

R22 STARTING ENGINE AND RUN UP

Seat Belts	Fastened	
Fuel Shut-off Valve	On	Located behind the left passenger seat, shuts the fuel off from the fuel tank
Cyclic/collective Friction	Off	Full and Free travel. Move both together with a slow circling movement on the cyclic and lift collective to its full height. Also move the pedals to full left and right. You are looking for anything that stops the controls going to their extreme movement
Throttle		Full and free travel, again testing that it will open and close correctly
Collective	Down	Friction on
Cyclic	Neutral	Friction on
Pedals	Neutral	Slightly right pedal in
Landing Light	Off	This could drain the battery very quickly and give you problems starting
Governor	On	This one is a matter of debate between different instructors as to whether it should be on or off. On should prevent a pilot from inadvertently over revving on start. I prefer you to have it off for your first few hours of training until you are happily controlling the throttle. The Governor kicks in at 80% and the engine warm up is at 75%.As the engine warms the revs creep up and if you're not handy with the throttle the governor will take it at 80% when you're not ready. Once you are happy that you are monitoring the revs Governor On.
Circuit Breakers	In	In as required, leave any emergency landing light and Giro Circuit Breakers out. Giros can be easily damaged from unnecessary turning them on or off and they start becoming unserviceable. Make sure the caution circuit breaker is in as it inhibits the engine from starting if out.
Carb Heat	Set off	Pull it up and down to check it has full movement and is not stuck then put it in the off position which is down
Mixture	Full Rich	The mixture is connected to the carburettor and allows fuel into the engine. The full rich position is in and you must then cover with a guard. The guard is so you don't accidentally pull mixture rather than carb heat in flight. Unfortunately this can sometimes be located in different areas in the R22 so be careful.

All switches/radio	Off	Again to save battery and radios can be damaged if there on during engine start.
Clutch	Disengaged	The clutch is one of 3 things that will inhibit the engine from starting if engaged
Rotor Brake	Off	This will also inhibit the engine from starting if on. It is located behind left shoulder.
Map Light	Off	In many of the later models of R22, especially one that is night equipped, the map light bypasses the master switch and therefore can drain the battery even with the master switch off. It is located next to the rotor brake.
Master switch	On	This is the red switch located on the main dash. It provides power to the electric components.
Power Limits	Check MAP	Above your head is a small chart. It tells you your maximum allowable manifold pressure for that day depending on height and outside air temperature. You simply look at the air temperature outside on the temperature gauge and cross check against the chart your altitude. You can then add .9 as an additional 5 minutes take off power. This is very important and must be cross checked in your after take off check.
Radio Head Sets	On	
Radio	Turn On	Please down load separate PDF - Radio Made easy.
Radio	Off	You can turn it back on after you have taken the engine to 75% warm up.
Throttle twist for priming	As required	3 to 5 full twist if the engine is cold, 1 to 2 twist if the engine is warm. Check the oil temperature gauge.
Throttle	Closed	An open throttle on start up will cause the engine to over speed like starting a car with your foot on the accelerator. If this is done the engine will require inspection by an engineer.
Area	Clear	Have a good look round to make sure there is no one near the aircraft.
Strobe Light	On	This must be on when any part of the aircraft is moving
Ignition switch	Start then both RIGHT HAND	The ignition key works in a similar way to a car, turning the key to start will engage the starter motor to turn over the engine. Once the engine has started release the key that is spring loaded to return to both. Start the engine with your right hand and your left hand covering the throttle in a closed position, your feet covering the pedals in a neutral position. See note on pre start procedure.
Started Light	Out	This is located on the top lighting panel and is eliminated when the starter motor is engaged. It should go out when the engine is running.
Set Idle Speed	55%	Open the throttle until the revs read between 50 – 60 % if the engine is warm it may read higher than that after start.

Clutch Switch	Engage	The switch is the silver switch which has a red cover to stop an inadvertent deactivation in flight
Blades Turning	Less than 5 seconds	The clutch will now start to tighten the belts and if correctly tensioned the blades should start to turn within 5 seconds. If they take more than 5 seconds the belts may be too loose.
Alternator switch	On	This is a test of the alternator. First the alternator warning light should go out and then the amps gauge should spike. The alternator must provide a higher charge than the battery.
Oil pressure in 30 sec-	25 psi minimum	Monitor the oil pressure gauge which should read a minimum of 25 within 30 seconds of starting the engine
Wait for clutch light	Out	This will indicate that the belts have fully tensioned
Warm up RPM	70 to 75%	Open the throttle to 70 / 75% and wait for the engine gauges to go into the green. When opening the throttle you should increase the revs steadily but also move through the yellow ark quickly as this is the tail rotor vibration area and you should not allow the revs to hang around in this area.
Engine gauges	Green	The oil temperature will increase quite quickly but the cylinder head temp may take more time.
Warning lights	Out	All the warning lights should now be out
Mag drop at 75% RPM	7% max in 2 Seconds	By turning the key to R and L you effectively turn off one of the magnetos turning off one of the spark plugs in the cylinders. The engine runs on two spark plugs and you would therefore expect a drop in engine revs. An acceptable revs drop is not more than 7% in 2 seconds.
Carb heat check	CAT Rise and fall	Pull the carb heat fully out and wait to see a temperature increase on the carb heat gauge, and then lower to check for a carb heat fall. Should the engine revs increase during the test this could mean there has been ice building up during the warm up and the carb heat should be left fully out for the remainder of the test/warm up. If the revs drop or they remain unchanged then the carb heat should be set so the gauge reads about +10
Sprag clutch check at 75% RPM	Needle split	The engine revs will maintain the rotor revs through the Sprag clutch. When you quickly close the throttle the rotor should maintain its revs momentarily and therefore you should see a split in the revs needle.
		From this point allow the aircraft engine to idle both to complete your pre take off checks and to check that the aircraft will idle without cutting out. You don't want to idle for too long as this can begin to build up carbon on the spark plugs
Doors	Closed and locked	
Cyclic / Collective frictions	Off	

Governor	On	Wind open the throttle to just above 80% RPM. The governor should now take over the throttling and increase the revs to 102/104%. Cover the throttle while this happens in case of a governor runaway being more than 104% and moving to the red line. In such a case you should immediately roll the throttle back to idle.
Lift collective slightly, reduce RPM	Horn light @ 97%	By raising the collective by ½ an inch and rolling off the throttle to allow the revs to fall below 97% the warning horn and Low RPM warning light should indicate. The governor will still be controlling the throttle so you may have to be firm on the throttle in order to overcome the governor.
Before take off check	Area Clear	Each part of the start up procedure is designed to be a check both on the safety aspects and checks to make sure the equipment is functioning correctly. You should not rush these checks as you may miss something that could lead to a problem later in the flight.

Shut-down procedure

DO NOT TAKE HANDS OFF CONTROLS		
Lever Down, rpm 70-75 %	Frictions On	Make sure you roll the throttle down to below 75% before removing your hands of the collective, wait for the revs to come down or the governor will simply take them back up. If you like turn the governor off.
Cyclic, Pedals Neutral	Friction On	Slight right pedal, in cyclic in central position
CHT Drop	Throttle closes	Wait two minutes or until you can clearly see the H on Cyl Hd Temp. This is to allow the engine to cool and level the oil temperature. Closing down too early may damage the engine.
Clutch Switch	Disengaged	Pull both the switch and guards back and make sure clutch light has come on.
Wait 30 secs	Pull Fuel Idle	This will then starve the engine of fuel and it will stop. Don't be tempted to turn of with the key.
Wait 30 secs	Apply Rotor Brake	The rotor brake has given poundage of strain. Don't pull too hard as it will simply break. It tends to work best like an ABS. Pull release pull
Clutch Light Out	All Switches to Off	All switches to off and make sure the key is also in the off position. Also pull any circuit breakers like the giros
Datcom	Not Number	

