Aircraft Maintenance
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Lecture – 07
Aircraft Brakes System

So, we have seen the different types of landing gears, the types of wheel assemblies installed in the landing gear, the different types of tires, tubes. Another part of the landing system a very important part is the aircraft brake system, the brakes as we all know in all automobiles brakes are an essential component in any vehicle, similarly in aircrafts also brakes are a very important part.

So, in this module we will see the different types of brakes, we will be starting with the basic types of brakes and then we will see how different types of brakes are installed.

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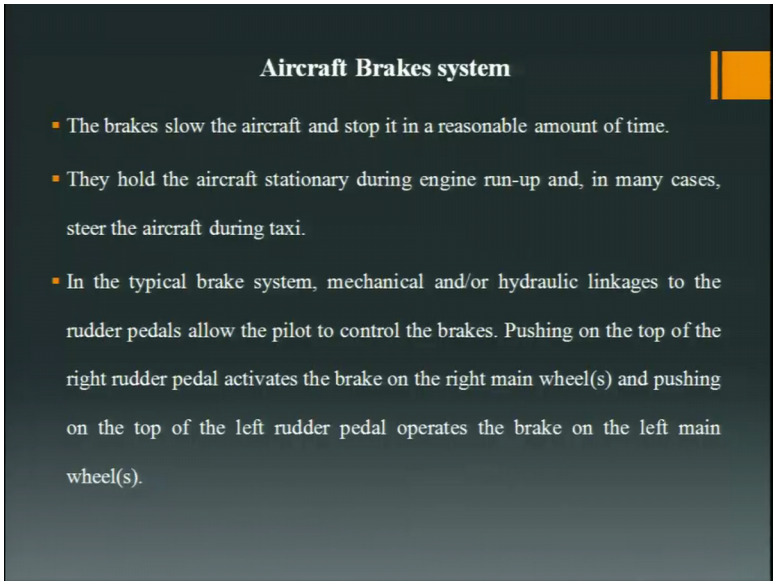

So, the brakes slow the aircraft and stop it in a reasonable amount of time, we all know that brakes the what is the basic purpose of the brakes, they slow the aircraft and stop it in a reasonable amount of time, they hold the aircraft stationary during engine run up and in many cases steer the aircraft during taxi.

In typical brake system, mechanical linkages or hydraulic linkages to the rudder pedals allow the pilot to control the brakes. Pushing on top of the right rudder pedal activates the brakes on the right main wheel and pushing on the top of the left rudder pedal operates the brakes on the left main wheel. So, basically the rudder pedals are depressed on the top for the right brake system, the right pedal is depressed and for the left brake the left pedal is depressed.

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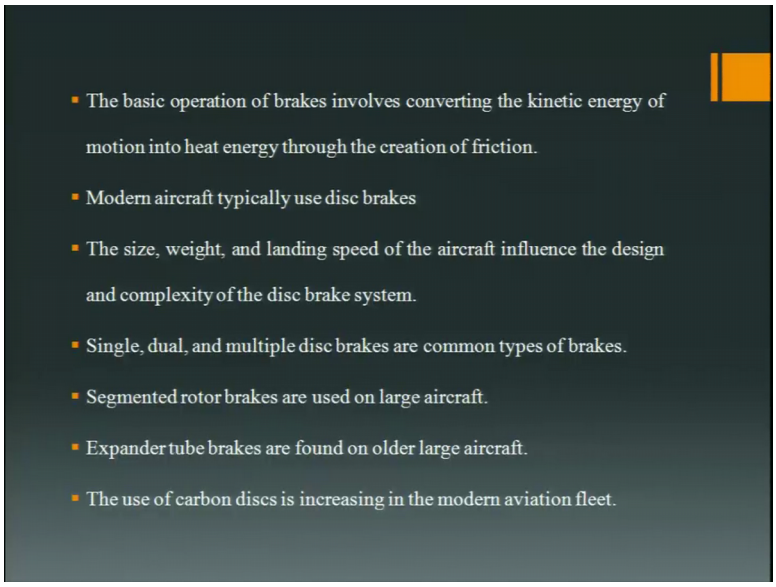

The basic operation of brakes involves converting the kinetic energy of motion into heat energy through the creation of friction. So, basically the kinetic energy is being created is being converted into heat energy through friction, modern aircraft is mainly using disc brakes. The size, weight and landing speed of the aircraft influence the design and complexity of the disc brake system.

So, depending on the aircraft type, the size of the aircraft the weight of the aircraft the landing speed of the aircraft, accordingly the design and complexity of the brake system is designed. So, the different types of brakes they may be single dual or multiple disc brakes as we a mentioned earlier mainly the aircrafts are using disc type brakes depending on the aircraft design, depending on the type of aircraft the brakes may be either of single disc brakes dual disc type or multiple disc type.

Segmented rotor brakes are also used on large aircraft, bigger aircrafts; segmented rotor brakes are used and in older aircrafts the expanded tube brakes were being used as the sophistication is increasing.

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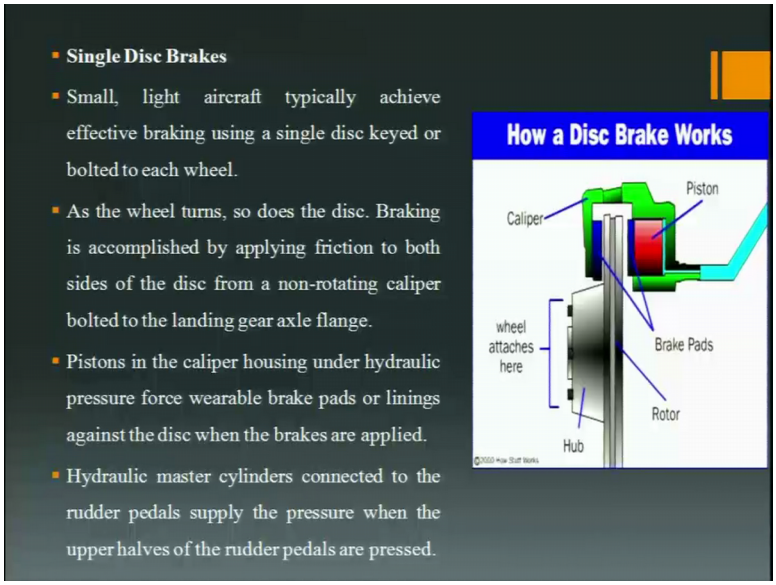

As we are getting better materials now a days the use of carbon discs is increasing in the modern aviation fleet. Now, coming to single disc brakes, so how a disc brake works you can see in the diagram, this is your hub assembly this your wheel, wheel. Now this rotor you can see here rotor, this is the disc which is attached to the wheel hub.

On both sides of the disc you can see here, these are the brake pads or we call them the brake lining this is the fixed these brake linings you can see this is fixed one is on the other side this is the piston and you getting the hydraulic pressure from the side.

So, small light aircraft typically achieve effective breaking using a single disc keyed or bolted to each wheel. So, you can this rotor or a disc is keyed to the wheel assembly as the wheel turns so does the disc since this disc or this rotor is keyed to the wheel assembly as the wheel turns the dis will also turn.

.Braking is accomplished by applying friction to both sides of the disc. So, braking is accomplished by applying friction to both sides of the disc you can see, you have the brake pads or the brake linings on both sides of the disc due to which the friction is created, these brake liners or the brake pads they are fixed in a unit called a caliper. They

a they are mounted here in the caliper and are which are bolted to the landing gear axle flange you can see this your landing gear axle flange here, they are bolted to this place.

Pistons in the caliper housing under hydraulic pressure this is the piston, this is coming under the hydraulic pressure the your hydraulic pressure is coming from this side. This forces wearable brake pad these brake pads they are wearable they get worn out or linings against the disc when the brakes are applied. So, when the brakes are applied by pressing the rubber pedals by pressing the top the rudder pedals in the cockpit hydraulic pressure is created from this side.

This hydraulic pressure forces the piston, when this piston is supposed this will push these brake linings against the disc as a result friction will be created and braking action will happen. Hydraulic master cylinders connected to the rudder pedals supply the pressure when the upper hubs on the rudder pedals are pressed. So, your rudder pedals are connected to the two hydraulic master cylinders. The hydraulic master cylinders they supply the pressure when the upper half of the rudder pedals are pressed.

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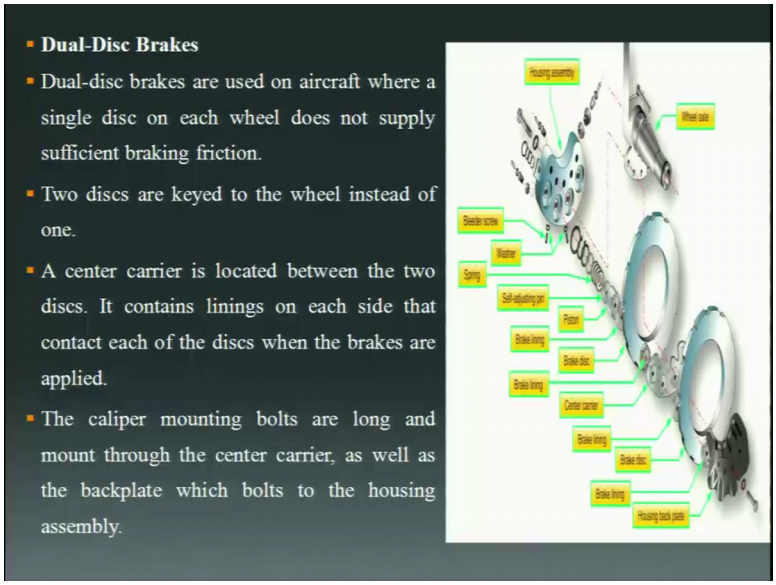

So, as the aircraft sizes became larger, single disc brakes were not effective. So, there was a necessity to have brakes which could provide more braking action. So, dual disc brakes were design, dual disc brakes are used on aircraft where a single disc on each wheel does not supply sufficient braking friction in these dual disc brakes there are two discs you can see in the diagram.

There are two discs this is one disc this is another disc, these two discs are key to the wheel instead of one. So, these two discs they are key to the wheel a center carrier is located between the two discs, this is your center carrier you can see this, this is your center carrier, this is located between the two disks it contains linings on each side. So, on each side you can see these linings, this is the lining there is one lining here on both sides of the disc one lining here on both sides of the disc.

Similarly on this disc you can see there is one lining here, and on the other side also you can see there is one lining. So, on both sides of the disc there are brake linings the center carrier is located between the two discs, this is the center carrier this is located between the two discs it contains linings on each side.

So, you have the linings on each side that contact each of the discs. So, these linings will contact the discs when the brakes are applied. So, basic principle is the same as the single disc a brakes, but in this you have two discs the caliper mounting bolts are long and mount through the center carrier.

These are the mounting bolts they are long and they mount through the center carrier as well as the black plate, this is the black plate this bolt goes through the black plate and the center carrier and it bolt the housing assembly.

In this diagram you can see two discs are there your braking is happening due to the friction between the brake linings and the discs the brake linings are there on both sides of the disc and these brake discs they are attached to the center carrier. So, these discs they are mounted to the wheel hub, when the wheel rotates the discs will also rotate these linings will provide friction to the rotating discs and the braking will happen.

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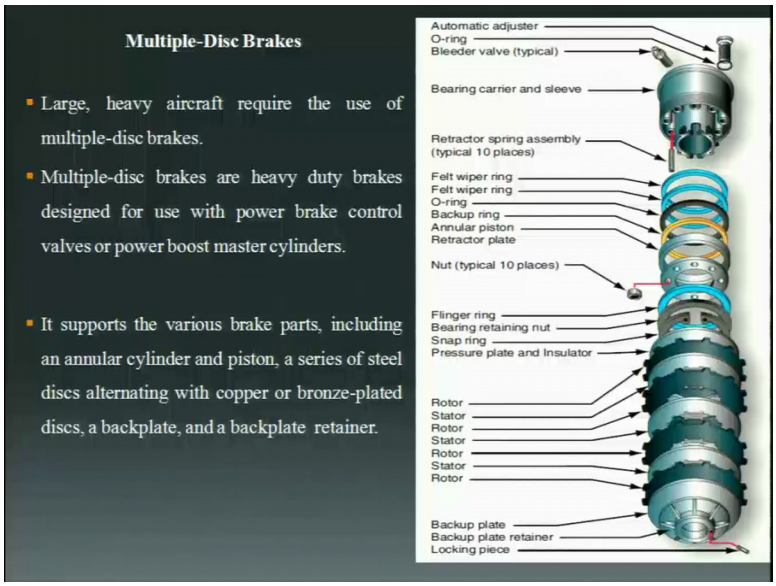

Now, another complex type of brakes is the multiple disc brakes, we have seen the single disc brake, we have seen the dual disc brake. Now this is multiple disc brakes, large heavy aircraft require the use of multiple disc brakes; multiple disc brakes are heavy duty brakes designed for use with power brake control walls or power boost master cylinders. So, as we have mentioned earlier depending on the type of aircraft depending on the size of the aircraft the brakes are designed.

So, for large and bigger aircrafts multiple disc brakes are required. They are heavy duty brakes designed for use with power brake control walls or power boost master cylinders. So, in this diagram you can see there are various discs, various rotors, here you can see these are the rotors, this is the rotor 1, 2, 3, 4.

So, you can see there are four rotors here, status you can see this is 1, 2, and 3, 3 status. So, rotor, stator, rotor, stator, rotor, stator, rotor, and then you have the back plate at the end on one side you have the back plate and on the other side you have the pressure plate.

So, you the pressure plate then you have the rotor, then stator, rotor, stator, rotor, stator, rotor, and then the back plate. So, this is the multiple disc break it supports the various break parts including an annular cylinder and piston here, you can see this is the piston, this is the piston a series of steel discs alternating with copper or bronze plated discs. So,

these discs or the rotors they may be copper made of copper material or bronze then there is a back plate and a back plate retainer.

So, it supports the various brake parts including an annular cylinder and piston. This is your annular piston series of steel discs, alternating with copper or bronze plated discs, a black plate and a back plate retainer. In the diagram this diagram you can see this is one type, there one type of multiple disc brakes, there may be other types of multiple disc brakes with different materials also.

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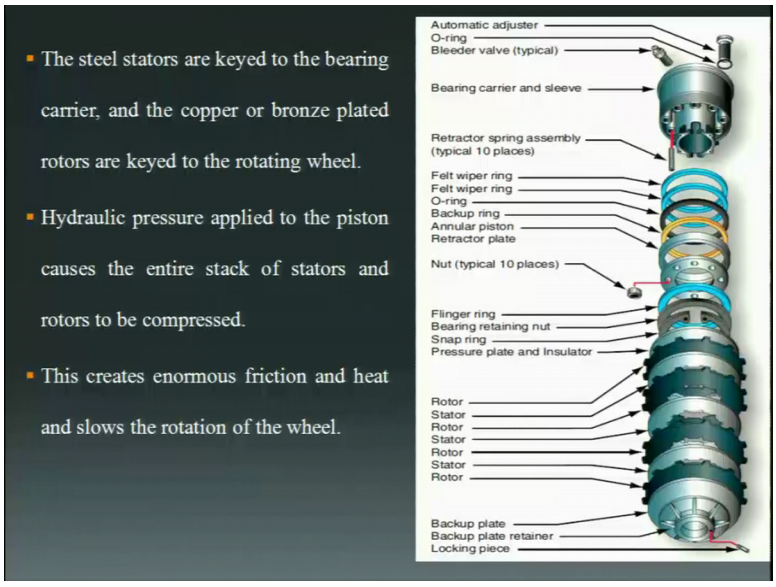

The steel statuses are key to the bearing carrier, these steel statuses they are keyed to the bearing carrier this is your bearing carrier, these stators are key to the bearing carrier and the copper or bronze plated rotors.

Those stators are of steel the rotors may be of copper or bronze and these rotors are key to the rotating wheel. So, the stators are key to the bearing carrier and the copper or brass plated rotors are key to the rotating wheel, hydraulic pressure applied to the piston. Now hydraulic pressure is applied to this piston, it causes the entire stack of stators and rotors to be compressed.

So, when the hydraulic pressure is applied to the piston that hydraulic pressure via the piston will cause the entire stack of stators and rotors to be compressed this creates enormous friction and heat and slows the rotation of the wheel.

So, due to the hydraulic pressure, it compresses the stack of stators and rotors this creates enormous friction and heat and eventually slows the rotation of the wheel. So, this is about the multiple disc brakes. We have seen the single disc brake, we have seen the dual disc brake and we have seen the multiple disc brakes.

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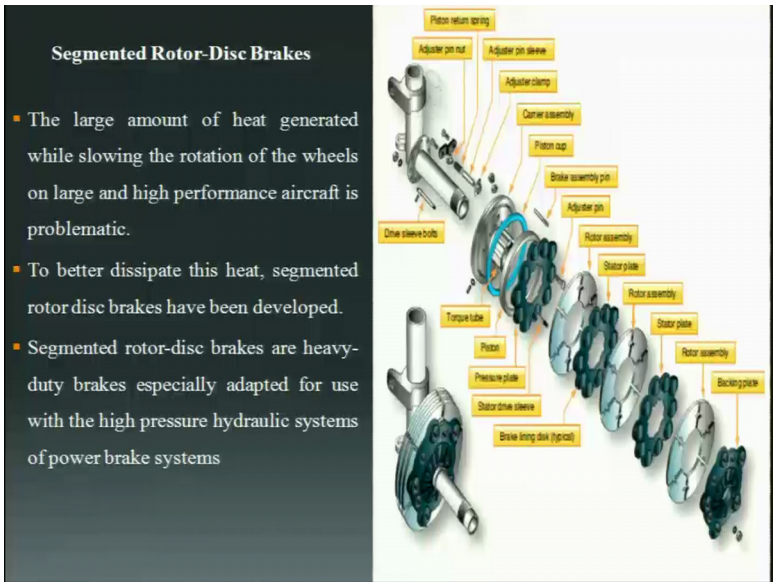

Now, another type of brakes where we have segmented rotors, so the discs they are of discs they are of disc type only, but the discs are segmented the large amount of heat generated while slowing the rotation of the wheels on large and high performance aircraft is problematic and due to friction large amount of heat is generated and this large amount of heat can be of problem.

So, to minimize this problem segmented rotor brakes were designed to better dissipate this heat, you can see in the diagram these are your rotors, 1, 2, 3, and you can see these rotors they are all segmented. The rotors are segmented, then you have the status you can see these are your status means the this is the stator plate stator then you have the back plate here, then the pressure plate on the other side. So, in this you can see there is a pressure plate.

Then you have the rotor, you have the stator, rotor, stator, rotor and back plate. So, it is almost the same type as the multiple disc brake, the difference is that the rotors they are segmented to better dissipate the heat, generated due to friction. Segmented rotor disc

brakes are heavy duty brakes they are heavy duty brakes, specially adapted for use with high pressure hydraulic systems or power brake systems.

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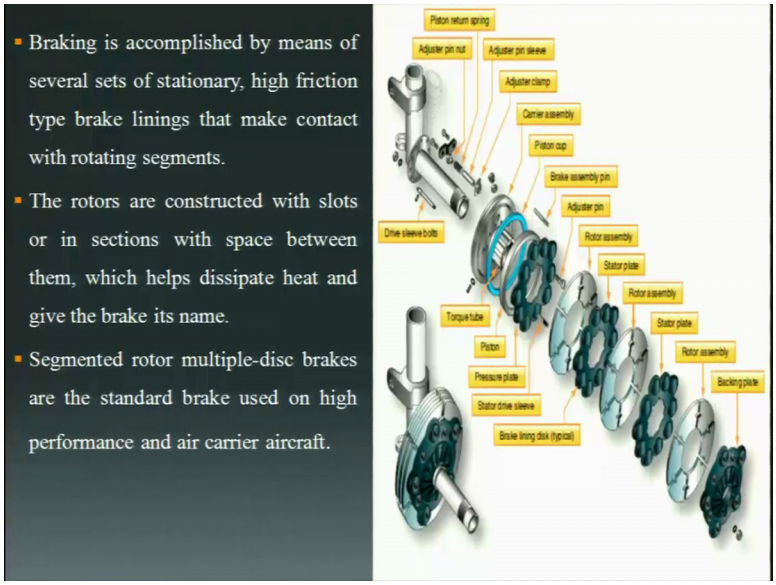

So, they are used with high pressure hydraulic systems or power brake systems, braking is accomplished by means of several sets of stationary, high friction type brake linings that make contact with the rotating segments. So, similarly as in the multiple disc brakes braking is accomplished by means of several sets of stationary, high friction type brake linings that make contact with the rotating segments.

The rotors are constructed with slots, you can see the rotors they are constructed with slots or in sections with space between them. So, there is space between the sections which helps dissipate heat and give the brake its name. So, these plots are designed in the rotors which help them to dissipate heat. So, that is why they are called segmented rotor brakes segmented rotor multiple disc brakes are the standard brakes used on high performance and air carrier aircrafts.

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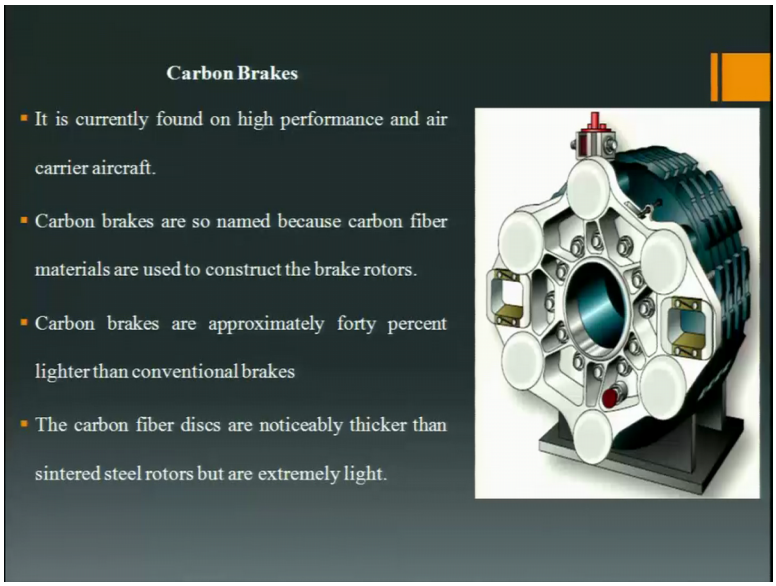

Now, another type of brakes carbon brakes, it is currently found on high performance and air carrier aircrafts carbon brakes are so named, because carbon fiber materials are used to construct the brake rotors. Carbon brakes are approximately 40% lighter, than conventional brakes. The carbon fiber discs are noticeably thicker than sintered steel rotors, but are extremely light.

So, you can see in the diagram there are carbon brakes they are found on high performance and air carrier aircraft. They are so named because the carbon fibers materials are used to construct the rotors, in this the rotors are made of carbon material, they are carbon brakes are approximately 40% lighter, than the conventional brakes.

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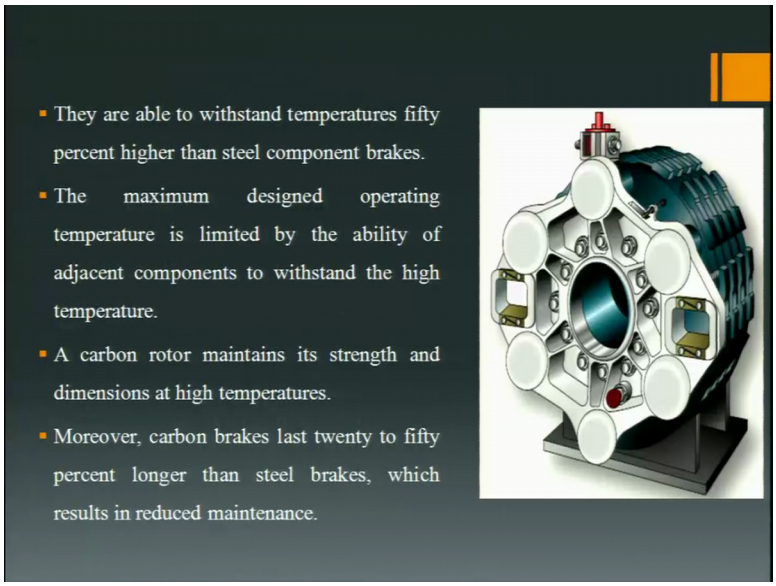

The carbon fiber discs are noticeably thicker than the sintered standard steel rotors, but are extremely light, these carbon brakes they are able to withstand temperatures 50% higher than the steel component brakes.

So, one of the advantages of the carbon brakes they are able to withstand temperatures like 50% higher than the steel brakes. The maximum designed operating temperature is limited by the ability of the adjacent components to withstand the high temperature. So, the components which are there in the surrounding adjacent components they should be able to withstand the high temperatures generated.

A carbon rotor maintains its strength and dimensions at high temperatures. So, the carbon rotor will maintain its strength and dimensions at high temperatures, moreover carbon brakes last 20 to 50% longer than the steel brakes, which reduce results in reduced maintenance. So, we have seen the advantages of carbon brakes as with passage of time we are getting better materials. So, we are able to get better brakes, where we are a finding to have better qualities and reduced maintenance.

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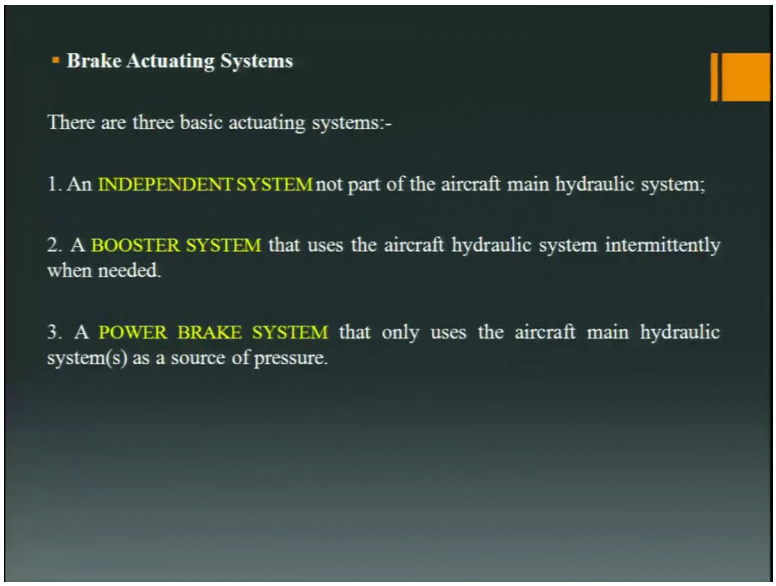

So, the different type of brake actuator systems, there are mainly three types of basic actuated systems one is the independent system, booster system, power brake system. Again depending on the type of brakes, type of aircraft the brake actuating systems are designed the independent system is not part of the aircraft main hydraulic system that is an independent system.

As its name suggests booster system uses the aircraft hydraulic system intermittently when needed and the power brake system only uses the aircraft main hydraulic system as a source of pressure. So, three types of system independent system which is not part of the main hydraulic system, booster system that uses the aircraft hydraulic system intermittently, and the power brake system that uses the aircraft main hydraulic system as a source of pressure.

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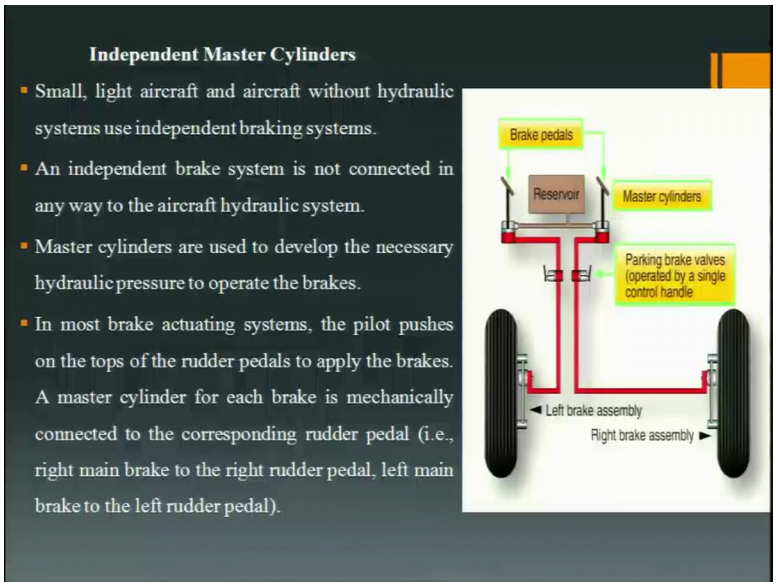

Independent master cylinders, this is basically the independent type of brake actuating system, which has got independent brake master cylinders. In the diagram you can see, these are your rudder pedals, these are your master cylinders, these master cylinders have a reservoir, fluid reservoir. Then these are your brake linings, this is your brake lining this your brake assembly here, and this is your wheel.

In this lining you can see there is a wall called a marking brake wall. Similarly, on the other line also you have the parking brake wall and this is connected to a brake unit here, this is the brake unit, this is a very basic type of a brake system small light aircraft and aircrafts without hydraulic systems use independent braking systems. So, very small aircrafts, light aircrafts, aircrafts which do not have a hydraulic system they use independent brake system.

An independent brake system is not connected in any way to the aircraft hydraulic system. Since, as the name suggests this is an independent system, the independent brake system is in no way connected to the main aircraft hydraulic system. So, this system can be used, on aircrafts which do not have the hydraulic system. Since this is of independent type master cylinders are used to develop the necessary hydraulic pressure to operate the brakes.

These are the master cylinders, which are used to develop the necessary hydraulic pressure to operate the brakes in most brake actuating systems the pilot pushes on top of

the rudder pedals. So, pilot will push on top of the rudder pedal to apply the brakes, a master cylinder for each brake. So, this is the master cylinder for this line for right line and this is the master cylinder for the left line a master cylinder for each brake is mechanically connected to the corresponding rudder pedal.

So, this master cylinder is mechanically connected to the rudder pedal that is right main brake to the right rudder pedal and left main brake to the left rudder paddle, when the pedal is depressed.

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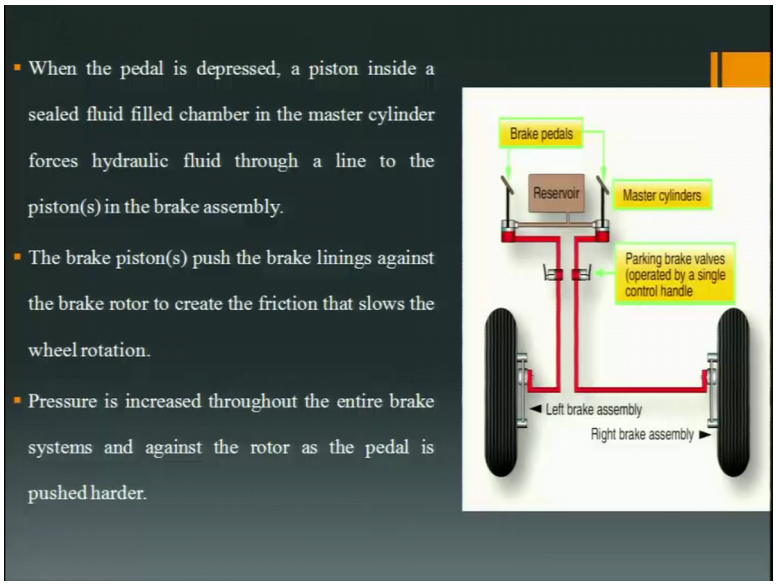

Now, when this pedal is depressed a piston inside a sealed fluid filled chamber in the master cylinder, in this master cylinder there is a piston here, and there is a chamber which is filled with fluid. So, when the pedal is depressed piston inside a sealed fluid filled chamber.

This chamber is sealed and end the fluid is filled in this chamber, forces hydraulic fluid through a line to the piston in the brake assembly. So, when the pedal is depressed this piston will force the hydraulic pressure to move from this line to the brake assembly. So, this brake assembly we have earlier seen that it also has a piston. So, this hydraulic pressure will push the piston here and this piston will push the disc will provide friction via the brake linings.

Pressure is increases, throughout the entire brake system and against the rotor as the pedal is pushed harder. So, when this hydraulic pressure is applied the brake piston will push the brake linings, this brake pressure will push the brake linings against the brake rotor against the brake disc to create friction that slows the wheel rotation. So, this hydraulic pressure will push the brake linings, against the disc or the rotor and it will create friction that will slow the wheel rotation. Pressure is increased throughout the entire brake system and against the rotor as the pedal is pushed harder. So, this is the independent brake system a very basic type of brake system.

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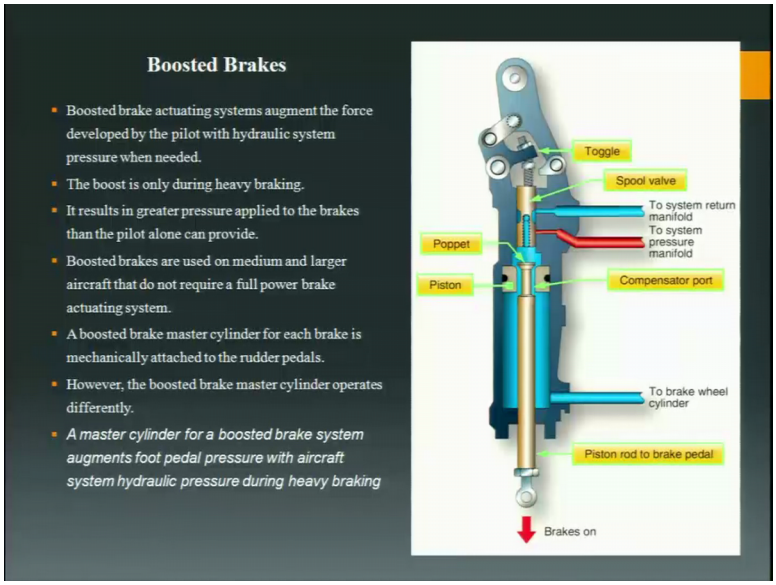

Now, boosted brakes actuating systems augment the force developed by the pilot with hydraulic system pressure when needed. So, as the name suggests this boosts the brake the force developed by the pilot this will boost the force developed by the pilot with hydraulic system pressure when it is required.

The boost is only during heavy braking, it results in greater pressure applied to the brakes that the pilot alone can provide. So, this provides a boost to the pressure which is created by the pilot, it results in greater pressure applied to the brakes that then the pilot alone can provide, boosted brakes are used on medium and large aircraft that do not require full power brake actuating since system.

A boosted brake master cylinder for each brake is mechanically attached to the rudder pedal. So, the master cylinder for these boosted brakes is of a special type and is

mechanically attached to the rudder pedal; however, the boosted brake master cylinder operates differently. A master cylinder for a boosted brake system augments the foot pedal pressure with aircraft system hydraulic pressure during heavy braking. So, foot pedal pressure is augmented with the aircraft hydraulic system pressure during heavy braking.

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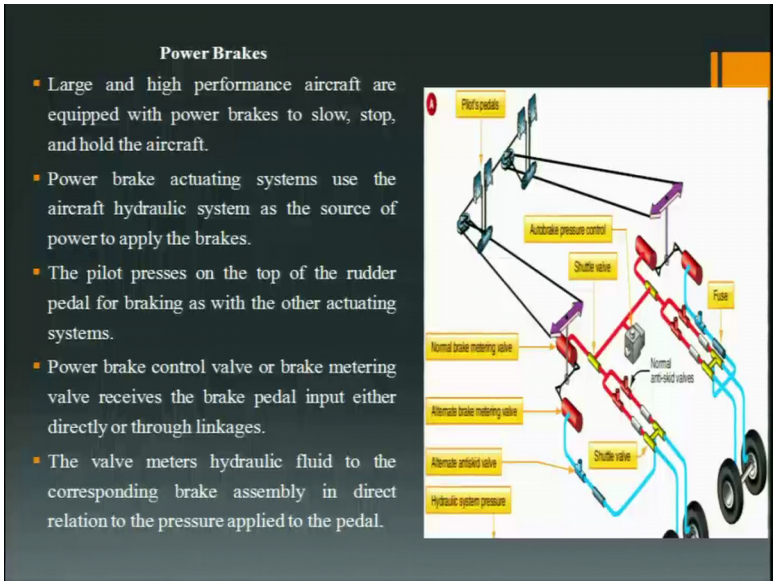

Another type of brakes the power brake, large and high performance aircraft are equipped with power brakes to slow stop and hold the aircraft. So, power brakes are used on high performance aircrafts to slow stop and hold the aircraft, power brake actuating systems use the aircraft hydraulic system as the source of power to apply the brakes. So, this type of brake system this these type of brakes they use the aircraft hydraulic system pressure as the power as the source of power to apply the brakes.

The pilot presses on top of the rudder pedal for braking as with the other actuating systems, in this type of system also pilot will press the rudder pedals, here you can see these are the rudder pedals. These rudder pedals they are mechanically linked here, these are the brake metering balls this is the brake metering wall and you have an alternate brake metering valve also and you can see, similarly on the right side this is the rudder pedal.

Brake metering valves on this said, then you have the anti-skid balls, the fuses, the shuttle valve, and these are the wheels this is a more complex system we will not go in

detail for this system just giving you a basic idea about what power brake is. So, power brake control wall or brake metering wall these are the brake metering wall receives the brake pedal input, these walls will receive the brake pedal input either directly or through linkages.

The valve meters hydraulic fluid to the corresponding brake assembly. So, this the purpose of this brake metering valve is to meter the hydraulic fluid to the brake assembly in direct relation to the pressure applied to the pedal. So, the pressure which is applied to the pedal direct, in direct proportion to that pressure applied the hydraulic fluid is metered and sent to the wheel assembly.

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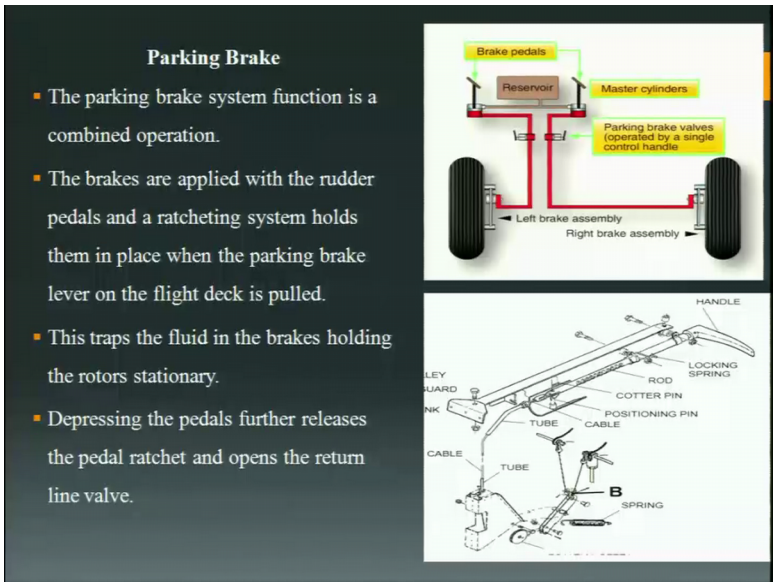

Now, parking brakes, parking brakes they are a very important part of the brake system the parking brake system function is a combined operation. So, this is the diagram for in this stop diagram you can see this is the diagram, where you can see the brake pedals here, these are the reservoirs now master cylinders, in the master cylinders you have the fluid reservoir also this is your brake line.

This is the brake unit and this is your wheel assembly and the tyre. So, in this brake lining there is a parking brake valve, the brakes are applied with the rudder pedals and a ratcheting system holds them in place when the parking brake lever on the flight deck is pulled. So, the brakes are applied with the rudder pedals. So, when you activate the parking brake you have to press the rudder pedals and pull this lever in this bottom

diagram you can see this is your parking brake lever here and this is a ratcheting system this is mechanically connected.

So, in order to activate the parking brake you have to press the rudder pedals, and simultaneously pull this handle. The brakes are applied with the rudder pedals and a ratcheting system holds them in place, when the parking brake lever on the flight deck is pulled. This traps the fluid in the brakes holding the rotor stationary.

So, this when you activate these parking brakes, when the parking brakes are activated this will hold the hydraulic pressure in the brake line, this will trap the fluid in the brakes and will hold the rotors stationary depressing the pedals further releases the pedal ratchet and opens the return line ball. So, when you depress the pedals further this will release the pedal ratchet and will open the return line ball, so this was a brief idea about the parking brakes.

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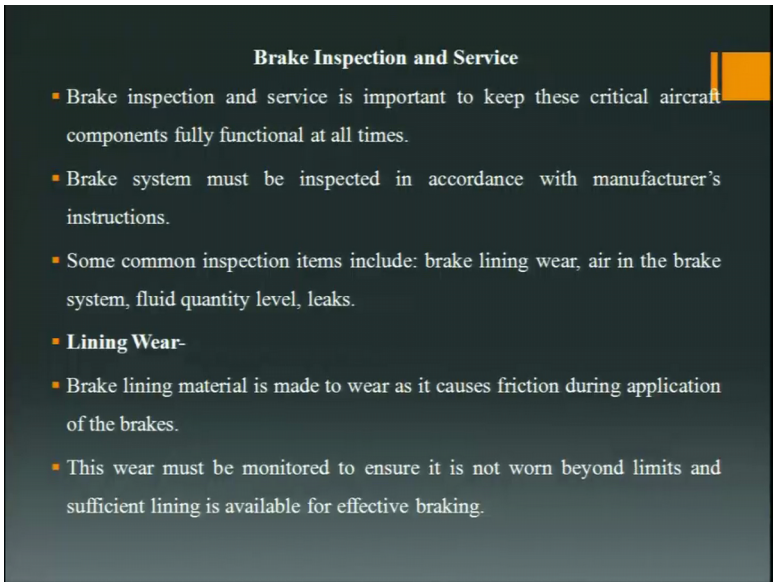

Now, what are the inspections we carry out on the brake system, what are the services we are carrying out? Brake inspection and service is important to keep these critical aircraft components fully functional at all times. brake system must be inspected in accordance with the manufactures instructions as it is the case with all the systems same with the brake system also manufacturers will issue various instructions in the maintenance manual.

And from time to time various inspections will be mentioned by the manufacturer. So, the brake system has to be inspected accordingly, some common inspection items include brake lining wear air in the brake system fluid quantity level and leaks. So, some of the common inspections, in the brake system, the brake lining where we have to be very careful about the brake lining, due to friction the brake linings will wear out and we have to continuously, during the pre-flight inspections also we have to continuously look for the brake linings.

The air in the brake system, in case you find there is air in the brake system you find the brakes spongy. The basic pub the basic reason is air in the brake system and the fluid quantity levels and leaks in the brake lines, lining wear brake lining material is made to wear as it causes friction during application of the brakes, this wear must be monitored to ensure it has not worn beyond limits and sufficient lining is available for effective braking.

So, as I just mentioned that brake lining is a very important component we have to be careful we have to check the brake lining material as. So, that it has not worn beyond limits and sufficient lining is available for effective braking.

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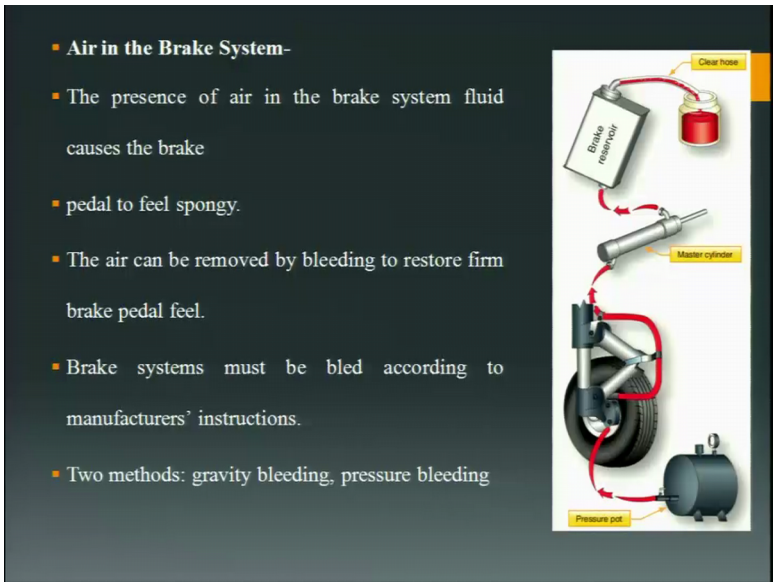

Now, air in the brake system as I just mentioned in case, there is air in the brake system what will happen you will feel that the brakes are spongy, so how to remove air in from

the brake system. The presence of air in the brake system fluid causes the brake pedals to feel spongy the air can be removed by bleeding to restore from brake pedal.

So, in order to remove the air from the system you need to carry out brake bleeding brake systems must be bled according to the manufactures instructions. So, depending on the manufacturer's instructions the brake system bleeding has to be carried out basically there are two methods of doing the brake bleeding. One is the gravity method and the other is the pressure method. So, gravity bleeding or the pressure bleeding.

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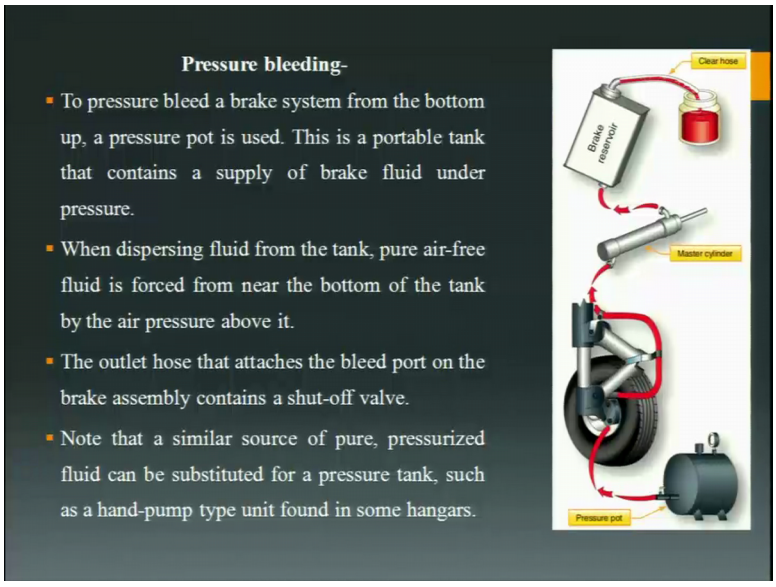

Now, pressure bleeding you can see in the diagram this is the pressure pot here, this is your brake unit this is your brake line this is your master cylinder, from the master cylinder this is the brake reservoir and from the brake reservoir and from the brake reservoir you have a container which has got the hydraulic fluid.

So, to pressure bleed a brake system from the bottom up, in the pressure system we are bleeding the brake system from the bottom to the upside. A pressure pot is used this is a portable tank that contains our supply of brake fluid under pressure. So, this is a portable pot or a portable tank, which is having hydraulic fluid under pressure this will supply brake fluid under pressure.

When depressing fluid from the tank, pure air free fluid is forced from near the bottom of the tank by the air pressure above it so, air free pure fluid is forced from this tank to the

brake unit the outlet hose that attaches the bleed port. So, there is a bleed port in the brake unit this hose will attach to the bleed port on the brake assembly and it also contains a shut off valve. So, this portable tank this supplies hydraulic pressure and a fluid to the brake unit here. This pressure pot or a tank this can be substituted by a hand pump type unit found in some of the hangars.

So, the basic idea is to supply fluid under pressure. So, when you are supplying hydraulic fluid under pressure from this side from the bottom the hydraulic fluid and the pressure will force the hydraulic fluid from the bottom to the up and whatever air is there in the system this will be bled out. So, the air in the system will come out in the form of bubbles here in the hydraulic fluid. So, in the pressure bleeding you are bleeding it from the bottom to the top.

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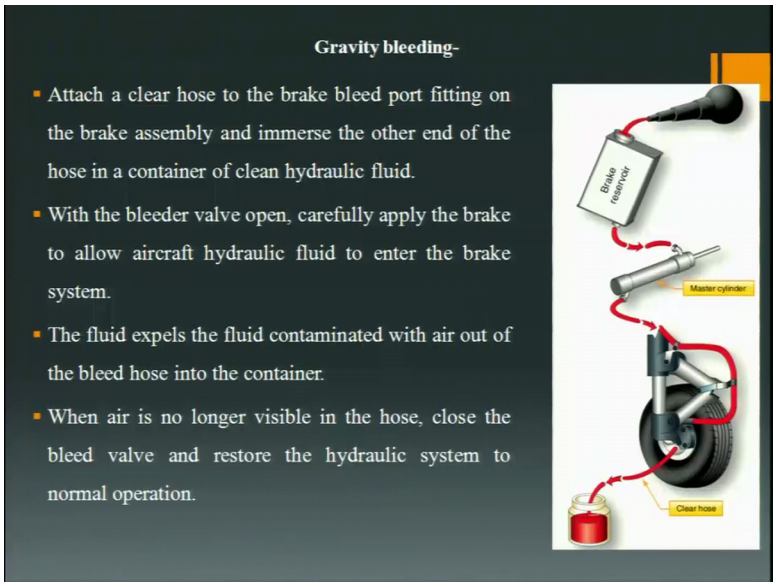

Another method called the gravity bleeding. Same thing you can see here this is your brake reservoir you are pouring in fluid hydraulic fluid in the brake reservoir from the brake reservoir, it is coming to the master cylinder from the master cylinder via the brake linings it is coming to the brake unit at the brake unit there is a bleeder port a hose is attached to the bleeder port and this hose is inside a container having hydraulic fluid.

A clear hose attached a clear hose to the brake bleed port fitting on the brake assembly, so there is a brake bleed port on the brake assembly you have to attach a clear hose and immerse this hose the other end of the hose in a container of clean hydraulic fluid, when

the bleeder wall was open, you carefully apply the brakes to allow the aircraft hydraulic fluid to enter the brake system.

So, you have to open the bleeder valve here and have to carefully apply the brakes. So, that the hydraulic fluid enters your brake system, When you apply the brakes, the hydraulic fluid will flow to the brake linings and the bleeder port is opened and this will come out the air in the system will also come out in the form of bubbles, the fluid expels the fluid contaminated with air out of the bleed hose into the container when air is no longer visible in the hose close the bleed wall and restore the hydraulic system to normal operation.

So, in the gravity method you can see the hydraulic fluid is being forced from top to bottom, in the pressure system the hydraulic fluid under pressure was being sent from the bottom to the top.

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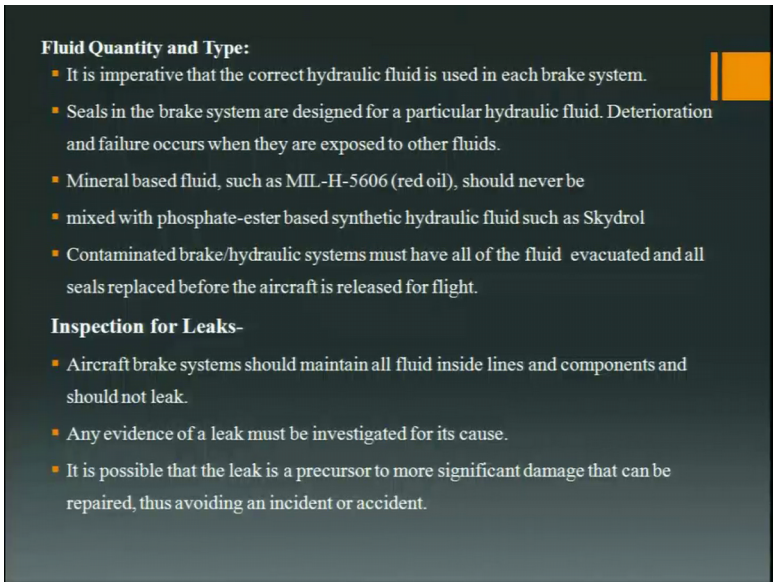

Now, a fluid quantity and type it is imperative that the correct hydraulic fluid is used in each brake system. So, we have to be careful that the correct type of hydraulic fluid as suggested by the manufacturer has to be used in the brake system.

Seals in the brake system are designed for a particular hydraulic fluid. So, the reason that you need to use the specific type of the suggested type of hydraulic fluid is because of the seals the material of the seals. So, seals in the brake system they are designed for a

particular hydraulic fluid, deterioration and failure occurs when they are exposed to other fluid, mineral based fluids such as mill h 5, 6, 0, 6, should never be mixed with phosphate ester based synthetic hydraulic fluid such as skydrol.

So, as we have mentioned earlier that the two types of two different types of hydraulic fluids should not be mixed with each other. Contaminated brake hydraulic systems must have all of the fluid evacuated and all the seals replaced before the aircraft is released for flight. So, in case if the hydraulic fluid in the hydraulic system or the brake system is contaminated then we need to evacuate all the fluid from the system, replace all the seals before the aircraft is released for the flight.

Inspection for leaks aircraft brake systems should maintain all fluid inside lines and components and should not leak. So, the brake systems should maintain all the fluid inside the lines and components and there should not be any leak, any evidence of a leak must be investigated for its cause. It is possible that a leak is a precursor to more significant damage that can be repaired thus avoiding an incident or accident. So, any indication of a leak in the brake line it must be investigated and rectified before any flight.

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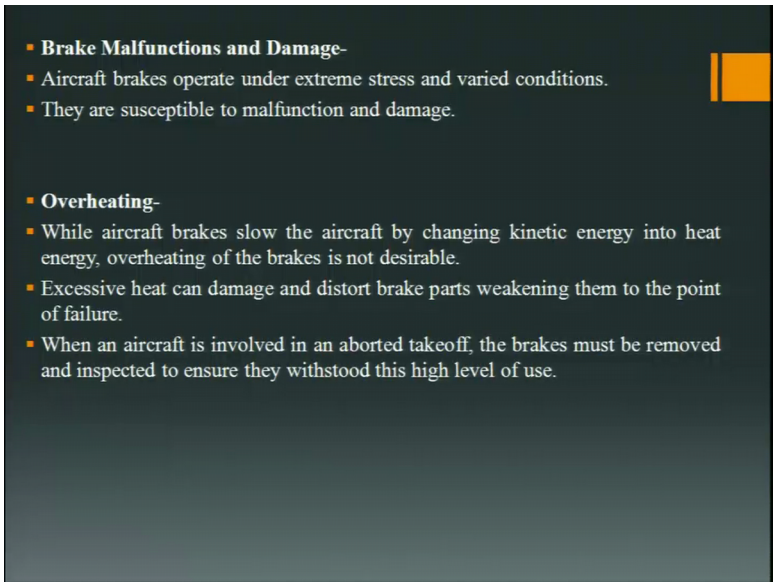

Brake malfunctions and damage, aircraft brakes operate under extreme stress and varied conditions they are susceptible to malfunctions and damage. Overheating; when while aircraft brakes slow the aircraft by changing kinetic energy into heat energy, overheating

of the brakes is not desirable. So, the brakes are converting the kinetic energy into heat energy, but still overheating of the brakes is not desirable.

Excessive heat can damage and distort brake parts weakening them to the point of failure. When an aircraft is involved in an aborted takeoff, the brakes must be removed and inspected to ensure they withstood this high level of use. So, the basic idea is that the brakes should not be exposed to overheating because in case if they are exposed to overheating it will damage and distort the brake parts.

And will weaken them and that can result in failure. So, in case an aircraft is involved in an aborted takeoff the brakes must be removed thoroughly inspected and they must be ensured that they are able to withstand high level of use, further use chattering or squealing brakes may chatter or squeal when the linings do not ride smoothly and evenly along the disc.

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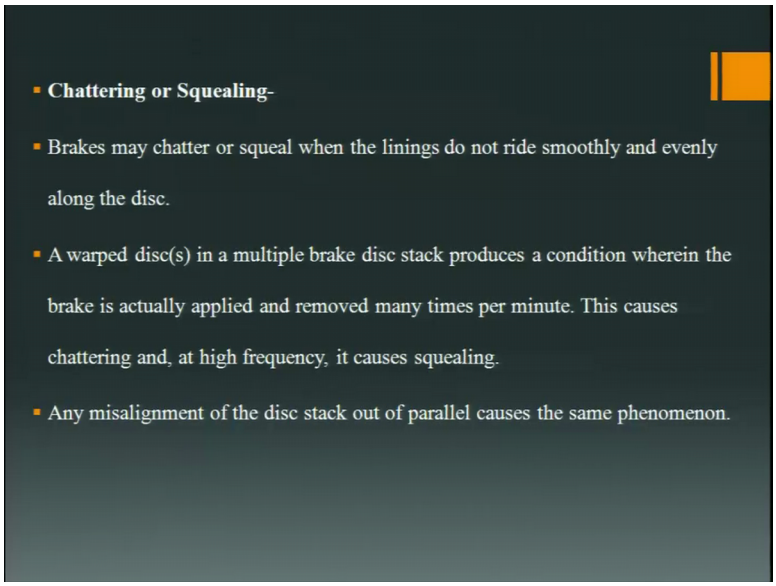

So, in case when the linings are not riding smoothly or evenly along the disc it may result in chattering or squealing. A warped disc in a multiple brake disc stack produces a condition wherein the brake is actually applied and removed many times per minute. This causes chattering and at high frequency it causes squealing. So, this is about a multiple disc brake, where warped disc will produce a condition where brakes are actually applied and removed many times per minute, this will result in chattering and squealing.

Any misalignment of the disc stack out of parallel causes the same phenomena. So, we have to be careful while using multiple disc brakes, warped discs, you have seen can result in chattering and squealing any misalignment of the disc stack will also cause the same chattering and squealing.

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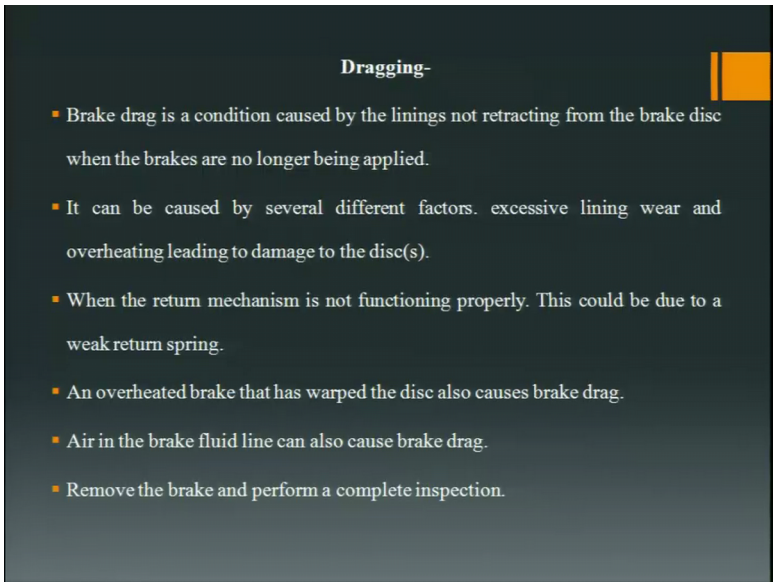

Dragging, brake drag is a condition cause by the linings not retracting from the brake disc when the brakes are no longer being applied. So, when the brakes are no longer being applied, still the linings have not retracted then it may result in brake drag. It can be caused by several different factors like excessive lining wear and overheating leading to the damage to the disc, when the return mechanism is not functioning properly this could be due to a weak return spring. So, in case the return mechanism is not functioning properly.

It may be due to a weak return spring; that means, your brake linings are have not returned when the hydraulic pressure is removed, when the hydraulic pressure has is been removed basically the brake linings should retract they should be clear from the brake discs, in case if they are not returning they are not clear of the brake discs they are still touching the brake disc then it may be result in brake dragging.

And this may be due to a weak return spring an overheated brake that has warped the disc also causes brake drag air in the brake fluid line can also cause brake drag. So, there are various reasons for brake dragging, it may be air in the brake fluid line, it may be

overheated brakes, it may be weak return springs. So, you have seen different reasons for brake dragging. So, in any case before further flights the system must be thoroughly inspected and this brake the faulty brakes may be removed.

Thank you.