How to Start a Cold Engine

If you're the first in the day to fly one of the club airplanes, or the plane has been setting for a while and the engine is cold, starting the motor requires a certain procedure. The following sequence usually starts the engine with just a few revolutions of the motor.

1. Club rules require the engine block temperature to be 40 degrees Fahrenheit, or warmer before starting the motor. Laser temperature guns are in each hangar to measure the block temperature. If the block temperature is less than 40 degrees don't start the motor.

2. The first thing to do is to NOT pump the throttle. I repeat ---DO NOT PUMP THE THROTTLE--- Pumping the throttle injects liquid fuel directly into the carburetor and will flood the carburetor/engine and it won't start.

3. Set the throttle at about ½ inch open and leave it there.

4. Set the mixture control full RICH. Make sure the carburetor heat is OFF and the fuel selector is on BOTH tanks.

5. Unlock the primer, pull it out to its FULL EXTENSION, then WAIT… When you pull the primer fully out it takes a few seconds for the primer mechanism to fill with fuel. If you listen carefully you can hear the fuel flowing into the primer. After 4-5 seconds push the primer ALL THE WAY IN. Don't rush, but keep pushing. There should be a noticeable resistance as you push, particularly in the last inch of travel.

   DO THIS TWO (2) times.

   After the second prime make sure the primer knob is fully pushed in and securely LOCKED. Pull on the knob, make sure the primer will NOT come back out.

6. In the clubs 172 set the mag switch to BOTH. (Make sure it's on BOTH)

7. Verify the throttle is open about ½ inch. (This is important)

8. Clear the area, HOLD THE BRAKES and press the starter.

9. The engine should start after 4, 5 revolutions. If the engine does NOT start after cranking 5, 6 seconds, release the starter, wait 20 seconds and press the starter again. The risk when the engine doesn't start is getting the starter motor too hot, which can damage the starter. If it doesn't start after two, or three attempts something is wrong. Stop, let the starter cool off for at least 10 minutes, review what you've done, give it one (1) more prime and try again.

10. As soon as the engine starts adjust the throttle to 1,000 rpm and monitor the oil pressure making sure it starts to increase toward the green arc. When the oil is cold the pressure gage moves kind of slow.

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Why do we need to prime the engine, NOT pump the throttle?

An internal combustion gasoline engine cannot burn liquid gasoline

The engine will only run when ***liquid*** gasoline has been converted to a ***vapor*** and the gas vapor is mixed with the correct amount of oxygen. The conversion from liquid to vapor requires heat. When an engine is cold the liquid-to-vapor conversion depends on available heat in the air and the temperature rise as a result of compressing the air/fuel mixture in the cylinders. (Even cold air has some heat).

The primer injects a small amount of liquid fuel directly into the intake manifold between the carburetor and the cylinders, bypassing the carburetor. While this small amount of liquid is laying in the intake manifold the available heat in the air and the heat of compression has a better chance of "vaporizing" enough fuel to get the engine started. The engine may run rough until the heat of combustion provides a more consistent vaporization of the fuel coming through the carburetor, but at least its running.

The job of the carburetor is to ATOMIZE the right amount of liquid fuel into very small droplets, which makes it easier for available heat to VAPORIZE the fuel. It does this by a rather complex arrangement of jets and air/fuel passages in the carburetor body. The carburetor has an accelerator pump that squirts liquid fuel directly into the throat of the carb each time you quickly push the throttle forward. This is necessary so that when the engine is RUNNING and you quickly push the throttle in, (like on a go-around) the engine won't hesitate, or maybe even die.

But, when you pump the throttle and the engine is NOT running this extra amount of liquid fuel floods the air/fuel passages in the carburetor, making it hard, or impossible for the carb to atomize the fuel. The carb is flooded and as you crank the starter liquid fuel continues to be sucked into the engine. After several revolutions of the prop the engine is flooded, the spark plugs are wet, fuel is dripping on the ground and until things get "dried out" the engine, "ain't gone-a start". Also, in some cases liquid fuel can get pushed into the exhaust manifold and may ignite when the engine does finally start. None of this is good – DON'T PUMP THE THROTTLE--

If you don't pump the throttle and you prime the engine correctly, you won't have the problem.

Priming correctly is the key to starting a cold engine. If you don't prime enough, or you prime too much, the engine probably still won't start. When you pull the primer out make sure you pull it ALL THE WAY, wait until the primer is full of fuel, then with one steady motion push it ALL THE WAY in. You should feel resistance as you push the primer in. If you don't feel resistance, you either didn't pull it out all the way, or you didn't wait until the primer was full of fuel. Do this twice, then start the engine.

After the last prime make sure the primer is locked in the closed position by pulling on the primer knob. If the primer is NOT completely locked it may work its way slightly open during flight resulting in a way too rich condition, a rough running engine and maybe some other bad things.

What to do if the engine is flooded

If the engine won't start and it's because of a fuel problem it could be either too much fuel (flooded), or not enough fuel (need to prime). A flooded engine has a strong smell of fuel especially around the exhaust and fuel may be dripping on the ground. If this is the case try the following:

1. Pull the mixture control all the way OUT to the engine cutoff position.
2. Push the throttle all the way IN to the full power position.
3. In Blue Bird turn the mag switch OFF. I repeat, turn the mags OFF.
4. Clear the area and press the starter for several revolutions.

You're trying to pump dry air through the carburetor and engine to dry things out. In Tweety because the mags are hot when the starter is engaged the engine may actually fire. If this happens IMMEDIATELY, release the starter and try a normal start.

After 8-10 revolutions of the prop, release the starter wait a few minutes for the starter motor to cool a little and then try a normal start:

1. Mixture full rich.
2. Throttle ½ inch open. (This is important)
3. Mags on both. (Blue Bird only)
4. Press the starter

It's up to you to decide if the engine is flooded, or needs more prime. When the first prime was done did you pull the primer all the way out and then let it fill with fuel before pushing it in? Do you have the throttle set to ½ inch open? Is the fuel selector on "Both", is the mixture control full rich?

My experience starting cold engines is that if there are no other issues (like a weak battery, etc.) and if you prime, etc. correctly, most of the time the engine starts in a few revolutions of the motor.