

# Florida Department of Environmental Protection

## Airboat Safety Manual



January 05

# SAFETY AND PRECAUTIONARY NOTES

## Propeller Safety

Do not get near the propeller. As an operator, be aware of anyone or anything that can contact the propeller. Some examples of items that have passed through propellers have included gloves, animals, push poles, jackets, limbs, ropes, wire, aluminum cans, nails, small tools and various engine parts. Any of these can result in serious vessel damage and possible bodily harm. Air currents can lift items from the bottom of the boat and the propeller can eject them with terrific force through the bottom of the boat. Safety and prevention of propeller damage requires that all equipment remain secured when underway. Consider using large waterproof containers or coolers to enclose all loose items. It is the responsibility of the operator to secure all equipment and instruct all passengers of safety precautions before starting the engine.

Operators should be aware of the column of propeller driven air (prop-wash) behind them that can lift and tumble canoes, turn over trash cans, soak equipment, throw debris, blow fledgling birds from nests and irritate bystanders. If you get caught behind an airboat, face away and duck your head, close your eyes and wait for its departure. However, it is always best to position your airboat away from others and not behind their propeller.

Avoid handling an unsecured propeller. When dealing with aircraft engines, the propeller could spin under compression. Aircraft engines can run with the magnetos on and the ignition device turned off. Therefore, when the magnetos are not grounded, the engine could start if the propeller is moved. There are a few circumstances where propellers must be moved for inspection, engine work, travel, or storage. In these cases precautions include:

- Ensure that magnetos/ignition are in the OFF position.
- Allow the engine to cool down.
- Use a loop of rope or use a boat paddle to position the propeller.
- Individuals entering the cage for repairs should take the keys out of the ignition, remove the battery terminal, turn the battery selector switch to OFF position, and tie the propeller off to a strong cage support.
- Be aware that exposed exhaust manifolds and pipes are hot and pose a burn or fire hazard.

## Safety Equipment

Airboats are considered vessels and most meet the Class A and Class 1 safety requirements for recreational vessels. The following safety gear must be worn or be on board at all times while operating airboats. Additionally, a Float Plan must be filed with a reliable person.

- U.S. Coast Guard-approved personal flotation devices (PFDs) and all U.S. Coast Guard-required equipment.
- Ear protection that meets or exceeds OSHA standards.
- Appropriate eye protection
- First-aid kit.
- B-1 type approved fire extinguisher.
- Cell Phone in water-proof buoyant case
- Drinking Water

# AIRBOAT PREOPERATIVE CHECKLIST

Before departure, a pre-operation check on the airboat must be conducted. This enables the operator to find possible deficiencies or shortcomings that will otherwise go unnoticed. All too often, accidents occur due to a person's neglect for conducting pre-operation checks. Accidents, injuries and mechanical breakdowns can often be avoided by simply performing maintenance and general inspections of the airboat before operation. The following checklist alone does not provide sufficient information to operate an airboat safely. Safe operation requires demonstration and practice as well. This is a reminder checklist for trained and experienced operators.

## Preoperative checklist

- **Trailer hookup**
  - Boat and trailer safety chains
  - Trailer lock
  - Boat to trailer tie downs
  - Refer to DSL Boating Policy for more details
- **Airboat (Do these checks, preferably, at the storage facility)**
  - First, make sure magneto switches (aircraft) and battery switch (automotive) are in the OFF position and remove key from ignition
- **With Engine Off, Check**
  - Fuel level, fuel leaks
  - Propeller for cracks, dents, bolts for tightness
  - Rudders and fittings
  - Hull for any loose equipment or foreign matter
  - Engine and engine compartment for any loose fittings, nuts, bolts, etc
  - Engine mounts
  - Cage, engine stand and seat stand for cracks and breaks
  - Engine oil level
  - Radiator fluid level and clamps and hoses for tightness and wear (*automotive*)
  - Communications equipment
  - Polymer and rivets (Steel flex where applicable)
- **Start engine and run for about two minutes**
  - Check for
    - Firing of both magnetos (*aircraft*)
    - Oil and fuel line leaks
    - Coolant leaks (*automotive*)
    - Check all gauges while boat is running
- **Shut engine**
  - Recheck oil level
  - Check navigation lights
  - Check trim tab
  - Load all safety gear, PFD's, hearing protection, etc
  - Make sure bilge pump is operational.
  - Insert drain plugs

# Weather

Due to the tropical climate in Florida, weather conditions can change very rapidly. Electrical storms can cover an area of fifty miles in just one hour. Because of this, Florida has the highest rate of lightning strikes in the country. In 1993, fifty-eight people were struck by lightning, resulting in four deaths. Fog, wind, and heat also play a critical role in Florida's weather. As a result of these facts and statistics, airboat operators are in a very high risk group and should use precautionary measures to avoid these storms.

- Prior to field operation, operators should know the weather forecast that has been predicted for the area they are to be working in as well as surrounding areas. It should be noted; however, that weather forecasts can change drastically within a two hour time frame. When in airboats, operators should constantly monitor changes they see or feel in the atmosphere.

Weather changes generally move in from the west, so keep a watch in the direction. Some additional indicators of declining weather conditions may include rising humidity, clouds lowering and thickening, clouds increasing in number, clouds moving from east or northeast toward the south, static on AM radio, strong winds in the morning, and wind shifts from north to east. If an operator is in doubt of weather conditions at any time, he or she should radio the field station to get updated information.

If a thunderstorm is seen in the distance, airboats should move to shore immediately. When observing lightning, you can easily calculate the distance between you and the storm by multiplying the seconds that elapse between a flash of lightning and a clap of thunder by 0.2. A five-second delay would mean that the storm is about 1 mile away.

In addition to lightning and rain, thunderstorms often bring rising winds. Airboats should be docked as soon as possible under these conditions. If caught in foul weather, operators should reduce speed and head for the nearest shore that can safely be approached.

- If an airboat is caught in a thunderstorm, battery jumper cables make a good emergency ground by clamping one end to the antenna and dropping the other end into the water.

Another weather feature that is of particular concern to boaters is fog. Fog is, in effect, a cloud that is on or near the ground. Fog is likely wherever an area of cold water exists. For this reason, fog can form on lakes, rivers, and canals where cold water flows through areas with very moist air. The cold water will cool air near the surface causing fog.

Fortunately, weather forecasters can predict fog with high reliability. Marine weather forecasts include information about anticipated fog. As weather forecasters normally do not give this information, airboat operators should always get the marine forecast before departing. When in foggy areas, airboat operators should operate with their strobe lights on and double check that their red warning flags are up and in place. Since visibility is lowered, special pre-cautions should be taken to drive slowly and avoid blind spots as much as possible until the fog lifts.

Signs of changing wind patterns or strong winds can be seen while approaching open areas or breaks in tree lines. Operators should look for changes on the water surface such as ripples. Breaks in tree lines should be approached with caution to avoid sudden wind gusts that may be present. Props often emit a slightly different noise in different wind patterns and experienced operators will be able to notice a difference. Whatever the situation, extreme caution and care should be taken whenever sudden wind gusts are encountered.

- Wind gusts often will change direction or appear suddenly and without warning in canals.

If an operator is traveling down a waterway and a sudden wind gust suddenly pushes the airboat in a different direction, the operator should slow down immediately. If there are no objects in the airboat's path of travel, the operator should let the wind push the airboat in the same direction as the wind and let the airboat slow down until proceeding forward. If an object is in the path of travel, the operator should slowly steer the rudders against the wind to avoid a collision.

## **Heat Stress**

In addition to electrical storms, fog, and wind; heat also plays a very vital role in daily operations. Heat stress is a serious potential health hazard. Heat stress can quickly result in death. With temperatures hovering in the nineties, in addition to high humidity, heat creates a great strain on the body. While performing strenuous work in the heat, the body can lose up to 1- 1½ quarts per hour. This means that is possible to lose anywhere from 1 to 12 pounds daily when doing strenuous work.

The solution to this problem is obvious. Workers must drink enough water to replace the water lost from sweating. Cool water is the ideal fluid replacement. Workers should drink every twenty minutes whether you are thirsty or not. Thirst is a poor indicator of these conditions, because by the time thirst is felt, the problem already exists. The use of salt or salt tablets is not recommended. Salt tablets cause stomach irritation, which may include nausea and vomiting. Workers should also wear loose clothing, use umbrellas for shade, and take regular breaks for water and rest, and supply sunscreen, as needed.

If at any time a person is feeling over heated, that person should find shade, be given plenty of fluids to drink, and be carefully monitored until conditions improve. The following table lists the three main types of heat emergencies, symptoms, and treatment, in order of severity.

**Note: Heat exhaustion can quickly proceed to heat stroke.  
Treat all heat emergencies as serious.**

<b>HEAT ILLNESS</b>	<b>SYMPTOMS</b>	<b>TREATMENT</b>
<b>Heat Cramps</b>	painful muscle spasms	administer lightly salted water by mouth, consult a physician
<b>Heat Exhaustion</b>	skin clammy and moist coloring pale and muddy	remove to cooler area
	fatigue, nausea, headache may feel faint	administer fluids by mouth (if conscious)
		get medical attention immediately call 9-1-1
<b>Heatstroke</b>	hot, dry skin; red mottled or bluish	immediate cooling of victim by immersing in chilled water
	high, rising body temperature: 104 degrees F or higher	wrap victim in wet clothing while fanning with cool, dry air
	mental confusion, loss of consciousness, convulsions	call 911 immediately informing them that heat emergency exists
		<u>Do not administer fluids</u>
		monitor vital signs, watch for signs of shock

# Maneuvering and Navigation

While operating an airboat in a canal or lake, airboat operators will be constantly maneuvering and navigating their way out of various tight spots and corners. Rough waters, stationary obstacles, and other boats will make maneuvering more difficult. Knowing proper maneuvering and navigation techniques is important due to the following:

- Knowing where you are and where you are going.
- Knowing the area and locations of possible trouble and blind spots.
- Knowing how to give directions to your location in case of emergencies.
- Knowing ways to avoid situations in which the boat may tip or undercurrent.
- Knowing proper ways to avoid other boats and obstacles.

Initial training of airboat operations should be conducted in shallow water ranging from 6 inches to 2 feet deep and free of obstacles. In this depth of water, learning to operate the boat will be easier. If mistakes are made, a trainee will be less likely to get in trouble in shallow water. Instructors who are training personnel on airboat operations should train at a slow pace ensuring that all the safety steps and proper airboat operations are covered thoroughly.

Due to the flat design of the bottom of airboats, it is not recommended that an opened hull airboat be operated in extremely rough waters, or in waves over 1½ to 2 feet. Waves at this height can easily ascend over the boat, resulting in submersion. Therefore, special care should be taken when turning corners or slowing where wake can easily capsize or sink the boat. In emergency situations where waves exceed 2 feet, the operator must continue, without stopping or turning (when appropriate), until the boat is out of the adverse conditions.

The bouncing that waves create on an airboat can be lowered by adjusting the trim tab. Newer airboats are fitted with electrical trim tabs that can be adjusted by the airboat driver. The operator should adjust the trim tab to the level that produces the smoothest, safest, and most comfortable ride. Caution: Trim tabs need to be adjusted when making turns; therefore, the position of the trim tab needs to be corrected, prior to turning. Trim tabs in the lower position may cause the boat to veer off course, causing abrupt movements.

When traveling at higher speeds, an airboat creates a wake with waves exceeding 2 feet in height. When coming to a stop, the driver of the airboat must gradually slow down before coming to a stop ensuring that the wake does not ascend the top of the boat from the rear. While approaching the stopping point, the driver should keep the accelerator partially down to "outrun" the wake. It is important that operators plan stops well in advance.

- Stopping often requires a long distance and drivers need to consider this distance especially when in narrow canals or tight areas.

When turning the airboat, the driver must be sure to avoid the wake that is created. Waves can easily ascend over the side of the boat. The waves strike the airboat with enough force to flip the boat over if it is perpendicular to the wave.

- The threat of waves ascending the top of an airboat is lessened if an operator turns the airboat at a 45 degree angle into the oncoming waves.

Wake from other boats is also a concern. Oncoming power boats (traveling at excessive speeds) will often not see other boats until they are within a close distance. When they see the boat they turn

sharply creating wake which is often capable of swamping an airboat. Whenever possible, the airboat operator should turn the airboat so that it faces the oncoming wave. This will eliminate the possibility of the wave coming over the side of the airboat where it is more vulnerable. This should only be done however, when the oncoming boat has passed and the threat of colliding has passed.

Extreme caution and care should be made when approaching dry area or areas that appear to be caked with mud. Operators should approach these areas at low speeds. If upon entering the trouble area you feel the airboat getting stuck, turn the airboat around and do not attempt to cross. Navigating in these muddy areas should be done carefully as the operator does not know exactly how an airboat will operate under these conditions.

If the airboat is stopped on dry mud or any area that is shallow enough for the boat to rest firmly on its bottom, and the boat will not move, use the following procedures. With the engine running at idle, push the rudder control forward. After pushing the rudder control fully forward, hold it in position with the throttle down for about 2 or 3 seconds. Rapidly pull the control fully to the rear and repeat the same procedure while holding it fully to the rear, keeping the throttle fully depressed. This may give it just that little extra bit it takes to get it moving.

There will be times when you may wish to cross a dry area and you may think it will give you some problem in sticking the boat. In this case it would be advisable to get up close to the area that you are going to cross with the back of the boat, now accelerate away from the area that you wish to cross rapidly, thus the propeller will force the water across the dry area and wet it down. You might repeat this technique a couple of times to get the area saturated with water. After doing this you will find that the boat will move across it very rapidly and without finding yourself up in the center of it stuck.

## **Other Boats and Obstacles**

Most non-fatal boating accidents are the result of a collision with another boat or an object in the water, such as rocks, pilings, or debris. During a five-year span from 1987-1991, 16,934 collisions with other vessels, fixed objects, or floating objects occurred in the United States. In these accidents, 788 people lost their lives. Knowledge, common sense, and courtesy could have prevented most of these accidents.

Prior to entering a lake or canal, operators shall ensure that a minimum of one red flag is present and in the upright position on the airboat. These flags should be kept as clean as possible. Flags that have become soiled with dirt and oil should be replaced with new flags that are brighter and easier to see. This simple procedure may be the last defense in avoiding collisions in congested areas. Operators should also check unfamiliar areas for locations of wakes and dams.

Every airboat shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and the risk of collision.

Every airboat operator must constantly be aware of approaching trouble areas and proceed at a safe speed so proper and effective action can be taken to avoid collision. To determine safe speed, an airboat operator should consider such things as visibility; traffic density, including concentration of fishing vessels, etc.; direction/velocity of wind, water conditions, and the proximity of navigational hazards.



- When entering a new area with an airboat, an operator should carefully examine the area for possible trouble spots.

Problem areas may be found by maneuvering through the area at low speeds. This also gives other boaters in the area an opportunity to see that you are present, avoiding potential collisions. Such obstacles as debris, fence posts, and blind spots should also be inspected. When water levels are low, rocks, branches and fence posts that were once under water, begin to emerge from the surface and are high enough to be an obstacle, but low enough to be unseen. The inspection of the work area should be done at a low speed. Obstacles that can be removed should be removed immediately.

When traveling in canals or narrow waterways, operators should stay to the right of the waterway as much as possible. This is especially important around corners where there are blind spots. Corners should be taken slowly, wherever visibility is restricted to ensure no traffic is coming from other directions. While navigating the airboat, the operator should continually be looking in all directions for possible trouble areas that may be approaching and be prepared to maneuver in open areas, if necessary.

## **Lifesaving/Open Water Retrieval**

Most boating fatalities are the result of capsizing or falls overboard. Approximately 90 Percent of fatalities are the result of drowning, and nearly 80 percent of fatalities in Boating accidents were the result of not using a personal flotation device. During the Years 1987 to 1991, 1,298 people drowned from falling out of boats. Most fatal Accidents are the result of capsizing, falls overboard, and collisions and are a sudden, unexpected occurrence. A PFD could save your life, but it is of little use if you don't wear it.

The National Safety Council statistics show that drowning is the second leading cause of accidental death for those between the ages of 1-44. Most of the 6,000 to 8,000 people drown annually never intended to be in the water and were unprepared. Sadly, most drownings occur within a few feet of safety. The following is helpful information to prevent drowning.

When selecting a PFD, read the label to make sure it fits your size and weight. Try your PFD on to make sure it fits properly and check to make sure it is Type II Coast Guard approved. To ensure your PFD stays in good condition follow these points:

- Wear your PFD at all times while in the boat
- Don't alter your PFD; if it doesn't fit, get a new one
- Don't put heavy objects on your PFD or use it as a kneeling pad
- Let your PFD drip dry before putting away after each use
- Never dry your PFD on a radiator, heater or any other direct heat source
- Put your name on your PFD (use permanent ink or marker)

In the event of an airboat capsizing the following rules apply. If you are out in a large body of water, do not try to swim to shore; instead stay with the boat until help arrives. The shore is usually further away than it looks and most boats will stay afloat. It is easier to spot an overturned boat in the water than a swimmer. Only leave the safety of the boat as a last resort and after carefully assessing the situation.

# PREVENTIVE MAINTENANCE AND MECHANICAL TROUBLESHOOTING

Airboats are very high maintenance vessels. Due to the remote areas of operation, some mechanical aptitude could prevent an overnight stay in a desolate area. The following is a list of tools and spare parts that are recommended to be on board, in addition to safety gear, prior to any trip. Also included are items to help in case your airboat gets stuck on dense vegetation, tussocks, high ground, etc.

<b>Tools</b>	
Regular pliers	Spark plug socket 7/8 inch
Channel locks	Sandpaper (fine grain)
Vise grips	Fingernail file/point file
Lon-nose (needle-nose) pliers	Feeler gauges
Cutting pliers	Test light
Phillips and slot-head screw drivers	Jumper cables
Combination wrenches to ¾ inch	Electrical tape/duct tape
Adjustable wrench to 1.5 inches	Tie wire, hose clamps
Set of shallow and deep sockets to ¾ inch in 3/8 drive	Fuses
3/8 drive ratchet	
<b>Tools to help get you un-stuck</b>	
Come-along	Cable (at least 30 feet)
Winch	Hurricane stakes with 4' pipe or pry bar to anchor stake
Shovel	Push Pole
Machete	Hand saw
Gloves	
<b>Spare Parts</b>	
Alternator belt	Engine coolant
Spark plugs	Extra engine oil
Assorted nuts, bolts, and washers, including Alternator bolt.	Other parts as necessary for your particular boat
Stainless steel throttle cable and crimping material	

**CAUTION!** Avoid entering the propeller cage to make repairs in water of sufficient depth for the boat to sink.

## **General Preventive Maintenance**

Newer engines follow manufacturer guidelines, etc

One of the most important and perhaps the most overlooked maintenance procedures is to keep equipment clean. At least once a week, all equipment should be thoroughly washed down. By doing this, there is an opportunity to look the equipment over and inspect it for possible loose parts or cracked pieces that might detach and strike the propeller, causing damage. One other important feature of keeping the engine clean is that it will run cooler. This is possible because the surrounding air will be able to get to the engine and eliminate some of the heat.

After washing, all grease fittings should be lubricated and all moving Parts should be oiled. Grease fittings should be greased at least after every 50 hours of operation. This will add years to the life of the equipment. Grease fittings on trailer wheels should be watched closely, checking for splattered grease which may indicate damaged bearings.

## **Aircraft and Automotive**

### **• Exhaust System**

Check for leaks – leaks between the exhaust manifold and cylinder may cause engine damage.

Check flexpipe – examine for corrosion and replace as needed.

Check mounting points.

### **• Propeller**

*Wood:* Wash and wax, check for cracks and dings. Return to the propeller shop for refurbishing when signs of wear, cracks, etc are evident. When airboat is not in use, store prop in a flat position. This assures that water will not collect in the tips of the prop and cause wood rot. Check mounting bolts for tightness.

*Composite:* Check with manufacturer. Repaint chips on blades with enamel paint. Check metal blade edges for damage. Check blade pitch. Check mounting blades.

### **• Oil**

Check level before starting and change oil and oil filter according to manufacturer, or at least every 50 hours. Maintain exterior of oil cooler free from debris. *Aircraft:* Use only aircraft engine oil, check and clean oil screen at every oil change, and check and change oil lines as needed. Aircraft engine oil temperature should run between 150f – 180f. Aircraft engine oil pressure should run at least 25 psi during idle and at least 50 psi during operation. *Automotive:* Automotive engine oil pressure should run at least 15 psi during idle, and at least 35 psi during operation.

### **• Batteries**

The terminals of a battery must be kept tight and free of corrosion. Loose terminals can cause a battery to fail or to charge improperly, and can cause loss of energy just when it is most needed to start an engine. In the worst case scenario they can cause sparking which could cause an explosion in the presence of vapors. Batteries should be firmly secured in airboats and away from all gas containers. Battery terminals must be covered against accidental short circuits, and if it is necessary to work on a battery, eye protection must be worn. Engine heat can result in the loss of electrolyte in the battery, which reduces battery capacity and can cause failure. If there seems to be low energy in the airboat battery, the electrolyte should be checked.

### **• Starter and bendix**

Keep bendix lubed with lithium grease. Check for cracks on the starter mounting brackets and bolts for tightness.

## Aircraft Engine

- **Engine:**

Air-cooled, no radiator. Keep all exterior engine components free of excessive grease, oil, dirt, debris and other material that would affect the cooling of the engine. Inspect for possible loose parts or cracked pieces that may detach and strike the propeller. Aviation fuel is recommended, but when not used or available use high octane automotive fuel.

- **Magnetos:**

No distributor, dual ignition. Occasionally spray with a moisture displacing solvent (CRC or WD-40). Also, check spark plug wires for cracks in insulation and replace as necessary.

- **Alternator:**

Keep battery terminals clean and tight. Check belts for wear and replace as necessary. Check mounting brackets for cracks and bolts for tightness.

- **Updraft Carburetor:**

Keep intake clean from dirt and debris. Drain water from carburetor. Check fuel lines for leakage, cracks, excessive wear and replace as necessary. Ensure all clamps are tight.

- **Fuel Pump:**

Mechanical pumps require no maintenance. Electric pumps may require periodic cleaning of the internal strainer.

- **Fuel filter/Water Separator:**

Periodically change cartridge.

## Automobile Engine

- **Engine:**

Liquid cooled. Keep all exterior engine components free of excessive grease, oil, dirt, debris and other material that would affect the cooling of the engine. Inspect for possible loose parts or cracked pieces that may detach and strike the propeller.

- **Distributor:**

Occasionally spray with a moisture displacing solvent (T-9, CRC or WD-40) Also check spark plug wires for cracks in insulation and replace as necessary. If applicable to your engine, check distributor points to see if they are opening and closing when the engine is cranked. Check for corrosion, use fine sand paper or a fingernail file to keep clean

- **Alternator:**

Keep battery terminals clean and tight. Check belts for wear and replace if necessary. Check mounting brackets for cracks and bolts for tightness.

- **Carburetor:**

Check the carburetor breather for dirt and debris and clean as necessary. Check fuel lines for leakage, cracks, excessive wear and replace as necessary. Ensure all clamps are tight. Check accelerator linkage. Cover carburetor when not in use to preclude rainfall collecting in carburetor.

- **Fuel Pump:**

Mechanical pumps require no maintenance. Electric pumps may require cleaning of the internal strainer.

- **Fuel Filter/water separator:**

Periodically change cartridge.

- **Radiator:**

Check fluid levels before starting engine. Change fluid per manufacturer recommendations. Flush system yearly to prevent rust buildup. Check hoses for cracks, leaks, and weak points. Ensure all hose clamps are tight. Check radiator fan belts for wear and replace as needed. Check radiator cap for leaks and proper pressure. Automotive engines should run between 150 F and 180 F.

- **Water Pump:**

While engine is running, check for leaks. Replace if necessary. Ensure that thermostat is functioning properly.

- **Reduction Drive:**

*Belt:* Tighten as needed. Grease bearings every 30 hours, but do not over grease. *Gear:* Check oil level for the gear and listen for unusual noises.

## **Airboat Hull**

- **Aluminum or fiberglass.**

Wash regularly to keep free of dirt and oil. Keep interior of hull free of debris, grease, and oil. A dirty hull is a fire and environmental hazard. Check for leaks

- **Polymer:**

Check to see if the material is attached properly. Look for cracks, repair as necessary

- **Grass Rake:**

Repair any damage

- **Engine Stand:**

Check for cracks and keep painted. Check condition of motor mounts; repair as necessary.

- **Steering:**

Keep fittings lubricated. Check cable operation and mounting brackets

- **Bow Attachment:**

Check to ensure it is secure and not rusting.

## **Trailer Maintenance**

- Refer to DSL Boating Policy

## **Troubleshooting Airboat Engines**

Preventive maintenance will eliminate most mechanical troubles, but not all of them. Equipment may occasionally malfunction, while on the waterways. Therefore, field troubleshooting is of great importance. When performing maintenance and mechanical troubleshooting in the field, safety should be the top priority for all employees. In no way should the health and safety of airboat operators be compromised during field troubleshooting.

Remember:

- If an airboat is skipping or missing, the airboat should not be operated. Running an engine that is skipping will cause over-heating and lead to costly repairs. The engine should never be run wide open, or at high RPM's for long periods of time. This will also cause over-heating.
- If an operator experiences extreme sudden vibration, the airboat should be shut down immediately. The battery should then be disconnected and the operator should look for prop damage and any loose or sheared prop bolts. Operators should hold the prop by one end and try to move it from front to rear to see if it moves. Do not operate the airboat until the problem is solved. It could be very dangerous. (Caution: Under no circumstances should aircraft engines be fully turned. Turning will cause the engine to turnover due to static build-up).
- Before attempting to repair electrical faults, check closely for gas fumes, specifically in the bilge area. Eliminate any vapors. If fumes persist, locate and repair leak. If no problems were found upon completion of inspection, the airboat operator should radio for mechanical assistance.
- Fire extinguishers should be checked monthly (indicate on the tag), to ensure the extinguisher has the proper amount of pressure. Check the seals to ensure that they are intact. Check the nozzle to insure that there is no powder or obstructions in it; if there is, replace the extinguisher. Occasionally, invert the extinguisher and hit the base with the palm of your hand to insure that the powder has not packed and caked due to vibration. It is a known fact that caking of dry extinguisher agent is a major cause of failure of dry chemical extinguishers. All fire extinguishers should be taken in for annual checks.

The following are some tips for correcting breakdowns or problems in the field:

- **Engine will not turn over**

- Check battery switch and cables
- Check operation of starter switch with test light
- Attempt jumping across solenoid

- **Engine turns over but does not start**

An engine that turns over, but will not start, is usually an indication that there is a lack of ignition (spark) or lack of fuel

- *Aircraft* – Check to see if magneto switches are on, remove plate from magnetos to see if points are firing, If not, file or replace points.
- Depress accelerator until gas drips from carburetor. If no fuel appears, break down carburetor and remove accelerator pump and oil leather plunger, replace and try again
- *Automotive* – Check spark plug firing; remove a spark plug, reconnect the plug wire and ground the plug housing on the engine. Turning the engine over will produce a visible spark and/or an audible snap if the plug is firing. If a spark does not occur, check all wire connections on the coil and distributor cap.
- Check to see if fuel pump is on
- Check fuel filter, replace if clogged
- Check fuel lines, and fittings
- Drain water from carburetor
- **Engine starts, but loud grinding noise comes from starter**
  - Check bendix gear for proper operation
  - Spray Bendix with T-9, WD-40 or CRC
  - Give starter a light tap
- **Starter engages, but engine does not turn over – you hear clicking noise**
  - Grease and oil bendix gear and shaft
  - Give starter a light tap
- **Engine runs, but you hear a whistling noise**
  - Check intake manifold gaskets. Replace blown gaskets. Do not operate with a blown gasket as it may cause engine damage
- **Engine runs rough or suddenly quits**
  - Check, fuel supply, fuel filters, fuel water separator, and spark plugs
  - Check propeller
- **Engine is overheating**
  - *Automotive* – Check radiator fluid level, and hoses for leaks. Check water pump for leaks and thermostat.
  - *Aircraft* – Check oil cooler for debris, and check engine oil level.

## GLOSSARY

<b>Airboat</b>	A boat that is propelled by air thrust from a motor driven aircraft propeller
<b>Aircraft Engine</b>	Air-cooled engine used to propel an airboat
<b>Avgas</b>	High-octane (100) leaded fuel used in aircraft engines.
<b>Backwash</b>	Trailing wave of water that may wash over transom, resulting in sinking or capsizing
<b>Bendix</b>	Retractable gear and spring apparatus attached to the spindle of the starter motor. Upon engaging the starter switch the teeth of the bendix engage the teeth of the fly wheel
<b>Buddy Bearings</b>	Spring-loaded caps that fit on the end of trailer axles and maintain pressure to force grease into the wheel bearings.
<b>Cage</b>	A shield of welded tubular metal and welded wire that encircles the motor and propeller on an airboat
<b>Chine</b>	The angular intersection of the bottom and sides of a boat
<b>Darting</b>	Improper trim causing the bow to dig in and jerk from side to side
<b>Dieseling</b>	An undesirable run-on of the engine after the ignition has been turned off. Dieseling occurs most often in high compression, hot engines as they continue to suck fuel in and ignite it from heat and compression. This may be prevented by the addition of a fuel cut-off mechanism.
<b>Engine stand</b>	Metal stand used to support airboat engines
<b>Flex Pipe</b>	Flexible metal tubing used as an exhaust pipe
<b>Fuel water separator</b>	A filtering device that separates water from fuel
<b>Grass Rake</b>	Device mounted on the front of the hull designed to lay vegetation down
<b>Jugs</b>	External aircraft cylinders
<b>Magnetos</b>	The apparatus that generates the electrical current burst to the spark plugs, which ignites the gasoline charge in the cylinder. The magnetos must be shorted out with the mag switches to stop the engine (an impulse magneto supplies the extra burst of electrical current needed to start an aircraft engine)
<b>Oil Cooler</b>	Device used to cool engine oil
<b>PFD</b>	Personal floatation device
<b>Pitch</b>	The amount of angle or twist of the propeller blade. Pitch, diameter, and configuration of the propeller determine its performance and must be matched to the boat.
<b>Plane</b>	The effect of boats rising up to ride on top of the water when they are moving rapidly enough. A boat may motor through the water slowly or “plane out” by moving rapidly along the surface of the water. Boat handling characteristics become much different once a boat has planed out.
<b>Polymer</b>	A hard plastic material. When affixed to airboat hulls it permits them to slide over vegetation with less resistance and protects the hull.
<b>Porpoising</b>	Improper trim causing the bow to pitch up and down
<b>Propeller flange</b>	The metal disc through which the propeller bolts extend, and attaches the propeller onto the crank shaft. It should be tightened to factory specifications.
<b>Prop Wash</b>	The column of air and water emitted rearward from an airboat by the propeller.
<b>Reduction Unit</b>	A device (belt or gear) used to adjust an automotive airboat engine to an appropriate propeller speed for optimal thrust production. Generally, the reduction is 2:1 where there is one revolution of the propeller for every 2 turns of the engine.
<b>RPM</b>	Revolutions per minute. A measure of engine speed indicated by the number of times an engine’s crankshaft spins around its axis in a minute
<b>Rudder</b>	the airfoils, fin or fins mounted behind the airboat propeller and attached to the steering stick by a cable or rod. The rudder provides directional control by

directing the propeller's air flow in the opposite direction of the desired movement of the rear of the boat.

**Steel Flex**  
**Tachometer**  
**Transom**  
**Trim**  
**Trim Tabs**

Paint-on resin coating applied to aluminum hulls for protection.

A primary gauge that shows the RPM's of the engine

The rear wall of an airboat's hull

The angle of the boat in the water, important for proper travel

Adjustable plates mounted on the hull near the lower transom that affect water resistance and can be used to adjust the trim of the boat to enhance control and performance



## References

Department of Environmental Protection. Directive 620.

Florida Fish and Wildlife Conservation Commission.  
Formally known as

Florida Marine Patrol. Safety and Training Manual for Airboat Operations.

Florida Game & Fresh Water Fish Commission. Airboat Manual.

South Florida Water Management. Airboat Manual.

U.S. Army Corps of Engineers. Airboat Training Manual. 1997 Edition.

**Department Of Environmental Protection**  
**Airboat Operation Procedures**

**Lesson Plan**

**Course Title:** DEP Basic Airboat Operation And Safety

**Lesson Title:** Airboat operations

**Certified Instructor(s):** Richard Malloy, Professional Land Surveyor II  
Judy Ludlow, FDEP, Biological Scientist  
Ed Harris, Biological Scientist  
Robbie Lovestrund, Biological Scientist

**Prepared By:** Richard Malloy, Judy Ludlow, Ed Harris, Robbie Lovestrund, Division of State Lands  
**Date:**

**Approved for safety training by:** Donald Trussell, DEP Safety Program Administrator

**Time Frame:** 8 hours

**Learning Goal:** At the completion of this training, the candidate will have satisfied the **minimum requirements** of the Division of State Lands (DSL) Boating Policy for airboat operation.

**Objectives:** The candidate will be able to:

- Explain the nomenclature of an airboat regarding types of hulls, engines, and propellers.
- Identify proper preventive maintenance procedures and basic equipment trouble shooting.
- Identify safety precautions and liability concerns as they relate to proper airboat operations.
- Launch and recover an airboat in the water.
- Operate an airboat in different environments including deep and shallow water, vegetation, mud bottoms, dry land, inclines and declines.
- Demonstrate to the instructor acceptable proficiency in the proper operations of an airboat.

**Evaluation Procedures:**

- Candidates must successfully complete a written exam.
- Candidates must operate an airboat for a minimum of ten hours under the direct supervision of a certified airboat operator before taking the practical exam.
- Candidates must successfully complete a practical exam (operating an airboat).

**Methods of Instruction:**

- Lecture, Video tapes, and Demonstration

**Equipment and Supplies Needed:**

- Airboats with trailers
- Safety equipment including eye and ear protection, boating safety gear
- 14 buoys with line and weights

**Candidate Materials:**

- Appropriate clothing for wind, rain and sun protection

**Instructor Supplies**

- TV, VCR, Exams, Handouts, Sign In Sheet

**References:**

- Florida Game and Fresh Water Fish Commission *Airboat Manual*,
- South Florida Water Management District *Manual for Airboat Operations*

## Lesson Title: Airboat Operations

### I. Administration and Orientation

- A. Overview of Course
- B. Expectation of candidates
- C. Attendance
- D. Instructor and candidate introductions

### II. Airboat Introduction and Nomenclature

#### A. Types of hulls

- 1. Fiberglass
- 2. Aluminum
- 3. Advantages and disadvantages of hull types
- 4. Use of floor jacks
- 5. Deck vs Open
- 6. US Coast Guard Boat Classification, Gear

#### B. Hull Bottoms

- 1. Polymer
- 2. Slick coats
- 3. Steel Flex

#### C. Engine Types

- 1. Automotive
- 2. Aircraft
  - a. ground power
  - b. air-worthy vs. rebuilt
- 3. Reduction units – gear and belt drives
- 4. Aircraft vs. Automotive
  - a. horsepower vs. engine weight
  - b. torque
  - c. repairs
  - d. fuel requirements/recommendations
  - e. Engine start and shut-down – magnetos vs. distributor?
  - f. Boat use helps determine boat type

#### D. Propellers

- 1. Wood – paddle and straight
- 2. Polymer – Ivo, Warp drives - # of blades
- 3. Pitch and Length
- 4. Tip Speed – maximum RPM
- 5. Inspections and maintenance
- 6. Safety concerns
- 7. Cage
  - a. designed to keep objects off prop

### **III. Preventive Maintenance**

#### **A. Operational Pre-checks**

1. Disconnect Power!
2. propeller inspection – blades and retainer bolts
3. oil and coolant levels
4. reduction gear belts
5. alternator belt
6. cage/prop guard
7. seat stand
8. rudders and steering linkage
9. securing loose items

#### **B. Maintenance schedules**

- 1, Automotive engines, 20 - 50 hours
2. aircraft engines, 20 - 50 hours

#### **C. Service requirements**

1. oil and filter changed (capacities)
2. coolant checked and filled
3. oil cooler inspected
4. magnetos inspected
5. major nuts/bolts tightened
6. corrosion protectant sprayed on critical areas

#### **D. Post Operating**

1. Freshwater wash-down
2. Corrosion protections applied
3. Boat, seat and engine covers

### **IV. Safety, Liability and Courtesy – The reason for this course**

#### **A. Propeller danger Awareness**

1. Starting
2. operating
3. wind and water spray velocities
4. Courtesy operations – noise, prop wash
5. Propeller damage caused by loose debris
6. Use of flags

#### **B. Liability**

1. Operator responsible for passengers and safe operation of airboat
- 2. Must operate within the scope of training, supervision and agency policy**
3. Float Plans

#### **C. Courtesy operations**

1. Whenever operating near residences, keep engine noise at minimal level
2. Keep stern away from other nearby vessels
3. Give wide berth, or operate at slow speed near other boats,

## V. Operations

- A. Identifying basic steering, throttle, and switches
- B. Unloading and loading demonstrations
- C. Slow speed turns, figure eight's
- D. Planning speed turns, figure eight's, stopping
- E. Serpentine and evasive maneuvers

## VI. Testing

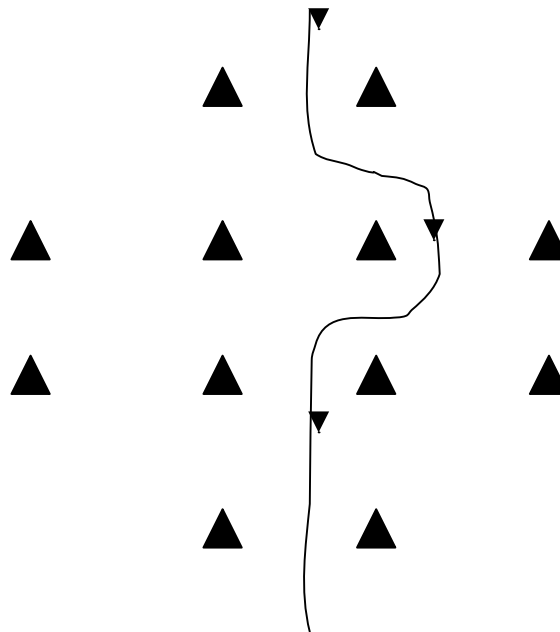
- A. Each candidate will demonstrate to the instructor acceptable performance, safety and knowledge of liability regarding airboat operation. This will be documented on the written and practical exams.

Part of the practical exam will include operating an airboat through a serpentine and evasive maneuver course. These are diagramed below.

**Serpentine Course**



**Evasive Maneuver Course**



# Airboat Operations Practical Exam

Candidate Name \_\_\_\_\_

Date \_\_\_\_\_

Instructor Name \_\_\_\_\_

Airboat Description \_\_\_\_\_

Satisfactory (S) or Unsatisfactory (U)

**1. Launching and Recovering** \_\_\_\_\_

Candidate demonstrates proper methods in loading and unloading an airboat in a safe manner and without causing damage to equipment, people, and property.

Comments: \_\_\_\_\_

**2. Operation through serpentine course** \_\_\_\_\_

Candidate operates airboat through a 6 buoy serpentine course without hitting any buoys, 3 out of 5 times.

Comments: \_\_\_\_\_

**3. Operation through evasive maneuver course** \_\_\_\_\_

Candidate demonstrates safe evasive action maneuver 3 out of 5 times through a 12 buoy course.

Comments: \_\_\_\_\_

**4. Basic operations** \_\_\_\_\_

Candidate demonstrates proper steering and throttle control in performing starts, stops and turns in a safe manner. Candidate performed safe operation within policy requirements, operator safety, public safety and liability concerns.

Comments: \_\_\_\_\_

**5. Docking** \_\_\_\_\_

Candidate performs a safe docking without risk to operator, passenger, or the public. Candidate demonstrates proper drift and engine shut-down within 2 attempts without causing any damage or liability risk. Departing was performed in a safe manner without exposing prop wind to others.

Comments: \_\_\_\_\_

**6. Written Exam**    Pass \_\_\_ Yes \_\_\_ No

**Candidate must receive a satisfactory performance level in all categories for approval.**

Approved \_\_\_\_\_ Disapproved \_\_\_\_\_

Instructor Signature \_\_\_\_\_ Date \_\_\_\_\_