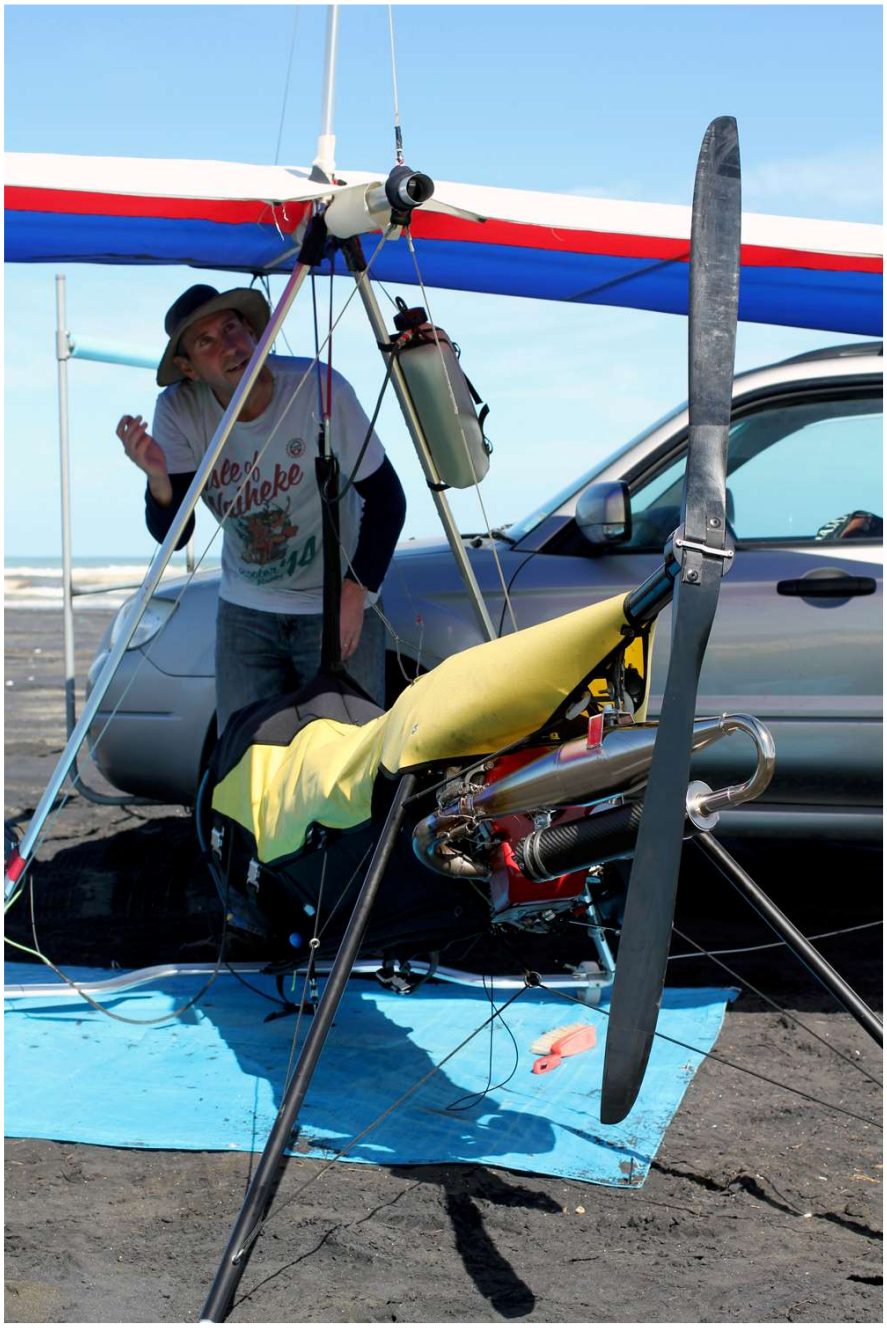
2020

Powered Hang Glider Training Program



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Contents

1. Purpose and structure of this powered hang glider training program

The purpose of this program is to introduce a qualified and current HG pilot to the sport of powered hang gliding (also referred to as FLPHG (Foot-Launched Powered Hang Gliding)).

The structure of this program is as follows. It begins with an introduction of the instructor and the student, before launching into Part 1 and Part 2.

Part 1 "Talk about and Show": This is a sequence of events to inform the student (via a sequence of events) on the various processes involved in a powered HG flight, beginning with preparation for departure from the student's home and ending with the stowing of equipment and post-flight record-keeping

Part 2: The Syllabus "Now, you do it!" This is a framework to assist the instructor in the training of the student and in the evaluation of the student's skills as they strive to become a qualified powered HG pilot (satisfying the requirements of the OPMF60 – POWERED HANG GLIDER CERTIFICATE). A copy of this OPMF60 certificate is available on the New Zealand Hang Gliding and Paragliding Association (NZHGPA) website.

2. Introduction: The instructor and the student

2.1 The instructor's HG qualifications and currency

An instructor of powered hang gliding in New Zealand is required to hold an OPMF61 – POWERED HG INSTRUCTOR CERTIFICATE. A copy of this certificate is available on the New Zealand Hang Gliding and Paragliding Association (NZHGPA) website.

The instructor should also have currency in powered hang gliding.

2.2 The instructor's choice of training site

To minimize risk, the instructor should have prior experience in powered flying from the training sites that they intend to use in the training of their student. If not, then the instructor should fly at a site and assess any risks before using it as a training venue.

The instructor should keep records of each of the training sites that they use. If the site is privately owned, then the instructor should record the contact details of the person in charge of the site. Other important data to include in the record are notes of any site risks or hazards. These risks or hazards may be permanent or may be dependent on seasonal or on local weather conditions.

Training at the sites should be under weather conditions appropriate for the student's level of experience and taking into account the instructor's experience at the site. When planning a training session, it is essential for the instructor to consider:

- Wind strength
- Wind direction

- Thermic activity
- Assessment of hazards

2.3 Student skills and HG qualifications

- Be a full member of the N.Z.H.G.P.A.
- Be an Intermediate-rated pilot (40+ hours) or above
- Not be suffering from any of the medical complaints indicated on the N.Z.H.G.P.A. medical declaration
- Not be under the influence of drugs or alcohol
- Have flying currency
- Experience in XC flight is recommended
- Be aware of and have experience in flying in thermic lift and sink

PART 1: "Talk about and Show" A sequence of events in a powered HG flight

This is "a day in the life of a powered hang gliding flight." It describes the sequence of the various steps involved in a powered HG flight, beginning with preparation for departure from the student's home and ending with the stowing of equipment and post-flight record-keeping.

Whilst this may be considered a "best practice" document, it represents only one of many acceptable programmes. Instructors are encouraged to document their own programmes and procedures where different to those outlined here. Feedback and suggestions on this document is invited.

3. Harness storage

The powered harness should be stored in its bag, resting on its back. If storing on a concrete floor, old carpet or other padding material underneath the bag is recommended. Like a hang glider, dry the harness if wet before bagging and storing.

The propeller is stored in its own bag which is placed inside the harness.

Note: Storing the propeller separately from the harness increases the risk that it will be forgotten and left at home.

4. Harness transportation

A powered harness should be transported resting on its back, to prevent damage to the engine. The powered harness has exposed and fragile components, such as the air intake and carburetor. Handle the powered harness with care. DO NOT subject the harness to physical shocks, bumps or drops.

4.1 Transporting on a vehicle roof rack

If the seats of your vehicle do not fold down flat, or if there is insufficient room, then you can transport your powered harness on the roof rack of your vehicle. Like with a hang glider, rack padding is advised.

The powered harness will sit on the rack on its back. Secure the harness with two straps, and use a third strap to go around the adjacent hang glider and then around the powered harness, to provide additional stability. The straps should be firm enough to prevent the harness from rocking from side to side.

Note: Storing the harness in a bag should eliminate the risk of accidental reserve deployment when being transported on the roof of a vehicle.

4.2 Transporting inside a vehicle

If you have space inside your vehicle and the seats fold down flat, then transportation inside your vehicle may be convenient. You will not have to lift the powered harness up on to the roof, and the harness will be protected from rain.

4.3 Management of harness fuel tank and fuel supply

A sturdy plastic box that will hold both the harness fuel tank and the plastic jerry can (used to hold extra fuel) is recommended. Most jerry cans will tip over if unrestrained. If this happens, fuel may leak from the can. If the jerry can and harness fuel tank are stored snuggly in a sturdy plastic box, the box will prevent these fuel containers from tipping and will contain any fuel leakage. Such a plastic box can be purchased from a hardware store. Select a box size that will hold both the harness fuel tank and the plastic jerry can together and prevent them from tipping over. Do not use too big a box.

4.4 Management of flight instruments, pilot gear, etc.

The pilot is recommended to store their flight instruments, helmet, jacket, gloves, googles, radios, etc., in a single large plastic box. This can be prepared on the morning of the flight so that no essential gear is left at home. It also simplifies the loading of the vehicle.

Before you depart, you will have four main items to load.

1. Hang glider on roof rack
2. Powered harness on roof rack (or in vehicle)
3. Fuel box: holding harness fuel tank + plastic jerry can
4. Plastic box: holding flight instruments, clothing and other flight gear

Note: Keeping a checklist with the box reduces the likelihood of forgetting something which may have been removed between flying days.

4.5 Management of anchor, hammer and tether

Store your anchor, tether clip and hammer (if used) in your vehicle to avoid leaving this essential equipment at home.

5. Checking general weather conditions in advance

A powered hang glider, like a free-flying hang glider, requires suitable weather conditions before you can even consider leaving home. The approach is the same as for conventional hang gliding. You will use the same information resources to plan your powered flying day as you would for non-powered flying, namely:

- Weather forecasting websites
- Live rain radar websites (useful for detecting squalls and rain fronts)
- Live weather websites

5.1 Surface wind speed and powered hang gliding

The challenges of nil wind

Nil wind conditions are NOT RECOMMENDED for a pilot's first takeoff. There is a high risk of failure for an inexperienced powered pilot. They may not successfully transition from jogging to moon-walking, and then trip and fall forward.

Light wind of 2-4 knots
This strength is suitable if the student has experience in powered takeoffs.

Moderate 5-10 knots
This is the optimum windspeed range for a student's VERY FIRST powered harness takeoff. After landing, if the pilot turns to head downwind because they have overshot the tethering point and need to turn around and go back, they should attempt to jog at a speed of 6-8 km/h over the ground to mitigate the effects of the tailwind. Note: this is tiring if more than 100 meters from the tether.

Strong 11-15 knots
At this wind strength on the surface, ground-handing may be difficult without assistance. Please be aware that it is not possible to walk backwards in a powered harness; only forwards. If a pilot on the ground turns the glider to walk heading downwind, the wind from behind may lift the trailing edge of the glider and flip the glider forward and over, resulting in damage and possible injury.

Too strong +15 knots
DO NOT attempt to train in such surface wind conditions. Strong gusts bring the risk of anchor failure and subsequent damage to equipment and glider or injury to the pilot.

5.2 Use of wind-speed meters
A reliable and accurate hand-held windspeed meter is very useful for gauging the average windspeed and for measuring any gusts.

5.3 Quality of airflow at the site
Laminar airflow is your friend. Turbulent airflow is your enemy. Look around you at the site and see if there are any enemies in the neighborhood. Your hang gliding knowledge will help you once again. Do you see a row of trees or a building upwind? Is nothing impeding the incoming airflow for several hundred meters upwind? Are you at the beach? (The beach offers the best laminar flow.)

Sinking air will make takeoff difficult. Is the site on the lee side of a hill? If so, then wind may be coming over the hill and cascading downwards onto your site, making it difficult to gain altitude after takeoff. Try to avoid this condition by being aware of the site and the wind direction.

On a thermic day, you may encounter lift or sink within the runway area. You may take off and encounter a thermal halfway down the runway. Conversely, you may encounter sink and find it impossible to climb for a couple of hundred meters ahead, even at full throttle.

For the inexperienced powered pilot, thermic activity (both lift and sink) is an additional complication. If you encounter thermic lift on takeoff when you are a couple of hundred feet above the ground, take advantage of this free lift to gain extra altitude. Conversely, if you find yourself in sink, then hold your course (if it is safe to do so) until you pass through the zone of sinking air.

As a hang glider pilot you will be familiar with the phenomenon of wind gradient when landing. The same applies to powered hang gliding when landing. Airspeed is your friend.

6. The training site

6.1 Selection of the training site for the very first powered flight

6.1.1 Launch site authorization

The site of launch of the powered hang glider is likely to be a flat field. Since free flying hang gliders cannot launch by themselves from flat land, it is unlikely that the site will have a rating issued under OPMF41.

Refer to Section 5.5.2.3 of the NZHGPA ORGANISATION & PROCEDURES MANUAL (OPM)

Advantages of a sandy beach for initial flight

A coastal site with a broad sandy beach and soarable cliffs offers many advantages as the site for a pilot's very first powered experience. Better still if the pilot is already familiar with the location through soaring hang glider flight. The author's first powered flight was at a beach where he had flown for several years. This familiarity with the site boosted confidence and added safety through awareness of existing hazards.

A coastal site will offer laminar airflow with little risk of sink or thermic lift likely inland. This will help make takeoffs and landings more predictable, which is important for the pilot in their first powered experience. Another significant advantage is the potential for the pilot to ridge-soar on the cliffs at the beach in the right conditions. This will allow the pilot to shut off the engine and to have plenty of time to practice other important powered harness skills such as retracting and deploying the landing struts, and mid-air engine restarts.

Caution: A shelly or pebble-covered beach should be avoided, due to the risk of the pilot flicking debris up with their feet on takeoff, damaging the propeller.

Disadvantages of the beach

The popularity of beaches is also a disadvantage, especially on the weekend when many people will also want to use the same location. Not all students have free time on weekdays, which may limit lessons to the busy weekend periods.

Be mindful of other beach users. Hazards may include cars, motorcycles, horses, dogs, small children, the elderly, and others. It is better to choose a less crowded but more inconvenient part of the beach than to try and take off or land where the risk of an accident is much higher.

Sand contamination is a further disadvantage of beach training. Sand can be dangerous if it gets into and jams the throttle or fouls the fuel line connections. Steps to control sand contamination include placing a small plastic bag over the mouth throttle and securing the bag with a rubber band. The exposed end of the fuel line from the harness should also be similarly capped with a plastic bag to keep sand out.

Use the beach for the first day of training!

The strategy is to use a coastal site familiar to the pilot for the very first powered hang glider flight, preferably with the option of ridge soaring with which to practice important basic skills. If this first day of training at the beach goes well and the student can demonstrate that they have mastered the basic tasks, the instructor may decide to switch to an inland site for subsequent training.

If using a sandy beach, begin training a couple over hours before low tide. The wind should ideally be around 45 degrees from blowing straight in. This is a compromise. If the wind is blowing parallel to the beach, the pilot will have an unlimited runway but will likely be unable to ridge-soar. On the other hand, if the wind is coming straight in from the sea to the cliffs, the ridge soaring will be excellent, but the student will be forced to take off towards the waves. This is potentially dangerous in the event of engine trouble and the inexperienced pilot panicking and freezing at the controls, unable to turn and land cross-wind on the beach. The optimal scenario would be for a forecast change in wind direction throughout the day, with the wind swinging around to come in from the sea at around low tide in the afternoon, after the pilot has experienced several takeoffs and landings. The ideal wind speed on the ground would be 5 to 10 knots. Be mindful of gusts or temporary lulls in wind speed.

Tasks for when the pilot can fly up to a coastal ridge and soar on it

- Strut retraction and deployment
- Mid-air engine restarts
- Engine idling and propeller braking
- Radio use
- Preparation for landing: deploying struts, stopping engine, braking propeller

6.2 Hazards at an inland training site

Hazards inside the field

These can be dangerous objects on the ground or turbulence generators. Examples of the former include large rocks, water troughs for animals, electric or other temporary fences, tree stumps or logs, and machinery. The pilot should recognize turbulence generators from their hang gliding days. These would include buildings and trees.

Hazards next to the field

Hang glider pilots will be familiar with these hazards that include power lines on the side of the road, ponds, creeks, and other bodies of water that could be reached by the pilots flying out of control.

Hazards in the neighborhood of the field

A range of hills even some distance away can still be a source of sinking air or other disturbances if the site is on the lee side and the wind is moderately strong on the ground. If there is an active airfield in the neighborhood, then it is likely that fixed-wing or helicopter students will be in the area, possibly flying overhead. If in proximity to an airfield, the

instructor should have an airband radio tuned to the correct local frequency and be monitoring the transmissions of other pilots.

- Monitor local air traffic broadcasts
- Observe and notify local aircraft if necessary
- If the airfield is controlled, obtain a clearance from air traffic control prior to flight
- Choose a less congested location for training!

Note: Use of an airband radio requires an ARO or FRTO rating and for the correct radio protocols to be followed.

6.3 Runway area selection (the part of the site you will use for takeoffs and landings)

- The runway should be on damp, compacted sand or short grass well below the arc of the propeller tip
- Asphalt or concrete is not suitable as it will wear the struts' plastic tips
- Soft dry sand is hard to run on, and the drag of the struts on the ground is high, also sand will be flicked up by your feet into the spinning propeller
- Avoid loose shells or pebble beaches (risk of propeller damage)
- Avoid grass longer than 30 cm (can drag on struts and may strike propeller)
- If there are tall weeds in your way, remove them
- The runway should be long enough that if the pilot experiences an engine failure on climb out (and is too low to turn back) they can continue forward into wind and land safely
- The runway should be level
- Hazards should be minimized
- Place a windsock or wind direction indicator off to the side of the runway area, in a location visible to the pilot as they start their takeoff

7. Cameras as teaching aids

If a picture is worth a thousand words, then a video is worth ten thousand. Video cameras can roughly be grouped into two categories: firstly, hand-held with a zoom lens; and secondly, action cameras that are attached to a part of the hang glider.

The hand-held camera can be used to record the actions of the instructor, especially when demonstrating a series of tasks that should be performed in a certain order, for example, the attachment of the fuel tank to the hang glider. The student can use the camera to film the execution of the task by the instructor, to create a video record that the student can review to refresh their memory. Please note that the student should not let the action of filming distract them from the learning process; the recording should merely serve as a memory aid to reinforce the learning process. Similarly, the instructor can record the actions of the student and later play them back during a review of the student's performance. For example, the

instructor can film the student's takeoff and landing, to show the student what they did and to give them constructive feedback.

The action-camera mounted on the hang glider can supply visual information not visible from the ground. The sound recording function of the camera can provide useful information about engine performance (the pitch of the engine note will be proportional to the engine rpm) and airspeed (the louder the wind noise, the higher the airspeed). Think of this camera as like a black box on an aircraft.

8. Pilot clothing

Pilot clothing is essentially the same as for ordinary hang gliding.

- A suitable hang gliding helmet
- Lightweight, sturdy boots with ankle protection
- Eye protection
- Knee pads are optional, but may increase comfort when entering or exiting the harness

9. Radios

A two-way radio with a push-to-talk (PTT) and helmet headset is recommended for the pilot to enable communication with the instructor.

10. Selection of hang glider for powered flying

- Must have a current warrant of fitness (WoF)
- Will require the rear section of the keel, aft of the attachment point of the rear keel wires, to be removable (to avoid fouling the propeller)
- Should have wheels on the base-bar (in case the pilot trips on takeoff or landing)
- Weight of pilot + motor harness with its reserve parachute + full fuel tank should not exceed the hang glider manufacturer's maximum recommended clip-in weight for that glider model. To find this maximum weight, see the hang glider manufacturer's specifications on their website or read the glider's owner's manual.
- A beginner glider is recommended for the same reasons as with conventional HG training. If the pilot has advanced hang gliding skills, then an intermediate 70% double-surface glider that is capable of carrying the clip-in weight of the powered harness and fuel tank will suffice
- A topless hang glider is NOT recommended for powered training due to its weight, higher stall speed, and inertia of the wing. The VG cord of a topless glider is a deadly potential hazard. The VG cord will extend a couple of meters behind the base-bar when pulled all the way out. It will likely foul the propeller, pull the base bar in and cause a crash.

11. Rigging and tethering of glider

The hang glider is rigged as per normal. The main modification to the hang glider to allow the operation of a powered harness is the removal of the aft section of the hang glider's keel to avoid fouling the propeller. Once this rear section of keel is removed, the hang glider is no longer able to support itself on the ground and must be tethered.

The hang glider tether system is like a boat mooring. It consists of an anchor that is driven firmly into the ground, an adjustable line (one of the straps used to secure the hang glider to the roof rack can also be used as the adjustable line), and a clip (to connect to the glider's nose-plate loop).

A length of nylon cord (some 60 cm in length) can be used to make a loop that will connect the nose of the glider to the tether system clip. Secure this loop around the keel of the glider, at the nose plate in a position that will not hinder the fitting of the nose cone (if the glider has a nose cone). This loop will stay permanently on the glider. It should hang down about 10 to 15 cm from the nose of the glider so that the pilot can reach it while in the harness, to detach and re-attach the tether system clip to the nose loop.

11.1 Ground anchors

Ensure that the ground anchor does not rise above the ground as high as the arc of the spinning propeller. Ideally, the grand anchor will only protrude for a couple of centimeters above the ground. The top of the anchor will have a slot or hole (with no sharp edges to wear into lines) through which the adjustable line or strap can be fitted.

A small sledgehammer is ideal for pounding the anchor into the ground. The anchor should be inserted into the ground on a 45-degree angle. Simply driving the anchor vertically down into the ground may allow it to pull up out of hard ground fairly easily.

Position the ground anchor at the point on the runway where you will have sufficient space to easily land downwind of it, and then walk forwards into wind to approach the tether.

For soft sand

- 1-metre long steel waratah (Y-cross section) post. This may need to be driven some distance into soft sand to provide firm anchorage. A trowel or small shovel may help to dig this anchor out of the sand after use.

For hard ground or grassy fields

- 40-cm long, 15-mm diameter reinforcing rod with a pointed tip

For softer grassy fields

- 30-cm plastic (T-cross section) tent peg

Note: Beachcombers and the public like to collect shiny things. If you have a nice adjustable strap and clip sitting in public view while you are off flying, it is possible that they might not be there when you return. One strategy is to use a rough looking tether line and to carry the clip with you (clipping the nose loop to one of the nose wires).

11.2 Keel pitch adjustment

- Adjust the tether length so that the nose of the glider is about 20 cm higher than the end of the complete keel (you have not yet detached the end of the keel)
- Nose too high = high tension on tether (risk of anchor pulling out of the ground)
- Nose not high enough = risk of a breeze from behind tipping glider forward onto its nose

After you have adjusted the length of the tether line so that the nose of the glider is at the right height, remove the aft section of the keel. You will now be ready to attach the fuel tank and clip the powered harness to the hang glider hang strap.

Caution: Make sure that the end section of the keel has been removed after the glider is tethered.

12. Powered harness fuel tank

I will assume that the powered harness uses an external fuel tank that is attached to one of the uprights. Be sure that the fuel tank cap is screwed on and that the fuel tank air inlet is open.

Caution: If the fuel tank air inlet is accidentally left closed, atmospheric air pressure will collapse the fuel tank as the fuel is sucked out of it by the carburetor.

12.1 Attachment of external fuel tank to glider keel near A-frame apex

- Loop the fuel tank safety line up over the keel and secure
- Attach the tank to an upright using the tank's upper and lower straps
- Check that tank is firmly mounted to upright
- Check that the tank's air inlet is open

13. Powered harness attachment to glider

- Place the harness in its bag on the ground behind the glider (harness on its back)
- Unzip harness bag
- Take propeller bag out of the harness (do not attach the propeller yet)
- Deploy harness struts and hook the strut bungies into place
- Lift harness carefully out of its bag (keeping the struts pointing up)
- Carefully rotate harness and place on its struts (do not strike a strut on the ground as you rotate the harness
- Lift the harness riser, pull towards the glider (approaching glider from behind) and clip the riser carabiner into the glider hang strap
- Lock the carabiner
- Attach the harness fuel line to the fuel tank (check that it clicks to lock the connection)
- Attach the propeller to the propeller shaft and secure with pin and clip
- If applicable, attach any communication lines from the harness to instruments (typically the engine rpm line and head temperature line)

- If propeller folds, unfold it, then spin it to check that it turns freely (make sure that the propeller brake is OFF)

If in a sandy environment, keep plastic bags over the mouth throttle and the end of the fuel connection when not in use, to keep sand out.

Caution: The Mosquito NRG mouth throttle has a cylinder-in-barrel construction and is vulnerable to sand contamination. Never let this type of mouth throttle come in contact with sand. The throttle action will jam if fouled by sand.

14. Pre-start checks

- Propeller brake OFF (the propeller should spin freely when turned by hand)
- Check that the rear section of the keel has been removed (to avoid propeller strike)
- Throttle closed (check the carburetor directly)
- Harness zipper lines not tangled
- Check that you have no items in your clothing pockets that could fall out in flight (wallet, car keys and cell phones in trousers, etc.). Not only would these items be lost, they might damage the propeller if they fall through its spinning blades
- Check that all zipped pockets on the harness are closed. Failure to close zip pockets could result in items coming out in flight and fouling on or damaging the propeller
- Check all safety wiring for breaks or looseness in secured bolts
- Check that reserve parachute handle is not coming loose
- Check that kill switch is not ON
- Check for un-wired loose bolts
- Check for loose electrical connections
- Check that inlet silencer and its mountings are not loose
- Check exhaust system and its mounts for cracks (see if exhaust system “wiggles” or not when lightly pushed or pulled)

15. Post-flight checks

Repeat all steps in the Pre-flight Check list above. Be sure that the propeller brake is OFF. Wipe any oily residue away before packing harness into bag. Always place the propeller in its own bag and then place the bag inside the harness to keep these two items together.

16. Cautions on starting engine

- Check throttle is closed (check the carburetor to confirm throttle position)
- Open the propeller (if a folding design)
- Check for hazards such as pets or members of the public nearby (especially young children). The instructor will advise members of the public of any hazards.
- Cold engines, having not been run for several weeks, may not easily start. If this is the case, then kneel in front of the harness, facing the engine, in a position where you can restrain the harness from moving forward, and where you have direct access to the

choke or kill switch. During the starting procedure you will not rev the engine above around 2,500 rpm. The goal is to confirm that the engine will start and that it is able to idle

Note: If you are confident that the engine will start, then you may start the engine while strapped into the harness

- Shout "Clear Prop" before starting. Be sure that there are no hazards such as pets or members of the public nearby
- Apply full choke but no throttle
- Engage electric starter for a couple of seconds only (Do not continue to run the starter continuously as it will overheat)
- Once engine fires (and dies), then choke OFF and apply ¼ throttle
- Engage starter motor
- If engine floods, remove spark plug and dry / change the spark plug
- Repeat above procedure to start
- Engine may idle but die after a few seconds due to an air bubble in the fuel line. If so, then repeat the starting procedure
- Once the engine is idling and warmed up, turn the engine OFF by applying the choke

17. Entry into harness (glider tethered)

- Enter harness while engine is OFF. Pulling on parts of the harness as you get into it may while the engine is running may pull on the throttle wires and cause the engine rpm to rise.
- Get down on knees, and shuffle backwards over the base bar and into the harness
- Buckle leg straps
- Put arms through arm holes
- Buckle chest straps
- Check that choke, starter tube (Mosquito) and other controls are not fouled
- Check that shoulder straps are not twisted
- Connect helmet PTT cable to radio (if applicable)

18. Exit from harness (after glider is tethered)

- Disconnect helmet PTT cable from radio
- Unbuckle chest and leg straps
- Open harness
- Take arms out of arm holes
- Get down on knees and exit harness by moving forwards

19. Un-clipping glider nose loop from tether / re-clipping

The pilot in the harness will unclip the tether line clip from the glider nose loop. Take care to control the pitch of the nose once the glider is released. Do not let the nose pitch up, especially in windy conditions.

As a training exercise (to be covered later in the syllabus) it is a useful skill for the pilot to be able to un-clip, walking forward, then around and back and to re-clip the nose loop to the tether line clip by themselves. For the first lesson, it is helpful for the instructor to assist the pilot in un-clipping and clipping.

20. Ground handling the powered harness

- The pilot cannot walk backward in a powered harness; only forwards. If they attempt to walk backward, the struts will fold up
- Instructor assistance in ground handling recommended if wind is over 8 knots on the ground
- Do not make small-radius turns when propeller is spinning (high risk of prop strike on trailing edge of sail)
- If wind on ground is moderate or strong, land downwind of tether and walk forward.
- If you land upwind of the tether in wind too strong to allow you to jog downwind, take off and go around again if possible

21. Ground handling if alone in high wind +15 knots

- Disconnect helmet PTT line to radio
- Unbuckle harness while keeping glider pitch level (a little tricky)
- Get out of harness while keeping glider pitch level (use one hand to control glider pitch
- Move to face the front of the glider while holding nose wires
- Unclip fuel line to external tank
- Unclip harness carabiner
- Get into glider A-frame and move glider to safe place (sheltered from wind).
- If not windy at the derigging site, temporarily rest the glider nose-down/keel up, facing into wind. It is risky to leave the glider unattended in this position in case the wind shifts
- If windy at the derigging site, remove external fuel tank and instruments. Unclip nose-wire and drop glider flat onto the ground
- Return to harness, put arms through harness arm holes (as if you were getting into it), stand up and walk, dragging the harness on its skids to a safe place

22. Taking off (directly into a headwind of 4-10 knots is ideal)

- The pilot is in the powered harness and is ready to take off
- Start the engine

- Idle the engine. The propeller should not be turning, however sometimes the throttle lines will be slightly pulled by the pilot standing up in the harness, which may cause engine rpm to rise
- Unclip the nose loop from the tether
- Move forward several meters to clear the anchor
- Stop. Brace the glider and run the engine to full power for about 10 seconds to confirm full rpm and to clear any air bubbles from the fuel line. Use the tachometer (if one is fitted) to confirm that the engine is reaching expected full-power rpm
- Reduce rpm to idle
- Place A-frame of shoulders as with a conventional HG launch
- Level wings and keep eyes on the horizon
- The key is to allow the glider to achieve flight from the trim position

22.1 Walk, jog, run, moon-walk

- **Walk**. (Immediately breaking into a run tends to lift the glider nose which may induce a tip stall where the glider will begin to turn by itself)
- **Jog**. Bring the engine rpm up to full power over the space of a couple of seconds
- Let the engine do the work of pushing you forwards. While doing so, keep the wings level and look towards the horizon ahead (just like in a conventional hang glider launch)
- **Run**. Once the glider is flying you relax your palms and your fingers because you do not have to carry its weight anymore
- Keep your hands on the uprights (as in a hang glider hill launch)
- Use a light grip on the uprights. Because the thrust force enters the glider right at the hang point, it only requires a light touch to control the pitch
- Keep the glider in trim; let the airspeed increase
- Let the glider gradually rise and take you with it
- Maintain the pitch angle (do not raise the nose or you may "mush" and begin to stall)
- As the weight starts to come off your legs, begin "**moon-walking**"
- Keep moon-walking as the airspeed increases
- Keep moon-walking even after you begin to leave the ground. Do not "pull up" your legs as soon as you feel the lift-off
- Shortly after lift-off, the glider may suddenly climb too fast - be prepared for this and pull in to increase airspeed and avoid a stall

22.2 Keep hands on uprights as you leave the ground

- Keeping your hands on the uprights will enable you to maintain control if the engine loses power or stops as you are taking off
- DO NOT rush to get your hands on the base bar while the struts are still dragging on the ground as this will increase friction between the strut and the ground, and make it harder for the glider to get airborne. In addition, if you are forced to abort the takeoff

in this position, it will be very difficult to reach the uprights before the base bar hits the ground

22.3 Aborting a takeoff

Powered runs and stops

The idea of running at full power to simulate a takeoff (but spitting out the throttle) and bring the glider to a stop is an action associated with a takeoff abort. Be aware of the risk that the pilot might trip (especially if this is their first powered run). The practicing of mid-air engine stops should be left until around midway through the training program, when the student is more familiar with the powered harness. Takeoff aborts are rare in powered hang gliding, although they do happen and are an important part of training. The student should be able to take off, fly circuits, and land, *before* practicing a takeoff abort.

Abort early. Avoid the "I can save this situation if I fly a little longer" mindset

- Spit out mouth throttle immediately (the tendency is to clench your teeth, which will apply full throttle)
- Let skids bleed off your momentum, flare and run out the landing

If engine is not running properly on takeoff, abort immediately

- For a takeoff abort at low height, there will probably not be time to kill the engine let alone brake the propeller
- A safe landing is more important than a broken propeller
- Spit out the mouth throttle!
- Stop the engine in mid-air ONLY if safe to do so. Do not distract yourself from your landing while you attempt to kill the engine or brake the propeller
- Use the kill switch or choke to stop the engine ONLY if you have time to safely do so
- Apply the propeller brake ONLY if you can safely do so
- Remain flying into wind, and land
- Mitigate the risk of a takeoff early abortion by selecting a runway area that has plenty of clear space ahead in which to land. Avoid taking off towards fences, power lines, trees, rising terrain, water or other hazards

22.4 Moving hands to the base bar

- Once your rear skids are safely off the ground and you are climbing, you can transition your hands from the uprights to the base bar
- Do not push out on the base bar
- Gain airspeed and climb gently at a rate of about 100 to 150 fpm
- Be aware that local sinking air may suppress your climb
- If you encounter a thermal, use it to gain altitude
- Be aware that the base bar will be far further back than with HG free flying. You will adapt to this new normal position
- Maintain airspeed to maintain control

- Gauge the base-bar position at trim. Fly with your hands off the base bar to do so, as with conventional hang glider flying
- Confirm the hang-point position in a similar way as you would for a non-powered hang glider. With the added weight of the engine, the glider may tend to stall when you take your hands off the base bar. If this is the case, the hang point will need to be moved forwards. Prior to your next flight, move the hang point one hole further forward (or there are no holes, move the hang loop forward about 1 cm) and test again

22.5 Gaining height and turning downwind

- The mouth throttle is only really used in the takeoff and climb out
- When you are about 300 ft AGL, you should switch from mouth throttle to the pull-throttle (Note: some models of powered harness only have a single throttle control that also functions as the mouth throttle)
- Climb while maintaining airspeed; avoid steep climbs when close to the ground
- If you experience an engine failure when climbing steeply, the hang glider will lose a lot of height before recovering; climbing at a flatter angle at a higher airspeed makes recovery easier
- Keep the harness (and thrust line) parallel with the keel
- Make only gentle, shallow turns at ¾ power (at first)

22.6 Retracting struts

- Do this at an altitude where you will have sufficient time to re-deploy the struts if the engine were suddenly to fail
- Reduce throttle to about 6,000 rpm (or the setting where your altitude is maintained)
- Level the wings and fly straight ahead at trim
- Once struts are retracted and held by their retaining clips they should stay in place. However, if a strut falls out of its clip, pull on its retracting line to raise it, and then manually re-clip it. If one strut falls out of its plastic clip repeatedly, then afterwards wrap some insulation tape around the strut at its point of contact with the clip. (Check that the clip is not damaged)
- Having the harness open (when the struts are down) will disrupt the cooling airflow over the engine. Zip up harness as soon as it is safe to do so. Lengthy full-throttle running while the harness is fully unzipped and the struts are deployed is not recommended; the engine may overheat

23. General cruising

- A “general cruising” rpm is an engine speed that maintains your altitude
- Keep your harness in line with the keel of the glider
- A strong thrust vector that is not parallel with the keel will tend to turn the glider. Reduce engine speed if you intend to make tight turns, such as when thermalling
- Do not twist too far off your centre line or the propeller may strike the trailing edge of the wing. Stay parallel to the keel

- Long VG cords are dangerous. If the glider has a VG cord that extends more than 1 meter when fully pulled, be sure that the cord will not foul the propeller or other moving parts. If necessary, tie the end of the VG line to the base bar
- Use your VG as you would with non-powered gliding. Level flying over an extended distance is usually done at full VG. You will reduce VG when in thermic conditions

23.1 Taking advantage of lift

To make the flight more relaxing and efficient, take advantage of thermal lift or ridge lift when you encounter it, just as you would in non-powered hang glider flight. Having a powered harness will give you opportunities to learn about thermals. You can use powered flight to visit multiple potential thermal triggers and test them all in a single flight. If you did not have a powered harness, you would only be able to visit one potential thermal trigger (if it turned out not to be working and you were forced to land). What do you do when you encounter a thermal while cruising along in your powered hang glider?

A powered hang glider will thermal just as well as a non-powered one. The main difference is that with a powered harness you have a large counterweight (the engine) behind your feet. When you encounter a useable thermal, reduce VG and throttle back the engine. If the thermal lift is 200 to 300 fpm, then you can maintain a cruising rpm and make wider turns. If the thermal lift is over about 300 fpm then you should throttle back to an idling speed. If the engine idles slowly enough for the centrifugal clutch to disengage, then you can apply the propeller brake once to stop the propeller turning so that it automatically folds. You will not need to lock the propeller brake when using a folding propeller. If you have a solid propeller and decide to keep the brake on, DO NOT forget to release the propeller brake before you power up the engine again!

23.2 Escaping sink

Sinking air on a thermic day is an indication that a thermal is nearby. A patch of sinking air will generally be quite local, with the main exception being the sinking air on the lee side of a range of hills. Always assume that you will encounter sink and that you may lose a couple of hundred feet of altitude as you pass through it. Give yourself a buffer of altitude to cope with this (another good reason to stay at above 500 AGL in cross-country flight).

24. Pilot mindset when flying a powered hang glider

24.1 Low flying

"Low flying" is defined in the Civil Aviation Rules as flying at less than 500 ft AGL unless taking off or landing. The minimum altitude to fly over congested and built-up areas is 1,000 ft AGL (see the excerpt from the Rules below regarding towers and other obstacles rising above the surrounding landscape). Just as with a non-powered hang glider, you are required to fly with an altimeter that shows altitude to an accuracy of 100 feet.

> (Note: A powered hang glider may be flown below a height of 500 ft AGL for ridge soaring, if such flight does not endanger persons or property on the ground.) Refer to the Civil Aviation Rules 91.311 Minimum heights for VFR flights.

Your powered hang gliding safety will be enhanced by avoiding low flying. Low flying has several disadvantages.

- If your engine fails, you will have little time to prepare for a landing. Deploying the struts, shutting off the engine and braking the propeller requires time that you might not have if flying low
- You may not have enough altitude to glide to a safe landing spot if your engine fails while you are flying low
- Your noise and impression of speed will be far greater to observers on the ground when you fly low. The risk of public complaints to authorities will be far greater. Farm animals and nesting birds will be far more distressed

24.2 The public's right to privacy -- no one likes a "Peeping Tom"

Flying low and circling over dwellings may give the impression to the residents that you are "spying" on them. Many people will not like the idea that their privacy is being invaded, and may film you on their smartphone and complain to the authorities. This will bring the sport of powered hang gliding into disrepute.

24.3 Public safety when taking off and landing

Preparing to take off from a public space

- If you are alone and there are unsupervised children or pets, ask an adult member of the public to watch for children or animals approaching the spinning propeller from behind
- If there are unsupervised children or pets around and no-one to assist you, you should end your attempt to take off until the risks have passed

Landing in a public space

- Just like with a non-powered hang glider, keep a watch out for vehicle movement (on the beach). Wait for moving vehicles to leave the area where you intend to land
- Land away from the public
- Avoid flying low on your final over people riding horses, etc.

ALWAYS ASSUME THAT YOUR ENGINE WILL FAIL AT ANY MOMENT!!!

ALWAYS BE WITHIN GLIDING DISTANCE OF A SAFE LANDING!!!

24.4 High flying

Check the appropriate VNC for information on maximum altitude limits where you plan to fly, as you would for non-powered hang glider flight.

- Advantages of high flying (within the legal limits) are mainly the greater gliding distance available to you if your engine were to fail

- Disadvantages of high flying include the lower temperatures and the changes in wind speed and direction that you may encounter at different altitudes. These could catch the unwary pilot out. Use your GPS/vario ground speed indicator to assess the current wind speed and direction. When up high, your movement relative to the ground will be very difficult to assess by eye

24.5 Reference to the CAA General Operating and Flight Rules

For more detailed information on flight rules, please refer to the Civil Aviation Rules, Part 91 and Part 106, CAA Consolidation (10 November 2011) on General Operating and Flight Rules.

25. Lower flying for inspection of a potential landing field

When preparing to land in an unfamiliar (typically rural) field, it is prudent to fly sufficiently lower over the field to adequately inspect it for potential hazards. This may include the following that might not be visible from a cruising altitude.

- Fences, especially temporary single-wire electric fences
- Crops
- Power lines
- Uneven ground
- Hard objects such as rocks or pieces of machinery
- Water or mud

26. Deploying struts in preparation for landing

Deploy struts as you reduce rpm to lose height over the landing zone. It is normal to deploy the struts while the engine is running at a low speed (idling or slightly above). If your engine is running, you can power up again to gain height if the strut lines become tangled during deployment. Do not leave it too late to deploy your struts.

There is a small chance that the Velcro-patch-tipped strut line end may become wrapped around one of the struts, preventing strut deployment. If the line fouls, gain altitude to give yourself the time you need to unwrap the line. This is why you should NEVER turn off the engine until both struts are properly deployed for landing.

27. Stopping engine and braking propeller

Use the choke to kill the idling engine. If the engine has a kill switch that can be turned on or off, then that may also be used.

After the engine stops, the propeller will continue to freewheel. A freewheeling propeller has the advantage of creating more drag for landing, but if the landing is rough and a strut collapses, the spinning propeller will easily be damaged from striking the ground.

ALWAYS land with the propeller locked or folded. Apply the propeller brake to stop the freewheeling propeller from turning. As soon as a folding propeller stops spinning, the airflow will close the two blades of the propeller together. The propeller brake will not need to be locked. A single, firm pull will be enough. Look behind you to confirm that the propeller has folded. On the other hand, a solid propeller will require the propeller brake to remain locked to prevent the propeller from spinning up again as the air passes over it. ALWAYS release the propeller brake after you land.

28. Mid-air engine restart

Check that the propeller brake is off. Start the engine as per normal. There is always a slight chance that you will flood the engine and be unable to restart it in the air. You may have no choice but to land out, then remove and dry the sparkplug before restarting the engine and taking off again. Always carry a sparkplug spanner and a spare sparkplug in your harness.

Whenever starting the rotation of a folded propeller, ALWAYS do it very gently. Do not start the engine and immediately go to full power. Suddenly accelerating the propeller shaft rotational speed may cause centrifugal forces to throw the folding propeller blades outwards violently enough to break them.

29. Landing approach

- Before you begin the downwind leg, the struts will be deployed, the engine and VG will be OFF, and the propeller will not be spinning. Use a standard aircraft approach as with a non-powered hang glider: downwind leg, base leg and final
- On final, keep the speed up as usual and keep one leg straight and snug in the harness' boot for as long as possible to prevent the motor from swinging sideways
- Hang the other leg down and use it to maintain balance

30. Air speed on final

- On final keep your airspeed up (pay attention to the roar of the wind)
- If the wind roar dies off, you know your airspeed has dropped
- Keep your hands low on the uprights just above the base bar, knuckles forward so that you can pull back on the A-frame easily while in a prone position to maintain the airspeed. (Alternatively, use your regular hang glider landing technique if not comfortable with this method)
- Once on ground effect, shuffle both hands up (from low on the uprights to about ear height as you go upright at the same time)
- Let the skids bleed off your speed
- Like with a conventional hang glider landing, push UP (not out) on the uprights
- Run out the landing (flares will be not as high-angled as a conventional hang glider, due to the powered harness being horizontal behind you rather than hanging downwards like a conventional hang glider harness)

31. Landing in strong winds (over 10 knots on the ground)

- Go upright on final approach while keeping both hands on the base bar
- You will be able to apply pitch pressure more easily with your hands on the base bar
- Keep your hands on the base bar and maintain airspeed as you descend (pay attention to the noise of the wind). If you can see that your groundspeed remains low as you descend through the wind gradient, then keep your hands on the base bar and maintain a safe airspeed
- DO NOT use this base bar landing technique in lighter ground winds (less than 10 knots). If the wind speed on the ground is lighter, i.e., you notice that your ground speed is significantly increasing as you pass down through the wind gradient, then slowly and deliberately transfer your grip from the base bar to the uprights

32. Engine failure and landing out

32.1 Engine failure on takeoff

- If too low to make a downwind leg (less than 150 ft AGL), then remain on course into wind, and land
- It is important to select a takeoff site that allows this. If you are too low to turn back, you will have no choice but to keep flying forward into wind. For this reason, don't take off towards hazards such as water or unsafe ground
- If high enough, turn downwind and make an aircraft approach to land back in the takeoff field

32.2 Engine failure during cruising flight

- To repeat, ALWAYS assume that your engine will fail at any time and ALWAYS be within gliding distance of a safe landing
- Mitigate engine failure by planning your flight in advance. Check a topographical map or Google Earth to help identify potential landing spots along your planned flight path. When following your planned flight path, adjust your altitude on course to ensure that you are always able to glide to landing areas. Don't limit yourself to only one landing choice; give yourself at least a couple to be on the safe side
- The further you are from a landing area, the higher you need to fly to be able to glide to reach it. If you intend to cross a forest or body of water, first climb to an altitude that will be high enough to enable you to glide to a safe landing in case your engine fails as you are crossing
- If your engine fails, immediately brake your propeller to reduce drag, then head directly to your pre-determined landing area and prepare to land

33. Ground handling after landing

The pilot cannot walk backward in a powered harness; only forward. If the pilot walks backward, the struts will dig into the ground and retract. Therefore, the pilot should ideally

land downwind of the anchoring point, so that they simply walk forward to the tether and then clip their glider nose loop to the tether clip.

If the wind speed on the ground is light and the pilot has overshot the anchoring point, they can then turn around and walk in a downwind direction back to the tether. If the wind is stronger, say, around 10 knots, then the pilot should jog back, to mitigate the force of the wind behind them. Jogging more than 100 meters is tiring, so the pilot should aim to land close to the anchoring point in the first place.

In strong wind, it is more important to land downwind of the tether, and walking into wind towards the tether. If the pilot overshoots the anchoring point, it may be simpler to restart the engine, take off into wind, and make a downwind circuit before re-landing downwind of the anchoring point.

The instructor can assist the student (in the harness) to move backward by physically lifting the back end of the powered harness off the ground so that the ends of the struts clear the grass, so that the pilot can walk backward.

After the pilot has clipped their hang glider back on the tether line, they can get out of the harness and begin the post-flight check. See the post-flight check details mentioned previously.

34. Packing up the powered harness

34.1 While harness is still attached to glider

- Place a plastic bag over the mouth throttle and secure with a rubber band
- Stow mouth throttle in chest zip pocket (optional)
- Connect chest and belt buckles of the harness (keeps the harness nice and compact) to hold the harness closed
- Disconnect fuel line from the harness to the fuel tank and place plastic bag over the harness fuel line end to keep debris out and secure with a rubber band
- Remove propeller from the propeller shaft and place in propeller bag
- Carry out post-flight check of powered harness
- If the harness has an electric starter motor, check the resting voltage of the start motor battery with a voltmeter. If the battery requires recharging, remove the battery from the harness

34.2 After unclipping harness from glider hang loop

- Unclip and place harness riser and fuel line into dorsal zip pocket of harness and zip up
- Move harness back about a meter from the glider
- Place harness bag over harness
- Pick up and gently flip harness onto its back, so the struts are pointing upwards
- Unhook strut bungies and retract and clip in the struts to the harness frame

- Place propeller case inside harness
- Zip up harness bag

34.3 Stowing the bagged harness in or on your vehicle

- Handle gently. Avoid impacts. Keep harness on its back.
- If transporting on a padded roof rack, make sure the straps do not put stress on delicate parts of the powered harness, such as the inlet silencer /carburetor
- Secure the harness with 2 straps. Tighten these 2 straps to firmly hold the harness to the roof rack so that it does not wobble when lightly pushed
- Recommend the use of a third strap to connect the middle of the harness bag to the glider bag in parallel (for extra security). Only lightly tighten this third strap

35. Powered harness flight log book

The pilot should keep a logbook (that doubles as a scrapbook for receipts, business cards and other useful documents). The logbook should be sturdy. A hardcover, spirally bound, lined A4-sized notebook is ideal.

Many pilots keep electronic log books, but a physical logbook is often helpful whilst training.

35.1 Logbook entry fields

- Date
- Site name
- Flight duration
- Flight description and comments
- Engine time (hours and minutes)
- Observations of harness (if relevant)
- Any problems or evidence of wear
- Battery voltage at end of flight (for electric starter motor models)
- Paste invoices / business cards into log book when parts/services are sourced. For example, you may want to contact the shop that serviced the carburetor previously. If you paste the shop's receipt or business cards into your logbook, you will not lose this important information

36. Starter motor battery

A LiFePo (lithium ferrous phosphate) battery is recommended. This type of battery poses less of a fire risk than a LiPo (lithium phosphate) battery. This type of modern battery is significantly lighter, and can carry more energy and be recharged faster than a NiCad battery.

If you buy a second-hand harness that has the original NiCad battery, you should replace it with a new LiFePo battery. The higher "cranking power" of the new battery will make starting the engine much easier.

36.1 Battery maintenance

- Periodically check for loose connections
- Use a voltmeter for your battery management
- Do not allow the resting voltage of your LiFePo battery to fall below the maker's recommendation. For example, if the minimum recommended voltage is 12.6 V, then you should remove the battery from the harness for recharging when the post-flight voltage falls to around 12.9 V
- When charging, do not allow the battery voltage to exceed the manufacturer's recommendation. Beware that voltage will spike upwards as the battery approaches its full charge. Monitor the voltage across the battery terminals carefully in the latter stage of charging (when the voltage is about 1 volt below the maximum recommended voltage) to avoid over-charging. You will find that in the last 1 volt of charging, the rate of voltage increase will become faster and faster

37. Personal locator beacon (PLB) and GPS trackers

If flying cross country in areas where there is no cellphone coverage, you should consider carrying a personal locator beacon or GPS tracker. In recent years the price of these units has come down to only a couple of hundred dollars, making them affordable to the average pilot.

38. Reserve parachute deployment

The deployment of the emergency parachute from the harness of a powered hang glider is fundamentally the same as from a non-powered hang glider harness.

On the Mosquito NRG powered harness, the reserve parachute bag handle is connected to the kill switch. The action of pulling out the parachute handle to free the parachute bag (ready for deployment) will trip the switch and stop the engine (the propeller may continue to freewheel unless the propeller brake is applied). If the pilot is able to brake the propeller to stop it rotating, this may reduce the risk of the spinning propeller possible fouling on the lines of the parachute.

If the powered harness is not fitted with an automatic or manual kill switch, then stop the engine by throttling back to idle and applying the choke.

39. Regular servicing/checking of powered harness (at home)

- Check spark plugs
- Be aware of the hazards with running engine in garage, such as ventilation of exhaust gases and debris (paper, etc.) being sucked into the propeller
- Fuel filter. Clean when sediment builds. Replace annually
- Mouth throttle and other control cable lubrication. Periodically check and lubricate
- Rust prevention and control. Check visually for surface rust. Apply rust killing solution

- Check operation of control cables. On the Mosquito NRG harness, the throttle cable collector is mounted on a metal plate that is secured in a pocket in the harness behind the pilot's right shoulder. If this metal plate slips out of its holder (which may sometimes happen), the operation of the control cables will be affected
- Check lines and cables for signs of wear
- Check for loose bolts
- Check for metal fatigue cracks, especially in the exhaust system components

40. Periodic servicing of powered harness

- Carburetor stripping and refitting every 100 hours or when required. For best results, use the services of a lawnmower or chainsaw repair company who will be able to clean, service and pressure-test the carburetor
- Parachute repacking. The reserve parachute should be periodically repacked as specified in the parachute manufacturer's manual
- Strut bungy cord replacement, particularly on hot (exhaust) side. This side will last for about 50 hours of flying (or one busy year of flying)
- If the centrifugal clutch is slipping, disassemble and clear away any oily deposits. Brake cleaner may also be useful

41. What next? Where to fly?

While the student is gaining their certification to fly a powered hang glider (see OPMF60) they will be flying under the guidance of their instructor. The main flying sites are likely to be the coast, inland private fields, or other suitable open public spaces.

The student's flights will be in the vicinity of these sites, initially under the direct line of sight of the instructor. In time, the student and the instructor may both fly their own powered hang gliders (ideally in radio contact with each other) for short cross-country flights to build the student's confidence and to expose them to a wider variety of conditions.

After gaining their certification, the student will be able to organize their own flights and likely be looking for new places to fly from. There are many uncontrolled airfields and airstrips around New Zealand. It is not within the scope of this training program to cover the use of such airfields. Before the student can use these airfields, they may need to be familiar with:

- The rules and protocols for using these airfields
- How to correctly and legally use an airband radio to communicate with other pilots (of fixed-wing aircraft and helicopters for the most part) who are flying near, landing at or taking off from the airfield

Birds of a feather flock together. The new powered hang glider pilot will find support, technical advice and mentoring in the groups of powered hang glider pilots in New Zealand

and also those groups overseas that can be reached through social media networks such as Facebook. These networks can be useful for finding answers to technical questions.

The social aspect and comradery of flying together can be a source of motivation to the new pilot, helping them to retain their passion in their new sport and to acquire the knowledge that will enable them to get the most out of their powered hang glider flying in the safest and most responsible manner.

PART 2: Syllabus (fulfilling the requirements of OPMF60)

This syllabus is designed to assist the instructor in confirming that the student has understood and is capable of performing the tasks and skills described in Part 1 that collectively form a typical powered hang gliding flight, beginning with preparation at home, on to the choice of timing and location for the flight, the rigging and preparation of the powered hang glider for flight, the flight itself and post-flight tasks.

The goal is for the instructor to use this syllabus to confirm that the student meets the flight requirements listed in OMPF60 (the powered hang glider certificate).

42. Student information and background

42.1 Student contact details

- Name
- Address
- Contact telephone number
- E-mail address
- Emergency contact telephone number
- Other relevant contact information

42.2 Student HG qualification and currency

- If you do not already know the student through your hang gliding activities, contact the student's hang gliding club to gain information about their hang gliding abilities and attitude
- Confirm their current membership of the NZHGPA
- Check their hang gliding flight logbook

This syllabus assumes that the student will supply all of their equipment. It is common in New Zealand for a hang glider pilot to purchase a powered harness second-hand (having never flown it).

The first lesson should focus on the powered harness.

43. The powered harness

- Storage of harness. Confirm that the student is storing the harness in a way that will not damage the harness
- Harness fit and adjustment. Does the student fit their harness? Like with a conventional non-powered harness, suspend the harness in a garage (from a rope attached to a secure ceiling mounting point). The adjustment options will be similar to those of with a conventional non-powered harness (shoulder straps, behind-foot packing, etc.)
- Engine fueling. If the harness has not been used for many years, the fuel lines and fuel line filter may need to be replaced. The carburetor may require an overhaul. Even if

the engine starts, sediment in the old fuel lines may become dislodged, leading to carburetor jet blockage and engine failure

- Spark. Confirm that the magneto can deliver a spark. Check whether the kill switch has been activated or not
- Attachment of propeller to harness
- Engine starting. If electric starting is used, the old battery (especially a NiCad battery) may need to be replaced with a modern LiFePo battery
- Review the hazards of running the engine in a garage (exhaust gases, spinning propeller, etc.)
- Loading / unloading from vehicle. Review the method the student will use to transport the bagged powered harness to the flying site. Check their loading/unloading technique
- Check how the student intends to carry fuel and the harness fuel tank in their vehicle
- Check how the student intends to manage their flying instruments, helmet, and other gear
- Check the student's ground anchor and tethering system
- Confirm the date of the powered harness's reserve parachute repack

The second lesson should be on site, and should focus on: 1) the integration of the hang glider and the powered harness, and 2) ground handling

44. Integration of HG and powered harness, and ground handling

44.1 Hang glider review

- Review the choice of glider
- Confirm the currency of the glider's warrant of fitness (WoF)
- The instructor should check the glider for damage or wear
- Confirm that the student can correctly carry out the following:
    - Nose loop installation to keel at the nose plate
    - Tethering and un-tethering of the glider to ground anchor
    - Correct adjustment of the length of the tether
    - Keel-end removal and replacement
    - Fitting and un-fitting of fuel tank to glider (a half-full tank is adequate)

44.2 Tethering system review

- Choice of ground anchor
- Choice of tether cord (rope or adjustable strap)
- Choice of clip

44.3 Integration of powered harness and hang glider

- Confirm that the student can properly unload their powered harness and clip it onto the hang strap of the tethered hang glider (see PART 1 "Powered harness attachment to glider" for details).

- Confirm the correct connection of the harness fuel line to the fuel tank
- Confirm the pre-flight inspection process (see PART 1 “Pre-flight checks” for details)
- Review and demonstrate the operation of the following harness controls
    - Mouth throttle
    - Main cruising throttle (on Mosquito NRG harnesses)
    - Choke
    - Starter motor activation
    - Propeller brake and its locking / unlocking action

44.4 Engine starting

- See PART 1 “Cautions on starting engine”
- Demonstrate the starting of the engine, then kill the engine with the choke and ask the student to start, idle and then stop the engine
- Have the student change the sparkplug to simulate the action to take if the engine has flooded and will not start

44.5 Getting into and out of the harness

- See PART 1 “Entry into harness (glider tethered)”
- Demonstrate the harness entry technique to the student and then have them do it

44.6 Ground handling

- With the student in the harness (engine OFF), have the student unclip the nose loop of the glider from the tether clip, then walk forward as if moving to the takeoff point
- Have the student make a wide circle on the ground, to return to the tethering point on the downwind side. Have the student attempt to reattach the tether clip to the nose loop.
- Have the student unbuckle themselves and exit the harness

The third lesson will be on site and will focus on the takeoff, field circuits, and landing. Although this is called the “third lesson” it may be integrated into the previous lesson on the same day, at the instructor’s discretion.

45. Takeoffs, circuits, and landings

It is assumed that the site of the student’s first powered flight will be one with a smooth, laminar airflow of between 4-10 knots, preferably at a location familiar to the student. Their local soaring beach site may be ideal if the beach is wide and sandy (not shelly or pebble-covered) and with few people or vehicles around.

45.1 Preparing for takeoff

- Have the student (wearing their flying gear and radio harness) get into the harness
- See PART 1 “Entry into harness (glider tethered)”
- Perform a radio check
- Check that the student is able to start the engine while in the harness. If the student floods the engine, have them get out of the harness and change the spark plug

- See PART 1 “Taking off (directly into a headwind of 4-10 knots is ideal)”

A hand-held camera to record the student’s takeoff can be useful as a training tool to highlight any issues or successes in feedback to the student. An action camera attached to the glider can also be used (although the footage will not be viewable on site unless the camera is connected to a laptop).

45.2 First takeoff at a beach

Flying at a beach where the student has previously free-flown their hang glider is ideal if the beach is suitable for powered takeoffs. If the cliffs are soarable at the time of the first powered takeoff, then this will be a bonus.

Video of a first-time powered flight at a coastal site familiar to the pilot https://www.youtube.com/watch?v=VV2jx0uyXQ0

The flight will be for the student to take off into wind and then climb to about 300 ft ASL and then approach the cliffs in an attempt to get ridge life. If the cliffs are soarable, the student can switch over from the mouth throttle to the pull (cruising) throttle, and reduce the engine speed. Full takeoff rpm will not be necessary.

If the cliffs are soarable, the student can throttle back to idling speed. The student can treat the powered harness as if it were an ordinary non-powered harness. The student should soar for a while at their familiar coastal site to help them relax and prepare for their first landing in the powered harness. The student will not need to retract the struts in this first powered flight.

To prepare for landing, the student must kill the engine with the choke then apply the propeller brake to stop the propeller turning. If the propeller is a solid one, then the propeller brake will need to be engaged and locked. For a folding propeller, a single firm pull of the brake will stop the propeller, which will then fold.

The landing approach will be the same as when landing in the powered harness. The student should get onto the ground effect and sense the struts gently coming in contact with the sand. The vibration from the struts contacting the sand will be the signal to begin to very gently flare the glider and run out the landing.

In subsequent flights at the beach on the same day, the student can practice and repeat the following tasks while soaring on the cliffs.

- Retracting and deploying the struts
- Idling the engine and applying the propeller brake to stop the propeller
- Restarting the propeller rotation when the engine is idling. If the harness has a folding propeller, then very gently increase engine rpm
- Stopping and re-starting the engine. (Be careful if using a folding propeller)

Towards the end of the lesson, the student may fly for some distance from the takeoff point, but should remain in radio contact with the instructor.

The student should demonstrate to the instructor the ability to:

- Climb to 1,000 ft ASL
- Demonstrate an ability to fly coordinated 360-degree turns under power in both directions

All takeoffs and landings should be logged by the student and instructor to go towards meeting the requirements of OPMF60.

45.3 First takeoff inland

If a coastal site is unavailable for the student's very first powered flight, then an inland field of suitable dimensions and offering a laminar airflow will be used.

If hazards are present, the instructor will discuss these with the pilot in the pre-flight briefing.

The initial flight plan at the inland site will be similar to a winch tow-up of a non-powered hang glider. (Check whether the student has been towed up inland previously.) The pilot will take off (into wind), fly straight and gain altitude to about 300 to 500 ft AGL, then reduce throttle from full power and make a slow turn downwind to begin a circuit of the field. The student may make several circuits of the field, and climb to about 1,000 ft AGL before turning off the engine, braking the propeller, and making an aircraft approach to land slightly downwind of the tethering point.

The following tasks must only be performed over the field and at an altitude of at least 1,000 ft AGL.

- Retracting and deploying the struts (do this with the engine idling)
- Idling the engine and applying the propeller brake to stop the propeller
- Restarting the propeller rotation when the engine is idling. If the harness has a folding propeller, then very gently increase engine rpm
- Stopping and re-starting the engine. (Be careful if using a folding propeller). Deploy the struts before you turn off the engine

45.4 Demonstrating a launch abort

Have the student take off but then to spit out the mouth throttle within several seconds of leaving the ground. The student will continue to fly forward into wind and to land. The student will not attempt to brake the propeller but rather focus fully on landing.

If the wind on the ground is around 8-10 knots, the instructor should assist the student in returning downwind on foot to the tethering point. Alternatively, if the student has ample room after landing from the launch abort, they may take off again.

45.5 Ground handling to return to tether

Confirm that the student can land consistently downwind of the tether. For practice, have the student land upwind a short distance from the tether, then turn downwind and jog back to the tether, then around the tether and approach the tether from the downwind side.

- Encourage the student to clip the glider nose loop to the tether clip unassisted

45.6 Out-of-circuit flights

When the student has gained confidence and ability to take off, perform circuits and land at the field (or beach), the instructor may consider that the student is ready for a longer flight lasting around 30 minutes. Such a flight will typically be into wind on the way out, and downwind on the return to the landing point.

It will give the student confidence and enhance safety if the instructor, in their own powered harness and with radio contact, can accompany the student on their early out-of-circuit flight(s).

Topics to consider and discuss on radio when flying with the student:

- Using thermals
- Escaping sinking air
- Awareness of other aircraft (the pilot must be constantly vigilant for other aircraft)
- Avoiding the lee side of hills
- Choosing a flight route that offers landing options (maintaining a constant awareness of landing spots)
- Avoiding areas that have not landing options, such as forests, swamps or bodies of water UNLESS one has sufficient altitude to glide to a safe landing
- Assessing candidate landing fields (in a scenario where the powered harness has insufficient fuel to return to the takeoff point)
    - Hazards in and around the field
    - Wind direction
    - Road access

46. Post flight

46.1 Post-flight checks and flight log

Review the student's post-flight check of the powered harness. Have them record their day's flights in their logbook, along with any records of engine hours or other issues. Check their logbook entry.

46.2 Derigging and loading harness onto/into vehicle

Observe the student's derigging of the powered harness from the hang glider and its loading into or onto the vehicle and its securing.

46.3 Pilot attitude (not bringing the sport into disrepute)

Review the points raised in PART 1 "Pilot attitude when flying a powered hang glider"

46.4 Hazard-review topics to discuss with the student

- Planning for engine failure immediately after takeoff and in flight

- Flying into dangerous areas such as hill lee-side, particularly when flying downwind and not maintaining awareness of what's behind
- Resisting the urge to copy some videos on YouTube that show powered flight a mere couple of metres above water
- If low-level flight is ever to be attempted (when inspecting a field for hazards prior to landing) then lower the struts and fly into wind. Flying low downwind will result in a very high groundspeed. In the event of engine failure, a crash landing would be likely
- Climbing up into strong winds or a different wind direction aloft. This happens a lot when people take off in a sea breeze and climb up into off shore airflow at altitude. Even experienced pilots have been caught by this one
- Airspace awareness! (It's so much easier to fly into controlled space without thinking). Read your VFR map as you plan your flight. Note landmarks such as towns, hills or rivers, and their relation to airspace boundaries.
- Never fly in an Mandatory Broadcast Zone (MBZ) without an airband radio and without compliance with the rules of the Zone
- Engine failure mitigation via a sensible flight plan
    - Consider road access in advance
    - Plan your flights via Google Earth
    - Don’t fly low over “tiger country”. Always be in gliding distance of a safe landing area
- Review the procedures for reporting incidents/accidents via the NZHGPA website

47. Powered HG Site Form Use OPMF41

Fill out one sheet per powered hang glider flying site.

This form can be found on the association website www.nzhgpa.org.nz

Members/ OPM & forms/ Administration forms/ Launch Site Rating

Collect the sheets together in a folder to serve as a reference and database of useful information about each of the flying sites that you will use.

Important information to include in the data sheet:

- Name and address of the site
- Contact details of land owner or person responsible for the site
- Where it says 'launch rating hang gliding' please write 'Powered HG'
- Include a sketch plan of the site
    - Draw a compass symbol indicating north
    - Draw in any hazards such as power lines, roads, etc.
    - Note any turbulence generators such as rows of trees
    - Indicate the length of the takeoff strip (see Google Earth)
- Note any other site users such as powered aircraft or skydiving operations
- Radio frequency of the site (if an airfield)
- If used by the public, note the times when busy (esp. for sports fields)
- Note the web address of any useful local weather station
- ON THE BACK SIDE OF THE DATA SHEET, record the date that the site was used together with any comments about site conditions.

Appendix 1. Safety Check List

Print out a copy of this Safety Check List. Take this List, together with the relevant Powered HG Site Data Sheet, to the site you will use.

- Hang glider safety check
  - Hang glider is correctly rigged (nose-cone is in place, etc.)
  - Hang glider is correctly tethered to the ground anchor
  - Hang glider preflight check completed
- Powered harness safety check
  - Harness is clipped into the hang glider and carabiner is locked
  - Fuel tank air intake is open
  - Harness preflight check completed
- Pilot safety check (you (the pilot)) are physically and mentally fit to fly)
  - You are not under significant stress from work/personal relationships
  - You have had a good night's sleep
  - You are not under the effects of alcohol, drugs or medication
- Public safety check (are members of the public present?)
  - Are children or dogs present?
  - Are other vehicles being driven / ridden at the site?
  - Have you notified the land owner or site operator that you plan to fly and have obtained clearance?
- Site safety check
  - Refer to the Powered HG Site Data Sheet for the site
  - Confirm any hazards at the site
- Weather safety check
  - Will the wind speed and direction cause turbulence generators to create turbulence?
  - Is there a wind sock set up?
  - Are rain fronts approaching?
  - Are there signs of cloud overdevelopment?
- Other aircraft / site user safety check
  - Will other aircraft or skydivers be using the site?
  - Are other aircraft flying overhead regularly?
  - What frequency will they be using?