NOC: Introduction to Airplane Performance

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Module - 01
Lecture - 03
Introduction to airplane and its components

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This is Sinus 912 aircraft which is a motor glider and its manufacturer is Pipistrel. So, we will today we will discuss about the structure and the instrument panel of this motor glider. This is an all made its construction is of composite material. This is the spinner of the aircraft having a 2 bladed propeller which is vireo. Then, it has a rotex 912 engine installed in it which is a 4 cylinder engine and it is a piston engine 4 stroke.

Moving ahead we come to the wing. This is the starboard wing of the aircraft which is containing a pitot tube. This is the pitot tube which senses the pitot pressure and the static pressure from the static veins located just beneath it. It senses the dynamic pressure and gives to the pitot instruments like ASI, altimeter and vertical speed indicator.

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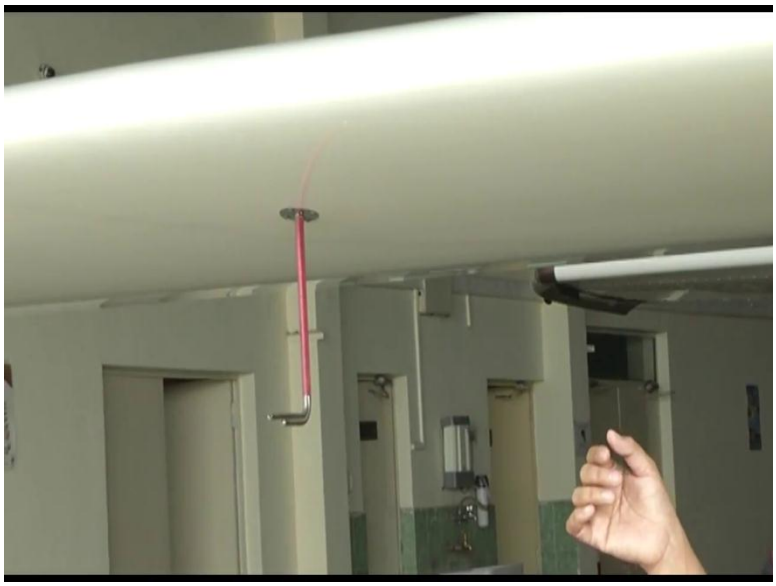

Then, it has a wing span of 15 meters. For this wing contains a flaperon. Normally all aircrafts have either aileron and a flap, but in this varying motor glider the 2 control surfaces are combined in one and then that is of flaperon which consist of a flap and aileron that helps in rolling and as well as at the time of takeoff and landing.

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So, this is the impeller section of the aircraft this is the tail section which consist of the vertical stabilizer, the horizontal stabilizer; attached to it is the moving part that is the elevator and the rudder. Elevator gives us a pitching moment of the aircraft while moving up and down, and rudder gives us the yawing motion to the aircraft. So, this complete section gives us the tail section of the aircraft. Beneath this you can see, there is a kit, tales kit which consist of a hole which is moving for tying the aircraft when it is parked on the ground.

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So, further we will move towards the port side of the wing that again contains a flaperon. And, as you can see on top of this glider here we have antennas. These are VHF antennas - one is for communication and one is for receiving. And, on top of, for this very aircraft we have an optional parachute installed in it which can be served as an emergency equipment which is being installed over here. So, this was the basic of the motor glider. And, on top of the wing you can see that curve shape part; that is the fuel tank cap which is used for filling the fuel tank which is installed in the wings.

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Now, we will move inside the cockpit to just have a brief view of the instrument panel and the controls. So, this is the instrument panel of the motor glider which we were discussing about just a few minutes back about the composite motor glider sinus 912. This complete is the instrument panel which consists of an alpha m f t installed in this center which gives us the readings of various engine instruments; and, apart from that various airframe gauges.

And, for standby instruments we have some analog gauges like we have airspeed indicator which gives reading in knots about the airspeed, then we have the turn coordinator and the level indicator which tells that aircraft matting towards left or right the turn of the aircraft. Then it tells about the altimeter, the height of the aircraft in feet. Then we have temperature gauges and the manifold pressure gauge. Along with these along with the readings which comes in these analog gauges we also get those same readings in the alpha m f t.

And, below you can see the control stick like in some aircrafts you have the control column, in some we have control wheels and in some we have control stick, but the function of all is same. It is used to control the primary motions of the aircraft that is when you are moving left or right the flaperons of the aircraft of this aircraft is moving. Normally when you move towards left or right the ailerons move, but for this sinus 912 flaps and ailerons are combined. So, when we move it towards left or right the flaperons

on install on the wing moves. If you pull it or if you push it then the elevator comes in action.

And, there you can see the rudder pedals. When the left pedal is moved, when the left pedal is pressed the rudder moves accordingly the action is transferred to the rudder towards left or right, and if you press the right pedal then the motion is transferred towards the moment of the control surface towards right, and if you press both of them together that gives the braking action that is feasible on the ground.

So, this is about the motor glider of very light aircraft; weight is approximately around 550 kg. And, these are the engine controls - the choke and the throttle. It has fixed seat arrangement in this. And, it has a magnetic compass over here to give the heading of the aircraft in which direction it is moving.

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As far as of now we have learnt about the conventional gauges that was been introduced in the earlier aircrafts, but nowadays the modern cockpit is being introduced that gives a display, a screen and a display on that screen inside the cockpit. Earlier we used to have gauges like we have in this aircraft that is airspeed indicator, the instrument and the alternator.

But in addition to these gauges we also have the display on the screens. This is the part of the modern cockpit. You can see, also see a glass cockpit that gives us a glass screen on which the display comes up. We can see this is the primary functional display, this is

the multifunctional display. There are various items on it to be displayed. These settings are made by the pilot at the time of flying whichever reading he wants to see.

This is, there is a gps in this, we have nav and com readings in this, there is a volume controller, this is the remote for the that, this is the heading control, this is the various nav and headings switches for this, then we have the range over here, then this is the multifunctional display that gives us the reading for fuel quantity that is the fuel quantity in both the tanks here tanks installed in the wing of the aircraft.

We have the egt the exhaust gas temperature, we have the c h t cylinder head temperature the oil temperature. the oil pressure and the fuel flow that is in gallons per hour. So, these 2 screens all together gives us the position of the aircraft, the heading of the aircraft, various engine instrument readings and how it goes about and it helps pilot to flying the aircraft.

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So, as of now we have covered about the airframe of the fixed ring aircraft. Today we will cover something about the engine of the aircraft. The engine installed on these fixed ring aircraft is the piston engine. Here, is a picture of a piston engine that is a 6 cylinder as you can see 1, 2, 3, 4, 5, 6; these are the 6 cylinders horizontally posed piston engine. Engine is the heart of the aircraft because it provides power to the aircraft. And, these are the cylinders in which the valves run. This is the 4 stroke piston engine. On top you can see this is the oil inlet point of the engine, here is the propeller governor; this is the alternator of the engine which provides electrical power.

In front, is the propeller, a 3 bladed propeller and, this is the couple crankcase in which the crankshaft runs, operates the cam lobes and thus operates the intake and exhaust valves inside this 2 operator, the opening and closing valves to operate the engine. These are the sparkplug installed and, similarly we have a sparkplug on the other side of the head. This is the cylinder head and, these are fins, with the cooling fins use to cool the engine.

Then, these are the lines for the fuel lines going to the various cylinders which supplies the fuel. Behind this you can see these are the mounts on which the engine is mounted. the mounts of the engine. Then we have the coolers for the engine; then, this is the hydraulic brake fluid which speeds the brake. So, this is about the piston engine. Behind this valve is installed the magneto which supplies power to the engine in; it is connected to the battery; battery trans starts the engine and then engine supplies power to the aircraft.

This is the jist of the piston engine that you can see. Piston engine is a 4 stroke engine which powers fixed ring aircrafts. On higher aircrafts you have turbo engines, turbo fan engines, road free engines. This arrangement is of various types on different aircrafts. In this aircraft you can see it is a horizontally opposed that is engines are opposed in a horizontal manner to each other. We also have a vertical opposed engine, we have a radial cylinder engines in which the cylinders are aligned in the radial way, but this is a kind of a horizontal opposed piston engine.

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As of now we have studied about the aircraft structure and aircraft engine. Today we are going to see about something about the landing gears that is used to balance aircraft on the ground. And, so, we have 2 types of landing gears - one is fixed and one is retractable. Fixed type of undercarriage is this which you can see; this does not have a retracting mechanisms. This is the short strut on which the landing gear is balanced. This is the nose wheel; the inner 2 are the main wheels.

So, this fix landing gear takes the load, absorbs the load when the aircraft lands. And, at the time of takeoff and the aircraft machine is in air these wheels creates strag which is an advantage added advantage in type of retractable landing gear like where I will show you just. In piper saratoga we have a retractable landing gear in which this the air oil oleo strut takes up the landing load and bends inside at the time of takeoff and a machine is in the air.

So, now, we will move up to another kind of fixed landing gear that is being installed on Hansa 3 aircraft. So, we have just seen fixed landing gear of sinus 912 motor glider. This is another type of fixed landing gear that is being installed on Hansa 3 aircraft. Here you can see, this is a strut, a steel strut which takes up the load. And, inside other usually landing gears have an oleo air and oil combination kind of a strut to bare up the load. But this vary undercarriage in Hansa 3 aircraft has a piston and just above and below the piston there are rubber pads to take up the load being imposed for this aircraft at the time of landing. Rest all a same as compared to the aircraft when this aircrafts land. The load

on the machine is being taken up by this strut, transferred on to the shock absorbing mechanism that is the piston and the rubber pads.

This is Cessna 206; as you can see it is also having a fixed landing gear or fixed undercarriage; that is also having a an air and oil combination kind of a strut, this is a strut. At the time of regular maintenance check we need to check the extension of the strut. There is a limitation for this extension. And, there is a centering camlock just behind this strut. If that is being locked then the aircraft cannot stay left or right.

So, this strut takes up the load at the time when aircraft is landing; this is the combination of air and oil and hydraulic oil, and it is a fixed landing gear, it creates a lot of track in the air, and it is also having an air conditioning system installed in this aircraft. So, this is the complete thing about the fixed landing gear for Cessna 206 h aircraft.

So, as of now we have studied about the fixed landing gear. This is a kind of a retractable landing gear; you can see a top link and air oil oleo strut which helps in shock absorbing of the aircraft while the aircraft is being touched on the ground. At the time of landing here is the spring which helps the aircraft landing gear to retract upward and low and keep it locked. These are the landing head doors which when the wheel is retracted upward these doors close and provides an complete aerofoil, a smooth surface to the aircraft structure, thus preventing a lot of drag which is an disadvantage in case of fixed undercarriage.