

NZGA Instructor's Handbook

Part 3

Appendix A—Instructing in Powered Sailplanes

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Introduction

The most important thing to remember about instructing in powered sailplanes 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 powered sailplanes, especially two-seaters, are rather poor compromises between adequate performance as gliders and adequate performers as self-launchers. Further more they are often complex and awkward to operate, and place demands on an instructor which may not have been encountered before. Also, some duals are not fully dual controlled, eg Janus CM. The main points of difference, together with some operational recommendations, are listed below.

Instructor Qualifications

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

- (i) Holds a valid instructor rating
- (ii) Trained and endorsed to act as pilot in command on the relevant powered sailplane.

Pre-take off checks

In order to emphasise that the powered sailplane is primarily a glider with a self-launching facility, the standard NZGA pre-take off check **CBSIFTCB** must be adhered to. However, the following items must be checked by the instructor prior to take-off, but should not be stressed to the trainee unless the flight is part of a powered sailplane endorsement for that trainee:

- 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 powered sailplanes 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 glider 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 powered sailplane 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 aircraft.

Taxiing

Of the powered sailplanes 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 sailplanes 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 sailplanes 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.

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

Powered sailplanes with aeroplane type undercarriages are taxied in the same way as a taildragger 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 (*see figure 7*).

Fig 7

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

Take off and climb

Generally speaking, the engines fitted to two-seat powered sailplanes have power outputs ranging from 30 to 65 kw (about 40 to 90 hp). Despite this rather modest power output, most powered sailplanes swing quite badly to one side on the take-off run when full power is applied. The direction of the swing depends on the direction of rotation of the engine—engines which rotate clockwise (when viewed from behind) will swing to the left under power, and the converse is true of engines which rotate anti-clockwise. Almost all the two seat powered sailplanes 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 take off run.

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.

Assymetrical blade effect is most marked on aircraft of taildragger layout such as powered sailplanes, 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 take off 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 sailplane early in the take-off run, other things being equal (eg crosswinds) and with due regard for the limited prop clearance on some types.

All this means that a powered sailplane demands an application of rudder when flown under power, and this will be alien to any pilot who is used to pure sailplanes. 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 sailplane 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 sailplanes, and a day's instructing will usually 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 sailplane takeoffs, it is **NEVER** justifiable to use less than the complete take off run available. The rate of climb of a powered sailplane when out of ground effect is not good, especially in summer, and the whole runway must be used if the pilot is to avoid creating a very large non-maneuvring area. And **NEVER** take off 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 powered sailplane's 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 sailplanes, 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 sailplane anywhere you would not be happy to go on aerotow.

Take off emergencies

Aborted take off

Take-offs may be aborted for a number of reasons -

Failure to become airborne by a predicted separation point.

This emphasises the need for instructors to know the take-off performance of the powered sailplane, and the effect on that performance of factors like long grass, soft ground, wet wings, upslope, downwind component or ambient temperature.

Complete or partial failure of the engine on the ground run.

Complete failure on the take off 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 take-off run with an ailing engine in the hope that the aircraft will become airborne before the boundary fence.

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 take-off. Even if the machine 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 take-off path. Better to abort the take-off 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. Whatever the reason, if the failure is complete the powered sailplane is in a situation similar to a glider on aerotow which experiences a rope break or failure of the tug engine. The comparison is not completely apt because the powered sailplane pilot will have the opportunity to choose exactly the take off flight path most appropriate to the conditions, whereas on aerotow the glider pilot is at the mercy of the tug pilot. In any case, the action following complete engine failure is very nearly the same as for a glider suffering a rope break or tug 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 plus half the wind strength) then choose further action to be taken in accordance with the height and position of the powered

sailplane in relation to the take-off strip. Remember that powered sailplanes with retractable engines have poor glide angles (around 1:16) 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 which 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 will 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 sailplane 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

Two-seat powered sailplanes with the engine and prop stopped have sink rates and glide angles considerably worse than their closest equivalent pure sailplanes. 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 powered sailplane has a higher sink rate than a pure sailplane 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 machine easily amounts to that equivalent to an extra person, and a large person at that.

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

Propeller windmilling

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 sailplane 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 powered sailplane 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 powered sailplane's basic glide angle to the much flatter glide angles of high performance sailplanes. 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

Powered sailplanes 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 powered sailplane engine must never be relied on as a 'save' from an outlanding. The reasons are:

- (a) the engine might not start, or
- (b) 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 powered sailplane makes it necessary to make decisions earlier rather than later.

The dive start

If for some reason the starting system is inoperative, most powered sailplane 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 sailplane. It is therefore obvious that it cannot be relied on as a 'last resort', as it would certainly leave the machine 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 powered sailplane with a known defective starting system, with the proviso that all re-starts must be attempted above 1500 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 powered sailplane is open to the greatest abuse. This is because it is very easy to use the engine to solve problems which 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 'tough 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 sailplane 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 machine 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 trainee's point of view, use of the powered sailplane as a glider makes subsequent conversion to pure gliders easy and straightforward.

Propeller clearance on most two-seat powered sailplanes is very limited. Even slight mishandling of the landing by the trainee 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 a brake control. Forget about the engine.

2. Join the circuit in exactly the same way as a glider does. Above all, do not climb the powered sailplane 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 sailplane will be climbing underneath gliders which are descending. Both types of machines 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 powered sailplane 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 sailplane 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 take off 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 power-plane practice of touch and go landings.

In summary, circuit training in powered sailplanes demands a high° of discipline if the right emphasis (ie on training **glider** pilots) is to be achieved, techniques which might seem superficially convenient may prove counter-productive in the long term.

Outlanding training

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

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 principle reason for this being lack of detailed knowledge of the paddock itself and in particular of its immediate surroundings. With the powered sailplane's ability to fly from paddock to paddock, it is tempting to and in any paddock which 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 suitable to:

- (a) the characteristics of the paddock and its surrounds as assessed from circuit height, and
- (b) the instructional effectiveness of the exercise in terms of assessing whether the trainee 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

Powered sailplanes are capable of adequately simulating the following emergency situations—

Aerotow rope break

Because the climb-out pattern of an average two-seat powered sailplane is fairly similar to many aerotow combinations at about 400 FPM, 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 1000 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 powered sailplane, 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 powered sailplane without diving to a considerable speed before pulling up into a simulated winch/auto climb. Therefore the machine 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 powered sailplane in this exercise, because if the machine 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 machine is going to do next.

General Warning

Be very careful of low level emergency situations. Powered sailplanes 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 1000 feet AMSL becomes effectively 4000 feet AMSL on a 35° c day, with its consequent effect on engine power output and wing and propeller efficiency. Once again, do not go anywhere in a powered sailplane that you would not be prepared to go on an aerotow.

Type conversions

Conversion to a two-seat powered sailplane is simply done by a qualified instructor experienced and current on type. Conversion to a single-seat powered sailplane 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 powered sailplane is advantageous, even if the characteristics differ from the single-seat glider.

Before commencing a motor glider conversion, the trainee 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 sailplane. The experience requirements in CASO 17 are the minimum required.

Theory lectures and exam

Allow plenty of time—3 hours minimum. Use ‘Basic Aeronautical Knowledge for Powered Gliders’ as a basis and supply the trainee with a copy of the notes. Expand on the written notes as necessary, particularly on points of practical application. Give particular emphasis to take-off distances and factors affecting, especially with reference to paddocks. It is beneficial for PPL holders to undergo the theory course as well, although this is not a requirement. Stress the importance of knowledge of CASO 17, and ensure trainees are familiar with airspace divisions and rules.

The exam is of course a requirement, but is far more important that trainees have a thorough understanding of operating techniques etc.

Flight manual

Give the trainee a copy of the Flight Manual to study for several days before conversion. Tell him to make himself familiar with cockpit layout, extension/retraction procedures, emergency drills etc.

Glider conversion

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 of the glider, include 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 Glider handling

Consider the pilot's previous experience and comparable types. Brief the glider's handling points, stress the increased weight with the motor, and tendency to sag during roundout and landing. If 17 m tips are available, use these for the first flight—it improves roundout, but brief the pilot on slower roll rate.

Aerotow

Pilot does 2 aero-tows to familiarise with the glider's handling. Two height depends on previous experience. In some cases 2 circuits will suffice.

Brief engine start and run-up

See 'Ground operation' in Theory notes. Ensure pilot is familiar with all engine controls, use of wheelbrake 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. Pilot may need to increase power 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 his wing initially, then let him taxi wing down. If he is happy, taxi faster, and try levelling the wings during taxi. Finally taxi to take-off 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 him the correct prop position for retraction. Get him to look in the mirror and note the features to look for to visually align the prop (canopy shut). Get him to practice stopping the prop in the right place by applying the brake while you turn the prop by hand. Repeat until he is quite happy.

Brief take-off

Checks—suggested sequence is to start engine, then do **CBSIFTCB** then **TMPFI** for engine. Pilot 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 trainee to do the checks last thing before take-off, because flaps, trim etc will be in different positions for taxi.

Take-off—open throttle slowly. Keep control column hard back for first few metres 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 and control column to it (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 take-offs.

Normal procedure is to taxi to take-off point, stop where you can see circuit base leg and finals, do cockpit checks, then line-up and take-off. If using a wingtip runner, get him to clear above and behind.

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

Climb to 3000 feet minimum overhead the airfield. Idle for 30 sec or until engine cools to recommended cylinder head temperature. Trim at retraction speed. Retract the engine, note slight trim change. Brief the trainee on all shutdowns 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. Instructor listen out on the radio for any problems or discussion.

Pilot to try several extensions/retractions. Stay in the overhead in case of problem with engine stuck out. Brief the trainee that if he finds himself with 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.

Pilot then does self-launch climb to 3000 + feet, and does exercise as briefed. After landing, debrief pilot on any problems. Further take-offs, extension/retractions as required. Then get pilot to do a landing with engine running, have him practice controlling descent with use of throttle. Next have him 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 pilot 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 windmilling should be stressed. In this case a glider angle of 1 in 41 becomes 1 in 16 at 43 knots and is degraded to around 1 in 9 at 70 knots, with a sink rate of over 700 feet/minute. Obviously when landing with the engine extended, drag producing devices, such as flaps, airbrakes etc should be used sparingly, if at all.

Final debrief

Tell pilot to be extremely cautious for first 50 hours or so. Never rush checks, 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 take-off from a paddock without walking and measuring length available, and considering all factors, moisture, vegetation, slope etc. Don't let anyone else fly the motor glider without correct training.

Point out that if pilot is flying from another site where gliding is in operation, the powered glider comes under the control of that operation. The powered glider pilot is **ALWAYS** under the control of the NZGA and their representatives, namely the local CFI and Branch Technical Representative.

On satisfactory completion of the conversion, including the requirement for 5 take-offs, 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** powered gliders. Make sure the pilot knows this is the case.

Power-assisted sailplanes

Sometimes referred to as 'turbo' sailplanes, 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.

Power assisted sailplanes are generally manufacturers conversions of existing high-performance designs. They are launched normally, by winch or aerotow, and their engine/prop functions are 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° of management, they should be regarded for conversion purposes as conventional sailplanes, the pilot being converted only needing to be acquainted with the specific self-retrieve facility before attempting to use it.

There is no need to train a pilot being converted to a power-assisted sailplane in accordance with the syllabus in CASO 17. Therefore a person approved as pilot-in-command of a power assisted sailplane is **NOT** approved as the pilot-in-command of a powered sailplane.