Aircraft Design
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Lecture - 43
Inspection of Aircraft

So, we are now on cessna 206 edge aircraft, we will be carrying out a daily inspection of this aircraft. Before releasing the aircraft of flight we carry out a daily inspection, this inspection is an addition to the inspections which we had just discussed. Before releasing this aircraft before the very first flight of the aircraft, this inspection is required to be carried out and with me is mister Paulwall; Mister Animesh Paulwall he is the chief technician on this aircraft he will help us out during this inspection. So, you can see this is this aircraft inspections are for fuselage inspections engine inspections in the fuselage it is it calls for inspecting the skin panels for cleanliness condition and signs of damage.

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So, we need to see the skin, the aircraft skin all over for the cleanliness for any damage for any scratches or something rivets you can see the rivets here, we need to watch the rivets whether the rivets are there some rivet has not sheared off. So, all over the fuselage we need to inspect this thing. Check for security and operation of door and their latches check condition and the hinges. So, you can see this door this is the main door of the aircraft we need to look at the hinges, these are the hinges of the aircraft we need to

watch the hinges we need to look at the latches the latches and the security and the security of this lock like we hate to see that the aircraft is locking properly the doors are locking properly.

Check all transparent panels and windshields for cleanliness and condition, you can see the transparent panels here here here all over there are transparent panels; we need to watch the transparent panels for cleanliness for the security and condition. Now check cockpit floor assembly and cockpit for cleanliness condition and security again.

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Going into the cockpit, we check for the general cleanliness and the general condition check seats and cushions for condition and security.

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So, you can see the cockpit here it calls for checking the cockpit floor assembly and cockpit for cleanliness condition and security, the complete floor has to be checked for neatness for cleanliness for condition, check seats and cushions for condition and security we need to check the seats the questions whether they are in order. Seat belts shoulder harness for condition and security you can see the seat belts here, these are the seat belts the shoulder harness we need to check, that the seat belts are in proper order they are not damaged. Check fire extinguisher for leaks and security you can see here there is a fire extinguisher.

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This fire extinguisher we need to check for the leaks and whether the fire extinguisher is properly secured. Check first aid kit for proper anchorage and ensure that the seal is intact, that is a first aid kit in the aircraft it is just behind. So, we need to check whether the first aid kit is properly anchored and that the seal is not damaged, ensure that the upholstery is securely anchored. Here the upholstery and everything you need to see that the upholstery is securely anchored all placards and correction cards are in position. So, there are various placards in the aircraft you need to watch all placards whether the placards are in proper order, they are properly fixed and all the required placards are in place.

Now, coming to undercarriage you can see the undercarriage here.

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We this is the main undercarriage the main landing gear, we need to inspect the main landing gear for its cleanliness and condition, we need to watch do a visual inspection whether all the things are in place whether there is no crack. The main and nose wheel tires for creep marks general condition and correct inflation, you can see this is the main wheel.

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We need to see that the there are no cuts, no damage in the tire the required creep marks are in place, they require locking this split pin this is properly there, we need to inspect the main wheel. Similarly this is the left wheel similarly you need to inspect for the right wheel and the nose wheel; the brake system for leakage of fluid joints and for satisfactory operation.

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You can see the brake system here the brake unit, we need to watch we need to see that there are no leaks in the brake unit, there are the brake liner is there the brake liner has not worn off, and there are no leaks and no damage in the brake unit.

This is the nose landing gear we need to watch for the cleanliness, proper strut extension, the attachment of the tog links all the bolts are in place, all the locking mechanisms are in place and there are no leaks in the shock strut. The nose wheel we need to watch the nose wheel the proper locking is there, proper anchoring is there, there are no tire there are no cuts on the tires and proper inflation is there.

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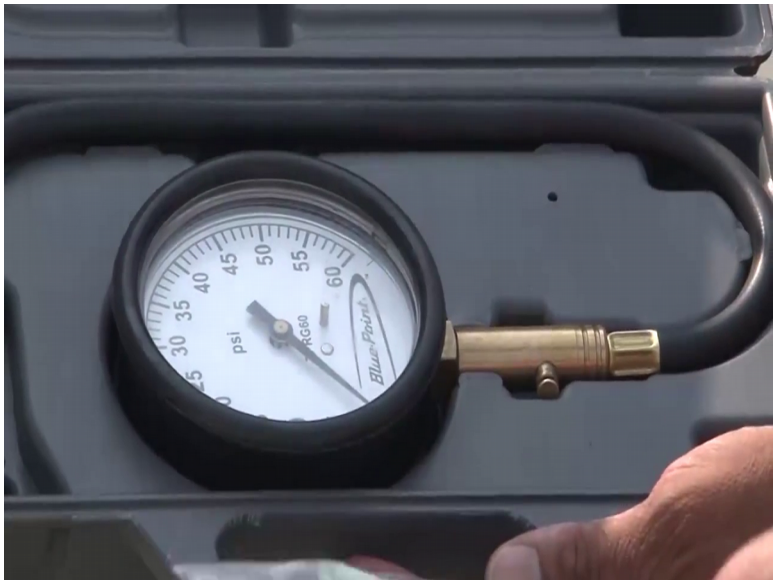

So, this is a tire pressure gauge we call it a TPG, it is properly calibrated we need to have a calibration tag, this calibration also has got a validity. Before using this instrument we need to ensure that your instrument is properly calibrated it is within the specified date limit, and then we need to measure the tire pressure. Please see the tire pressure and we will just show you how we measure the tire pressure.

So, before every flight we need to measure the tire pressure whatever is mentioned by the manufacturer, the tire pressure has to be checked. The tire pressure has to be checked it has 49 plus minus 3 psi. So, you can see it is it has come to 48 psi and the requirement is 49 plus minus 3 psi that is 46 to 52 psi. So, it is well within the range similarly we check it for all the tires. So, now, we come to flaps the inspection on flaps and the main

plane, we have to inspect the skin panels of the main plane and flaps for any signs of damage we need to check the flap rollers you can see the flap track here the flap track.

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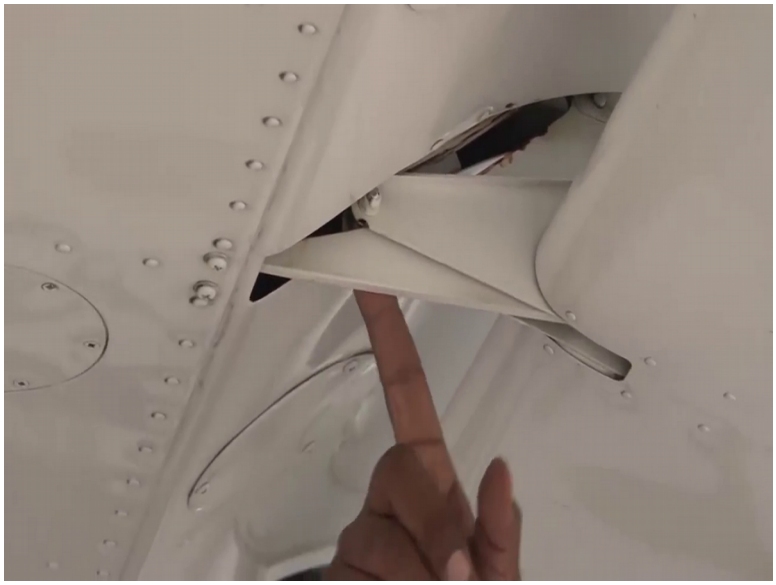

We need to see whether the track has not worn off, the rollers are in place. So, all the tracks and the rollers have to be inspected on both sides on the left side and as well as the right side. The lift starts for damaged straightness and security of attachment; these are the lift struts we need to check whether there is no damage here they are securely attached. Both sides you can see one side bottom and at the top similarly on the right side also, we need to check the aileron hinges and excessive play for corrosion and security.

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So, these are the ailerons you can see we need to check these ailerons their movement. So, that there is no binding in the movement you need to feel that movement, you need to feel that there is no binding, you need to see whether the trading edge is proper there is no distortion in the trailing edge, the skin panels there rivets everything is in place there is no damage. So, similarly on this is the left side you need to watch on the right side also the all ailerons are going through the tail plane.

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So, this tail plane you need to inspect the tail plane, the fin the rudder the horizontal stabilizer, the elevator, the trim tab all over the area you need to see whether your the still plane is clean, there is no damage there is no distortion, all the rivets are in place there is no sharing of the rivet plus elevator hinges the hinges the bolts are in place, the movement you need to check the movement of the elevator, that there is no movement there is no binding in the movement, your cables are in place. Similarly in the rudder watch the hinges the bolts are in place and the movement is proper. So, this is your inspection about your tail plane.

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Coming to the trim tab check the hinge whether the hinges are in place the skin panel is there is no sharing of the rivets and the surfaces are neat and clean. These are the static discharge wicks you need to see these static discharge wicks, they have not worn out they are in place, the static discharge you can see they are all over all over the tail plane. So, you need to watch these static discharge weeks 2.

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So, now, coming to fuel system, we need to take a sample of the fuel ensure that the fuel there are no sediments in the fuel, there is no dirt in the fuel sample, the fuel sample is free of water moisture.

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So, you can see this is a paste water finding paste, which we use to ensure that our sample or fuel sample or fuel in the aircraft tank is free of moisture.

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This is your fuel sampling bottle which through which we will take the sample. So, you can see there are various drainage points rain points for the fuel tank we take the sample from the different points, this is one point from where the fuel sample is being taken from the first point, we have insured we want to ensure that the fuel is free of dirt, there are no sediments. This is another point this was the real real point this is the forward point of the fuel tank. So, we want to ensure by taking the sample from different points.

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That the fuel is almost free of dirt there are no sediments and the fuel is safe for use this is a forward fuel drainage point this is the gascolator point we this is the lowest point in the fuel system. So, we want to take the fuel sample from the lowest point also to ensure

that the fuel is and a safe and a fuel system is free of any sediments. So, you can see the fuel sample, the fuel sample is free of all the sediments there is nothing there it is absolutely clear. So, now, I am pretty sure that my fuel system my fuel tanks and my fuel is safe for use. After taking the samples we will also ensure that the fuel tank caps which are there on the top of the wing they are secured, you can see he is he is ensuring that the fuel tank caps are secured properly secured.

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The fuel tank cap you can see there, there are vents also in the fuel tank cap we will ensure that the fuel tank vents are also clear and similarly on the right side also the fuel tank caps are to be ensured that they are safe, then these are the vents this is the vent line we ensure that the vent line this thing is not bent this is clear there are no obstructions in this.

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This is about the fuel system of the aircraft now. So, this is the propeller you can see we need to ensure that the blades leading edges have no damage the blade.

Blades are the spinner is properly secured there are no leaks in the propeller this is the oil panel.

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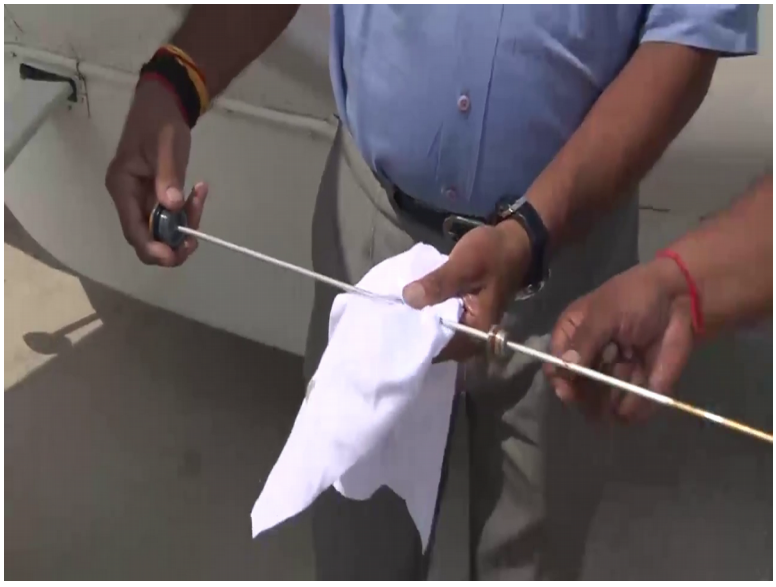

We will open this panel we need to see you can see the oil dipstick here, the oil tank cap. We will open this oil tank cap and ensure that the oil quantity is sufficient, you can see this is the oil dipstick, you can see the oil we will wash we will clean this lipstick with a

clean cloth, and we will dip it again and find out the quantity of oil in the oil tank. So, you can see here this is the maximum mark and it is slightly less than the maximum mark, which is eleven quarts the oil in the tank at present is sufficient for a safe flight.

So, now, this was about the aircraft airframe part coming to the engine we will open the engine cowlings, before the flight we will open the engine cowlings and check the engine we will do a visual inspection of the engine, and check whether engine parts engine components they are all in place, and there is no damage, and after the engine inspection is done the cowlings will be put in place. We will check for the security of these fasteners these are the fasteners whether the fasteners are properly secured, and it will be followed by a proper engine ground run up to see whether all the parameters are within the range and the aircraft is safe for flight.

So, please remove the cowling and now we are going to see how the cowling is removed and how we carry out an engine inspection. So, you can see the various fasteners here the various fasteners being opened, these are the fasteners at the top also. So, while putting the cowling in place, back end place we need to be very sure that all the fasteners are properly secured, because in case if some fastener opens during flight then it may be dangerous. So, it is very important to see that the fasteners are secured.

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You can see the engine now this aircraft cessna 206 has got a 6 cylinder lycoming engine lycoming io 540 engine. Now coming to the engine this is the right side of the engine, three cylinders we see whether all the screws they are in place there are no leaks there are no leaks.

All the fuel lines they are in place the spark plugs are properly anchored (Refer Time: 17:15) [FL]. So, now, the cowlings have been opened this was lycoming io 540 engine on the cessna 2 0 aircraft, it is a 6 cylinder engine we are on the right side these are three cylinders first second and third cylinder, then we need to ensure that these screws are in place, there are no leaks general inspection, the visual inspection, all the things are in place there is no damage these are the spark plugs you can see the three spark plugs. The spark plugs are in place the fuel lines they are not broken you need to watch the fuel lines all over the fuel lines are not broken, there are no leaks in the fuel lines this is the crankcase you need to look at the crank case that all the anchoring bolts, they are in place there are no leaks in the crankcase.

These are the engine mounts the engine mounts the mounting is proper the creep mark on the engine mounting bolts they are in place, these are the shock mounts you need to see that your shock mounts are not damaged, your exhaust muffler you can see this is the exhaust muffler, you need to watch your exhaust muffler, you need to look at the weld seems very important that your weld seams are intact they are not open, you need to see the anchoring the anchoring is in place, your ducts they are not damaged they are in place, these are the baffle fins you need to watch for the baffle fins the baffle fins are the cylinder fins.

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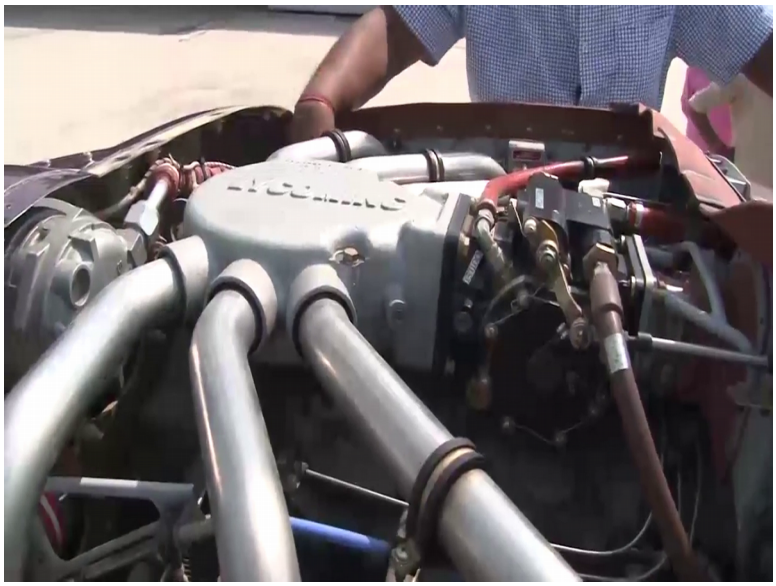

So, now, you can see the engine from the top you need to ensure that your cylinder fins, these are the cylinder fins you can see these are the cylinder fins, you need to see that there is no breakage there is no damage in the cylinder fins.

The fuel lines these are the stainless steel fuel lines thin lines there is no damage they are secured properly. There are no leaks the spark plugs are in place all the attachments they are in place. This is your injector you need to ensure that your mixture, your throttle and your governor everything is in place, there is no damage all the split fins are bringing place. So, all the components whether it is the fuel manifold the fuel injector the compressor, the fuel lines the various tubings, you need to ensure you do need to do a visual inspection and ensure that everything is in place.

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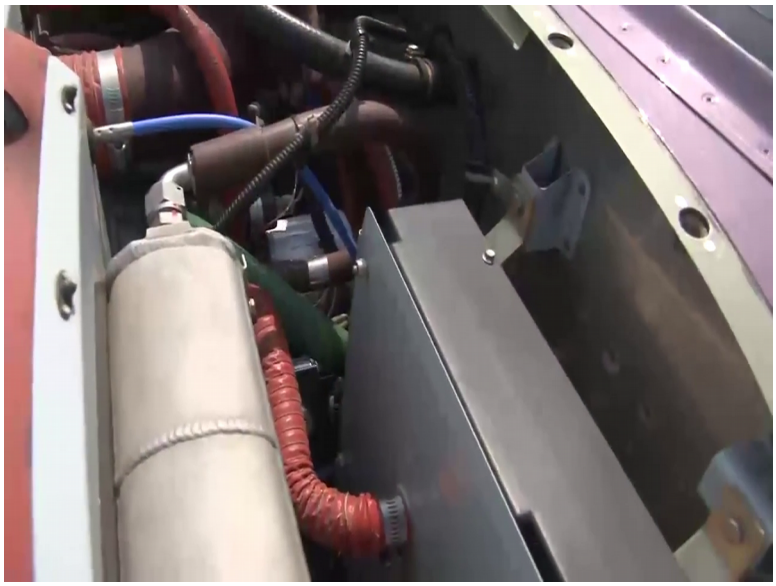

Here you can see the oil cooler; the oil cooler you need to ensure that your all cooler locking is in place, there are no leaks in the oil filter, that is it this is the oil cooler then you have the magnetos here.

You need to ensure that all the electrical connections in the magnetos, they are in place they are properly secured. So, after doing a complete visual inspection of the entire engine, we will put back the cowlings and we will do a engine ground on.

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So, now, we are inside the cessna 206 h aircraft this is the cockpit, this is the pilot seat where I am sitting this is the instrument panel, we will start the aircraft we will see the show you the procedure how we start an aircraft. These are the keys for this aircraft, this is the aggression switch you can see the aggression switch here, you put the keys here at present it is in the off condition, this is the parking brake I will put the parking brake, before starting we need to put the parking brakes press the rudder pedals and pull the parking brake the parking brake is on now.

These are the cowl flaps, this is the cowl flaps control I need to open the cowl flaps I have opened the cowl flaps, this is my fuel tank selection, this aircraft has got two fuel tanks one in the left tank and one in the right tank. So, I have put the fuel tank selection put in the both position. So, that the fuel can simultaneously be supplied from both the tanks this is your throttle control this is your mixture control sorry propeller control and this is your mixture control. So, before starting I need to adjust my throttle to the quarter condition, throttle is in the quarter condition slightly in this is my standby battery switch I need to check my standby battery for 10 seconds, when I select this standby battery switch on the test mode this lamp should glow and I will hold it for 10 seconds.

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And then put it in the armed condition. So, now, my standby battery is armed you will see this is the PFD and the IMFD.

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This screen has started going this is the garmin thousand avionics system this is my digital instrument, you can see lot of parameters here on the screen manifold pressure this is the rpm this is the fuel flow this is the oil pressure oil temperature, cylinder head temperature exhaust gas temperature, fuel quantity, left tank right tank this is for the electrical bus voltage battery voltage, then these are the various instruments you can see the outside air temperature, now with this screen on I put the master switch on.

My master switch is now on throttle is already quarter inch in, I know I am supposed to prime the engine this is my mixture control. I put the mixture control in the full rich condition, this is now full rich full length full rich conditioned and I will put the fuel pump switch on with the fuel pump switch on I need to. So, see this fuel flow gauge here this should register the fuel flow gauge should register. So, that is an indication that your engine is getting primed. With a mixture full rich throttle quadrant, and now I am putting this you can see this fuel pump, switch this is the fuel booster pump I am putting the booster pump on. Listen the sound and it has registered already registered, now with them.

Now the mixture is out and I am going to start the engine now. See the ignition switch the ignition switch off position, brakes on and I am taking the clearance from outside and engaging the ignition switch to start the engine. We needed a engine on are they engine is on, the engine is on the very first thing you have to watch for when you switch on the

engine is the oil pressure, the oil pressure is supposed to register within 30 seconds to ensure that your oil has a started flowing within the engine, and proper lubrication has started taking place. This is my rpm you can watch here this is the rpm.

I need to put the engine on 1200 rpm so that the oil temperature comes to the limit.

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See the oil temperature here it is just starting in the green range, I have put it in a different mode here you can see the actual value of the oil temperature here, it is 100 degrees Fahrenheit at the moment. So, I will wait for the oil temperature to slightly increase. So, that it is comfortably in the green range and then we will overhead.

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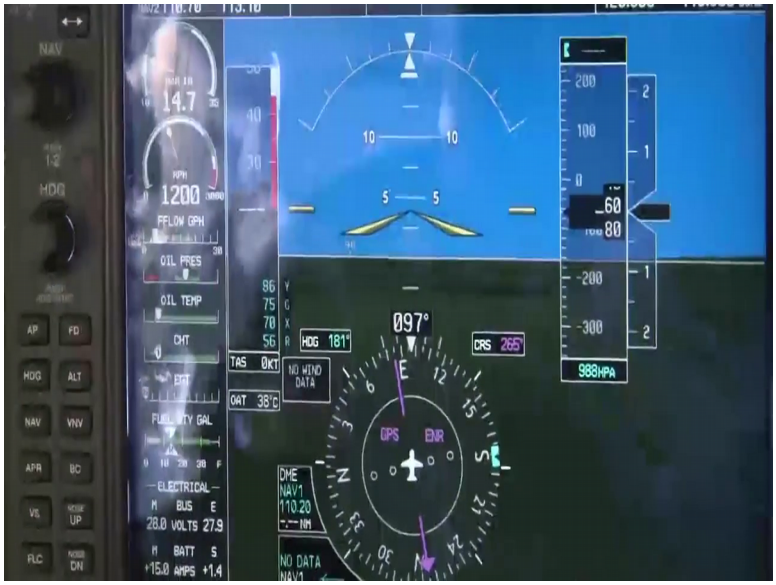

So, I put the engine on 1200 rpm you can see the rpm here 1200, my all the parameters are in the green range see the fuel flow the oil pressure oil temperature is also now in the green range, the cylinder head temperature is yet to touch the range and other parameters are also within the range. Now I am waiting for my cylinder head temperature to come in the green range, it is you can see it is 175 degrees Fahrenheit to 180 degrees Fahrenheit for cylinder one here. So, CHD is also now in the green range.

This ensures that your engine has achieved the oil temperatures required, for doing the engine grounded. Since the oil temperature is already in the ground green range and moving ahead I will take the rpm to 1800. So, with this I push the throttle gradually

inside and take the rpm to 1800 watch it. So, now, I am started I started increasing pushing and the rpm is increasing, you can see watch the rpm increasing here it is 1500 while doing there are we need to be very careful about the brakes, the brakes should be in place.

Now see the rpm rpms in 1800 rpm is 1800 and 1800 rpm I need to check my pitch propeller pitch this is my propeller pitch at the moment it is in the fine position, I will put it pull it put it in the course mode and watch rpm drop. So, I am pulling this on this propeller pitch and you watch the rpm here. To watch the rpm here see this pitch control I am pulling it in the course condition and watch this is the drop from 1800 8 drop to 1580. So, you can see it was almost are 220 rpms drops, which is well within the limits.

At 1800 rpm I am also supposed to check my magnitude drop up, magnitude means I will put the ignition machine switch from both condition you can see the ignition switch here in the both condition. At the moment it is in the both condition I will put it in right mode and in the left position, and in doing so, I will check the rpm drop the rpm drop should be within the limits. So, you can see my throttle rpm in 1800, I am putting it from both to the right position see it was 1720 it from 1800 it drop to 7020; that means, a drop of 80 rpm. Now it is back to 1790, I will make it slightly more 1800.

Bring it to 1800 you see it is 1800, again and I am putting in to left phone now the ignition switch left mode and you see the drop, I will do it again see from 1800 drop to 7040; that means, drop of 60 rmp. So, there was a drop on one side it was a drop of 80 rpm and on the other side it was drop of 60 rpm. So, this is well within range. So, now, from 1800 I will go for (Refer Time: 30:43) you need to watch the rpm here, you need to watch the rpm here and the manifold pressure. So, I am going to give it full throttle full throttle means maximum power.

So, here we go now, you can see throttle full in and (Refer Time: 31:26) 36 50and 1 5 you can see the rpm maximum r gear, and the maximum and involve it is well within the range. So, I am putting the rpm I am putting the throttle back, gradually putting it back gradually reducing power, you can watch the rpm gradually decreasing you can see the rpm gradually decreasing the manifold pressure gradually decreasing and all along you can see the ranges.

All the parameters are within the green range you can see all parameters are within the green range, the fuel flow the oil pressure the oil temperature in the cylinder head temperature, fuel quantity everything manifold pressure everything is within the green range; that means, your aircraft is perfectly to fly. So, I am gradually decreasing the rpm now we will come to 1000 rpm, see gradually it has decreasing it is decreasing you can see the rpm gradually decreasing here orders 1000 1020.

From here 1000 I will go to the ideal rpm which is the minimum rpm; that means, throttle pull half pull out. I am going to check the ideal rpm that is the minimum rpm, see the minimum rpm it is 600 at the moment I will check my mixture control also here, I gradually pull this control out and see the drop in rpm. It should increase a bit and then drop it is 610 620 you can see yeah see your rpm has increased and decreased. So, this is the check for the mixture, with the mixture check after this I will again increase the throttle.

I will again increase the rpm, I will take to 2000 clear my spark plugs clear my engine see the rpm increasing now 2000. Now I will bring it back to idle my engine is clear now I will bring it back to idle and then I will switch off. So, you are seen all along your parameters are in green range to cut off the engine, to switch off the engine I will pull this lever the mixture control out, which will stop the supply of fuel to the engine and the engine will eventually shut down you can see.

I am pulling this lever out the fuel supply is shut and the engine has cut the engine is out now I put the ignition switch back to off. I am switching off switched off this screen, switch off the master and switch off the arm condition. After the ground on I also need to ensure that my controls, my controls are proper there is no binding in the controls I will ensure that my controls are there is no binding in the controls, the ailerons are operating properly, the elevator is operating properly, at the same time my instruments, my standby instruments my other instruments and switches circuit breakers everything is in place there is no damage.

So, with all these inspections you have seen the inspection outside the fuselage the engine inspection the landing gear inspection the cockpit inspection the instrument inspection, the instrument panel inspection, and the ground run after satisfying your

ourself, that the aircraft is completely safe for flying we will release the aircraft for further flights.

Thank you.