GNZ INSTRUCTORS' MANUAL

Part 3

INSTRUCTING IN SELF-LAUNCHING POWERED GLIDERS

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Introduction

The most important thing to remember about instructing in self-launching powered gliders is that we are training glider pilots, not power pilots. This may seem obvious, but is often forgotten in the enthusiasm of having an engine to play with. Many self-launching powered gliders, especially two-seaters, are rather poor compromises between adequate performance as gliders and adequate performers as self-launchers. Furthermore they are often complex and awkward to operate, and place demands on an instructor which may not have been encountered before. Also, some two-seaters are not fully dual controlled, eg Janus CM. The main points of difference, together with some operational recommendations, are discussed in this document.

Self-launching powered glider syllabus

The GNZ Manual of Approved Procedures (MOAP) Appendix 2-D details the self-launching powered glider knowledge requirements, and contains the syllabus and check sheets. This is supported by GNZ AC 2-14, which provides sufficient material to prepare pilots for examination.

Instructor qualifications

A person may instruct on powered gliders in accordance with the following conditions:

1. Holds a valid instructor rating
2. Is trained and endorsed to act as pilot in command on the relevant powered glider.

Pre-takeoff checks

In order to emphasise that the powered glider is primarily a glider with a self-launching facility, the standard GNZ pre-takeoff check CB SIFT CBE must be adhered to. However, the following items must be checked by the instructor prior to takeoff, but should not be stressed to the student unless the flight is part of a self-launching powered glider endorsement for that student:

T – Throttle Friction set

M – Mixture rich, choke off

P – Propeller fully fine

F – Fuel contents adequate, fuel cock on

I – Instrument—engine indications checked

Ground handling and taxiing

Ground handling

The ground handling characteristics of self-launching powered gliders depend more than anything else on their undercarriage design.

Machines with conventional glider undercarriages (central mainwheel plus tailwheel) will have either wingtip wheels or mid-span outriggers on stalks. High performance single-seaters with retractable engines usually have wingtip wheels and these machines are ground handled and parked just like conventional gliders. Two-seaters, and a few low performance single seaters, having conventional glider undercarriages, have mid-span outriggers and need more care in their ground handling.

The outriggers are usually made of springy nylon and are prone to breakage, especially when the aircraft is pushed backwards on rough ground. It is essential that one person on the handling crew holds the wings level to keep the outriggers clear of the ground. The outriggers must be regarded as absent when the aircraft is pushed backwards.

Some two-seaters have aeroplane type undercarriages, ie two mainwheels and a tailwheel. These are ground handled and parked just like a light aeroplanes.

Taxiing

Of the self-launching powered gliders with conventional glider type undercarriages, most production models have steerable tailwheels which are connected to the rudder pedals. This may not be the case with homebuilt designs or conversions of production gliders.

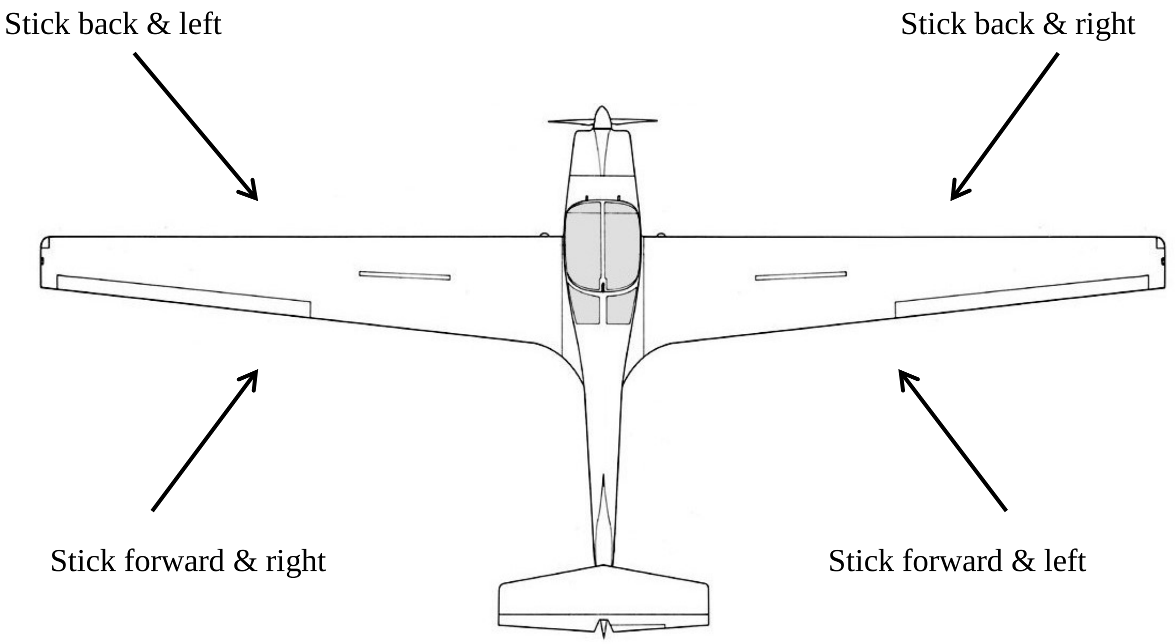
Generally speaking, even those powered gliders with steerable tailwheels tend to be awkward and ponderous on the ground and they all have rather large turning circles. Keep this in mind when taxiing in confined areas or near other aircraft. Increased power may be necessary to improve rudder effectiveness, especially down wind or cross wind. Flaps where fitted should be set to full negative to improve ground clearance.

When clear of obstacles, powered gliders should be taxied at a speed sufficient to keep the outriggers clear of the ground. This may or may not be possible, depending on the wind.

Wheel brakes vary in effectiveness and method of operation. Know your type and be sure to keep within its operating limitations.

Powered gliders with aeroplane type undercarriages are taxied in the same way as a tail-dragger light aircraft, ie by a combination of steerable tailwheel and differential mainwheel braking. This usually gives better manoeuvrability than the outrigger/wingtip wheel types, especially in tight spots.

For all types, the control positions for taxiing should be in accordance with the following diagram. Arrows denote wind direction.



Whenever the control column is forward during taxiing, exercise extreme caution with use of wheel brake/s.

Takeoff and climb

Generally speaking, the engines fitted to two-seat self-launching powered gliders have power outputs ranging from 30 to 65 kw (about 40 to 90 HP). Despite this rather modest power output, most aircraft swing quite badly to one side on the takeoff run when full power is applied. The direction of the swing depends on the direction of rotation of the engine—engines that rotate clockwise (when viewed from behind) will swing to the left under power, and the converse is true of engines which rotate anti-clockwise. Many two-seat self-launching powered gliders have Volkswagen derived engines, which rotate anti-clockwise when seen from the cockpit and will therefore cause the aircraft to swing to the right, demanding left rudder to keep straight during the takeoff run. (Rotax engines generally rotate the other way.)

The reason for the swing is a combination of slipstream effect and asymmetric blade effect. It has little, if anything, to do with torque, which is negligible on such small engines. Slipstream effect results from the spiral prop wash striking the fin on one side and causing a swing. On VW engines it strikes the RH side of the fin, causing the nose to swing to the right. It is present to some extent at all attitudes and speeds, but is most marked at low speeds.

Asymmetrical blade effect is most marked on aircraft of taildragger layout such as self-launching powered gliders, and is caused by the thrust line being inclined at an angle to the relative airflow. This results in the downgoing blade having a higher angle of attack than the upcoming blade, and the net result is that the thrust line becomes offset to one side of the crankshaft. Again using the VW example, the thrust line is offset to the left, causing a RH swing. Asymmetric blade effect is present in the tail-down attitude, for example at the start of the takeoff run and during a climb. It is absent in straight out level flight and this is a valid reason for raising the tail of a powered glider early in the takeoff run, other things being equal (eg crosswinds) and with due regard for the limited prop clearance on some types.

All this means that a self-launching powered glider demands an application of rudder when flown under power, and this will be alien to any pilot who is used to pure gliders. To make matters worse, many two-seaters are marginal on power and demand that the slip/skid ball is centred during the climb in order to make it go up at all. It is therefore not possible to ignore the often considerable rudder pressure needed in these machines, and this makes them somewhat tiring to fly. It also gives them a very unbalanced feel in the climb, particularly as the rudder is already much heavier than a pure glider because of the springs and linkages to the steerable tailwheel. Further adding to the fatigue factor is the very high engine-on noise level in most powered gliders, and a day of instructing can leave one hoarse!

Cylinder head temperatures and oil temperatures must be watched carefully during the climb, when power setting is high and airspeed is low. Generally speaking it is a mistake to reduce the throttle setting during the climb, as doing so may take the power-jet (if fitted) out of operation. The power-jet provides an excess of fuel at full throttle and this excess is essential for cylinder cooling. Climb speeds must be kept as high as practicable, to maximise under-cowling pressure and ensure that cooling air reaches behind the rear cylinders.

To complete the picture on powered glider takeoff, it is NEVER justifiable to use less than the complete takeoff run available. The rate of climb of the aircraft when out of ground effect is generally not good, especially in summer, and the whole runway must be used if the pilot is to avoid creating a very large non-manoeuvring area. And NEVER takeoff with wet wings.

During the climb the view ahead may be restricted by the engine or the high climbing nose attitude. Instructors must ensure that the aircraft heading is changed regularly during a climb to ensure elimination of all blind spots. Because of the poor climb performance of some two-seat powered gliders, the climb-out pattern must be planned to ensure that the aircraft remains within reach of landable areas during the climb. As a guide, do not take a powered glider anywhere you would not be happy to go on aerotow.

Takeoff emergencies

Aborted takeoff

Takeoffs may be aborted for a number of reasons:

1. **Failure to become airborne by a predicted separation point.** This emphasises the need for instructors to know the takeoff performance of the aircraft, and the effect on that performance of factors like long grass, soft ground, wet wings, upslope, downwind component or ambient temperature.
2. **Complete or partial failure of the engine on the ground run.** Complete failure on the takeoff run leaves the pilot with no alternative but to abort. Partial engine failure leaves the pilot with a decision to make—to continue or to abort. On the assumption that the aircraft will not have achieved its predicted separation point (otherwise it would be airborne), the throttle should be closed and the takeoff aborted. There is no case for continuing the takeoff run with an ailing engine in the hope that the aircraft will become airborne before the boundary fence.
3. **Loss of control on ground run**. For whatever reason (long grass catching in outriggers, excessive crosswind, mishandling), loss of control on the ground run demands an aborted takeoff. Even if the aircraft does eventually leave the ground in apparent safety it can quite easily be so far off line that it may collide with obstacles well outside the normal takeoff path. Better to abort the takeoff than tempt fate.

Engine failure during climb out

Engine failures can occur for a number of reasons; mechanical failure, fuel starvation or fuel exhaustion are the most common. For whatever the reason, if the failure is complete the aircraft is in a situation similar to a glider on aerotow which experiences a rope break or failure of the tow-plane engine. The comparison is not completely apt because the self-launching powered glider pilot will have the opportunity to choose exactly the takeoff flight path most appropriate to the conditions, whereas on aerotow the glider pilot is at the mercy of the tow pilot. In any case, the action following complete engine failure is very nearly the same as for a glider suffering a rope break or tow-plane failure, with the obvious exception that it is not necessary to pull the release.

The first priority is to set the speed at the ‘safe speed near the ground’ (stall speed plus 10 kt plus half the wind strength) then choose further action to be taken in accordance with the height and position of the aircraft in relation to the takeoff strip. Remember that powered gliders with retractable engines have poor glide angles (typically less than 1:20) with the engine extended but stopped.

Partial engine failures are more subtle. Without detailing all the possibilities, the pilot must decide whether to rely on any small amount of power that may be left following a partial failure, whether to try to rectify the problem (it may, for example, be carburettor ice), or whether to shut the engine down completely and carry out a safe landing as a glider. In circumstances of partial engine failure, it is most important to give priority to keeping the aircraft under full control, and not be distracted by trying to coax a recalcitrant engine into life.

Engine shut-down procedures

It is very poor practice to shut down an engine straight from its full-power climb setting. In fact in the case of most VW-derived engines it will not be possible to do so—the engine will be so hot that it may just keep running even after it is switched off. If this happens the engine is trying to tell you something. The message is that a proper cooling down procedure must be followed before switching the engine off. This procedure must be known for each powered glider type and must be strictly observed in the interests of satisfactory operation and reasonable engine life.

When the engine is stopped, the propeller should be set in the position recommended in the Flight Manual (usually horizontal in front-engined types) and feathered if applicable. The propeller brake may be needed to stop the propeller in some cases, but before using it, check that the IAS is not too high. Cowl flaps should be closed.

In-flight performance and characteristics

Engine off

Self-launching powered gliders with the engine and prop stopped have sink rates and glide angles considerably worse than their closest equivalent pure gliders. The sink rate suffers because of the extra weight of the engine and its associated electrical and fuel systems, as well as the fuel itself. The glider performance suffers because of the increased cross-sectional area of the engine installation, the propeller and the more complex undercarriage necessary to provide propeller clearance on the ground. Propeller drag may be minimised by feathering (mechanically twisting the prop blades to align the airflow).

Whatever the glider performance, the fact remains that a self-launching powered glider generally has a higher sink rate than a pure glider, and in the case of trainers this can often be significant degradation. This is not surprising in view of the fact that the dead weight being carried by the aircraft easily amounts to that equivalent to an extra person.

Remember that the pace at which an instructor needs to work is in inverse proportion to the performance of the glider. Many self-launching powered gliders used for training have very poor performance engine-off and this can cause significant workload problems.

Propeller wind-milling

This is defined as the engine being switched off but no effort being made to stop the propeller. The propeller is driven against the engine compressions by the passing airflow and the drag is enormous—about 2 to 3 times that of a stopped (non-feathering) propeller. Furthermore, even a small increase in speed incurs a disproportionate increase in drag. Avoid this situation at all costs—ensure the propeller is stopped, using the brake if fitted. If no prop brake is fitted, slow the powered glider down, right to the stall speed if necessary, and that will usually stop the propeller.

Engine running at various power settings

In this situation a self-launching powered glider behaves more or less like a light aircraft, although this is only strictly true at the higher power-on settings. Between idle and, say, 60% power, the throttle may be set to simulate glide angles ranging from the aircraft's basic glide angle to the much flatter glide angles of high performance gliders. This is a useful asset when carrying out exercises like cross country navigation training.

Re-starting the engine in-flight

There are two cases to consider here; the normal start, using the particular starting system fitted to the type, and the dive start, which is used when the battery is flat or there is some other problem with the starting system.

The Normal start

Self-launching powered gliders are seldom critical as to the airspeed needed for restart. To start, simply ensure fuel is on (and there is some in the tank!), place magneto switch to 'On' and start, using the particular method recommended in the aircraft Flight Manual. Note that full power cannot be applied immediately, and if the engine is cold it will have to be progressively warmed up prior to applying full power.

A self-launching powered glider engine must never be relied on as a 'save' from an outlanding. The reasons are:

1. the engine might not start, or
2. the necessary warm up time precludes the use of full power in sufficient time to be of any use.

Any imminent outlanding should be planned as for a normal glider so that if the engine does not start as anticipated the landing can be carried out without problems. If it does start, it's a bonus and you can fly home.

This is an extremely important point, and it is worth stressing again—NEVER RELY ON THE ENGINE TO SAVE YOU FROM AN OUTLANDING. It will therefore be obvious that, far from allowing a pilot to cut margins, cross country operation of a self-launching powered glider makes it necessary to make decisions earlier rather than later.

The Dive start

If for some reason the starting system is inoperative, most self-launching powered glider engines can be started by diving and pulling up to get the propeller rotating. It is very unlikely that the propeller will start rotating in a straight dive, even if the speed becomes very high. A pull up of about 2 to 3g is needed to effect the necessary change of angle of attack on the propeller blades, and it is during this pull-up that the blades will start to flick over the compressions. If all the necessary settings of fuel and ignition have been made before the manoeuvre is started, the engine will probably start quite readily.

This technique of engine starting is very height consuming, several hundred feet being needed in the case of a low to medium performance aircraft. It is therefore obvious that it cannot be relied on as a 'last resort', as it would certainly leave the aircraft much too low to safely complete a landing off a proper circuit if the starting attempt failed. Its sole virtue is that it will enable operation of a self-launching powered glider with a known defective starting system, with the proviso that all re-starts must be attempted above 1,500 feet within easy gliding range of the landing area and with the actions in the event of failure to start being pre-planned.

Circuits, approaches and landings

This is the area where the self-launching powered glider is open to the greatest abuse. This is because it is very easy to use the engine to solve problems that really ought to be solved by using judgement, or to get as many landings as you can into a particular session without regard for how the circuits relate to how a glider normally flies circuits. It is also tempting to land with the engine running, with a view to carrying out 'touch and go' to achieve the objective of doing as many landings as possible. All of these things have pitfalls.

It is important to stress once again that we are training glider pilots and that the effort must be made to ensure that the powered glider is flown just like a glider. It is a glider with a self-launch facility. The circuits, approaches and landings must be carried out with this in mind.

Some guidelines can be laid down as follows:

1. Fly circuits, approaches and landings engine-off. This emphasises the gliding purpose of the training and has the added benefit that everyone concerned with the operation is continually reminded that the aircraft is primarily a glider. Thus, powered aircraft integrating with the gliding operation regard it as just another glider and have no expectation that it will ever get out of their way. This is ultimately to the benefit of the gliding operation. From the student's point of view, use of the self-launching powered glider as a glider makes subsequent conversion to pure gliders easy and straightforward.

   Propeller clearance on most self-launching powered gliders used for training is very limited. Even slight mishandling of the landing by the student can cause the propeller to hit the ground, especially if a bit of pitching occurs during, for example, a bounced landing. This will splinter a propeller and possibly damage the engine. The expense of a new propeller, possible damage to the engine and the loss of flying revenue more than overcome any imagined loss of efficiency in circuit training caused by landing engine-off.

   The final nail in the coffin of engine-on landings is that the instructor may be tempted to rescue a mishandled landing by using power. This is generally not possible because we are not equipped with enough hands to cope with all the required actions. The right way to fix any mishandled glider landing is by a combination of attitude and airbrake control. Forget about the engine.

2. Join the circuit in exactly the same way as a glider does. Above all, do not climb the aircraft along the downwind leg. This is tempting, as it can speed up the circuit training process, but it is a highly dangerous practice because the powered glider will be climbing underneath gliders which are descending. Both types will be in each other's blind spots and the danger is obvious. Do all the climbing upwind of the field, cool the engine down, switch off and join the circuit normally.

3. A touch and go landing is another tempting way to speed up the training process. The hazards of landing engine-on have already been pointed out and it would be foolish to ignore them. However, it is possible to carry out a touch and go from an approach with the engine stopped if the engine is reasonably warm and the aircraft has an electric starter. On balance, though, it is not recommended practice, especially at busy gliding fields and especially at a combined glider/power operation. The last thing a visiting pilot expects, if he sees a powered glider on finals with the prop stopped, is for the thing to do a touch and go. Much better to do a full stop landing, taxi back and takeoff again. This has the added benefit of reinforcing a pre-takeoff check before every flight, an invariable gliding practice which is not adhered to in the normal light aeroplane plane practice of touch and go landings.

In summary, circuit training in self-launching powered gliders demands a high degree of discipline if the right emphasis (ie on training glider pilots) is to be achieved. Techniques that might seem superficially convenient may prove counter-productive in the long term.

Outlanding training

One of the most useful functions of a self-launching powered glider is cross-country training. Navigation, thermal centring, height-band selection, etc, can all be done with equal effectiveness by a pure glider, but the ability to carry out several circuits and approaches into outlanding paddocks in any one flight is unique to the self-launching powered glider.

Note the intentional use of the term 'circuit and approach' in this context, intentionally omitting any reference to the landing itself. Outlandings generally entail more risk than landings back at home base, the principal reason for this being lack of detailed knowledge of the paddock itself and in particular of its immediate surroundings. With the self-launching powered glider's ability to fly from paddock to paddock, it is tempting to land in any paddock that appears superficially suitable for training purposes. It is very easy to get caught out by, for example, any undetected single wire electric fences. There are numerous cases of this kind of accident on record.

It is therefore recommended that approaches into outlanding paddocks be terminated at a break-off height appropriate to:

1. the characteristics of the paddock and its surrounds as assessed from circuit height, and
2. the instructional effectiveness of the exercise in terms of assessing whether the student would have successfully landed on the paddock.

If you cannot tell at, say, 50 feet AGL whether the techniques used during the circuit and approach would result in the landing being successful, it is questionable whether you are suited to the job of instructing in that particular role. The exception here is where a club has a number of paddocks for outlanding training which have been properly assessed, their surrounds and surface are known and the owner's permission obtained to actually land in them.

Simulated launch emergencies

Self-launching powered gliders are capable of adequately simulating the following emergency situations:

Aerotow rope break

Because the climb-out pattern of an average two-seat self-launching powered glider is fairly similar to many aerotow combinations, a reasonable simulation of an aerotow failure such as a rope break can be given by closing the throttle at varying heights during the climb-out. Like actual rope-break practices, they should be started high (about 1,000 feet) and worked downwards as confidence develops. Exactly the same principles apply as to gliders, priority being given to preserving adequate speed in order to conserve total energy. Instructors should beware of becoming 'rope-break happy' with a self-launching powered glider, in the process ending up pointing back at the strip at all kinds of strange angles and positions and acquiring for themselves a reputation of possessing zero airmanship. Use the machine intelligently and it can provide perfectly sensible simulations of real life emergencies.

Winch/auto cable breaks

This is a more contrived exercise than the aerotow failure case and demands very careful setting up in order to be realistic and safe. It is not easy to establish a 45° climb angle in a self-launching powered glider without diving to a considerable speed before pulling up into a simulated winch/auto climb. Therefore the aircraft is first dived to a speed of about 80 knots and pulled up to about 45° with the throttle being opened fully as the final climb angle is achieved. Then, with the climb at 45°, when the speed falls to 55 knots indicated the throttle is closed to simulate the cable-break. This gives adequate training in the control movements and sensations experienced in the cable-break case, and is a very good introduction to the lag experienced in establishing a safe speed following the pitch-down manoeuvre. This is probably the limit of the usefulness of the aircraft in this exercise, because if it is used to teach the judgement of ‘what do I do with the height I have now’, it becomes a nuisance to other users of the aerodrome, who have difficulty predicting what the aircraft is going to do next.

General Warning

Be very careful of low level emergency situations. Powered gliders are generally not over-endowed with power and it is easy to get into a situation which is very difficult to get out of. This is especially true on summer days—remember that an airfield at 1,000 feet AMSL becomes effectively 4,000 feet AMSL on a 35º C day, with its consequent effect on engine power output and wing and propeller efficiency. Once again, do not go anywhere in a self-launching powered glider that you would not be prepared to go on an aerotow.

Type conversions

Conversion to a two-seat self-launching powered glider is simply done by a qualified instructor experienced and current on type. Conversion to a single-seat self-launching powered glider is not quite so straight forward, because they come in a variety of configurations, and the instructor cannot demonstrate procedures in the air. Where possible, some dual instruction in a two-seat self-launching powered glider is advantageous, even if the characteristics differ from the single-seat glider.

Before commencing a powered glider conversion, the student must be assessed by the qualified instructor responsible for the training as being ‘competent to handle a glider of performance and characteristics similar to that of the powered glider’. If you have any doubts about the pilot’s experience or capabilities, do not proceed with the conversion. Remember that the workload with the engine is higher than a pure glider.

Powered glider basic aeronautical knowledge and exam

GNZ AC 2-14 ‘Powered Glider Basic Aeronautical Knowledge’ provides guidance on the various configurations, applicable operating rules, systems, etc. Expand on the AC as necessary, particularly on points of practical application. Give particular emphasis to takeoff distances and factors affecting this, especially with reference to paddocks.

An examination paper is available from the GNZ National Operations Officer. The exam is of course a requirement, but is far more important that students have a thorough understanding of operating techniques etc.

Flight manual

Ensure the student has a copy of the Flight Manual to study for several days before conversion, with a view to familiarisation with cockpit layout, extension/retraction procedures, emergency drills etc.

Conversion sequence

The following gives a suggested sequence of instruction. The conversion should not be hurried, and several hours should be allowed for.

Daily inspection

Brief the DI, including general points on fuel mixing, fuel care, filtering, prevention of water in fuel etc. Also discuss noise level and associated radio difficulties—use of headphone/ear defenders.

Brief of handling

Consider the pilot’s previous experience and comparable types. Brief the aircraft handling points, stress the increased weight with the motor, and tendency to sag during roundout and landing. If longer wing tips are available, use these for the first flight—it improves roundout, but brief the pilot on slower roll rate.

Aerotow
Pilot does two aerotows to familiarise with the glider's handling. Tow height depends on previous experience. In some cases two circuits will suffice.

Brief engine start and run-up
Ensure the pilot is familiar with all engine controls, use of wheel-brake and how to lock it on etc. If unable to hold the control column back during start, trim full nose-up. Always get someone to clear the propeller area before start. Brief engine run-up—ensure pilot knows what to look for, ie allowable mag drop etc. Hold control column hard back, open throttle slowly as tail tends to lift during run-up—if it does, reduce power slowly, don't chop the power because the tail will bang down).

Brief the Taxi
Flaps full negative. Take care with wind and weathercock tendency. Ensure large area for practice. Point out that it is easier to turn into wind. Taxi slowly. Increased power may be needed at times to make rudder more effective, especially downwind. Allow for radius of turn. Brief pilot to use a wing-walker until experience is gained, or in long grass or confined areas.

Pilot does engine start, run-up, and taxi practice. Hold the wing initially, then let the pilot taxi wing down. If happy, taxi faster, and try levelling the wings during taxi. Finally taxi to takeoff point and shut down.

Brief engine extension/retraction
Ensure the pilot knows the procedures, and what to do if the prop stops in the wrong place. CHECK switches are all off; then show the correct prop position for retraction. Get the pilot to look in the mirror and note the features to look for to visually align the prop (canopy shut). Get the pilot to practice stopping the prop in the right place by applying the brake while you turn the prop by hand. Repeat until quite happy.

Brief takeoff
Checks—suggested sequence is to start engine, then do CB SIFT CBE then TMPFI for engine. The student may like to write the checks on a placard and attach to the control column or to the panel for the first few flights. Remind the student to do the checks last thing before takeoff, because flaps, trim etc will be in different positions for taxi.

Takeoff—open throttle slowly. Keep control column hard back for the first few metres of ground roll to prevent tail lifting too far, then ease control column forward until the tail just lifts (control column will be about central). Remind glider pilots that they no longer have a towplane to follow, and must choose their own line to follow (choose a feature at the far end of the strip). Be aware of possibility of yaw due to torque effect, crosswind etc; however with tailwheel steering and slipstream, rudder is more effective. Use wingtip runner for first few takeoffs.

Normal procedure is to taxi to takeoff point, stop where you can see the circuit base leg and finals, do cockpit checks, then line-up and takeoff. If using a wingtip runner, ask if it's clear above and behind.

On takeoff, open throttle, check engine indications normal. Accelerate to takeoff speed and allow aircraft to fly off as normal. Keep your hand on the throttle during the entire takeoff and initial climb. Allow the aircraft to accelerate to climb speed; don't climb too steeply near the ground. Climb at recommended speed; lower speeds give high nose attitude but poorer climb, poorer lookout, and hotter engine.

Climb to 3,000 feet minimum overhead the airfield. Idle for 30 seconds or until engine cools to recommended cylinder head temperature. Trim at retraction speed. Retract the engine, note slight trim change. On all shutdowns, brief the student to set the engine controls ready for restart as far as practical; this makes a quick restart easier. When ready, extend and restart the engine. Listen-out on the radio for any problems or discussion.

Student to try several extensions/retractions. Stay in the overhead in case of problem with engine stuck out. Brief the student that if stuck with the engine extended or partially extended and unable to start, simply forget about the engine and do a normal approach except that drag will be about the same as 2/3rds airbrakes.

Student then does self-launch climb to 3,000+ feet, and does the exercise as briefed. After landing, debrief on any problems. Further takeoffs, extension/retractions as required. Then get the student to do a landing with engine running, and to practice controlling descent with use of throttle. Next, the student should do a landing with engine extended and stopped. Further flights and practice as required. Include practice stalling with various power settings, steep turns with power, climbing turns etc.

Emergency procedures

Ensure the student becomes totally familiar with the emergency procedures relevant to the type (consult the Flight Manual). In particular, the degraded performance with an engine extended and wind-milling should be stressed. In this case a best glide angle of about 1 in 40 can become less than 1 in 20, and is degraded much worse at higher speeds—a sink rate of over 700 feet/minute at 70 kt would be typical. Obviously when landing with the engine extended, drag producing devices, such as flaps, airbrakes should be used sparingly, if at all.

Final debrief

Tell the pilot to be extremely cautious for the first 50 hours or so. Never rush checks, and be meticulous in engine care and maintenance. Practice air starts until totally familiar. Point out that during conversion, engine was warm throughout; and it may be harder to start after 3—4 hours soaring. Never try to re-start from low altitude, and ALWAYS have a paddock selected before raising the engine for a start. Never takeoff from a paddock without walking and measuring length available, and considering all factors, moisture, vegetation, slope etc. Don’t let anyone else fly the aircraft without correct training.

Point out that if pilot is flying from another site where gliding is in operation, the self-launching powered glider comes under the control of that operation. The powered glider pilot is ALWAYS under the control of the local CFI and GNZ Regional Operations Officer.

On satisfactory completion of the conversion, including the requirement for 5 takeoffs, landings and air starts, sign the pilot’s log book. Remember that you are signing for a type rating on one particular type, not all self-launching powered gliders. Make sure the pilot knows this is the case.

Gliders with sustainer motors

Sometimes referred to as ‘turbo’ gliders, these are defined as being capable of cruising but not self-launching. The low powered engine and multi-blade folding ‘fan’ are designed purely as a self-retrieve function.

Gliders with sustainer motors are generally manufacturer’s conversions of existing high-performance designs. They are launched normally, by winch or aerotow, and their engine/prop functions are mostly or entirely automatic under one single extend/retract control. Most of them do not even have a throttle. Because of the absence of complex systems and the fact that they require no degree of management, they should be regarded for conversion purposes as conventional. A person approved as pilot-in-command of a glider with a sustainer motor only, is NOT approved as the pilot-in-command of a self-launching powered glider.