

# The Role of the Motor Glider for Gliding Training

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## a) The Motor Glider as an Instructional Machine

The original idea behind the development of the two seater motor glider was to be able to extend the flight in non-soarable conditions and to allow the glider to use soaring conditions which would otherwise have been out of reach. However, although many instructors and most student pilots consider the average winch launch to 400 metres gives insufficient time for efficient instruction, 5-8 minute flights are close to the optimum in terms of flying time for progress made.

Over a short flight like this a much higher intensity of instruction can be maintained. It can be shown that there is a law of diminishing returns, i.e. the longer the flight the lower the rate of instruction per minute. Because of the nature of the problem of forming the habit of using the stick and rudder together, intensive practice in turning one way and the other is usually more effective than either continuous circling or the occasional turn between periods of straight flight. Later in the training when the student is concerned with the circuit planning, long flights are quite unnecessary. The lack of noise during gliding flight plays a very large part in allowing high intensity instruction. (Because of the noise it is practically impossible to instruct as we do in gliders in either a normal light aircraft or a motor glider while it is climbing under full power.)

If longer duration flights are required it may be more economic to do them from aerotow launch than with a motor glider even if the conditions are not soarable. However, this is not practical unless high aerotows are possible. When a low cloud base prevents high tows the motor glider is much more efficient and economic.

If the instructor on a glider allows the student to make his own judgements and decisions without interference, it is inevitable that the glider will require ground handling back some distance before the next launch. This is very time consuming. (If training two seaters repeatedly land accurately at the launch point, it is a sure sign that the instructor is not allowing the student to do both the planning and the flying without assistance!)

The real advantage of the motor glider arises from its ability to taxi unaided, to launch itself and make touch and go landings.

At the circuit planning stage of the training, individual flights are of negligible value. Groups of three winch launches are a great improvement since the student can learn by trial and error and can compare the flights, so refining his judgement. Groups of five or more winch circuits would result in even more rapid progress but is seldom practical in club flying.

The motor glider offers up to six worthwhile circuit flights in a thirty minute lesson and has the advantage that when the instructor needs more time or just one more circuit to repeat something, it is a simple matter to extend the session by five or ten minutes. Exercises which involve landing in the middle of the airfield, such as cable break practice, and running out of height on the circuit, involve a great deal of ground handling time with a normal glider. The motor glider is particularly useful for these exercises which are often neglected in glider training. In short, the motor glider offers the instructor greater flexibility with the option of having high or low launches and long or short flights as required. It totally eliminates ground handling time and improves both the circuit planning and the landing instruction by increasing the amount which can be done in a given time.

In the role of an advanced trainer, the motor glider is ideal for teaching cross country navigation, selection of fields and making field landings. Advanced training of this kind can be carried out in non-soarable conditions and without the need for road retrieving.

## b) The Advantages of the Motor Glider in Terms of Club Operations

Each individual club has its own very special problems so it is impossible to generalise. At Lasham, the major problem is that the launching and landing areas are somewhat restricted. Using both car launching (18-24 launches per hour maximum) and aerotowing (3 tow planes-18 launches per hour) congestion between launches and landing gliders limits the operations in non-soaring conditions. When launch-

ing capacity is restricted in this way, any increase in training launches must decrease the launches available for solo machines. Additional gliders do not increase the launches achieved but merely congest the launch point.

The motor glider offers great advantages if all the basic training is done before converting onto the gliders. By saving two seater glider launches, large numbers of launches are available for an expansion of solo flying. Then air experience 'joy ride' flights and the very large number of initial training flights made by pupils who subsequently give up gliding use only motor glider flying time. An analysis at Lasham one year showed that almost half the two seater launches made were with passengers and students who gave up before reaching solo standard.

## Youth Training Schemes

Gliding is an attractive means of introducing young people to aviation but is not ideal when it is necessary to fly large numbers in a short time. On most gliding sites there is a definite limit to the number of gliders which can be operated efficiently and the cost of non-soaring glider flights is relatively high. Motor gliders can provide up to twice the utilisation of a glider on winch or aerotow when the flights are of less than 15 minutes duration. It is an easy matter to increase the productivity by increasing the number of machines in use. The mobility of the motor glider enables large scale operations to be continued without congestion and at relatively low cost. A further attraction for youth flying is the ability for the motor glider to fit in well with other aircraft at any airfield and to operate from a small airstrip. This makes it a possibility to take the motor gliders to any suitable airfield instead of requiring that the pupils travel long distances to the gliding site.

A basic training on a machine such as the Falke is a sound basis for further training on either gliders or light aircraft.

## Special Techniques of Instruction used at Lasham

One of the most important advantages of the side by side seating arrangement is that the student can see at a glance how much of the flying is being done by the instructor. In addition the instructor has a far better view and can see how relaxed or nervous the student is during the flights. Many of the errors in co-ordination and general handling of the controls are extremely difficult to detect except by actually observing the movements of the controls. For example, the failure of the student to reduce the amount of rudder after the bank has been established in a turn, or to make

the small backward pressure necessary to prevent the nose from dropping, are both almost undetectable when the bank is applied gradually and a gently banked turn is being made. Both are essential habits causing serious problems when the bank is applied more rapidly or if a slightly steeper turn is made, as on a final turn onto the approach.

In learning to co-ordinate well, it is the habits which must be watched because once formed they are very difficult to correct. They are more important than the smoothness and accuracy of the turns in the early stages.

Side by side seating makes it very easy for both the instructor and student to observe control movements. In cases of difficulty, visual observation of the movements is usually more effective than merely feeling the instructor's control movements in a demonstration of turns. (Pupils do not have much sense of feel or movement with their feet.)

In the early stages the student in a tandem machine has no way of telling which control pressures are due to feed back from the control surfaces and which are due to the instructor interfering and making corrections. This is particularly serious in machines where the rudder loads are not progressive or reverse when the glider is allowed to slip or skid (K7, Bocian, Berg Falke 2, K13).

If the student is seated in the right hand seat for the first few flights including the early landing instruction, the instructor can demonstrate by placing his right hand over the student's hand on the stick. In this way every movement can be felt by the student and the feel is not masked. This technique is particularly useful on early landings. After several demonstrations, the instructor can allow the student to attempt landings and can assist or take over by reaching over to the student's stick as on the demonstrations. The student is then fully aware of how much of the landing he has made without assistance. At this stage the instructor has his left hand on the airbrake lever and he uses them without reference to the student. Once the landings require no help and no change in airbrake setting to correct serious ballooning, the student is ready to start using the airbrakes himself. At this stage at Lasham it is normal to change seats into the left hand seat so that the student has the airbrake lever which is easier to reach.

### **Stalling and Spinning**

Stalling and spinning exercises are given towards the end of the basic Falke training and are repeated at the glider stage. Advantage can be taken of drizzle or rain which transform the gentle stall of the Falke into a somewhat un-

predictable and sudden stall seldom found in gliders. This is particularly useful practice for more advanced solo glider pilots.

In dry conditions the wing can be induced to drop more readily by leaving the elevator trim forward and by using 12–1400 r.p.m. A sharp wing drop occurs from almost straight flight if the stall is approached very slowly while applying a small amount of rudder.

### **Cable Break Practice**

Simulated winch launch cable breaks can be practiced by pulling up into the normal winch launch angle with excess speed. The student follows the instructor on the controls and takes over when the instructor cuts the throttle completely to simulate the cable break. The heights and positions of the cable break are varied on each attempt to give the student practice at making the decisions and carrying them out. After touch down, the power is reapplied whenever space allows for a safe climb away ahead.

A series of 5 or 6 cable break practices takes 20–30 minutes. This in no way replaces the need to practice in the glider on actual launches but it gives the student extra experience and practice at this much neglected exercise.

### **Aerotow Rope Breaks**

Without prior training a rope break on an early solo aerotow puts the student in a frightening situation and there is a high probability of an accident.

The exercise used at Lasham is designed to increase the confidence of the student by demonstrating that, in the vast majority of cases, he will be in easy gliding reach of the gliding site for a downwind landing. A thorough briefing on rope breaks and wave offs is given before the flight. The instructor simulates the rope break by closing the throttle. Ideally the climb is made below a two seater glider on aerotow and the Falke is flown at 60 knots to provide a similar excess of speed to the glider. The instruction suggests a turn of 90° after the rope break so that the situation can be assessed. If the field is within reach a demonstration downwind landing is made. Otherwise a field has to be selected for a landing out. Practice is also given at dealing with the 'wave off' situation – emphasising the need to check the airbrakes are not open (a common cause of trouble). In this case the speed is usually low (because of the drag of the airbrakes or because of engine trouble) any immediate turn is dangerous and a field landing must be made.

The rest of the 20–25 minute flights is an inspection of possible landing places on each of the take off directions. This is desirable because students on early aerotows are unable to

look at fields and keep station safely and accurately.

### **Special Approach Exercises**

The motor glider offers advantages by being able to repeat similar approaches in quick succession. For example, the position and execution of the final turn is critical for spot landings.

The effect of a gentle final turn on the position and height of the final approach can be compared with a steeper turn and a turn in which the nose is allowed to drop. Each approach can be made using the same ground feature for the base leg so that the effect of these variations is obvious. If traffic permits all three approaches can be made in a few minutes by only climbing to about 500 feet (150 metres).

The technique of adjusting the approach with the airbrakes in order to descend towards a given point (known as aiming point technique) can be very easily and quickly demonstrated and practiced.

During the circuit planning training it is easy and quick to practice the detection and action in event of the glider running short of height on the circuit and also rejoining the circuit from unusual directions and positions such as often occur during early solo soaring attempts.

The final session at Lasham consists of a series of situations where the student is left to make all the decisions including a choice of landing area if it is not possible to reach the normal glider launch point.

Throughout all this training the instructor controls the engine and the power is never used to avoid the need, for example, to turn in early because of slight shortage of height. The motor glider is treated by all gliders and tow planes as just another glider regardless of whether the propeller is stopped or turning. Small amounts of power are sometimes used throughout the complete circuit in order to simulate a glider of better performance. In this case the additional power is cut when the student begins to open the airbrakes for the approach.

### **Instructor Training**

The motor glider plays an important role in England for instructor training. Exercises can be practiced more efficiently than in a glider and the majority of the BGA instructor's courses consist of Falke flying.

Of particular value is the teaching of action by the instructor to correct bad landings and ballooning and to instruct while doing so. This is a difficult and time consuming exercise on a glider.

### **Advanced Training**

The motor glider offers interesting possibilities for advanced cross country training. Ideally the student wears ear

muffs or a headset so that he is less aware of small changes in power settings.

The instructor uses the throttle as a means of boosting the thermal strength once the student has found a thermal and is circling in it. Between thermals the rate of descent is adjusted by the throttle to approximate the performance of the glider being depicted so that the student flies comparable speeds as indicated by his speed to fly ring on the variometer. In this way, the rates of climb are artificially boosted so that higher cruising speeds are needed. This leads to the student working under higher pressure than normal. Thermals must be found and centered quickly, map reading, speed control, dolphin techniques, final glides and all the other vital aspects of high speed flying can be practiced on a good soaring day. The higher work load under training results makes normal glider cross country flying relatively easy. As far as the student is concerned he merely responds to the indications of climb and sink on the variometer and flies from cloud to cloud as on a normal glider flight. If he fails to locate lift the exercise ends in a field landing practice and an early return to base.

#### **Disadvantages of Motor Glider Training**

The major disadvantage is that the students are not fully occupied while they are not flying. This is serious with Youth schemes and may encourage the non co-operative, lazy type of student who would otherwise drop out at an early stage on the glider.

On balance, most gliding clubs need more wealthy members and to some extent gliding clubs may have to accept that there are many potentially good pilots who cannot spare the time to be devoted, every weekend, full time club members.

At Lasham, the students soon learn to help once they get to the glider stage and we have no real regrets about adopting motor glider training.

At some sites, the general feeling is anti motor gliders. This is often due to instructors using the power to correct planning errors or avoid situations which they would have had to deal with in a glider. The students find it difficult to accept the training as valid unless the machine remains a glider until after each touch down. A few biased instructors (usually those unable to instruct on the motor glider) can undermine the student's acceptance of the training. It seems a mistake to mix glider and motor glider training in the early stages because of the handling differences. In the same way it is better to train all through on one type of glider rather than have the confusion of several types with different characteristics.

#### **Requirements for a Motor Glider for Training**

1. Good all round view and glider handling. Control loads and response, airbrakes and flying speeds as close as possible to the training two seater glider in use. Effective elevator trimmer and little or no changes of trim with power, nose up or yaw. (Eliminated by engine offset and down thrust.)
2. Adequate take off from rough grass. Good rate of climb. The climb rate of present machines should be doubled. This reduces problems from noise and would give better safety margins in turbulence and sinking air. Climbing time is almost non-instructional.
3. Glide performance. The Falke is just adequate for local soaring and training purposes. Better gliding angles can always be simulated with power so that pure gliding performance, although desirable, is not essential for training.
4. Landing characteristics  
The present tail wheel layout of the Falkes and K16 is ideal for training. Good shock absorption and adequate propeller clearance is essential.

#### **5. Cockpit noise level**

For instructional purposes additional sound proofing seems desirable. Instructors suffer serious fatigue after 4-5 hours of training flights.

#### **6. Seating arrangement**

Side by side seating is superior for basic training. Tandem is probably better for advanced training and Tandem is definitely better for early solo flying on the motor glider.

#### **7. Structure**

Simplicity and ruggedness are essential to achieve a high utilisation with low servicing costs.

#### **8. Power**

The engine must be tolerant to long periods of idling, rapid cooling and have easy and reliable starting. The present V.W. conversions are excellent.

#### **Conclusions**

Is motor glider training quicker in terms of hours to solo?

There does not seem to be a significant advantage although there are fewer students requiring very large numbers of launches, i.e. it seems easier to overcome problems on the motor glider. In terms of instructional value, the motor glider is clearly more effective than all aerotow training because of the increase in the number of approaches and landings carried out. Landing the Falke satisfactorily requires a high standard of piloting which must result in better landing technique on the glider.

On balance, the student benefits most by the much more thorough training possible because of the ease of practising cable breaks and other time consuming exercises. Personally, I believe a good motor glider is a far better training machine than either a glider or a normal light aircraft.

I hope these notes may be interesting and useful to instructors and clubs who are using motor gliders for training.