the long run. Weight is roughly equal using any three of these different structural materials. Welded steel is generally used for highly stressed fittings.

The cockpits of modern soaring craft are completely enclosed, not only to promote flying comfort at high altitudes and through storms, but to effect materially greater efficiency in streamlining. Means for emergency exit with parachute receives careful attention. Ventilation at low altitude is important due to the hot house effect these enclosed cabins produce.

One of the mechanical features meriting considerable attention is the ease of assembly. It is customary to keep the sailplane loaded on a trailer when not in use, both for economical transportation to and from the soaring site, and to save hangar rental. Thus, both wings must be removed, tail surfaces either dismantled or folded, and the sailplane securely lashed on its trailer in a minimum of time. More than ten minutes should not elapse from the time the last landing is made and the sailplane is loaded on its trailer for the trip home. Recent designs can do it in half that time.

The trailer is generally used to retrieve the sailplane and pilot after some long flight across country. A simple two wheel framework of rugged construction suffices, though care must be taken in stowage fittings to insure that the loaded sailplane cannot chafe itself to pieces going over rough roads. A covering to protect the sailplane from road dirt and loose stones is quite desirable, also. Since the retrieving trailer may make several thousand miles per year, it must receive more than merely casual consideration. (During the 1939 National Contest, the author's trailer traveled 8,000 miles to, from, and during the meet.)

Unless the sailplane is so designed that it assembles in an automatic and foolproof fashion without necessity for safety wires, cotter pins, etc., a careful and well rehearsed inspection system is mandatory prior to flight. To assemble and fly without this intermediate precautionary measure is but to invite swift disaster.

It is self-evident that each landing a sailplane makes must be a "dead stick" landing and first judgment must be accurate and final. Were the sailplane's gliding angle as steep as the airplanes, this would be relatively simple with a little practice. However, when one flies a craft whose normal gliding angle is 30:1, it does not require much thought to deduce that an approach over even a normal obstacle would require a tremendous distance before landing would eventually be made. The usual precision landing techniques are ineffective due to the great wing span, making rapid, violent turns, "fishtails," and slide slips only partially effective, and entirely too hazardous. To effect a steepening of the glide path without any attendant increase in speed, the use of small spoilers which break up the wing's lift have proven most effective. These are small plates, located on the wing's upper surface a few feet from the fuselage, and controlled by a lever in the cockpit. Upon approaching a small field, the pilot uses this control as he would a throttle, approaching with the spoilers partially opened, settling toward whatever obstruction he must clear. If he sees he is undershooting his mark, he closes the spoilers. As soon as he has definitely assured himself he is making his objective, he uses more and more spoiler, and in this manner can land with ease and safety in fields which are absurdly small for other forms of aircraft. No sailplane can be considered safe or complete not equipped with this or some equally effective glide path control device.

Interconnected with the spoilers in all new German designs is a diving brake, which extends below the wing and permits even vertical dives without the danger of attaining too high a speed. For the person whose piloting skill does not insure his safety inside clouds, this is a very valuable device, since by using it he can insure himself against excessive and dangerous speed. It is likewise valuable as a means of losing altitude on soaring days when conditions make it difficult for a soaring plane to normally descend.

The instrument board of no sailplane is complete without a reliable air speed meter, rate of climb indicator, altimeter, and turn and bank indicator. Their use is indispensable to successful mastery of soaring technique, and should be augmented by the addition of a compass and barograph for any official flights for distance or altitude. Space does not permit of any lengthy discussion of the refined techniques to be employed when soaring on instruments, but suffice it to say that only by their intelligent use and interpretation can distaster be averted once a vigorous cloud has been entered.

Landing gear usually consists of some form of belly skid behind which there is located a small pneumatic wheel. The wooden skid is generally of ash and mounted to the fuselage by shock absorbers made of tennis balls, rubber, or springs. Its length permits safe landings to be made even on rough terrain, while the ground friction assists the braking action following landing.

The landing wheel, if used, should be located behind the center of gravity, and on the center line of ship. Though it might appear awkward to handle, the single wheel landing gear is quite easy to balance on the ground. A brake is customarily employed to shorten the landing run, and is quite advantageous in small fields.

The omission of a wheel from the skid arrangement requires excessive power to effect take-off, to avoid which the owners of skid equipped sailplanes sometimes make up little two wheeled cradles which drop away from the sailplane once it has been launched. This has a rather makeshift air about it, however, and is not recommended.

The mere mechanics of gliding is quite simple yet not widely understood. A wing obtains lift as a result of its forward motion through the air. To offset drag, power is required, in the airplane from its engine, in a glider from the descent of its weight back to earth. As long as the power developed by its descent equals the force of its air drag, the forward slanting motion will continue until it comes to rest again on the ground. *A GLIDER OR SAILPLANE ALWAYS DESCENDS RELATIVE TO THE AIR SUPPORTING IT.*

If the drag is very small, as it is in highly streamlined gliders, or sailplanes, then the distance covered for a given rate of descent is large, or the rate of descent for a given forward speed is small. Now, if the air through which the glider is flying rises faster than the glider descends, then the glider will increase its elevation relative to the earth, even though IT CONTINUES TO DESCEND RELATIVE TO THE SUPPORTING AIR. An analogy would be the dropping of a feather in an elevator. If in an upward bound elevator, one releases a feather at the tenth floor, and it strikes the elevator floor at the level of the twelfth floor, then, like a sailplane, it will have descended upward to a higher elevation.