

Safe Operation of Compact Tractors

Authored by Robert “Bobby” Grisso, Extension Engineer, Biological Systems Engineering, Virginia Tech

Follow these safety tips and maintenance procedures for checking, servicing, and operating compact tractors to extend their life and reduce breakdowns and accidents.

Regardless of size, all power units are potentially hazardous if improperly maintained or operated. Observing all safety precautions before, during, and after tractor operation is essential to operator safety.

Types of Grounds-keeping Equipment

Lawn and turf maintenance is easier because of modern compact tractors, but carelessness can cause trouble. Most tractors used for grounds care can be classified into three size groups: 1) riding lawn mowers (8-25 horsepower), which are fitted with a mower; these usually have no attachments, 2) lawn and garden or compact tractors (12-32 horsepower) to which a variety of tools and equipment can be mounted, and 3) large tractors (18-80 horsepower), which have a low center of gravity for working slopes and can be equipped with a variety of attachments.

Read the Operator’s Manual

The most important safety job for an operator is frequently reading the operator’s manual. It contains safety tips and procedures for checking and servicing the equipment. Following these instructions will increase operating life, reduce major breakdowns, and prevent serious accidents.

Grounds care equipment is noisy. Personnel should communicate with an equipment operator using the hand signals as shown in Figure 1. These hand signals could prevent a serious accident if a quick reaction is needed.

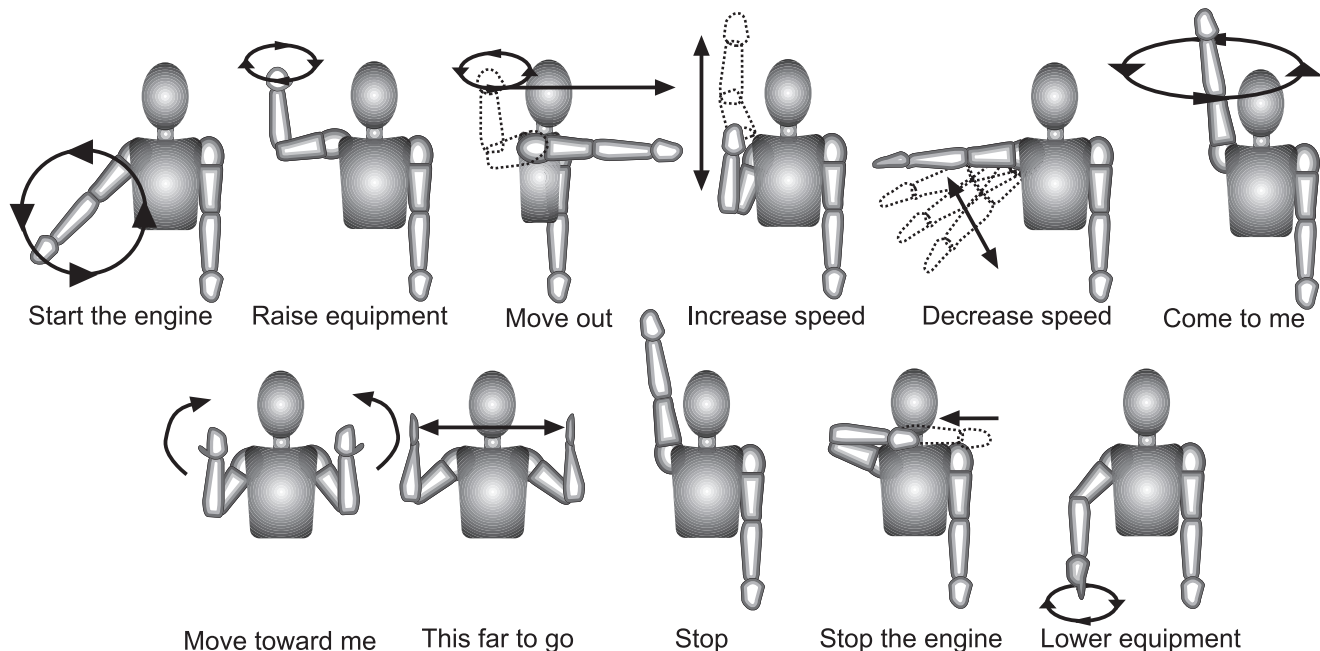


Figure 1. Equipment is noisy; use hand signals to communicate between operator and other personnel.

Take responsibility for small children in the area and teach them to respect mowing equipment and moving vehicles. Keep children away from mowing areas and do not allow passengers on the tractor or dump carts. Explain the danger of sharp blades rotating at high speeds and the potential of thrown objects that may move at speeds of 170 mph. For the safety of others, especially children, never leave a running machine unattended; shut it off and always remove the keys.

Personal Safety Check

- Wear close-fitting, sturdy clothing (Figure 2). Avoid clothing with tears, bulging pockets, frayed edges, and heavy cuffs that may tangle in revolving equipment parts. Cut-off trousers or shorts offer no protection from flying debris.
- Wear heavy, non-slip shoes, preferably with steel toes. Sure footing is essential to your safety. Heels help prevent slipping and good soles reduce dangers of tripping and falling.
- Wear ear muffs in excessively noisy conditions (more than 85 decibels) to prevent hearing damage and reduce operator tension and fatigue.
- Wear a dust mask in extremely dusty conditions to protect against dust and debris that may be blown about.
- Wear safety glasses or goggles for protection from

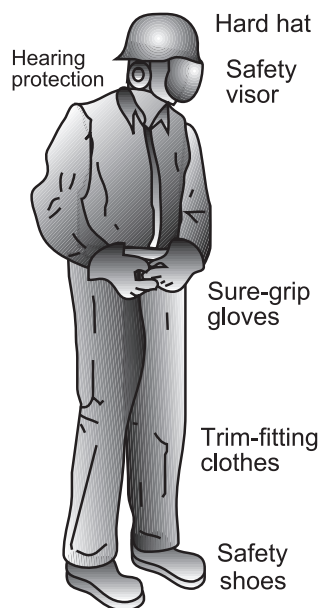


Figure 2. Safety clothing and equipment provide extra protection in the event of an accident situation.

thrown rocks, pieces of wire, glass, or other objects and from exposure to dust, insects, and low hanging branches.

- Keep alert. Fatigue, worry, preoccupation, illness, and the like are enemies of safety. Drugs and/or alcohol impair an operator's skill and judgment. When you begin feeling tired, too hot, or too cold, take a break (at least 10 minutes) to stretch, walk about, lie down, or snack. A break will restore alertness and help you continue the job accident free.

Inspect the Equipment

Before starting the equipment, make these final inspections and adjustments:

- Check the fuel level and refuel while the engine is cool and in a well-ventilated area. Wipe off any spilled fuel. Keep sparks and flames away from the fuel tank and engine. Do not smoke while refueling. Store additional fuel in a well-marked, safety storage container. Gasoline storage containers should be colored bright red. Diesel fuel containers should be yellow.
- Check coolant when the engine is cool on liquid-cooled engines. Do not remove a radiator cap when the engine is hot, and never add cold water or coolant to a hot engine.
- Do not smoke or light a match when checking the battery electrolyte level, especially right after changing a battery or after running the battery down from cranking. Hydrogen gas from a battery (even in low concentrations) may explode in the presence of a spark or open flame. Keep a rubber cover on the positive battery post to guard against sparks.
- Adjust the tractor seat to fit the operator's needs and comfort. A properly adjusted seat will help prevent operator fatigue, which may contribute to accidents. Improper seat adjustment also may hinder the operation of hand levers and foot pedals in an emergency. An upgrade seat for smaller tractors will help absorb many of the bumps in a rough field.
- Adjust the tread width, tire pressure, tractor weights, and cutting height so the equipment is properly prepared for operation.
- Sharpen or replace dull blades.
- Never disconnect (or by-pass) factory installed safety features.

Starting Procedures

Consult the operator's manual for the correct starting procedures. Remember the following general tips:

- On typical systems (Figure 3), before the engine will start, these conditions must be satisfied: (a) the ignition key must be "ON," (b) the transmission must be in neutral, the clutch pedal depressed, or both, (c) the power-take-off (PTO) or mower must be disengaged, and (d) the operator must be properly seated.
- Do not operate an electric starter for more than 30 seconds at a time because of heat build-up in the starter motor. If the engine will not start, turn the key to "OFF" and wait for a minute or two before trying again.
- Provide good ventilation if you must start an engine indoors. Engines give off carbon monoxide, a poisonous, odorless, and colorless gas.
- After the engine has started, make a final check to be sure all people, pets, and obstructions are out of the area, then increase engine speed to the recommended level.
- Move the gear-shift lever to the desired gear and engage the clutch slowly, following the manufacturers recommendations for shifting. On most tractors, start out in the gear that you intend to use for driving or operating.
- Smooth starts are essential both for equipment and

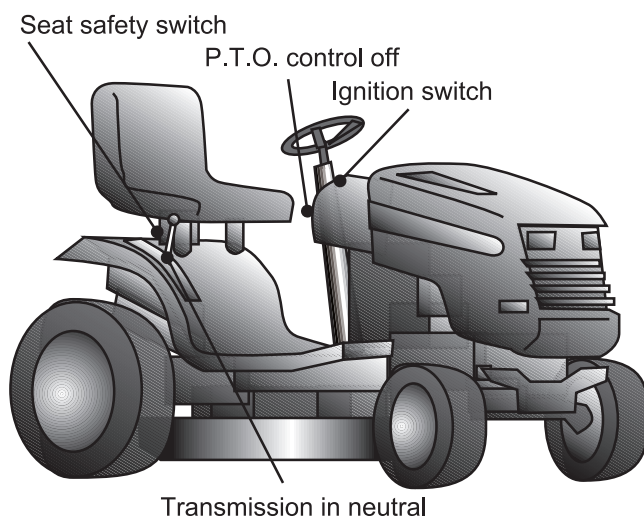


Figure 3. Many compact tractors have an interlock safety system. Do not remove these devices; they are for your protection.

operator safety. Apply power gradually to the drive wheels. Do not "pop" the clutch by letting it out too fast. Engaging the clutch too quickly could result in flipping the tractor over backward.

Be Alert While Operating!

- Before starting to mow, check the area and remove any debris (rocks, cans, wire, toys, etc.) that might be thrown if struck by a rotating mower blade.
- Locate solid obstacles that might be hidden in the grass or overgrowth (large rocks, boundary stakes, irrigation heads, stumps, etc.). Avoid low-hanging branches, electric lines, and guy wires that can cause costly equipment damage, tractor upsets, and operator injuries.
- While maneuvering the tractor, be alert and watch the area ahead for moving vehicles, people, or animals that might cross the path of the tractor. Be prepared to change course or stop.
- Avoid mowing too close to trees. The equipment may damage a tree, and low branches may distract you and lead to an accident. Wood chips placed at the tree's base will keep the turf neat and trimmed and will keep the mower away from the tree base.
- Reduce speed while operating on embankments; a hole, bump, or quick turn may result in tragedy. Use the widest possible wheel spacing and keep the tractor properly ballasted (Figure 4). Mow up and down the slope with a lawn tractor. If you must climb a steep slope, go up in reverse to reduce the chance of a backward overturn.
- Stay clear of ditches, embankments, and ponds. Apply power carefully when driving out of a ditch; a tractor upset happens easily under these circumstances. A rollover protection structure (ROPS) and seat belt will protect the operator, but cautious operation should be the first priority.
- Leave the tractor in the same gear when going downhill as was used going uphill. The engine will act as a brake.
- While backing, look behind to be sure the way is clear. Some lawn and garden tractors have a forward/reverse lever that will reverse the tractor with a short pause. Be sure to bring the tractor to a full stop; look

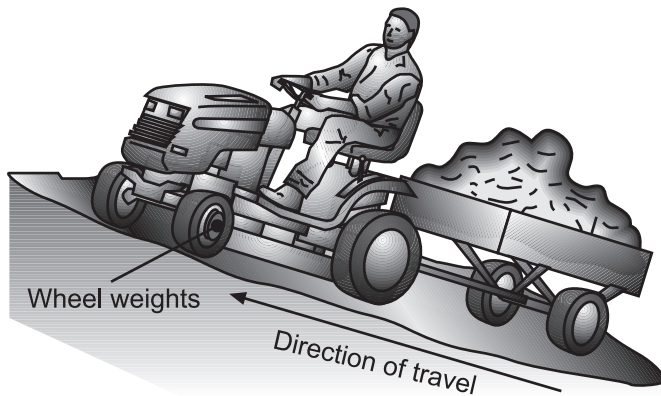


Figure 4. Downshift to a lower gear when climbing steep grades. Loads on the rear increase the chance of a backward upset. Add front wheel weights or front-end weights for balance.

and be alert as you reverse directions.

- Stop mower blades before crossing gravel patches.
- Do not drive lawn and garden tractors on streets or highways. Their small size makes them difficult to see.
- Never dismount from the operator's seat while attachments are running.
- If a mower becomes clogged, be sure the rotary blades are turned off and the tractor engine has stopped. Never put your hands under a mower deck if there is any possibility that the blades are still rotating.

Stopping Procedures

Proper stopping procedures can influence the ease with which the equipment will start the next time. An operation is not successful until the operator has safely dismounted and the equipment properly stored. Remember to:

- Remove the load from the engine to lessen shock on the bearings and reduce wear.
- Place the transmission in park or neutral. Set the brakes and lower any mounted implements to the ground. Serious injury may result if raised equipment accidentally drops.
- Reduce engine speed, and allow engine to cool for one or two minutes at one-third throttle speed and

no load. This allows hot spots to cool and prevents possible damage to seals and valves.

Shutting Down

- Reduce engine speed. Turn the switch to "OFF." Leaving the ignition switch "ON" causes the battery to discharge. Do not dismount from the operator's platform until the engine and all implements are no longer in motion.
- Dismount carefully; falls are a leading cause of accidents.
- Close the fuel tank shut-off valve to take the pressure off the carburetor diaphragms and/or float valve. A closed valve will prevent fuel leaks and potential fires.
- If the engine has an ignition lock and key, remove the key before leaving the mower as a safeguard against unauthorized operation. If the engine has no ignition key, remove the wire from the spark plug.

Summary

These safety tips and maintenance procedures for checking, servicing, and operating compact tractors will extend equipment life and reduce breakdowns and accidents.

Additional Reading:

Colvin, T.S. 1974. *Grounds Keeping Equipment Vol. 1; Operating Tractors for Grounds Keeping and Ornamental Horticulture*. AAVIM. Athens, Ga., pg 95.

Tractor Safety: Lawn Care Training Guide Safe Use of Tractors. 2014. Virginia Cooperative Extension Publication Number BSE-48NP (BSE-111P), Blacksburg, VA

Acknowledgements

The author also acknowledges the coauthors for their contributions of the previous version: Glen Hetzel, Bruce Stone, John Perumpral, Don Ohanehi, and Kirk Ballin.