalating cost of manufactured sailplanes, is the saving in cost to the purchaser, providing he is willing to take the time necessary to complete a sailplane from a kit.

2. If more homebuilt sailplanes become available, there will be many more choices of types and classes, compared to the little choice there is today of manufactured sailplanes.

3. Encouraging the design and construction of new types by qualified engineers and designers and "Akaflieg" groups, so that new designs and technologies are developed, as has happened with airplanes.

4. Having sailplane homebuilding organizations in more countries can be of benefit to the World soaring movements.

5. Homebuilding from Kits can enable the World Class Sailplane to get closer to its price goals, and should result in more being available so that international World Class competition can be held at an earlier date.

6. As increasing numbers of World Class sailplanes become available, soaring would be possible in the Olympics.

It will take years to get kit sailplanes available in quantity so it is hoped that many designers will start developing sailplanes that are adaptable to kit building.