



## Overview

Fandrich powerrakes are designed to rapidly collect large volumes of cones with helicopters that stay above the forest canopy. The powerrake hangs on the cargo hook of the helicopter and can be released in an emergency.

Fandrich powerrakes use technology patented in Canada and the United States. They weigh about 365 lbs and should not be used with helicopters having a net lift in excess of 1800 pounds. The pilot controls the rotation of the rotors through switches on his control stick. After raking 10 to 20 trees or more, the pilot flies the cones to an unloading site.

**Caution: Stay clear of the rotors at all times.**



## Instructions for Ground Crew

Local safety regulations must be respected at all times and take precedence over the following practices. The ground crew should wear suitable shatterproof eye protection, ear protection, safety headgear with chin straps, gloves and reflective vests. The ground supervisor should be easily identifiable and should return to the pilot's side of the helicopter when he is finished so the pilot can see the signal that loading is complete. All ground crew should understand any signals arranged between the supervisor and the pilot.

To unload a powerrake, one or two people on the ground pull a latch on each side of the powerrake.

Most cones and branches will slide out automatically. The remaining load can be removed by hand. After unloading, the ground crew close the non-latch side of the basket and then close the latch side against the fibreglass cone to lock the basket in place.

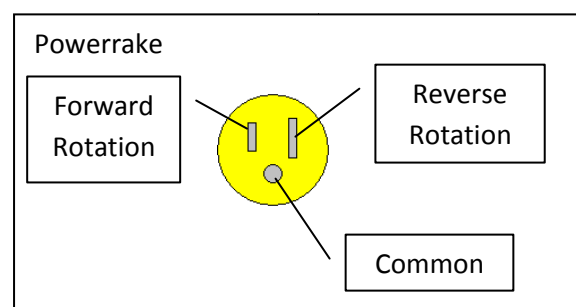
Top up the 4-stroke Honda engine fuel tank with gas whenever the helicopter is being refuelled.

In very cold weather, the following procedures may be used:

- Switch to AW22 hydraulic oil
- Prior to starting the engine cold, place the engine and pump under a blanket and heat the engine with a portable heater. (Ensure the heater does not cause any localised danger of fire or melting. No blowtorch should be used on the engine or other equipment.)
- Prior to starting the engine cold, remove the pump from the mounting bracket and start the engine unloaded. When the engine is warm, stop the engine and re-attach the pump. (The mounting bracket should not be removed from the engine.)
- Shut the fuel off and let the engine stop by itself at the end of the working day.

## Wiring Details

Fandrich powerrakes are controlled by a three-wire electrical cable ending in a household electrical plug that is to be connected to the helicopter. A powerrake requires two switches and a return.



Power at 24 volts between the green and black wires switches the solenoid control valve in the hydraulic circuit to cause the rotors to turn in a direction that pulls the powerrake down and strips the cones from the branches. Power between the black and red wires causes the rotors to reverse rotation and pull the rake back up the tree.

When no switches are on, the rotors are stationary or freewheeling as all hydraulic ports are open.

### **Operation to Maximise Finger Life**

1. Every unloading run, remove any branches that have been caught in the power rake and are being hit by the fingers.
2. Keep the rotors stationary when ferrying. Rotate the rotors only when needed to strip branches.
3. Use the reverse rotation sparingly.
4. Minimize the amount of rotor stalling (in congested branches).
5. Do not run engine unnecessarily fast. The engine speed should be below 4000 rpm.
6. Minimize the exposure of fingers to sunlight when the rake is stored for more than a few days.

### **Servicing Instructions**

Servicing instructions for the Honda engines are provided separately in Service Bulletin #1/4.

Continually (at least daily): Inspect cables for damage or wear. Replace frayed or damaged cables immediately.

Every 10 hours (or when a leak is observed): The hydraulic oil level should be checked. The level should be 2" below the top of the oil tank cap when the machine is level. On observing an oil leak from a loose fitting, the fitting should be tightened. On observing oil leaks from other sources, contact Fandrich Cone Harvesters. AW32

hydraulic oil should be used in the machine or AW22 hydraulic oil in very cold weather.

No greasing should be necessary during operation.

### **Changing Power Rake Fingers**

The plastic fingers have been designed to be soft enough to minimize damage to the branches yet stiff enough to be make cone raking efficient. Due to the nature of the constant flexing, fingers will break after a number of hours of use. Usually the performance of the powerrake will not be significantly affected when only 2 or 3 fingers are missing.

The fingers come in sets with 6 fingers per set. Three rows of fingers with 2 sets of fingers in each row can be found in each of the two rotors. A branch deflector extends across the two sets of fingers in each row.

NOTE: Yellow fingers are stiffer than blue fingers but don't last as long

For each row of fingers:

1. Loosen and remove bolts from one set of fingers. Loosen but do not remove the bolts in the other set in the same row to keep the other set of fingers and the branch deflector located.
2. Remove the one set of fingers (half of a row) which has had the bolts removed.
3. Place a new set of fingers into the slot where the old set has been removed. This may require light application of a hammer.
4. Insert bolts into the new set of fingers, passing through the branch deflector holes to locate the branch deflector.
5. Remove the bolts from the second set of fingers and remove it.
6. Place a new set of fingers into the slot where the second set has been removed and insert bolts.

7. Turn on nuts and tighten.

### **Preflight Checks**

Ensure that the three wire rope support cables are securely fastened to the kevlar body. Check cables continually for damage and wear. Replace frayed or damaged cables immediately. It is extremely important that the cables cannot separate from the kevlar body and fly into the helicopter rotors.

1. Lay the cables out to their full length, approximately 30 feet. If necessary, untangle the cables and place the cables parallel to each other.
2. Hang cable teardrop on the helicopter cargo hook or have the ground crew attach it once the helicopter is airborne. Attach the electrical connector to the helicopter.
3. Ensure that the cargo hook unlocking mechanism on the helicopter is working satisfactorily.
4. Remove the pilot's door and unnecessary articles to reduce the helicopter weight. Take only enough fuel for an hour's flight plus an adequate reserve.
5. Top up 4-stroke Honda engine fuel tank with gasoline. Check crankcase oil level of the engine.
6. Start Honda engine. Once engine is warm, open throttle to the speed desired.
7. Check operation of the powerrake by having the pilot rotate the rotors in both directions.
8. Ensure that the equipment used to communicate to the ground crew is fully operational.

### **Instructions for the Pilot**

Local safety regulations must be respected at all times and take precedence over the following practices. Cone collecting is strenuous flying and can lead to pilot fatigue. Take 15 minute rest

breaks after each hour of flying. A good plan is to double pilot and alternate during refuelling stops. Fly no more than 4 hours per day harvesting cones.

1. Ensure that the cables do not tangle as the helicopter lifts off.
2. Switch the rotors to forward rotation and lower the Fandrich powerrake over a tree. Ensure that no other tree or snag interferes with the helicopter operation.
3. On the way up, either leave the rotors turning to continue stripping the branches, or turn them off and free-wheel up the tree. When necessary, reverse the rotors to help lift the powerrake up the tree. This feature should be used sparingly.
4. Move to the next tree and repeat.
5. When the basket is full, fly to the unloading site and lower the powerrake while the ground crew stands clear. As there is an inherent risk of dropped payload, the equipment should not be flown directly over the ground crew. Hover above the ground while waiting for the supervisor to unlatch the basket and then re-latch it. Wait for the signal from the ground supervisor that all is clear for lift-off.

Should the engine stall during a cut, the rotation switch should be turned off to open all hydraulic lines so that the rotors can spin more easily.

### **Suggestions for Faster Collections**

1. Fly paths that minimize distances between trees. Generally fly out empty and collect cones on the way back so that the longest flight is with empty netting.
2. Select unloading sites that are below the stand being harvested. It is easier to fly upward with the netting empty than upward with the netting full of cones.

3. When possible, transport powerrakes to the collecting site by truck or trailer. Aerial ferrying of powerrakes reduces helicopter air speed to about 80-90 mph.

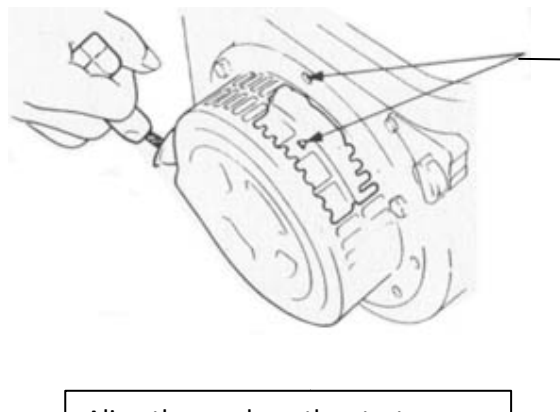
The main factors affecting collecting rates are the number and size of the cones on the tree-tops, the density of collectable trees in the stand and the flying distances. The speed of collections also depends on the species being collected, the shape of the treetops, the size of the helicopter, the efficiency of the ground crew and the skill of the pilot. Pilots with vertical reference skills require only two to three hours to become proficient with a Fandrich powerrake.

The powerrake can dump cones directly into trucks or trailers for transport to more convenient sacking sites.

#### **Transporting Powerrakes**

In securing a powerrake to a truck or trailer, ensure that the main body of the powerrake is held tightly and cannot move vertically or transversely. Keep in mind that a powerrake has an uneven distribution of mass.

Prior to transport, shut off the fuel valve on the Honda engine and pull the starter rope slowly until a resistance is felt. Continue pulling the rope until the notch on the starter pulley is on top. At this point, all valves are closed so that water and dirt will not enter the engine through the exhaust or carburettor during transport. The engine should be covered with a plastic garbage bag.



Align the mark on the starter pulley with the hole at the top of the recoil starter.

#### **Dimensions and Weight**

	Approximate dimensions	Approximate weight
Powerrakes	7'x7' X6.2' high	365 lb