NOC: Introduction to Airplane Performance
Prof. A. K. Ghosh
Department of Aerospace Engineering
Indian Institute of Technology, Kanpur

Lecture - 04
Hansa 3 Aircraft and Its Primary Systems

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Student: Today, we will learn about Hansa 3 aircraft, which is an NAL manufacture Aircraft, Hansa 3 is an all composite low wings single engine aircraft, which is equips with fixed tricycle landing gear. It consists of a conventional primary controls, namely aileron, elevator and rudder and secondary controls, which are flaps and tabs. The primary controls are manually operated by a dual interconnected set of controls sticks, which can be seen inside the cockpit and a rudder pedal, which is also located inside the cockpit, where our secondary control has a manual and an electric operation.

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There are two integral side by side seats for pilot and co pilot. The aircraft, this aircraft is powered by a Rotax 914 F 3 engine, which is a four stroke four cylinder horizontally opposed piston engine. The aircraft is equipped with a variable pitch two bladed constant speed Hoffmann composite propeller, the length of this aircraft is 7.6 meters and it is height is 2.6 meters. It is maximum takeoff weight is 750, 750 kg it has a fuel tank, which is fitted behind the pilot seat, with the tank capacity of 91 liters of which 85 liters is usable.

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Now, whenever we think about the aircraft description of the structure, we intend to say that the internal structure, comprising of the item of equipment and the various instruments on the cockpit panel and the external structure, which consists of the wing, a primary control surfaces, the secondary control surfaces, the landing gears, engine and the propeller.

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The most important part of an aircraft is the wing that is a lift producing device. The wing of Hansa 3 Aircraft is a single piece wing with three spars, the leading edge spar, main spar and the rear spa. It is of composite construction, because span are around 10.5 meters consisting of a primary control surface. Aileron attached to a wing and a secondary control surface flap, which is located in both side of each wing.

Flap is located in both side of each wing, which is secondary control surface used at the time of landing and as well as the time of takeoff. So, after the wing the main plane comes the tail plane, which consists of a horizontal stabilizer, that is a fixed surface to which, is attached a movable tail surface that is an elevator and a vertical stabilizer, which is again a fixed surface, to which it is attached a movable surface that is called rudder, this is the elevator movement and this is the rudder movement.

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Now, when we get to know about the elevators, elevators are the primary flight control surfaces, which are usually at the rear of an aircraft. Elevators are usually hinged to the tail plane or horizontal stabilizers, which is a fixed surface, which control the aircraft pitch that is, movement of aircraft about the lateral axis.

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And, when we talk about the rudder, rudder is a directional control surface, the rudder is usually attached to the fin or the vertical stabilizer, which is a fixed vertical surface. They control the yawing motion of the aircraft, that is movement of aircraft about the vertical

axis, the movement of the rudder is provided by means of rudder pedals, which is provided in the cockpit. A forward and aft movement of pedals is transmitted to the rudder pedals to the rudder controls by means of bell cranks, levers and push pull rods.

Pressing the right rudder pedal, turns the controls surface towards right, thereby which an air pressure acts upon it, which in turn forces the tail left and nose of the aircraft towards right. All primary controls are mass balanced and are provided with stops to limit the respective range of the controls. The primary control surfaces, which is attached to the wing is known as aileron, it is the hinged flight control surface usually forming part of the trailing edge of each wings of a fixed wing aircraft.

Aileron are used in pairs to control the aircraft in roll, that is the movement of aircraft about it is longitudinal axis, which normally results in a change in flight path due to the tilting of the left vector. Movement around the axis is known as rolling or banking, the sideward movement of the controls stick transmits motion to ailerons by means of lever, bell cranks and push pull rods. The normal range of the movement of aileron for Hansa 3 Aircraft is 20 degrees up and 20 degrees down.

As we can see, when the controls stick is moved towards left, the left aileron raises up, whereas the right aileron goes down. The left aileron, which is going up creates drag whereas the right aileron increases the surface area and hence raises the right wing, whereas the left aileron goes down, lowers the lift towards the left wing and hence the aircraft rolls towards the left.

Wing flaps are, manually operated by means of a control handle provided in the center pedestal located in the cockpit. The movement of the control handle it is transmitted to the flaps through torque tubes, bell cranks and push pull rods, wing flaps and in this aircraft is a single slotted fowler type flap, it has a 10 degree and 20 degree down position.

Flaps can be used at the time of take off and as well as the time of landing. Trim tab, which is located on the left elevator provided to aid the pilot by assisting in operation of primary control surfaces and also to keep the aircraft balanced. It is operated by an irreversible electrical actuator, which is located inside the horizontal stabilizer, which is directly attached to the operating lever of the tab and it is located on the LH side. This is all about the controls and the structure, external structure of Hansa 3 Aircraft.

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Here comes instrumental panels of Hansa 3 Aircraft, we can see the various instruments installed on instrument panel, will start with the primary flight instrument, that is air speed indicator, this is air speed indicator, which gives the reading in knots. Then, we have altimeter, which tells us the height that is the vertical speed indicator also known as rate of climb indictor, which tells us the feet per minute. ASI (Air Speed Indicator) altimeter and vertical speed indictor these three are the pitot static instruments out of which, altimeter and vertical speed indicator, inputs the static pressure whereas airspeed indicator, take the total pressure the dynamic pressure and does the static pressure.

Then, we have the gyro instruments, gyro horizon, we have engine instruments that is the manifold pressure gauge this is the tachometer, also known as RPM indictor, which tells us both the RPM, of the engine. The static RPM, for this engine on ground is around 2250 RPM. Then, we have the ignition switch over here, we have various indictors for CHT that has cylinder head temperature indicator, we have an oil temperature indicator, we have a oil pressure indicator.

Also, we have a turn coordinator aligned with it is a level indicator, which tells us the aircraft is aligning towards left or towards right, can see the markings on the cage as L or R. So, this is a turn coordinator, then we have various switches for lights, for electrical panels this is the radio communication set of this aircraft, above you can see the magnetic compass and just this is the outside air temperature gauge.

So, magnetic compass gives us the heading, where the aircraft is moving outside air temperature tells us the free air temperature of the air and the various gauges gives us the reading, which helps a pilot to maneuver the aircraft properly.

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Below here, you can see the various controls that is the throttles control and the propeller control. Here is the choke activate, then we have this is the flap lever, this is the choke, which is used to activate the engine, we have the throttle controls, we have the propeller controls. Propeller controls to make the make the propeller pitch fine or coarse it is having a constant speed propeller, which can be changed this, the throttle which can be set on idol on 100 percent and 115 percent that is the max RPM.

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This the lever for flap, which has three positions UP, 10 degrees and 20 degrees, UP is when flap is fully up, 10 degrees is, when flap is instructed downwards to 10 degrees and 20 degrees, when flap is retracted fully towards downwards that is 20 degrees, 10 degrees is use at the time of takeoff to increase the surface area of the wing and to increase lift, twenty degrees is used at the time of landing to increase more drag, and thus provides safe landing in a minimum distance.

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This is the controls stick, which is used to operate the primary flight controls, the aileron and the elevator. Moving it towards left or right gives the movement to the aileron and thus a rolling motion to the aircraft, moving it forward or aft gives the pitching moment to the aircraft, that is to the motion to the elevator and thus and aircraft pitching takes place.

Below, you can find the rudder paddles here, this are the paddles moving towards left or right and when this are used in ground both of them are together to give a breaking action to the aircraft. And air these serve as yawing motion this gives a yawing motion to the aircraft, pressing the left rudder pedal, gives the motion of the aircraft motion of the control surface towards left. Pressing the right rudder pedal, when right rudder pedal goes forward the rudder move towards right and accordingly gives the yawing motion to the aircraft.

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As I, mentioned behind the pilot and co pilot seat there is a fuel tank, tank capacity of ninety one liters this is the location of the fuel tank, this is fuel tank its tank capacity is 91 liters out of, which 85 liters is usable fuels and 6 liter is unusable. Whenever, an aircraft passes through the lightning atmosphere is a protection provided on the aircraft to protect it surface from lightning ill effect…

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So, on this Hansa 3 Aircraft there are 6 lighting arrestors, which arrest charges and passes on them to the two ground the charges. There are 6 lighting arrestors two, in the form of a triangular plate, which are located on both side of the wings one on top of the fuselage as aluminum rod and three on the three under on the three landing gears to main wheels and the nose gear these six arrestors in all carries away the charges and ground them to the surface, so that the surfaces aircraft surfaces is rotate from any lightning strike.

If, the aircraft flown in day time as well as in night there are certain light, which are provided on the aircraft surface to aid the pilot, to fly the aircraft and also to aid the pilot of other aircraft, which are flying in the air space in or around the aircraft. So, we have navigation lights located on the wing tip the left side that is a both side it contains a red light the right side contains the green light on top of the rudder there is a light, which is blinking all the time and that is known as an anti-collide that is anti-collision light.