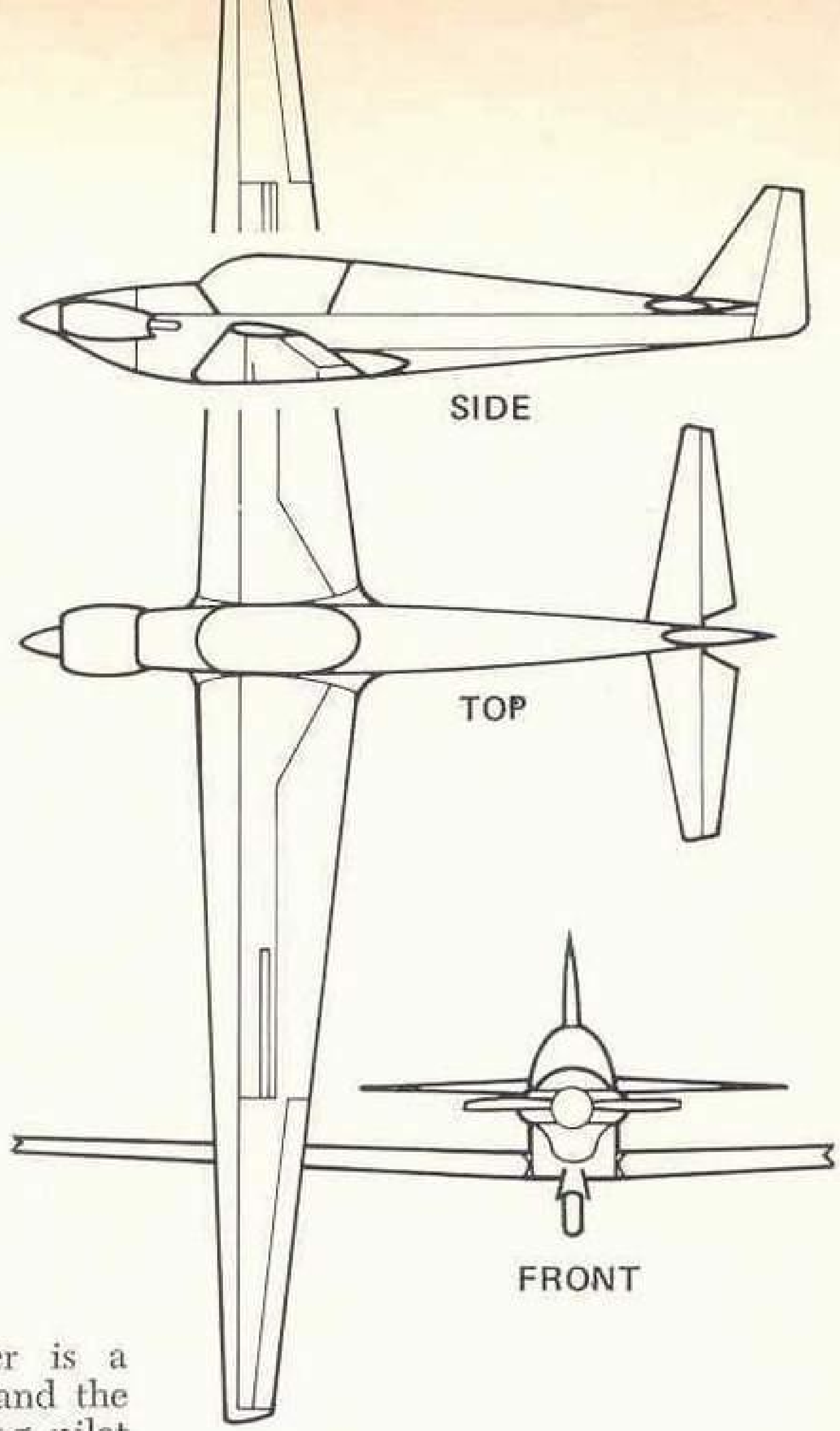
Chitty-chitty bang bang,
here come the motorgliders . . .

THE FOURNIER RF-4D



Phil Paul, the West Coast Fournier Dealer, discusses his product and the whole concept of auxiliary power.

Something relatively new on the aviation scene in this country is the auxiliary-powered sailplane—or *motorglider,* as it is known in Europe. The term suggests a glider that can be self-launched and then flown hither and yon without the usual logistical problems which are common to the sport of soaring. Once the motorglider has gotten itself airborne and an appropriate lift area has been found, the pilot simply shuts off his engine and soars on his merry way just as if he were in a true sailplane. If necessary, he can restart his engine to return home.

One might think that the motorglider is a relatively new idea, but the original credit must be given to the early Germans (and particularly to Wolf Hirth, who began experimenting with this type of aircraft as far back as 1924). Development in this field was stopped by the second world war. But by the time the first powered-glider meeting was held at Augsburg in 1959, eight different types were demonstrated. Each year more and more birds with motors have appeared on the scene. And while most of these new craft have come from Germany, mention should also be made of the successful Nelson Hummingbird series that was produced in the mid 1950's in California.

Because the motorglider is a composite of the airplane and the glider, it offers the sporting pilot three categories of performance. As a glider it can soar, as an airplane it can make cross-country hops, and some models can even be used for aerobatics.

While wearing its sailplane hat, the motorglider helps to overcome what to some people are the biggest objections to the sport of soaring. Normally, a soaring operation requires a crew of three to four people, ground support facilities, a tow vehicle, a towplane, and at least a half an hour of preparation before a flight can be made. The motorglider on the other hand is operated by one or two people and without all the extra equipment. It is ready to go at any moment's notice . . . during the week . . . in the evening . . . even though the rest of the crew is not available. And the owner of such a ship can fly when the weather is poor—when thermals are weak and there is no sun.

At times, soaring conditions may exist miles away from a pilot's home field. With auxiliary power, a glider pilot can fly to distant cumulus streets or wave-cloud formations that he normally would not consider attainable. And he can extensively investigate his local terrain for unsuspected sources of lift. In short, he has extra opportunities to *educate* himself, as well as to enjoy himself.

After finding lift strong enough to keep his flight alive without the use of power, the pilot normally kills his engine and soars like any other sailplane; however, he can—if he chooses—simulate any degree of performance he wants just by using small amounts of power. Thus, at one throttle setting, he becomes, say, a Ka.6; while at another setting, he may turn into a BS-1 or an AS-W 12.

On cross-country flights, he may pass the weak lift regions with his engine running if necessary, so that the risk of an off-field landing—or *any* landing away from home—is eliminated. As a consequence, the pilot is spared the trouble of derigging, waiting for the trailer, driving endless tiring miles home, and buying drinks for the crew.

Soaring in ridge lift and wave is simple and most exciting. (Motorgliders have already soared to 35,000 feet in the French Alps without benefit of their "cheaters.") And one need not undergo the acrobatic maneuvers sometimes necessary when passing through a wave's

Photo by PAUL CROWELL

rotor behind a towplane being buffeted every which way by the turbulence.

In other words, you have all the normal soaring possibilities *plus* the option not to land when you don't want to. The end result is a higher level of safety, more flying hours, increased exposure to workable soaring conditions, and better utilization of the aircraft.

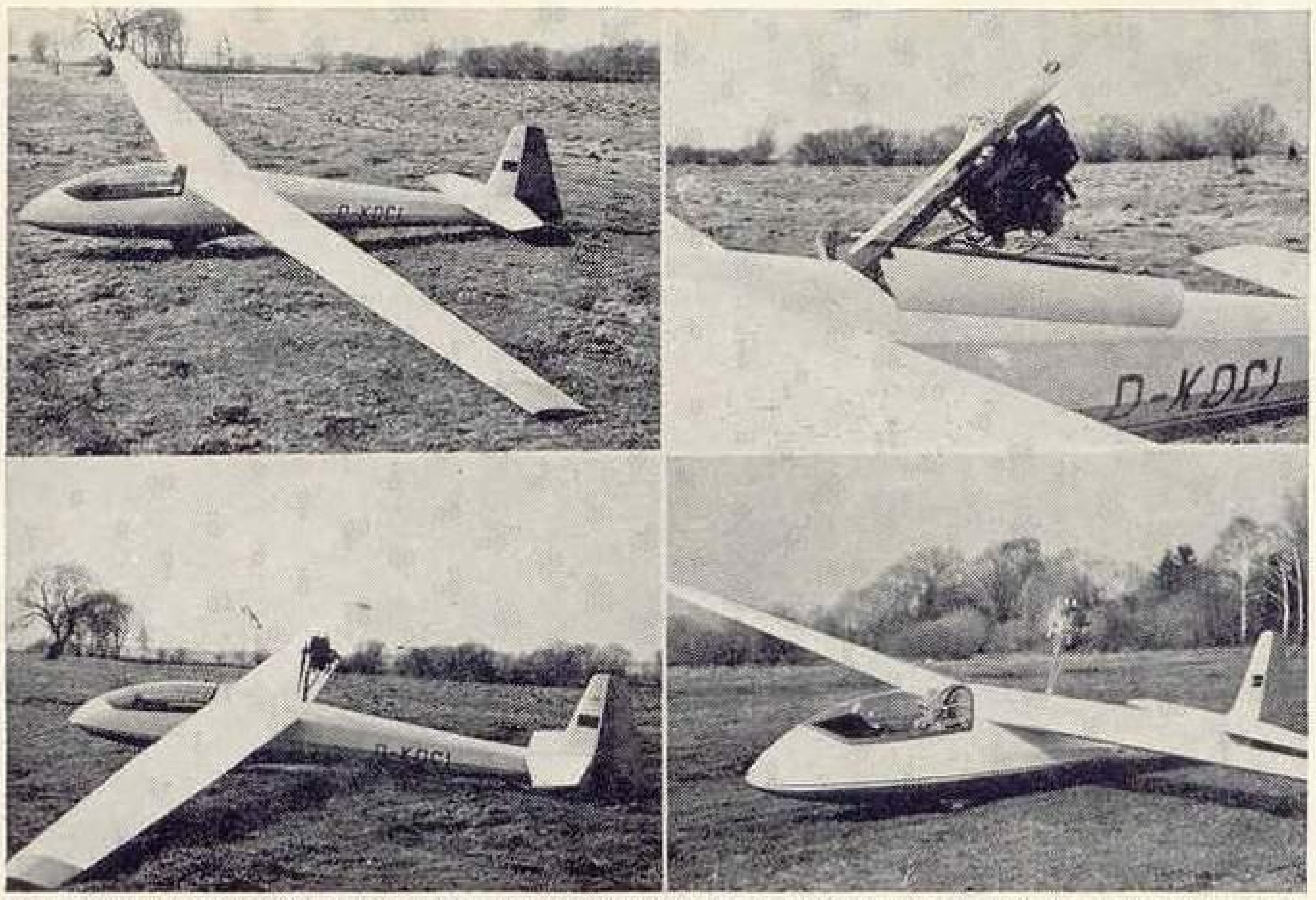
Compared with the typical light aircraft, the powered glider used as a cross-country machine affords higher aerodynamic performance; therefore, it requires a smaller powerplant, which makes it more economical. Cross-country speeds of over 100 mph and fuel consumption in the vicinity of a gallon per hour are not uncommon. The engine is simple. There are no complicated hydraulic, pneumatic, or electrical systems. The result is a low rate of trouble, a high rate of reliability, and a machine whose maintenance can be handled by club members who are qualified for glider maintenance. And while engines fail infrequently these days, if a pilot should happen to experience a forced-landing situation, clearly he could hope for nothing better than to be in a ship with the handling qualities and landing characteristics of a glider!

In the aerobatic category, the motorglider performs quite well. Because of its high aerodynamic efficiency, it is able to conserve potential energy, which is an important consideration in the performance of modern-day aerobatic maneuvers. When careful consideration is given to the design of the control systems, a motorglider can be made to render very respectable aerobatic performance—even power-off, if one wishes. Structural performance criteria for both the gliding and aerobatic categories are similar, so motorgliders are structurally capable of aerobatic flight. This gives an added peace of mind when flying either a sailplane or a motorglider in turbulence.

Presently six different motorgliders are in series production, all in West Germany. Many more one-of-a-kind designs have been built as home projects or as prototypes. In accordance with the design philosophy of each builder, there is wide variation in the style and configuration of the various motorgliders.

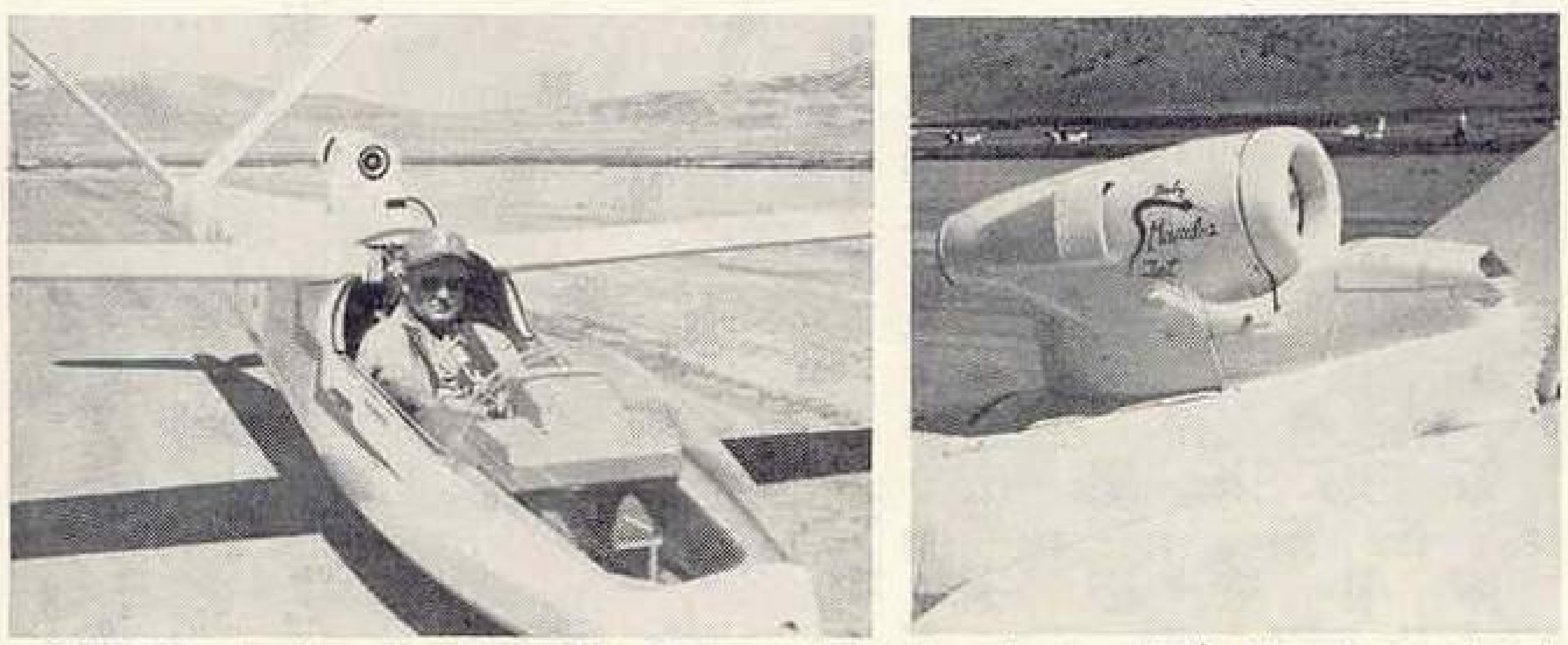
Some designers envision a pure sailplane form, in some cases a modified version of a well-known model. These ships have small auxiliary powerplants of from 10 to 25 hp; some of the engines are just large enough to sustain flight and do not provide take-off capability. The motors are usually mounted on a pylon somewhere near the sailplane's center of gravity, and some can be retracted into the fuselage to reduce drag during power-off operations. This allows a high-wing configuration, as is the case with most honest-to-goodness sailplanes. The most typical example of this type of motorglider would be the Scheibe SF-27M, which is self-launching, offers Ka.6ish performance, and is indistinguishable in flight from the unpowered SF-27 due to its retractable engine. The other outstanding *soaring* performer in this field is the Schleicher AS-K 14, which has the same 2-stroke, 4-cylinder engine and similar performance to the Scheibe but which has a low wing with its power up front in the nose (complete with a full-feathering prop). Delivery of both ships to the U.S. is expected to commence shortly.

The opposite end of the motorglider spectrum closely approaches



The Scheibe SF-27M. The editor of SOARING Magazine has placed an order for one, and we hope eventually to present a detailed in-depth analysis of the practical realities of owning and flying an auxiliary-powered sailplane.

With the Schleicher AS-K 14, it's what's up front that counts. The July, 1967, SOARING carried a report on this ship back when it was still called the Ka.12.



In 1963, Max Dreher designed this 17-lb. turbojet (maximum static thrust, sea level: 55 lbs.) and then mounted it on his Prue 215.

The new two-place Scheibe SF-25B has a 45-hp Stamo 1400-cc engine that uses Volkswagen and Porsche parts.

the characteristics and performance of small airplanes, while still affording some soaring ability. More substantial engines are used (between 30 and 50 hp), and they are almost always mounted in the nose. These ships offer more of the comforts of light aircraft, such as roomy cabins, adequate climb performance, and fairly good cross-country capability. Examples in this category include the Fournier RF-3 and RF-4 (L/D 20, minimum sink 3.9 fps), the two-place Scheibe SF-25B "Falke" (L/D 20, minimum sink 3.1 to 3.3 fps—depending on whether a passenger is carried), and possibly the motorized version of the Fauvel flying wing.

In the middle of the spectrum would be the Motor Blanik and the 42-hp Nelson Hummingbird (L/D 25, minimum sink 3 fps). The prospects for better and more economical training in these—and other—multiplace motorgliders is quite intriguing.

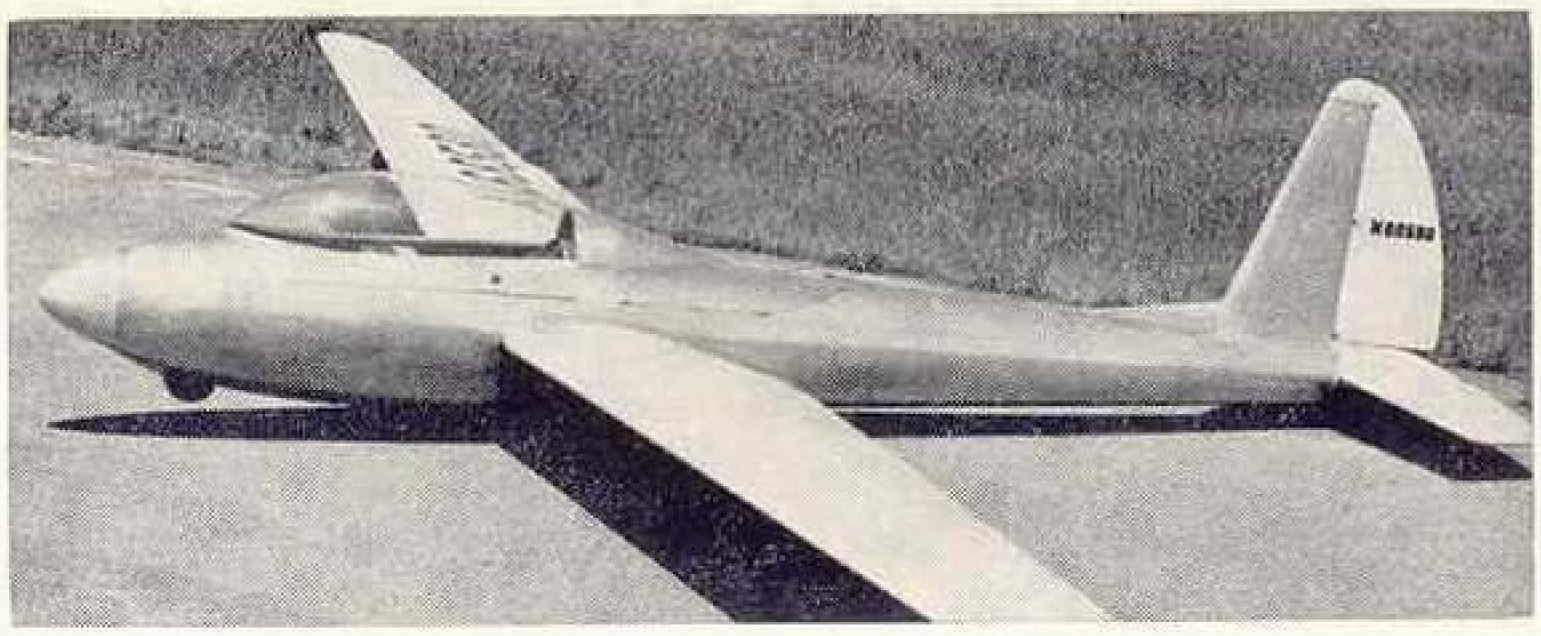
An important consideration for engine-in-the-nose motorgliders is that they have a landing gear which allows adequate clearance between the prop and the ground. The gear usually consists of a single main wheel (often retractable) and a tail wheel. The tail wheel should be steerable, and outriggers may be required on the wings for lateral control while taxying on the ground. "Front-engined" ships are necessarily low-wingers.

High-wing motorgliders by contrast may require an additional crew member or outsized outriggers to assist taxying. While a low wing is preferred from the standpoint of ground handling, a high wing may offer better visibility in flight and greater protection to the wing during off-airport landings (which, of course, motorgliders can decline to partake of).

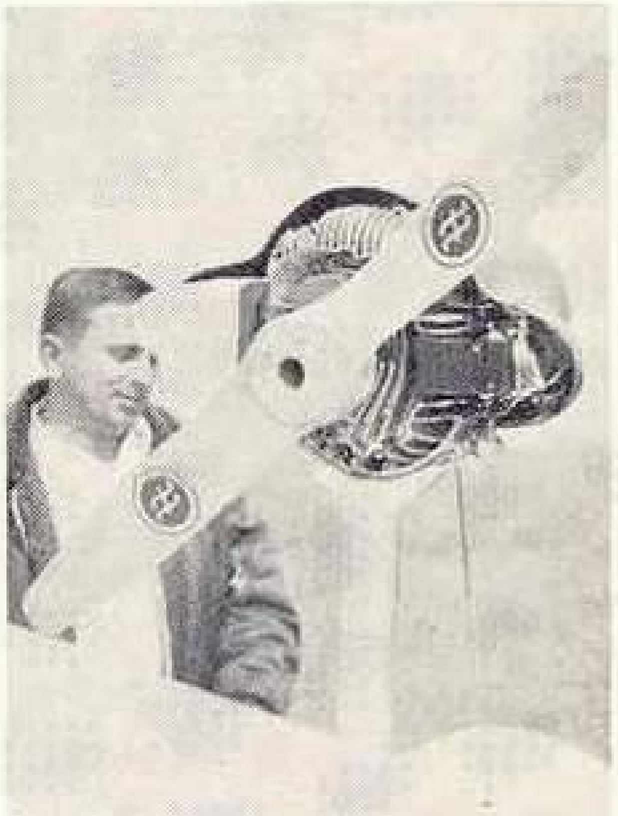
The total number of series-produced motorgliders to date exceeds 200. This number is rapidly increasing due to the growing interest in this new aspect of the sport. About 160 units of the total represent the Fournier RF-3 and RF-4 series, which has become quite popular in Europe. In order to become more familiar with these aircraft, consider a short history and description of the Fournier RF series:

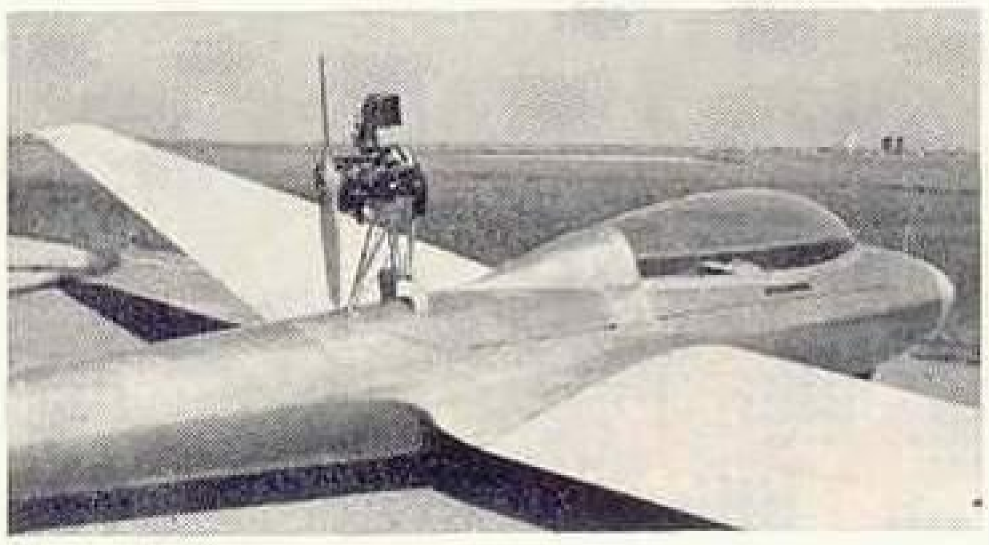
Once upon a time in France, where the official attitude toward home-built and experimental air-

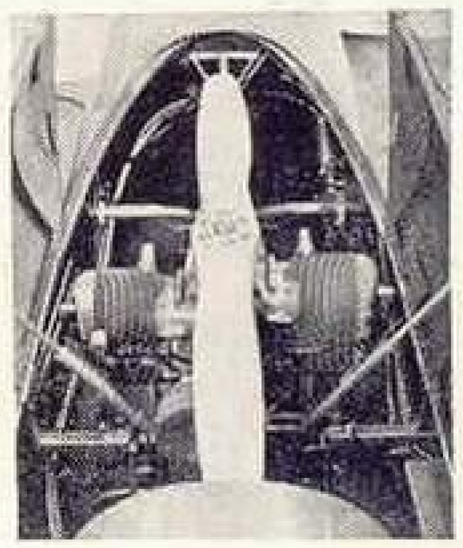
Right: The two-place Nelson Hummingbird was developed back in 1953, and seven ships were produced, five of which were still flying in 1967.



Below: A German firm, Fichtel & Sachs, is experimenting with the Wankel rotary combustion engine for sailplanes. Here a 10-hp unit weighing 18.74 lbs. has been mounted on a Ka.8. Photos from Hubert Zuerl







craft is very liberal, a certain Mr. Fournier wanted to have a nice small plane just for his own fun. He designed and constructed the RF-1 around a 1200-cc Volkswagen powerplant. A friend liked Fournier's plane so much that the two of them built the RF-2. Both little ships were seen in all of France, and soon everybody came to know and admire them—even the French government.

And so, with a little financial support from the government, it was decided that Mr. Fournier's plane should go into production. In 1962, Fournier improved the design further, and the RF-3 was born. Serial production of the RF-3 began at the little Jodel factory of Alpavia at Gap in the shadow of the French Alps. Orders increased, and production before long was up to four planes per month. The French market could be supplied, but soon pilots from other European countries found out about the RF-3, and production at the small Alpavia factory became insufficient to meet the demand. Having just finished Type Approval of the RF-4, the Alpavia management joined forces with the well-known German factory, Putzer Flugzeugbau, to found the Sportavia-Putzer Company.

With economic assistance from the German government, a brand-new factory was built at the sport airport, Dahlemer Binz, in the beautiful Eifel Mountains southwest of Bonn. It is significant that this facility was created expressly for production of the RF series, which is now being exported to ten countries around the world.

Construction-wise, the RF-4 is typically European (wood and fabric) with the exception that everything is covered with fiberglass and finished with epoxy paint. The finish is really very well carried out, and the epoxy looks like it should be impervious to all sorts of weather. The engine cowl and most of the fairings are of fiberglass construction.

The cockpit is very roomy, even for six-footers, and I found it no less comfortable than a Cessna 150 on a long cross-country flight. A baggage compartment behind the pilot's seat holds up to 22 lbs. The standard instrument panel consists of an airspeed indicator, altimeter, compass, variometer, bank indicator, tachometer, and gauges for the oil temperature and pressure. A "gear-up" warning light, buzzer, and stall warning are electrically operated from a battery. The gear light and buzzer come on when the throttle is retarded below a certain setting—also when the spoilers are pulled. So it is almost impossible to land the ship with the gear up, but if you do, special skids under the belly prevent damage to all but the prop ($125). If you break a prop, like we did at Merced, California (no, it wasn't a gear-up landing), all you have to do is tie a rope around the prop stub and tow the thing home.

The landing gear, itself, consists of a single mainwheel that retracts fully into a wheel well. Retraction is manual, rapid, and simple. Little effort is required as the assembly is counterbalanced. (A retractable ski is available as an option for snowy conditions.) Under each wing is an arc of steel wire carrying a small, nylon wheel which insures lateral balance on the ground. A steerable tail wheel is coupled with the rudder to give taxying control.

The Rectimo motor is basically a 1200-cc Volkswagen engine using a special Zenith carburetor and a Bendix-Scintilla magneto to give 40 hp. A mechanical self-starter is used both on the ground and for restarts in the air. The cruising speed is listed as 112 mph, with a range of 400 miles and a better-than-Beetle economy of 55 miles per gallon of fuel. I recently flew my RF-4 from Denver to Lancaster, California. During the 1050-mile, 10-hour flight, I averaged a ground speed of 96 mph (105 true airspeed) and burned 2.5 gph ($11). Incidentally, two of the three airports that I stopped at have field elevations of 7000 feet, but the take-off run in the RF-4 was not noticeably lengthened because of the altitude.

Take-off and landing in the ship are very glider-like. It must be allowed to fly itself off the ground when it is ready. Any horsing off only results in a premature return to terra firma plus numerous embarrassing oscillations. The shock cords in the landing-gear system ensure plenty of bounceability, and one must therefore fly with a certain amount of finesse. Sitting close to the runway (with the accompanying illusion of extra speed), the take-off run seems to be quite lengthy. But things are not as bad as they seem. We have made comparison tests of the fully grossed RF-4 with a fully grossed Cessna 150 (at sea level), and we are pleased to report that the RF-4 takes off in half the distance, climbs twice as fast, and reaches twice the altitude.

Once in the air, the RF-4's character becomes immediately evident. A turn to downwind, and you are only 200 feet from the centerline of the runway. The airport manager has complained about tight patterns, but that's the way the RF-4 wants to fly. It's a very maneuverable ship (two seconds from 45-degree bank one way to 45-degree bank the other), and the only other aircraft that comes close by comparison is the Swift. So it's like driving a Porsche among the Chevies and Fords—you have to use a lot of restraint.

One day we picked a fight with a friendly Citabria. There was nothing the Citabria could do to get away from us but climb. We stayed right on its tail through all sorts of unusual maneuvers. To be specific, the RF-4 performs very nice loops, rolls, Cuban-8's, Immelmanns, split-S's, and so on. The fuel system is gravity fed, so this poses some difficulties as far as power-on inverted flight is concerned. Hammerheads can also be accomplished, but the speed must be just right as the rudder power is somewhat limited for this maneuver. The engine runs very well through all this, even though one tends to get carried away, and the revs often soar several hundred beyond the 3600-rpm redline. And it sounds just like a midget racer.

When soaring the RF-4, the pilot positions the prop to the horizontal by using the hand starter. A speed of 60 to 65 mph seems to give minimum sink, and we have found that we can stay with 2-22's, 2-33's, 1-26's, and even a Minimoa (at 60 to 70 mph, the Minimoa's L/D is nearly the same as the RF-4's).

By way of conclusion, it should be mentioned that motorgliders have found wide acceptance in Europe, so much so that a separate class was planned for them at this year's German Nationals. It is fairly safe to say that in the USA the motorglider will be received not without a certain amount of prejudice and skepticism in some quarters. Such is the case with the introduction of any new idea or concept. The purists will argue that the motorglider takes all the sport out of soaring, and indeed—depending on your definition of "sport"—they may have a good point. But perhaps motorgliding is not exactly the same thing as conventional soaring and must not be judged by the same old standards. One thing is for darned sure, the purists (or whoever) will hardly be able to wait their turn to fly when they first lay their eyes on a motorglider the likes of the RF-4, the AS-K 14, or the SF-27M.

FOURNIER RF-4D

SPECIFICATIONS

Engine	Volkswagen-Rectimo 4 AR/1200cc, 40 hp
Wingspan	37.04 ft.
Length	19 ft. 8 in.
Wing area	121.5 ft.
Wing loading	7.10 lb./sq. ft.
Empty weight	600 lbs.
Useful load	260 lbs.
Maximum gross weight	860 lbs.
Aerobatic weight	815 lbs.
Power loading	21.4 lb./hp
Fuel capacity	10 gals.
Oil capacity	0.6 gals.

PERFORMANCE

Take-off distance	426 ft.
Take-off distance over 50 ft.	885 ft.
Rate of climb	690 fpm
Service ceiling	19,685 ft.
Maximum cruise	112 mph
Range	415 mi.
Stall speed	44 mph
Sinking speed, engine off	3.9 ft./sec.
Gliding ratio	20:1
Landing distance	330 ft.
Landing distance from 50 ft.	755 ft.

The Hummingbird's Hummer Hums On

Charles Rhoades of Irwin, Penn., has taken over the Nelson Aircraft Corporation, which owns the rights to the 68-lb., 48-hp, 2-stroke Nelson engine that was designed and built for the Hummingbird. Rhoades is saving the present, limited stock of Nelson engines for powered gliders and other worthwhile projects, and he is hopeful of seeing the engine manufactured in Europe so that it can eventually be made available in quantity at an economical price. In the meantime, he has commissioned Slingsby Aircraft to mount one of his motors on a T-49 Capstan, and is also interested in a Nelson-powered version of the T-53.

The Capstan now has more than 15 hours of test flying by the well-known Derek Piggott. Piggott says that the take-off in still air takes about 160 yards on a paved runway. The rate of climb is about 300 to 350 feet per minute at gross weight. The stalling speed has been raised by one or two knots, but otherwise Derek has difficulty detecting any difference that the addition of the engine has made to the general handling of the ship, either power "on" or "off."

A motorized Capstan would be primarily useful as a new and better form of trainer, and in weak conditions it would probably be flown with the engine on at all times (once they can get some exhaust mufflers—the pipes are only above five feet from the pilot's ear). To remove the engine and have a normal glider again is only about a half an hour's work.