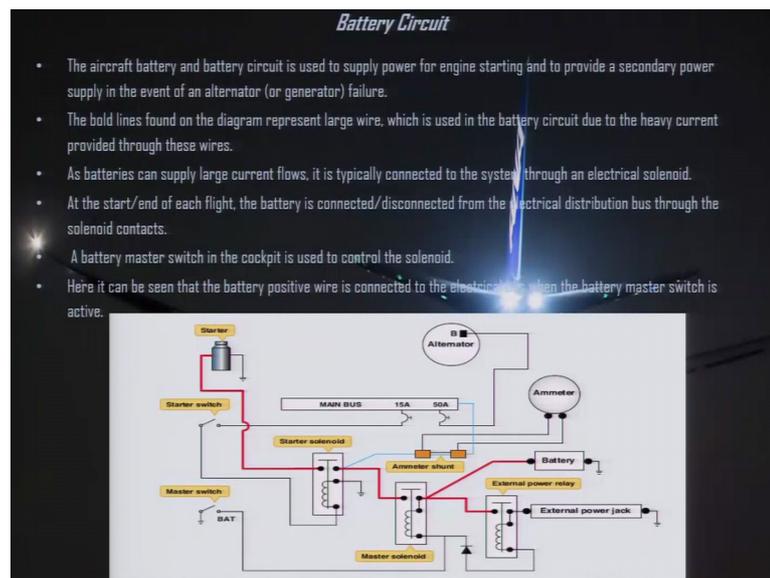


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Lecture – 10
Aircraft Electrical Circuit

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Now, we have come to battery circuit. We will see a what a battery circuit is, we have just seen an alternator, we have seen a battery in the circuit. Now, we will see how a battery circuit operates.

In the figure, you can see this is a figure of battery circuit of a small aircraft single piston engine aircraft. Where, you have a single electrical system the aircraft battery and battery circuit is used to supply power for engine starting and to provide a secondary power supply in the event of a alternator or generator failure. We all know that the battery is used to start an engine and it also provides us secondary power supply in case, your alternator or generator fails. In this diagram, you will see there are certain bold lines they are used to indicate heavy wires in the circuit, batteries can supply large current flows. It is connected in the circuit to a solenoids.

Battery is connected through a solenoid in an electrical system in this circuit. At the start or end of each flight the battery is connected or disconnected from the electrical

distribution bus through the solenoid contacts. Now, coming to this diagram you can see this is your battery this is your master solenoid or we can call it a battery solenoid, this is your starter solenoid, this is your main bus, this is your master switch, this is your starter switch, this is the starter and this is the alternator. Here, you can see there is an external power receptacle, here you have an external power receptacle and this is your external power solenoid. In order to start an aircraft, you can use a battery or you can use an external power so that you can save your internal battery.

This battery is connected to system to the total system through a solenoid. A master solenoid we call it a master solenoid or a battery solenoid. A battery master switch in which the cockpit is used to control the solenoid. This master switch this battery master switch is used to control this solenoid. And this master switch is there in your cockpit on the instrument panel.

Here, it can be seen that the battery positive wire is connected to the electrical bus when the battery master switch is active. This battery is positive wire you can see this is the battery positive wire, negative is grounded, battery positive wire is connected to the bus through the master switch. When you activate this master switch this battery gets connected to the main bus.

The ammeter shown in the battery circuit is used to monitor the current flow from the battery to the distribution bus. This ammeter this is ammeter is also connected in the circuit and this ammeter is used to monitor the current flow from the battery to the bus or from the bus to battery. When all systems are operating properly, battery current should flow from the main bus to the battery.

Now, in case when your system is operating properly is normal operation is there, then your battery current should flow from the main bus. This current should flow to the battery giving a positive indication on the ammeter. Current flowing from the bus to battery you will get a positive indication on the ammeter, this shows that your battery is being charged.

If the alternator or generator experiences a malfunction in case, if there is any malfunction in the alternator or generator your ammeter will indicate a negative value. Ammeter indicating a negative value means that the power is being extracted from the

battery and the battery is soon going to get depleted. A negative indication means current is leaving a battery to power any electrical load connected to the bus.

The battery is being discharged and the aircraft is in danger of losing all electrical power. In this battery circuit, this is your master switch, this is your master solenoid and this is the battery, battery negative is connected to ground, positive is connected to solenoid to the master solenoid and the negative end of the solenoid is connected to the battery. Now, when you put the master switch on in the cockpit the circuit gets completed the switch is on now.

This circuit gets depleted, the gets connected, the solenoid gets active, now these points will contact each other the circuit gets completed now the solenoid is active. With the switch on power here solenoid gets active the power goes from this solenoid from the master solenoid to the starter solenoid.

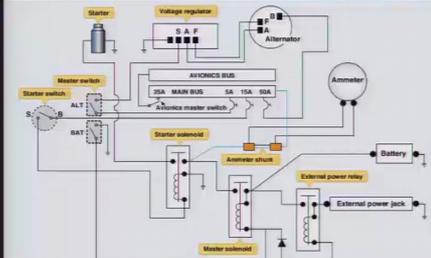
Now, power is here at the starter solenoid, when you put the starter switch on when you put the starter switch on, the starter solenoid also gets active. And the current flows from the starter solenoid to the starter. This is your main bus, from the starter solenoid you can see there is a connection to the main bus from this solenoid there is a connection to the main bus and an ammeter is also connected which indicates whether your power is going from the battery or it is coming from the alternative to the battery.

When you switch on this master switch. The power the solenoid gets activated when this solenoid gets activated, power is there at the main bus. From this, due to this solenoid getting activated, the power is now available at the main bus. And when you engage the starter switch this starter solenoid gets activated and power reaches your starter.

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Alternator Circuit

- Alternator circuits must control power both to and from the alternator. The alternator is controlled by the pilot through the alternator master switch.
- The alternator master switch in turn operates a circuit within the alternator control unit (or voltage regulator) and sends current to the alternator field.
- If the alternator is powered by the aircraft engine, the alternator produces electrical power for the aircraft electrical loads.
- The alternator control circuit contains the three major components of the alternator circuit: alternator, voltage regulator, and alternator master switch.



Next is the alternator circuit. In this diagram, you can see it is almost the same as the last diagram this is the battery, again the negative terminal to ground, this end positive terminal connected to the master solenoid or the battery solenoid, then you have the starter solenoid, the ammeter connected, then you have a starter switch here. This is your master switch; master switch has got 2 parts one is the battery. Another is the alternator, this your starter, this is your alternator voltage regulator then you have the main bus and one avionic bus.

Alternator circuits must control power both to and from the alternator. The basic purpose of this circuit is to control power from the alternator and to the alternator. The alternator is controlled by the pilot through the alternator master switch. This is your alternator master switch, the power to the alternator is controlled by this alternator mater switch.

The alternator master switch in turn operates the circuit within the alternator control unit or voltage regulator. Now, this alternator master switch will operate a circuit within the alternator control circuit or a voltage regulator and sends current to the alternator field. Via this voltage regulator, the current is sent to the alternator field and this is being controlled by the alternator master switch. The alternator master switch will operate a circuit within the voltage regulator and sends current to the alternator field.

If the alternator is powered by the aircraft engine, the alternator produces electrical power for the aircraft electrical loads. Now, when the alternator is powered by the engine

alternator starts producing electrical power for different aircraft electrical loads. The alternator control circuit contains 3 major components of the alternator circuit, alternator, voltage regulator and the alternator master switch. In this alternator control circuit, there are 3 major components. One is the alternator second is voltage regulator and the alternator master switch.

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- The voltage regulator controls the generator field current according to aircraft electrical load.
- If the aircraft engine is running and the alternator master switch is on, the voltage regulator adjusts current to the alternator field as needed.
- If more current flows to the alternator field, the alternator output increases and feeds the aircraft loads through the distribution bus.
- All alternators must be monitored for correct output. Most light aircraft employ an ammeter to monitor alternator output.
- *Figure shows a typical ammeter circuit used to monitor alternator output. An ammeter placed in the alternator circuit is a single polarity meter that shows current flow in only one direction. This flow is from the alternator to the bus. Since the alternator consists of slides in the armature circuit, current cannot reverse flow from the bus to the alternator.*

The voltage regulator controls the generator field current according to aircraft electrical load. This voltage regulator will control the generator field current according to, the aircraft electrical load. If the aircraft electrical engine is running and the alternator master switch is on the voltage regulator adjusts current to the alternator field as needed.

when the engine is running, your alternator master switch on, voltage regulator will adjust the current to the alternator field as needed.

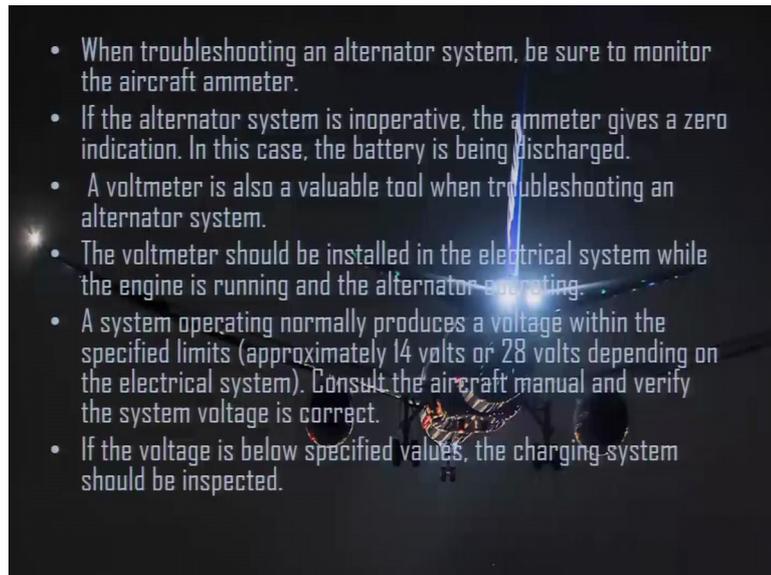
If more current flows to the alternator field, the alternator output increases and feeds the aircraft loads through the distribution bus. And all alternator must be monitored for correct output most light aircraft employ an ammeter to monitor alternate output. Coming to the diagram you see here you have battery, this is your master solenoid, now when you put this master switch on battery switch on, your master solenoid gets activated this circuit gets completed here when this switch is on.

This circuit gets completed the solenoid gets energized the master solenoid gets energized in turn it transfers power to the starter solenoid. At the same time, the power reaches your main bus. Now, power is available at the main bus when you put your starter switch on, when you start a switch on because of this starter switch, your this circuit gets completed with power already at the main bus and starters switch engaged, your starter solenoid gets active it gets energized and the power reaches from the starter solenoid to the starter.

Now, with the starter on your engine starts cranking and the engine gets started. And now, once the engine is running you switch on the alternator your alternator switch gets on with the alternator switch on power from the main bus via the alternator switch goes to the voltage regulator. This voltage regulator will now supply power to the alternator field with the power at the alternator field and engine running the alternator starts generating electrical power and supplies the main bus. This is how a basic alternator circuit operates.

In this figure, you show a ammeter which is used to monitor the alternator output. An ammeter is placed in the alternator circuit, which shows that current flow is flowing in one direction. This flow is from the alternator to the bus. Now, you can see in this diagram now the current is flowing from the alternator via the ammeter to the bus since the alternator now, because the alternator has got diodes the current cannot flow from the bus to the alternator. This was about alternator circuit. We have seen how the battery circuit functions, how an alternate circuit functions.

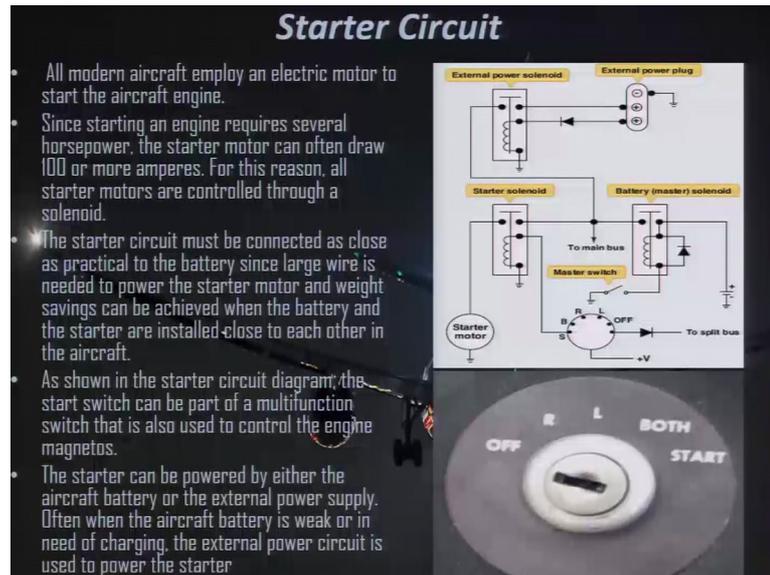
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Now, when troubleshooting an alternator system be sure to monitor the aircraft ammeter. In order to troubleshoot an alternator system, ammeter is a very important gauge to be monitored, to be seen. If the alternator system is inoperative the ammeter gives a 0 indication. In case, if your ammeter is showing 0 is indicating 0; that means, your alternator system is inoperative in this case, the battery is being discharged. Because, the power for all electrical loads is being supplied from the battery a voltmeter is also a valuable tool when troubleshooting an alternator system.

Another important tool for troubleshooting an alternator system is the voltmeter, here the voltmeter should be installed in the electrical system while the engine is running and the alternator operating. A system operating normally produces a voltage within that specified limits approximately 14 volts or 28 volts depending on the electrical system. Consult the aircraft manual and verify the system voltage is correct if the voltage is below specified values, the charging system should be inspected.

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now the starter circuit, we have just seen the battery circuit, the alternator circuit, now the starter circuit. All modern aircraft employ an electric motor to start the aircraft engine. Now, a days all modern aircrafts even small aircrafts they have a starter an electrical motor to start the engine. Since, starting an engine requires several horse power the starter motor can often draw 100 or more amperes. Starter while starting can draw 100 or more amperes for this reason all starter motors are controlled through solenoids. Because, of this high amperage starter motors are also controlled through solenoids.

The starter circuits must be connected as close as practical to the battery since, large wire is needed to power the starter motor and weight savings can be achieved when the battery and the starter are installed close to each other in aircraft. The starter circuit must be as close to the battery so that you can save on large wires this with this you can save on the weight also.

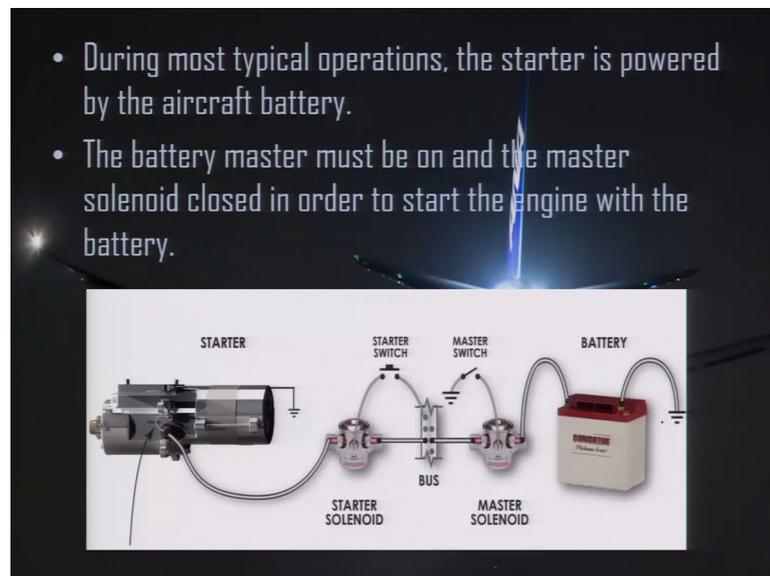
As shown in the starter circuit diagram the start switch can be part a multi-function switch that is also used to control the engine magnetos. In this diagram, you can see this is your master solenoid or the battery solenoid this is your battery here, negative to ground. Positive connected to your solenoid master solenoid, this is your starter solenoid, this is your starter motor this is your master switch this is your starter switch in this starter switch, you can see this is your start position start engage, this is your left right and both. These are for the magnetos left means on the left magneto right means on the

right magneto both means on the both magneto and this s is the start position; that means, with the key in this engaged in this s position your starter is engaged.

This start switch is a basically a multi-function switch which also controls the magnetos. The starter can be powered by either the aircraft battery or the external power supply. Again, your starter you can start give power to the starter solenoid either by the battery or by an external power. This is your external power plug and this is your external power solenoid. This either you can supply starting power by this solenoid via this solenoid from an external power to the starter solenoid or you can supply power from the battery to the starter solenoid.

In the bottom figure, you can see this is your starter switch, this is the multi-function switch, this is off, this is right, left, both and start. This is your key hole when your key is engaged to the start position; that means, your starter switch is engaged and once your engine starts, the key gets engaged to the both position. both means your both magnetos are working.

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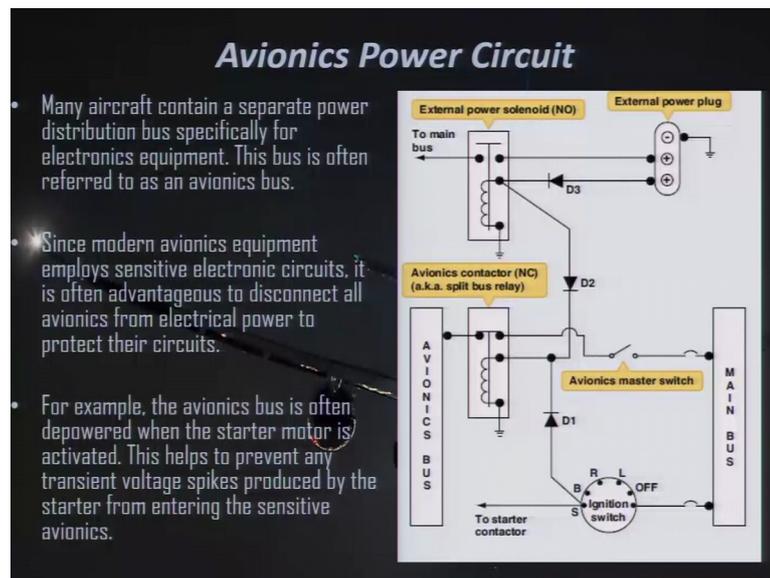


During most typical operations, the starter is powered by the aircraft battery. In most of the aircraft operation your starter is getting power from the aircraft battery. The battery master must be on and the master solenoid closed in order to start the engine with the battery.

This in this diagram, you can see this is the very basic diagram will give you some very basic idea how things are operating, this is a battery, this is your negative terminal to ground, positive is connected to the master solenoid. Now, this master switch when is engaged your solenoid gets energized, with the master switch engaged, solenoid master solenoid gets engaged, power from the master solenoid goes to the bus the main bus from the bus the power is at the starter switch.

Once you engage the starter switch, the starter solenoid gets energized and once the starter solenoid gets engaged is energized power from the starter solenoid goes to the starter. This is how the starter circuit is operating power from the battery, coming to the master solenoid master switch engaged, master solenoid gets powered, from the master solenoid power goes to the distribution bus main bus with the starter switch on, the starter solenoid gets engaged gets activated and power from the starter solenoid goes to the starter. This was all about your starter circuit.

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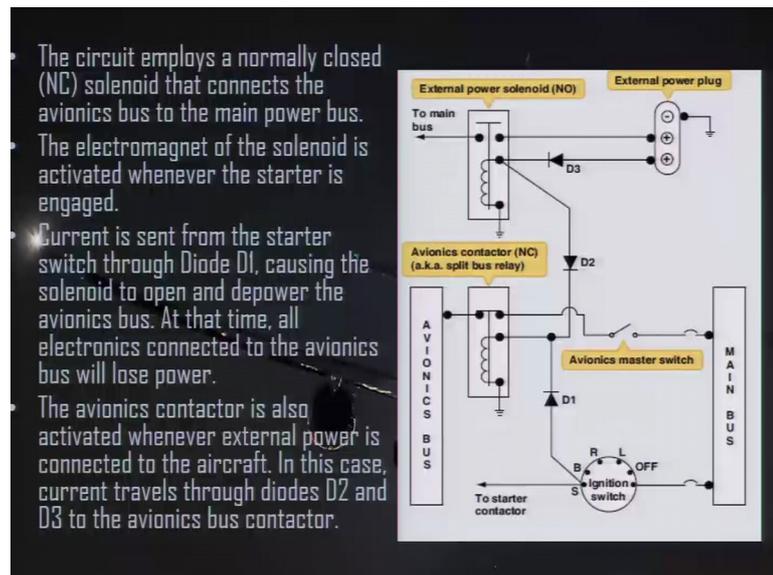
Now, another is circuit we have is the avionics power circuit. Many aircrafts contain a separate power distribution bus specifically for electronics equipment. Now, a days in the aircrafts whether light aircrafts whether complex aircrafts we have lot of avionics, lot of electronic equipment in the aircraft which are very sensitive. In order to separate these electronic equipment from rest of the electrical equipment in the aircraft, a separate

distribution bus is provided for the electronics equipment. This bus is often called as an avionics bus.

Here, in this diagram this is your avionics bus this is your main bus, this is your main distribution bus, and in addition to the main bus you also have an avionics bus. Since, modern avionics equipment employs sensitive electronic circuit it is often advantageous to disconnect all avionics from electrical power to protect their circuits. As I told that since these electronics equipment are very sensitive.

It is quite advantageous to disconnect all these avionics equipment from electrical power to protect their circuits. For example, avionics bus is often depowered when the starter motor is activated. When the starter motor is activated your avionics bus is depowered, this helps to prevent any transient voltage spikes produced by the starter from entering the sensitive avionics.

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This circuit you can see in the figure this circuit employs a normally closed solenoid. This is the solenoid this is the avionic solenoid. We also call it avionics contactor which is normally closed. This will connect the avionics bus to the main bus. In between avionics bus and the main bus is the avionics solenoid or the avionics contactor this avionics contactor connects the avionics bus to the main bus and this avionics contactor is normally closed. Solenoid the electro magnet of the solenoid is activated whenever the starter is engaged.

Now, in this figure, you can see this is your avionics master switch, this is your starter switch. Now, you have the power at the main bus you put the avionics master switch on. With the avionics master switch on now your power is available at the avionic solenoid at this point.

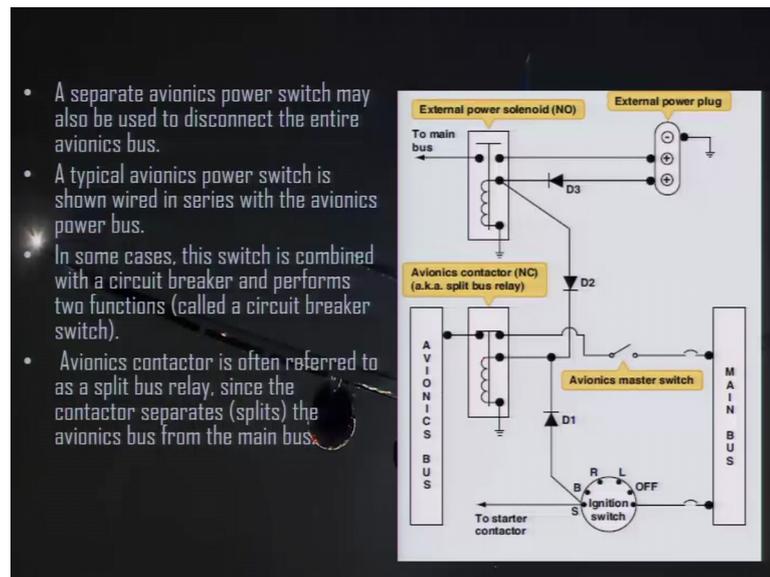
Once this starter switch is also engaged when you engage the starter switch the starter switch engaged, your avionic solenoid gets energized. Once this gets energized, these contacts will open once these contacts open. Power is interrupted to the avionics bus and in this way during starting you protect the electronics equipment the avionic equipment from the main power bus.

Current is sent from the starter switch through diode D1 you can see from the starter switch through diode D1 current is sent causing the solenoid to open and depower the avionics bus. When you engage the starter switch from this starter switch via this diode D1 the current goes to the solenoid.

The solenoid gets energized and these contacts open. Since, the solenoid is normally closed and once the solenoid is gets energized the contact open. And once the contact are open, this will depower the avionics bus at this time when all when this solenoid is de energized, all electronics connected to the avionics bus will lose power. The avionics contactor is also activated, whenever external power is connected to the aircraft. Again, this is your external power receptacle, this is your external power solenoid, you can connect the external power also and once the external power is connected, this will de energize your avionics bus.

In this case, current travels through diodes D2 and D3 to the avionics bus contactor. In case, if you are using an external power, current will travel via diode D3 and diode D2 to the avionics solenoid.

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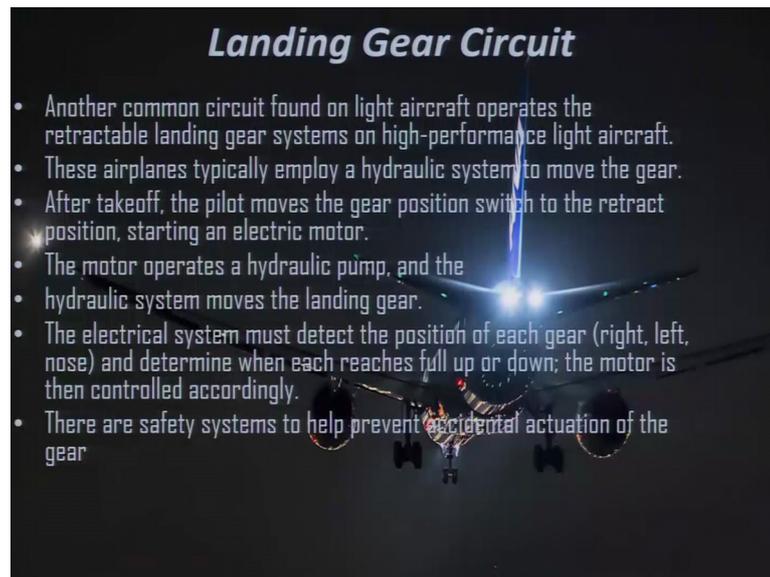


A separate avionics power switch may also be used to disconnect the entire avionics bus. You can also use this avionics power switch or a master switch to disconnect all the power from the avionics bus. In this figure, you can see avionics power switch is wired in series with the avionics power bus.

You can see this is connected in series with the avionics bus, this is the avionics master switch. In some cases, this switch is combined with a circuit breaker and performs 2 functions called a circuit breaker switch. In some of the diagrams, in some of the systems electrical systems this avionics master switch is combined with the circuit breaker and performs 2 functions that of a circuit breaker and a switch so called a circuit breaker switch.

Avionics contactor is often referred to as a split bus relay. This avionics contactor or an avionics solenoid is also called a split bus relay. Since, the contactor separates splits in this because the contactors separate they split the avionics bus from the main bus. That is that is why this is also called a split bus relay.

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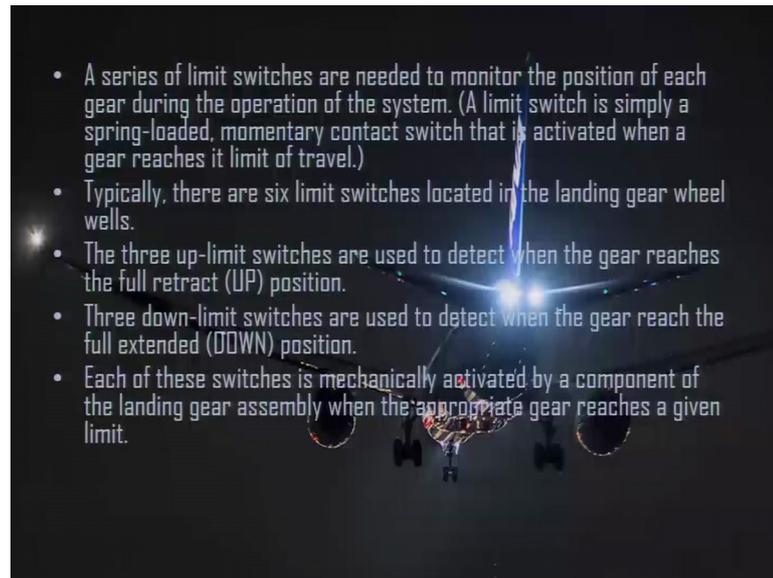


Now, coming to another circuit, a very important circuit in an aircraft a landing gear circuit. In those aircrafts, who have retractable landing gear systems. This circuit is very important in light aircrafts, who operate retractable landing gear systems this circuit is very important for them.

These airplanes employ a hydraulic system to move the gear. After takeoff the pilot moves the gear position switch to the retract position, starting an electric motor. In aircrafts employing an retractable landing gear system. After takeoff, pilot will select the landing gear selection lever to retract position. Once the lever is selected to retract position, your electric motor will start. The motor operates a hydraulic pump and the hydraulic system moves the landing gear.

The electrical system must detect the position of each gear, right, left or nose. Your landing gears there are 3 gears one is the nose wheel, nose gear, another is the left gear, and the right gear and this electrical system must determine when each gear reaches pull up or down. Then the motor is controlled accordingly, the motor is controlled by the position of each gear. It is very important to detect the correct position of the gear. Accordingly, your motor will be operated there are safety systems to help prevent accidental actuation of the gear.

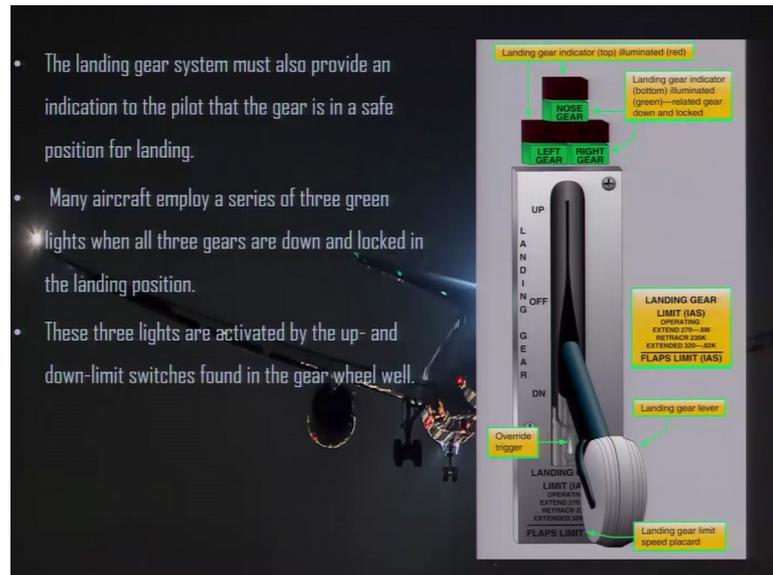
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In this circuit, landing gear circuit there are a series of limit switches to monitor the position of the each gear during the operation of the system. These switches also called as limit switches, they are simply spring-loaded switch with a momentary contact and are activated, when a gear reaches its limit of travel.

Generally, there are 6 limit switches located in the landing gear wheel wells. 3 up limit switches are used to detect when gear reaches the full retract position up position. 3 down limit switches are used to detect when the gear reaches the full extended or down position. There are 6 limit switches, 3 detecting your up-limit position that is the full retract position and 3 down limit switches which detect your full down position. Each of these switches is mechanically activated by a component of the landing gear assembly, when the appropriate gear reaches a given limit.

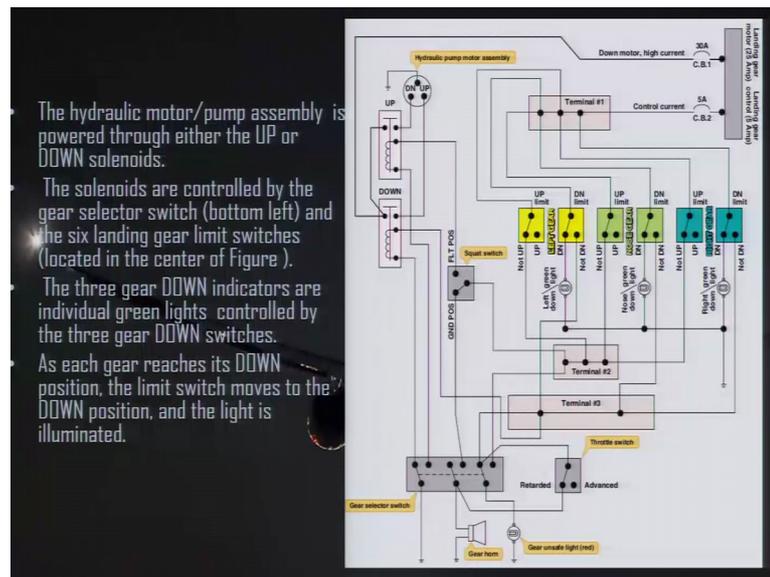
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The landing gear system must also provide an indication to the pilot, that the gear is in a safe position for landing. In the cockpit, a pilot also needs to understand whether the gear is in a safe position for landing or whether the gear is in an unsafe condition. Many aircraft employ a series of 3 green lights when all 3 gears are down and locked in the landing position. Here in the diagram, you can see there are 3 green lights: one is for the nose gear, left gear, right gear. These 3 green lights indicate that the landing gear is down and locked.

These 3 lights are activated by the up and the down limit switches found in the gear wheel well. This is your gear selection lever. When the pilot selects the lever to the up condition, your hydraulic motor operates and in order to bring the landing gears down, the pilot has to select the selection lever to the down condition.

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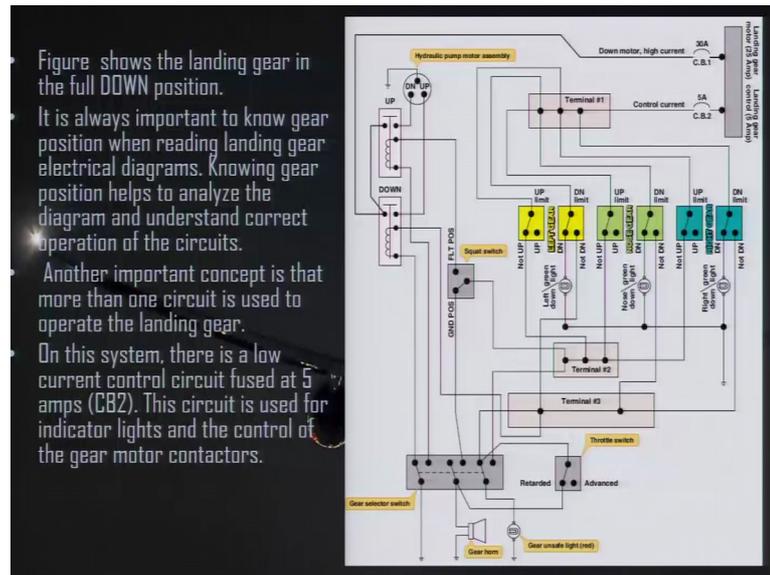


The hydraulic motor pump assembly is powered either to up or down solenoids. This hydraulic motor or a pump assembly is powered through the solenoids there are 2 solenoids, one is the up solenoid, another is the down solenoid. The power to the motor is through the 2 solenoids up solenoid or down solenoid.

The solenoids are controlled by the gear selector switch and the 6 landing gear limit switches. Now, the solenoids these solenoids are connect are controlled by the landing gear selection lever and the limit switches 6 limit switches, 3 up limit switches, 3 down limit switches. The 3 gear down indicators are individual green lights controlled by 3 gear down switches.

The down indicators are the 3 green lights in the cockpit and these green lights are controlled by the gear down switches. As each gear reaches it is down position the limit switches moves to the down position and the light is illuminated. When the gear reaches the down position, the limit switch will move to the down position and the light is illuminated.

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This figure shows the landing gear in full down position, while reading the circuit diagrams it is always better, to know the position of your landing gear it helps you in analyzing the diagram and understanding current correct operation of the circuit. In this circuit diagram and an important concept is that more than one circuit is used to operate the landing gear. There are more than one circuits which are being used to operate the landing gear there is a low current control circuit fused at 5 ampere CB2.

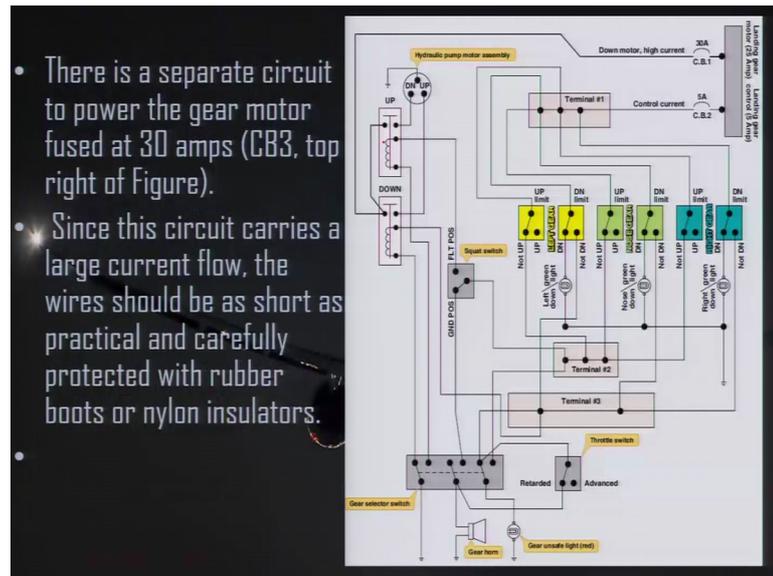
In the figure, you can see this is a 5 ampere CB this is the control circuit. This circuit is used to for indicator lights and the control of the gear motor contactors. These are the indicator lights this is this is your main bus, on the main bus there are 2 circuit breakers one is the 5-ampere circuit breaker, another is the 30-ampere circuit breaker. This 5-ampere circuit breaker is going via terminal one to the limit switches you can see there are 6 limit switches, 3 down limit switches and 3 up limit switches.

They are further connected to the indicator lamps the down, down lamps then this is your gear selector switch, this is your squad switch you have 2 solenoids, one is the up solenoid, another is the down solenoid. Then this is the hydraulic pump motor. In this circuit diagram, you can see you have main bus 2 CBs one is the control current which is supplying power to the limit switches and controlling the solenoids. You have the gear selector switch then this is your gear horn, this gives you this is the warning horn, this

gives you the gear unsafe light warning light, this is your throttle switch, this is your squad switch. We will be reading about the switches.

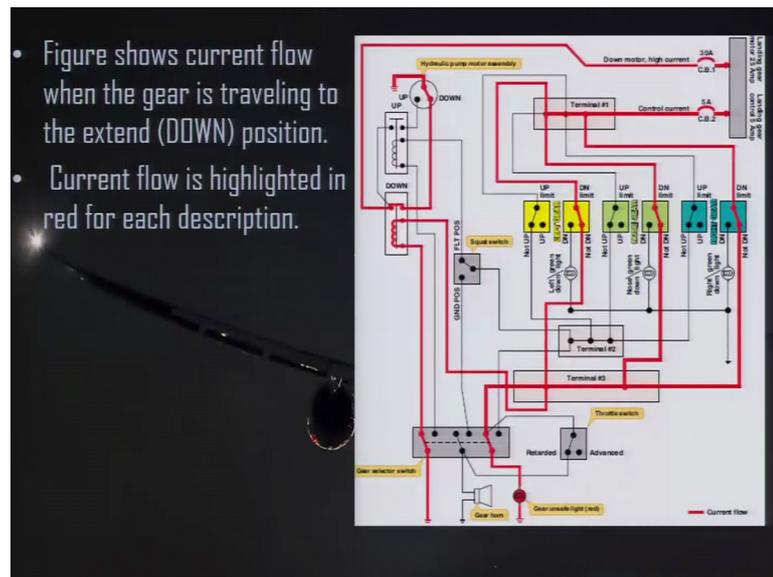
This circuit diagram, current from the 5 ampere CB is supplied to the indicator lights and also controls the gear motor contactors or the solenoids.

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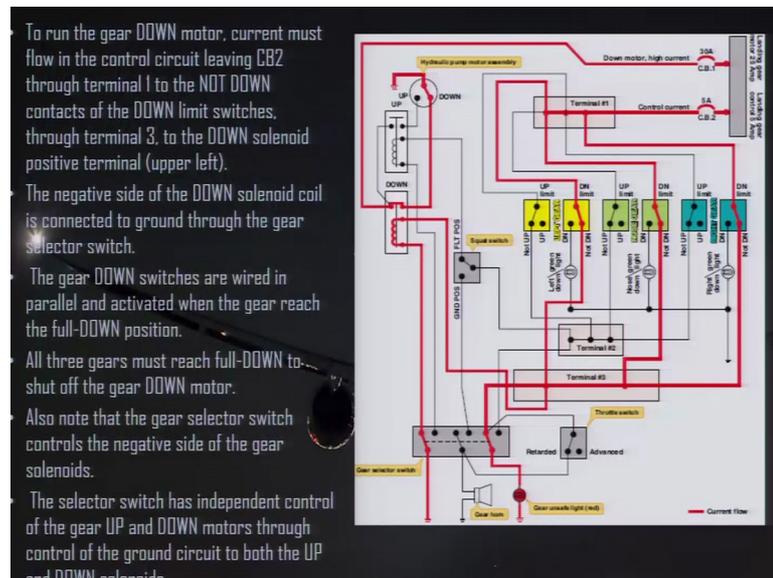
There is a separate circuit to power the gear motor which is fused at 30 amperes. This is the circuit breaker 30 ampere circuit breaker which is powering the gear motor to the solenoids. Since, this circuit carries a large current flow the wires should be as short as practical and carefully protected with rubber boots or nylon insulators. The current flow in this line is quite high. These length of these wires should be kept as short as possible and should be carefully protected with rubber boots or nylon insulators.

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In this figure, you can see the current flow when the gear is travelling to the down position when the gear is being extended. The this diagram shows the current flow the diagram as being highlighted red to indicate the current flow of the gear travelling in the down position.

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To run the gear down motor, current must flow in the control circuit leaving CB2. When the gear has to move in the down position, the current is supposed to flow from the main

bus through this 5 ampere CB. Through this line, you can see the red line then from this line to the limit switch to the down limit switch.

You can see the current flowing via terminal one to this down limit switch, then to another down limit switch and to the third down limit switch. You can see the current flowing here to run the gear motor current must flow in the control circuit leaving CB2 through terminal one to the not down contacts of the down limit switches. This is the not down contact of the down limit switch.

The current is flowing to the not down contact of the down limit switch, through terminal one the current from the CB through terminal one has come to the down limit switch to the not down position on all the 3 down limit switches. You can see on there are 3 down limit switches this one the second one and the third one this current is flowing to the not down position.

From here the current from the 3 down limit switches not down position the current has come to the terminal 3. You can see the 3 lines the current has come to terminal 3. From the terminal 3, the current flows to the down solenoid positive terminal.

you can see here, from here the current has flown to the positive terminal of the down solenoid. The negative side of the down solenoid coil is connected to the ground through the gear selector switch. This is the negative side of the down solenoid this is your down solenoid the negative side of the down solenoid is connected to the ground through the gear selector switch. These geared down switches they are wired in parallel and activated when the gear reaches the full down position. These switches all the down switches they are pack wired in parallel and gets activated when the gear selector goes to the down position.

All 3 gears must reach full down to shut off the down motor. All 3 gears much must reach in the down position so that this motor is shut off. Also note that the gear selector switch this is your gear selector switch this gear selector switch controls the negative side of the gear solenoid. This is the negative side of the gear solenoid this is being controlled by the gear selector switch.

The selector switch has independent control of the gear up or down motors through the control of ground circuit to both the up and down solenoids. This selector switch has an

independent control of the up and down motors through the control of the down circuit to both the solenoids. Now, when the pilot is supposed to lower the gear he will select the gear selection lever down. This is your gear selection lever, the pilot selects the lever to the ground position this circuit gets completed to the negative side of the solenoid down solenoid, this circuit gets completed.

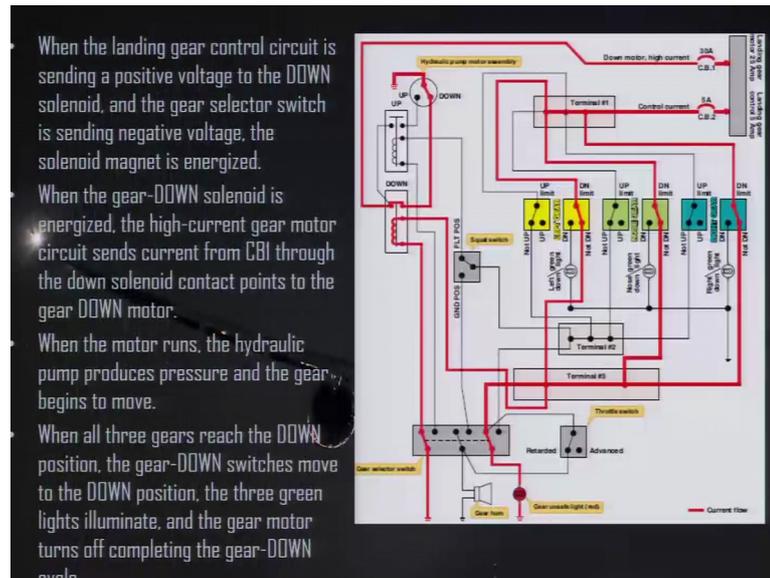
Current from the main bus via the 5 ampere CB through the terminal one is coming to the down limit switches to the not down condition, to the 3 down limit switches through the down limit switch at the now not down condition this is the not down position for this left gear, this is the not down position. For the nose gear and this is the not down position for the right gear. The current is flowing from the CB through terminal one to the down limit switch at the not down condition from all the 3 places.

The current from the down limit switch has come to terminal 3 see this current has come from this place, this current is coming at this point and this current is at this point. Now, the current from the 3 down limit switches via terminal 3 is going to the positive side of the down solenoid. The current has reached here the circuit is completed with the gear selection lever in the down position, the down solenoid is now energized, down solenoid gets energized and the power the current goes to the down side of the motor.

As the motor is activated the pump starts moving sorry the landing gear starts moving down. Once the landing gear moves down the down limit switch will contact the down points in the down limit switch from the not down condition to the down condition, all the 3 limit switches will come to the down condition. And the current supply in the down limit switch from the down condition will be to the green lights to the 3 green lamps here. The 3 green lamps will glow and the current to the down solenoid is interrupted.

Due to which, now there is no current here in the down solenoid and your motor is shut off. Further, you can see that the selective switch this also has an independent control of the gear up and down motors. Through the control of the ground circuit to both the solenoids. If you put this lever from down condition to off condition then also your supply your circuit is interrupted and this selection switch this has an independent control of the motors to the down solenoids or the up solenoids.

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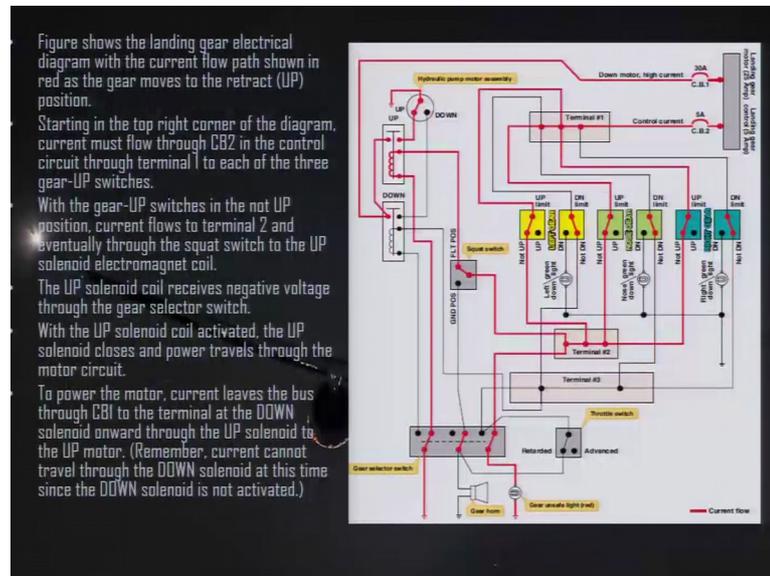
When the landing gear control circuit is sending a positive voltage to the down solenoid. When the circuit is sending a positive voltage to the down solenoid and the gear selector switch is sending negative voltage is sending negative voltage the solenoid magnet is energized.

As we just discussed when the solenoid is getting a positive voltage here and a negative voltage here, the solenoid gets energized when the down solenoid is energized the high current gear motor circuit sends current from CB 1 through the down solenoid contact points to the gear down motor. When the down solenoid is energized the high current gear motor circuit this will send current from CB 1 through the down solenoid contact points to the gear down motor.

Once this solenoid gets energized, the high current flows from this line to the down solenoid contact points and finally, to the gear down motor. When the motor runs, the hydraulic pump reduces pressure and the gear begins to move. When all the 3 gears reach the down position, now when all the 3 gears reach the down position the down limits switch will come at the down position, all the 3 limit switches the gear down switches move to the down position, the 3 green lights illuminates these 3 green lights will illuminate and the gear motor turns off completing the gear down cycle.

Now, when the switches limit switches come to down position, the current flow to the solenoid is interrupted which shuts off your motor. And your gear down cycle is completed.

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Now, this diagram you can see the landing gear electrical diagram with the current flow path shown in red as the gear moves to the up position or the retract position. Now, in this diagram the current flow is in the up condition up position. Again, current must flow through CB 2 in the control circuit here, the current must flow in the control circuit, through CB 2 to each of the 3 gear up switches. Now, see the current is flowing through the CB 2 via terminal one to the gear up switch.

You can see here the current is flowing to the gear up switch. In the gear up switch, it is the not up condition in all the 3 gear up limit switches you can see the not up condition. The current is flowing from the up-limit switch in the up-limit switch to the not up condition from the not up condition it has come to terminal 2. From all 3 switches to terminal 2. Starting in the top right corner of the diagram, current must flow through CB 2 in the control circuit through terminal one, through terminal one, through each of the gear up switches with the gear up switches in the not up position you can see the 3 gear up switches there in the not up condition not up not up and not up condition.

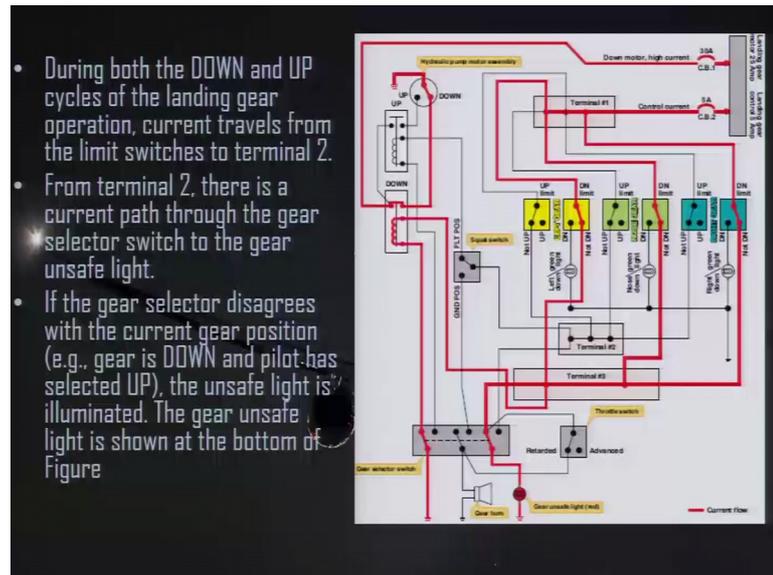
Current flows to terminal 2 from the limit switch, not up condition current is flowing to terminal 2 and finally, through the squat switch and finally, through this squat switch, to

the up-solenoid electromagnet coil. From terminal 2 via the squat switch the current has flown to the up solenoid this up solenoid this is the up solenoid this up solenoid coil receives negative voltage this will receive negative voltage through the gear selector switch. Through the gear selector switch, this up solenoid is getting negative voltage when the up-solenoid coil is activated the up solenoid closes and power travels through the motor circuit.

When this selector switch gear selector switch is selected in the up condition, up position, this completes the circuit the solenoid this negative voltage is coming here. The positive voltage is coming from terminal 2 via the squat switch to this solenoid. The solenoid gets energized up solenoid gets energized when the up solenoid gets energized. The current flows to the hydraulic motor to power the motor current leaves the bus through CB 1.

In order to power the motor current leaves through CB 1 through the CB 1 to the terminal at the down solenoid from this CB 1, the current is flowing to the terminal and the down solenoid onwards to the up solenoid from the down solenoid it has gone to the up solenoid to the up side of the motor. Remember, current cannot travel down through the solenoid in the down solenoid since, the down solenoid is not activated. Although the current is coming to the down solenoid, but it cannot flow further, because this down solenoid is not activated. From here. The current will flow to the up solenoid. With the solenoid energized the current then flows to the upside of the motor.

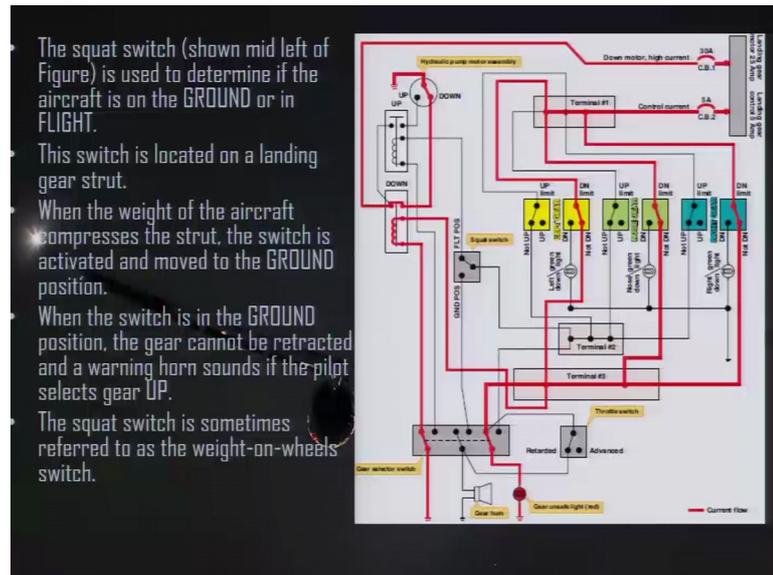
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During both the down and up cycles of the landing gear operation current travels from the limit switches to terminal 2. We have seen that in both the cycles whether it is the down cycle or the up cycle the current has travelled to terminal 2. From terminal 2, there is a current path through the gear selector switch to the gear unsafe light. From that terminal 2, via the gear selector switch this is the gear unsafe light the current also flows to the unsafe light.

If the gear selector disagrees with the current gear position, in case if the gear selector is not in line with the current gear position the gear for example, gear is down and pilot has selected it up, the unsafe light will illuminate the gear unsafe light is shown here in the bottom of the diagram. You can see here this is the gear unsafe light the current from the terminal 2 via the gear selector switch is also coming to the gear unsafe light. And in case if the gear selector switch disagrees with the current gear position this unsafe light will illuminate. To sum up case when the gear is in transit condition your gear unsafe light will illuminate.

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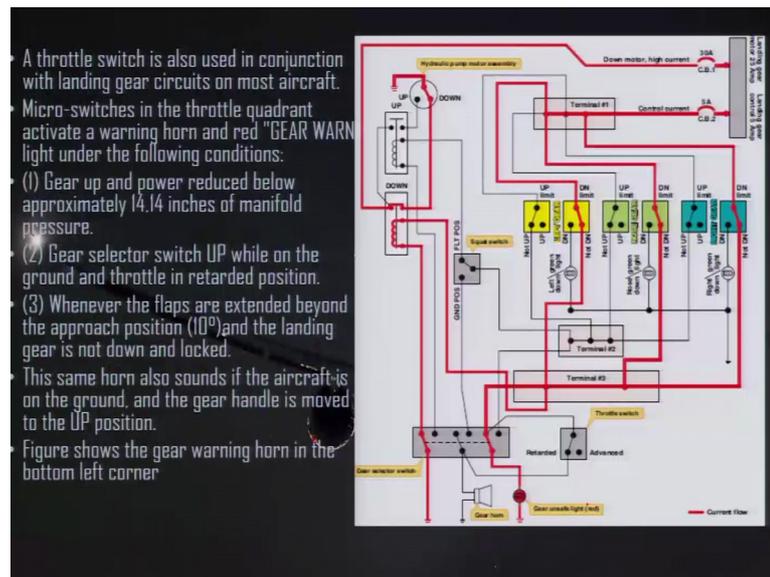


Now, the squat switch this is the squat switch this switch is used to determine whether the aircraft is on ground or in flight. This switch is located on a landing gear strut when the weight of the aircraft compresses the strut, the switch is activated and move to the ground position. When the switch is activated since the switch is located on the landing gear strut, when the aircraft is on ground, the switch gets compressed and moves to the ground position.

When the switch is in ground position the gear cannot be retracted. Once the switch is in the ground position, you cannot retract the gear and a warning horn sounds if the pilot selects the gear up. Once the switch is in the ground position the landing gear cannot be retracted and incase if your selection lever is selected in the up condition, your warning horn will sung.

The squat switch is also sometimes called as the weight on wheels switch.

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Another switch called a throttle switch this is a throttle switch, is used in conjunction with the landing gear circuits. There are micro switches in the throttle quadrant which are used to activate a warning horn and a red gear warning light under the following conditions.

The throttle switches they are in the throttle quadrant and these switches they operate a warning horn this is the horn and the red unsafe light under the following conditions. Now, the first condition may be that your gear is up, gear is in the up condition, is in the retracted condition and your power that is your throttle is reduced below approximately 14.14 inches of manifold pressure; that means, your gear is in the up condition and throttle is reduced.

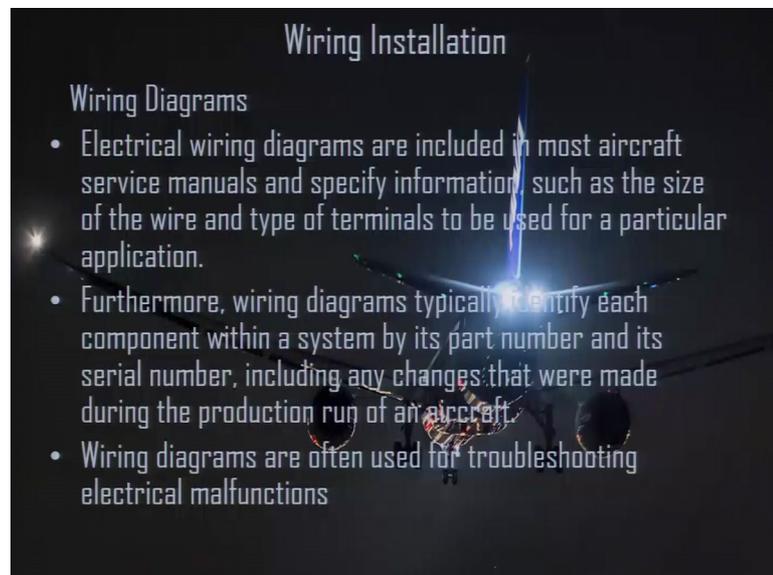
That may be the condition when you may have the red unsafe light and the warning horn. Gear selective switch up while on the ground and throttle in retarded position. Another condition, may that your gear selective switch is in the up condition, while you are on ground, while the aircraft is on ground and at the same time throttle is in the retarded position. This may be another condition where you may have warning horn and unsafe flight.

Whenever the flaps are extended beyond the approach position and the landing gear is not down and locked. In case, your landing gear is not down and locked and your flaps are extended beyond the approach position that is the 10 degrees position. Then also you

may have a condition where they may be a warning horn and then and a red unsafe light. This same horn will also sound when the aircraft is on the ground and the landing gear handle or the lever is moved to the up position.

This was all about the landing gear circuit diagram we have seen how the landing gear is extended, how the landing gear is retracted. We have seen the current flow we have 6 limit switches 3 up limit switches 3 down limit switches, then we have some safety features called the squat switch throttle switch, warning horn unsafe lights. This was all about your landing gears circuit.

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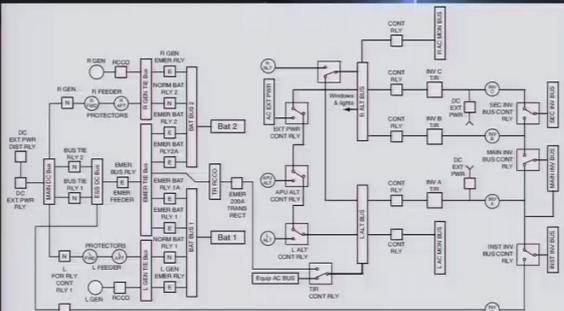
Now, coming to the wiring part of the circuit electrical system wiring is a very important feature. We will just look at the different wiring diagrams what are the different diagrams just a brief idea about different diagrams. Electrical wiring diagrams are included in most aircraft service manuals and specify information such as the size of the wire, type of terminals to be used for a particular application. In that wiring diagrams, you may be get the size of the wire the type of terminals for a particular application. All these wiring diagrams you can find in the aircraft service manuals maintenance manuals.

Furthermore, wiring diagrams identify each component within a system by it is part number and it is serial number including any changes that were made during the production run of an aircraft. These wiring diagrams are often used for troubleshooting, any snag in the electrical system.

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Block Diagrams

- A block diagram is used as an aid for troubleshooting complex electrical and electronic systems.
- A block diagram consists of individual blocks that represent several components, such as a printed circuit board or some other type of replaceable module.
- Figure shows a block diagram of an aircraft electrical system.

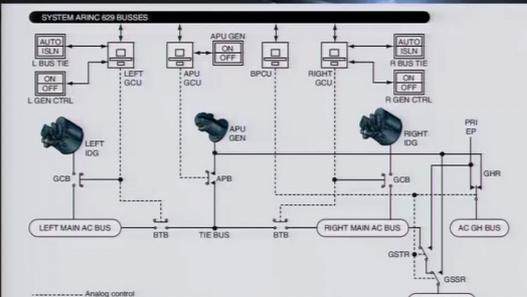


Then we may have some block diagrams, this is one sample of the block diagram a block diagram is used as an aid for troubleshooting complex electrical and electronic systems. A block diagram consist of individual blocks it consists of individual blocks that represents several components such as printed circuit boards or some other type of replaceable modules.

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Pictorial Diagrams

- In a pictorial diagram, pictures of components are used instead of the conventional electrical symbols found in schematic diagrams.
- A pictorial diagram helps the maintenance technician visualize the operation of a system.



Then another type of diagram pictorial diagrams, where pictures of components are used instead of the conventional electrical symbols. This pictorial diagram helps the

maintenance personnel to visualize the operation of a system. This is one sample of the pictorial diagram.

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Schematic Diagrams

- A schematic diagram is used to illustrate a principle of operation, and therefore does not show parts as they actually appear or function.
- However, schematic diagrams do indicate the location of components with respect to each other.
- Schematic diagrams are best utilized for troubleshooting

Another type of diagram, is the schematic diagrams they are used to illustrate a principle of operation. And therefore, does not show parts as they actually appear or function, but they indicate the location of components with respect to each other. Schematic diagrams they indicate the location of components with respect to each other. And are quite useful in troubleshooting.

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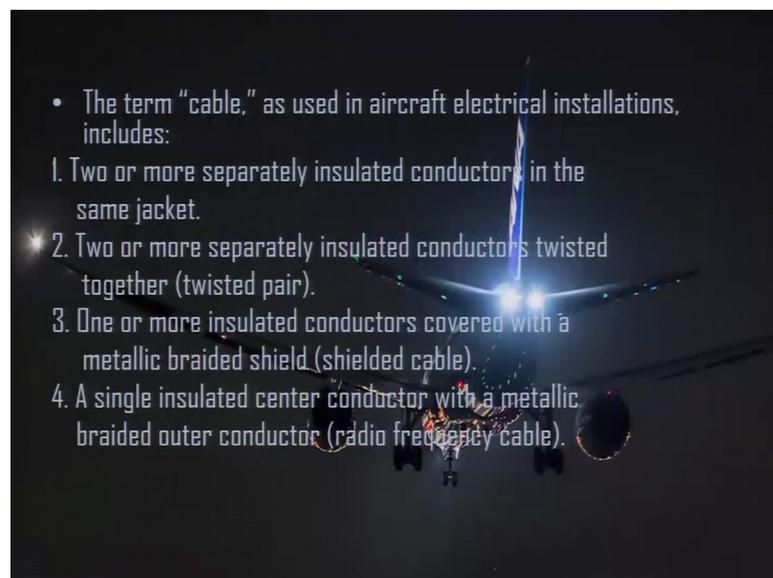
Wire Types

- The satisfactory performance of any modern aircraft depends to a very great degree on the continuing reliability of electrical systems and subsystems.
- Improperly or carelessly maintained wiring can be a source of both immediate and potential danger.
- A wire is described as a single, solid conductor, or as stranded conductor covered with an insulating material.
- *Figure illustrates these two definitions of a wire.*
- Due to in-flight vibration and flexing, conductor round wire should be stranded to minimize fatigue breakage.

Now, coming to the wire types, there may be different types of wires the satisfactory performance of any modern aircraft depends to a great extent on the continuing reliability of electrical systems and subsystems. Improperly or carelessly maintained wiring can be sourced of both immediate and potential danger.

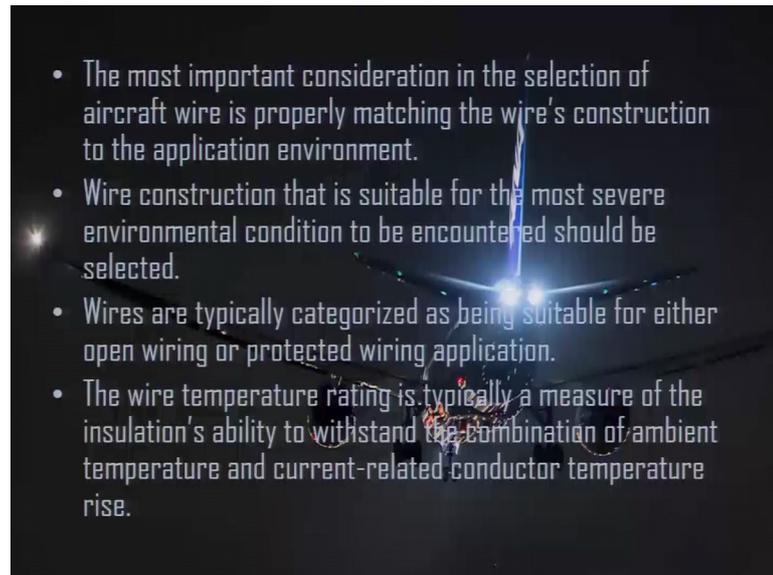
A wire is described as a single solid conductor, it may be a single solid conductor or stranded conductor this is stranded conductor, covered with an insulating material. Due to in flight vibrations and flexing conductor round wire should be stranded to minimize fatigue breakage. There may be lot of vibration and flexing in flight. All the conductors round wires they should be stranded has to minimize fatigue breakage.

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The term cable as used in aircraft electrical insulations includes 2 or more separately insulated conductors in the same jacket. 2 or more separately insulated conductors twisted together, one or more insulated conductors covered with a metallic braided shield. They may be called shielded cable, a single insulated center conductor with a metallic braided outer conductor. Also called radio frequency cable.

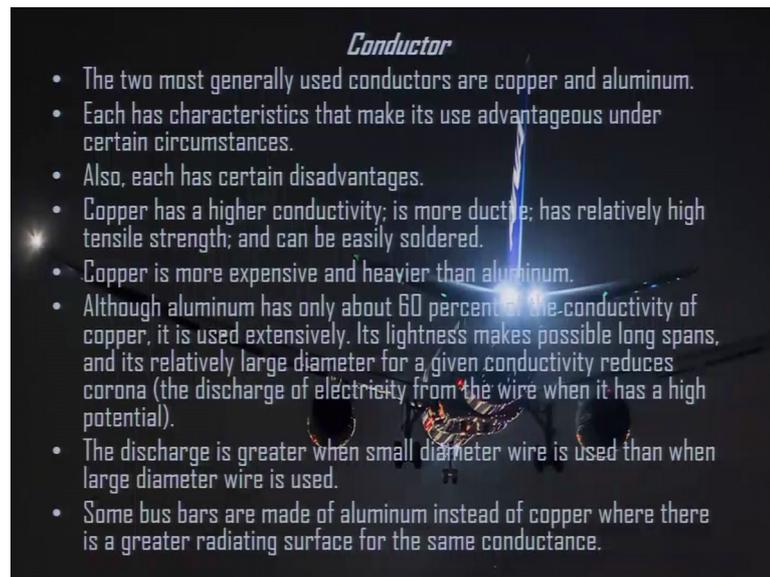
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The most important consideration, in the selection of aircraft wire is properly matching the wires construction in the to the application environment. Wire construction that is suitable for the most severe environmental condition to be encountered should be selected.

Wires are categorized as being suitable for either open wiring or protected wiring application. The wire temperature rating is typically a measure of the insulations, ability to withstand the combination of ambient temperature and current related conductor temperature rise.

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Conductor

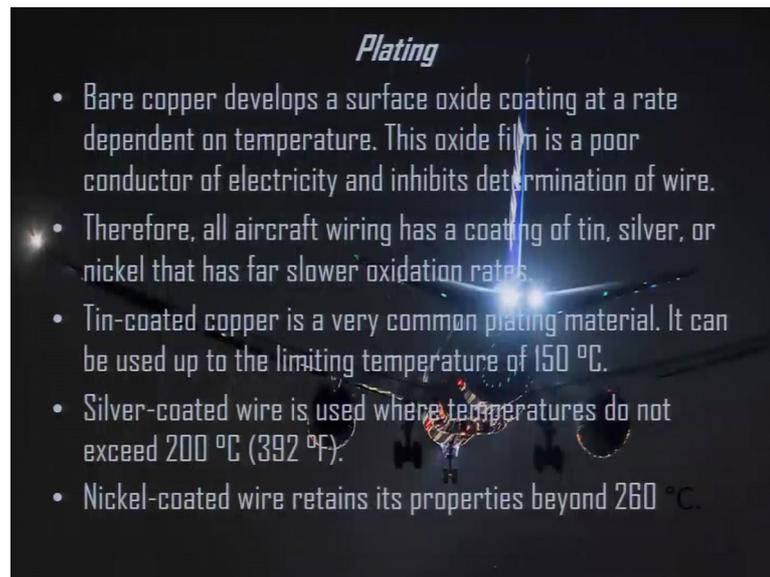
- The two most generally used conductors are copper and aluminum.
- Each has characteristics that make its use advantageous under certain circumstances.
- Also, each has certain disadvantages.
- Copper has a higher conductivity; is more ductile; has relatively high tensile strength; and can be easily soldered.
- Copper is more expensive and heavier than aluminum.
- Although aluminum has only about 60 percent of the conductivity of copper, it is used extensively. Its lightness makes possible long spans, and its relatively large diameter for a given conductivity reduces corona (the discharge of electricity from the wire when it has a high potential).
- The discharge is greater when small diameter wire is used than when large diameter wire is used.
- Some bus bars are made of aluminum instead of copper where there is a greater radiating surface for the same conductance.

Coming to conductors, the 2 most generally used conductors are copper and aluminum. Each has characteristics that make it is useful under certain circumstances, each has certain disadvantages also copper has a higher conductivity, is more ductile, has relatively high tensile strength and can be easily soldered. Where as copper is more expensive and heavier than aluminum.

Although, aluminum has only about 60 percent of the conductivity of copper it is used extensively. It is lightness makes possible long spans and is relatively larger diameter for a given conductivity reduces corona. Corona it is the discharge of electricity from the wire when it has a high potential.

The discharge is greater when small diameter wire is used then when large diameter wire is used. Some bus bars are made of aluminum instead of copper where there is a greater radiating surface for the same conductance.

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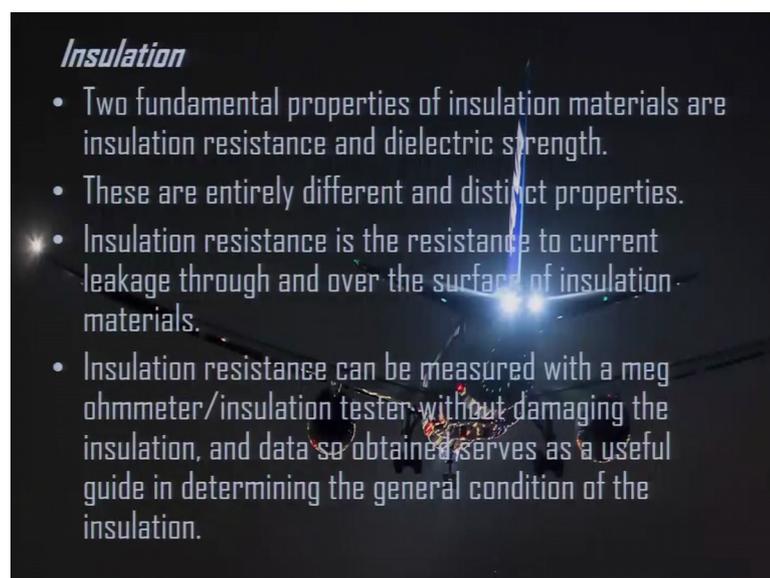


Plating

- Bare copper develops a surface oxide coating at a rate dependent on temperature. This oxide film is a poor conductor of electricity and inhibits determination of wire.
- Therefore, all aircraft wiring has a coating of tin, silver, or nickel that has far slower oxidation rates.
- Tin-coated copper is a very common plating material. It can be used up to the limiting temperature of 150 °C.
- Silver-coated wire is used where temperatures do not exceed 200 °C (392 °F).
- Nickel-coated wire retains its properties beyond 260 °C.

Plating a bare copper develops a surface oxide coating at a rate dependent on temperature. This oxide film is a poor conductor of electricity and inhibits determination of wire. Therefore, all aircraft wiring has a coating of tin, silver or nickel that has far slower oxidation rates. Tin coated copper is a very common plating material it can be used up to the limiting temperature of 150 degree centigrade. Now, silver coated wire is used where temperatures do not exceed 200 degree centigrade and nickel coated wires retains it is properties beyond 260 degree centigrade.

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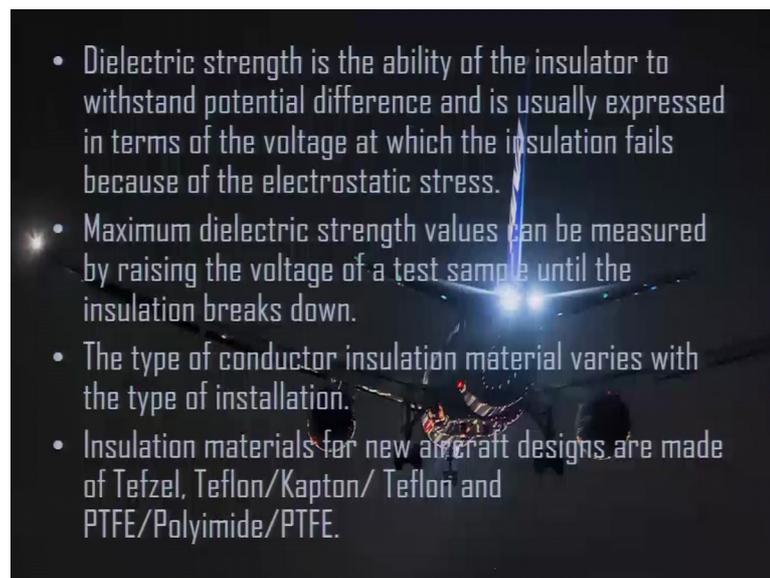


Insulation

- Two fundamental properties of insulation materials are insulation resistance and dielectric strength.
- These are entirely different and distinct properties.
- Insulation resistance is the resistance to current leakage through and over the surface of insulation materials.
- Insulation resistance can be measured with a meg ohmmeter/insulation tester without damaging the insulation, and data so obtained serves as a useful guide in determining the general condition of the insulation.

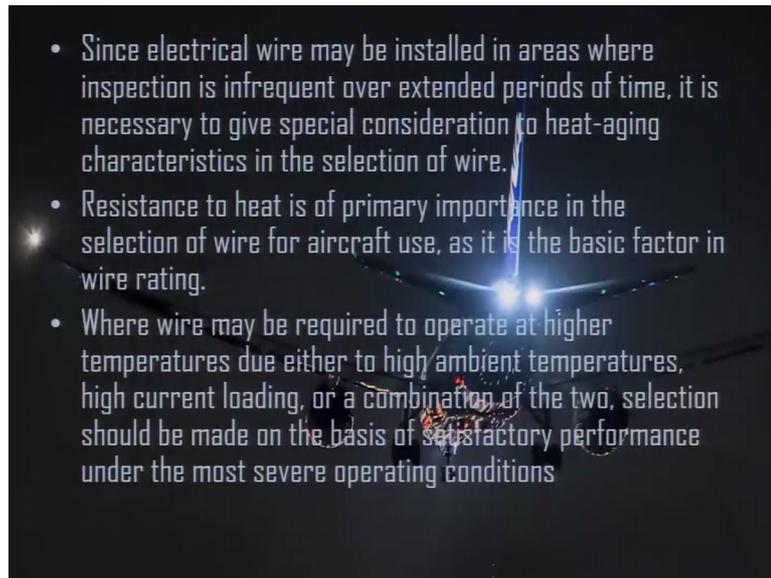
Insulation 2 fundamental properties of insulation materials are insulation resistance and dielectric strength. These are entirely different properties; insulation resistance is the resistance to current leakage through and over the surface of insulation materials. Insulation resistance can be measured with the meg ohm meter or insulator tester without damaging the insulation. And data obtained gives a useful guide in finding that your insulation is in the correct condition or not.

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Dielectric strength is the ability of the insulator to withstand potential difference and is usually expressed in terms of the voltage, at which the insulation fails. Because of the electrostatic stress maximum dielectric values can be measured by raising the voltage of a test sample until the insulation breaks down. The type of conductor insulation material varies with the type of installation. Insulation materials for new aircrafts designs are made of teflon polyimide or PTFE.

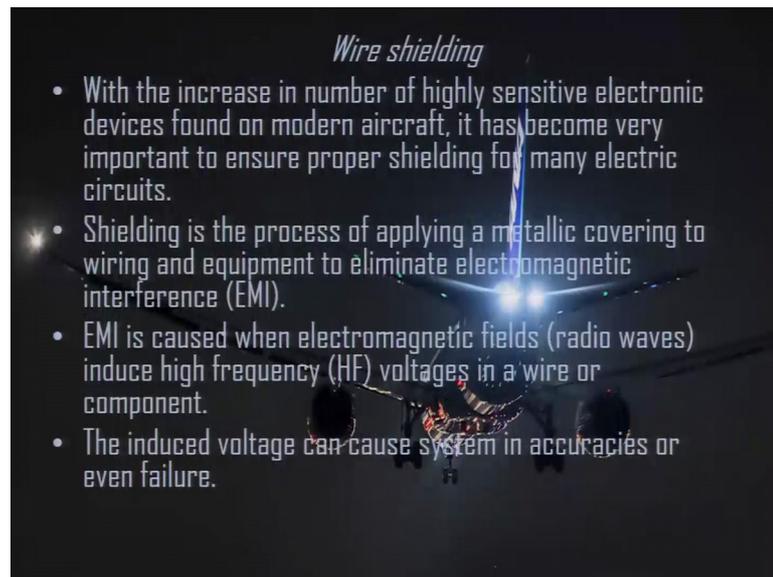
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Since, electrical wire may be installed in areas where inspection is infrequent over extended periods of time. It is necessary to give special consideration to heat aging characteristics in the selection of wire.

Resistance to heat is of primary importance in the selection of wire for aircraft use. As it is the basic factor in wire rating. Where wire may be required to operate at higher temperatures due either to high ambient temperatures, high current loading or a combination of the 2 selection should be made on the basis of satisfactory performance under the most severe operating conditions.

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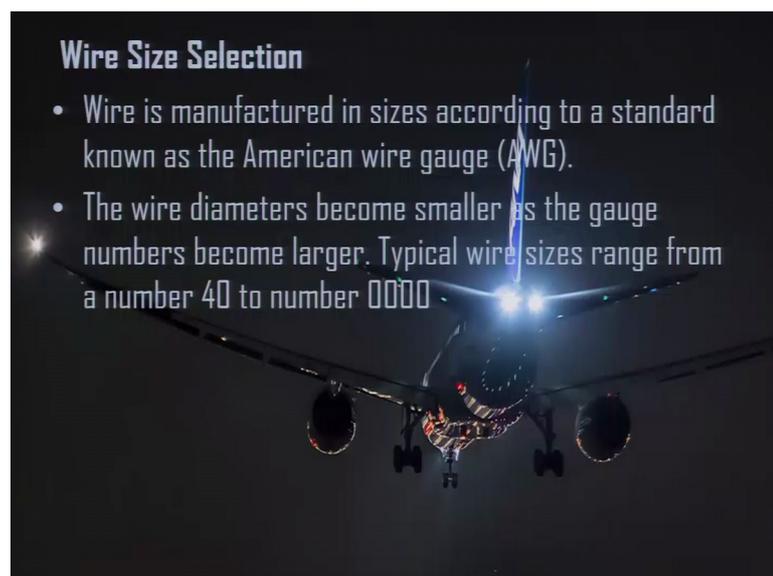


Wire shielding

- With the increase in number of highly sensitive electronic devices found on modern aircraft, it has become very important to ensure proper shielding for many electric circuits.
- Shielding is the process of applying a metallic covering to wiring and equipment to eliminate electromagnetic interference (EMI).
- EMI is caused when electromagnetic fields (radio waves) induce high frequency (HF) voltages in a wire or component.
- The induced voltage can cause system inaccuracies or even failure.

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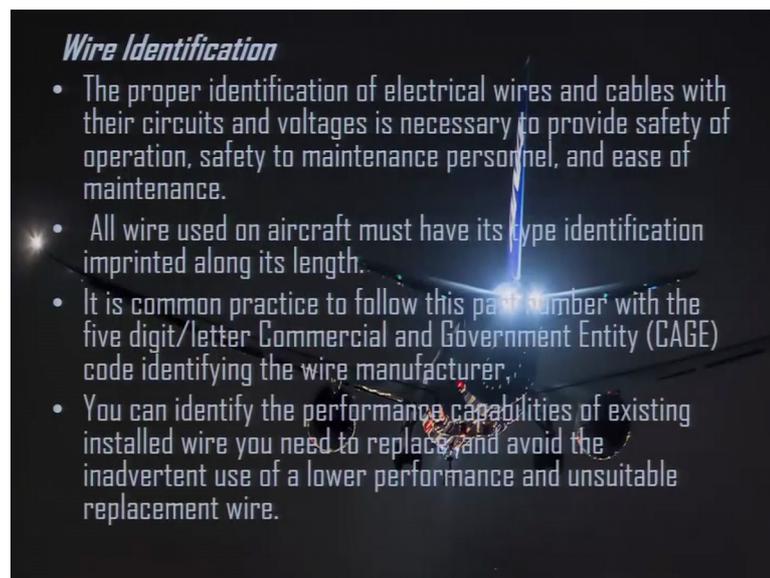


Wire Size Selection

- Wire is manufactured in sizes according to a standard known as the American wire gauge (AWG).
- The wire diameters become smaller as the gauge numbers become larger. Typical wire sizes range from a number 40 to number 0000.

Wire size selection wire is manufactured in sizes according to a standard known as the American wire gauge or the AWG. The wire diameters becomes smaller as the gauge numbers becomes larger. Typical wire size is ranged from a number forty to number 0 0 0 0.

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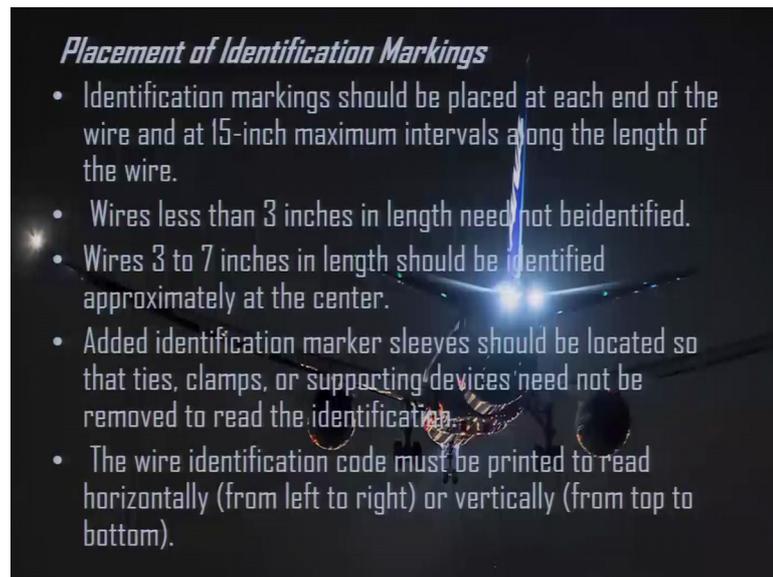


Wire Identification

- The proper identification of electrical wires and cables with their circuits and voltages is necessary to provide safety of operation, safety to maintenance personnel, and ease of maintenance.
- All wire used on aircraft must have its type identification imprinted along its length.
- It is common practice to follow this part number with the five digit/letter Commercial and Government Entity (CAGE) code identifying the wire manufacturer.
- You can identify the performance capabilities of existing installed wire you need to replace, and avoid the inadvertent use of a lower performance and unsuitable replacement wire.

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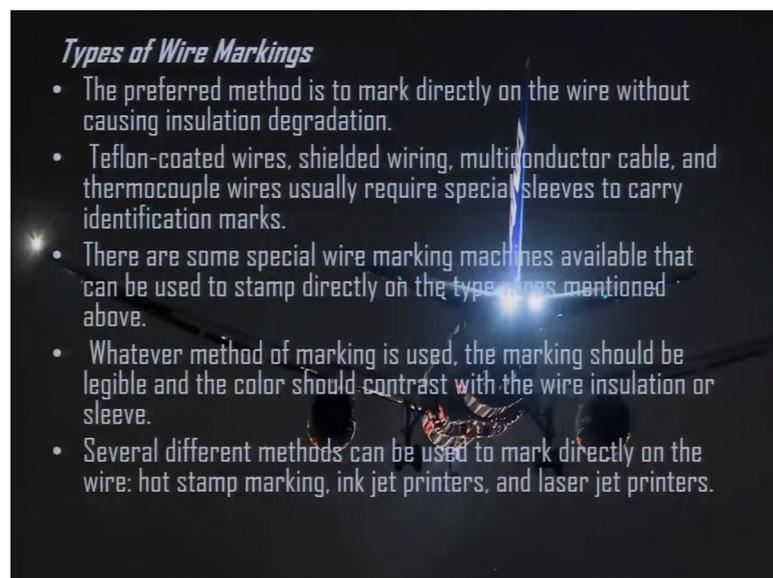


Placement of Identification Markings

- Identification markings should be placed at each end of the wire and at 15-inch maximum intervals along the length of the wire.
- Wires less than 3 inches in length need not be identified.
- Wires 3 to 7 inches in length should be identified approximately at the center.
- Added identification marker sleeves should be located so that ties, clamps, or supporting devices need not be removed to read the identification.
- The wire identification code must be printed to read horizontally (from left to right) or vertically (from top to bottom).

Placement of identification markings on the wire. Identification markings should be placed at each end of the wire and at 15-inch maximum interval along the length of the wire. Wires less than 3 inches in length need not be identified wires 3 to 7 inches in length should be identified approximately at the center. Added identification marker sleeves should be located. That ties, clamps and supporting devices need not be removed to read the identification the wire, identification code must be printed to read horizontally from left to right or vertically from top to bottom.

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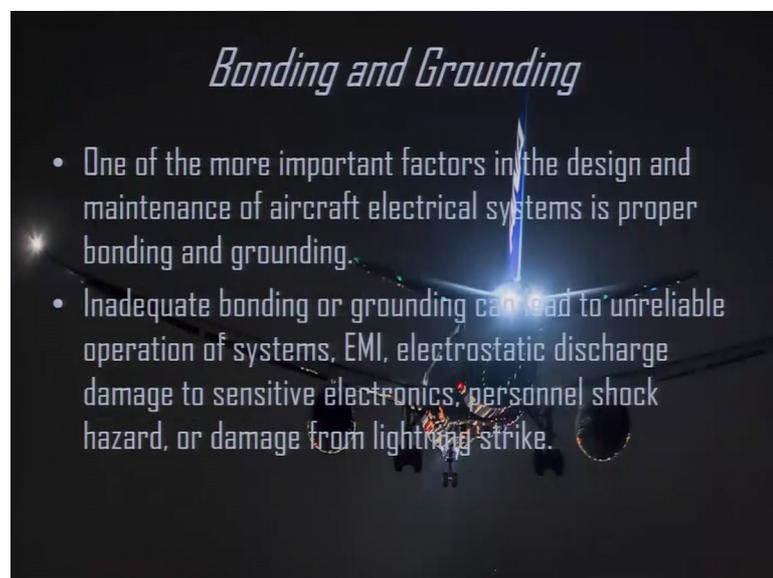
Types of Wire Markings

- The preferred method is to mark directly on the wire without causing insulation degradation.
- Teflon-coated wires, shielded wiring, multiconductor cable, and thermocouple wires usually require special sleeves to carry identification marks.
- There are some special wire marking machines available that can be used to stamp directly on the types of wires mentioned above.
- Whatever method of marking is used, the marking should be legible and the color should contrast with the wire insulation or sleeve.
- Several different methods can be used to mark directly on the wire: hot stamp marking, ink jet printers, and laser jet printers.

There are different types of wire markings the preferred method is to mark directly on the wire without causing insulation degradation. Teflon coated wires, shielded wiring multi conductor cable and thermocouple wires usually require special sleeves to carry identification marks. There are some special wire marking machines available that can be used to stamp directly on the type wires mentioned above.

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Bonding and grounding one of the more important factors in the design and maintenance of aircraft electrical system is proper bounding and grounding. Inadequate bonding or grounding can lead to unreliable operation of systems EMI, electrostatic discharge, damage to sensitive electronics, personnel shock hazard or damage from lightning strike.

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Grounding

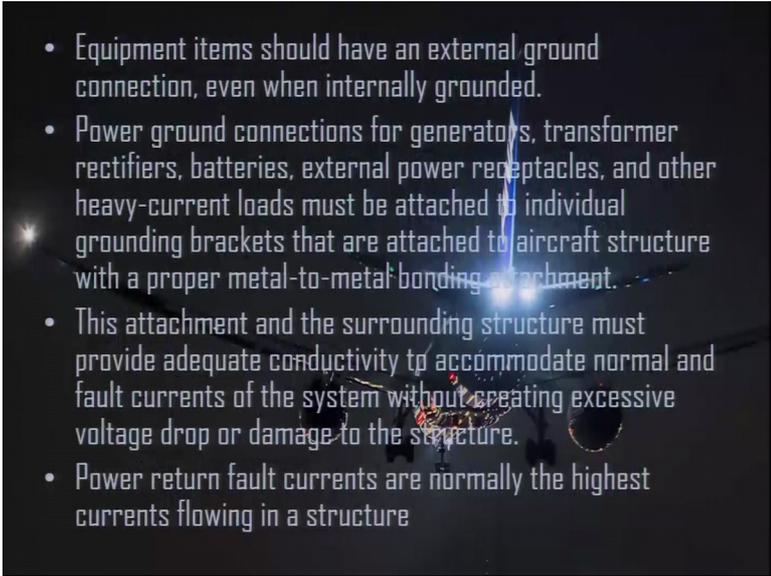
- Grounding is the process of electrically connecting conductive objects to either a conductive structure or some other conductive return path for the purpose of safely completing either a normal or fault circuit.
- The design of the ground return circuit should be given as much attention as the other leads of a circuit.
- A requirement for proper ground connections is that they maintain an impedance that is essentially constant.
- Ground return circuits should have a current rating and voltage drop adequate for satisfactory operation of the connected electrical and electronic equipment.



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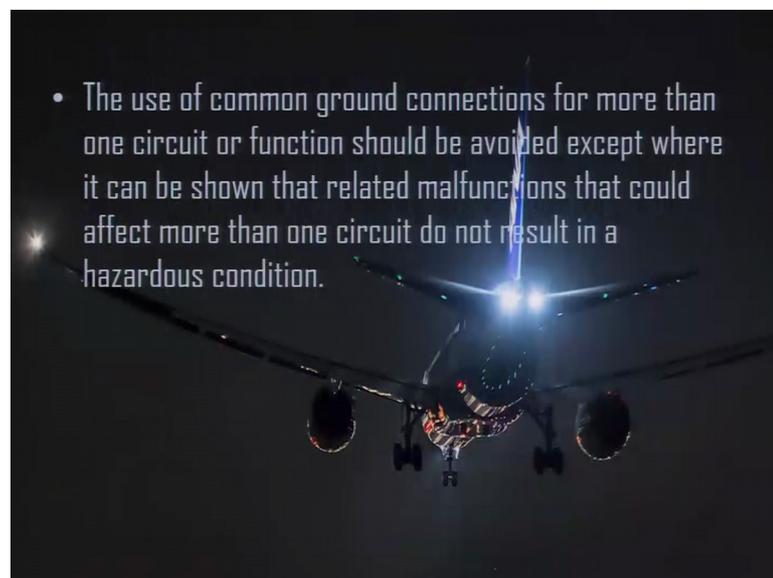
- Equipment items should have an external ground connection, even when internally grounded.
- Power ground connections for generators, transformer rectifiers, batteries, external power receptacles, and other heavy-current loads must be attached to individual grounding brackets that are attached to aircraft structure with a proper metal-to-metal bonding attachment.
- This attachment and the surrounding structure must provide adequate conductivity to accommodate normal and fault currents of the system without creating excessive voltage drop or damage to the structure.
- Power return fault currents are normally the highest currents flowing in a structure



Equipment items should have an external ground connection. Even when internally grounded. Power ground connections for generators, transformer, rectifiers, batteries external power receptacles and other heavy current loads must be attached to individual grounding brackets. That are attached to aircraft structure with a proper metal to metal bonding attachment.

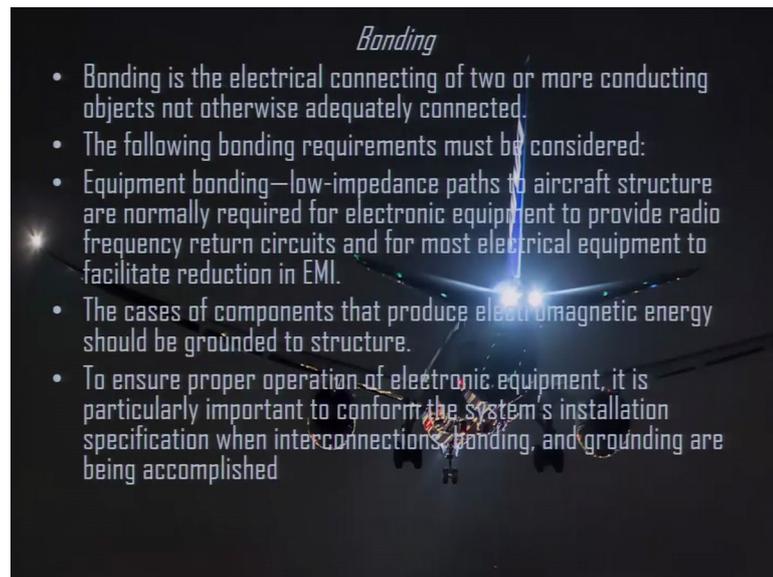
This attachment and the surrounding structure must provide adequate conductivity to accommodate normal and fault currents of the system without creating excessive voltage drop or damage to the structure. Power return fault currents are normally, the highest currents flowing in a structure.

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The use of common ground connections for more than one circuit or function should be avoided, except where it can be shown that, related malfunctions that could affect more than one circuit do not result in a hazardous condition.

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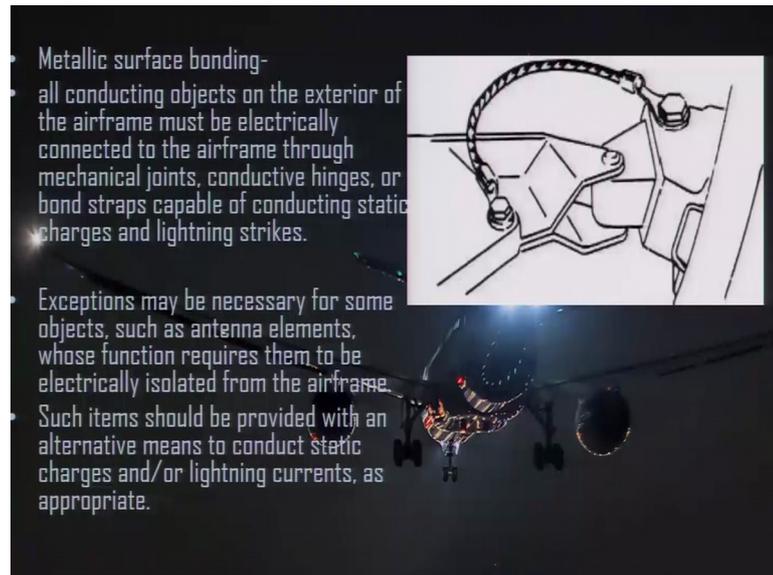
Bonding

- Bonding is the electrical connecting of two or more conducting objects not otherwise adequately connected.
- The following bonding requirements must be considered:
- Equipment bonding—low-impedance paths to aircraft structure are normally required for electronic equipment to provide radio frequency return circuits and for most electrical equipment to facilitate reduction in EMI.
- The cases of components that produce electromagnetic energy should be grounded to structure.
- To ensure proper operation of electronic equipment, it is particularly important to conform the system's installation specification when interconnections, bonding, and grounding are being accomplished.

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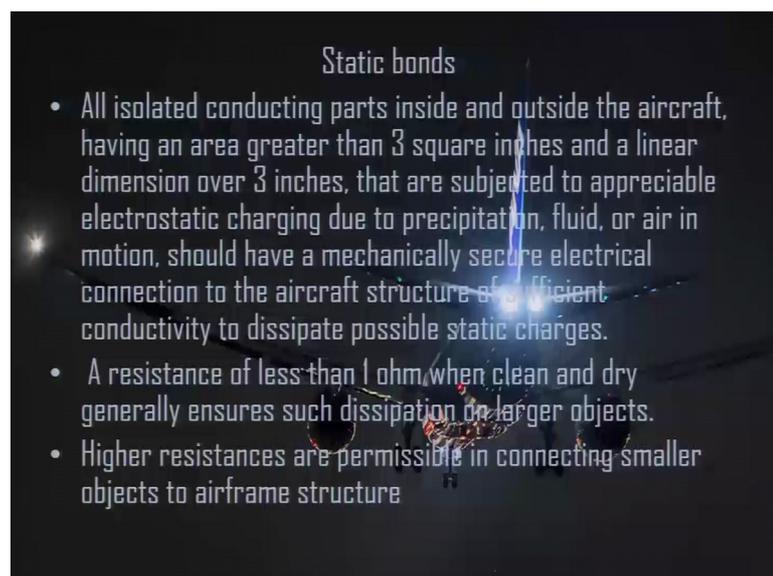
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- Metallic surface bonding- all conducting objects on the exterior of the airframe must be electrically connected to the airframe through mechanical joints, conductive hinges, or bond straps capable of conducting static charges and lightning strikes.
- Exceptions may be necessary for some objects, such as antenna elements, whose function requires them to be electrically isolated from the airframe.
- Such items should be provided with an alternative means to conduct static charges and/or lightning currents, as appropriate.

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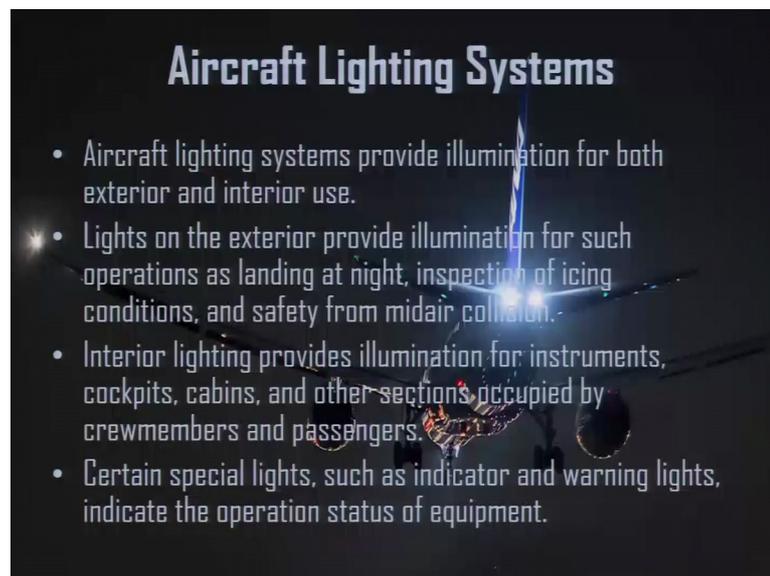


Static bonds

- All isolated conducting parts inside and outside the aircraft, having an area greater than 3 square inches and a linear dimension over 3 inches, that are subjected to appreciable electrostatic charging due to precipitation, fluid, or air in motion, should have a mechanically secure electrical connection to the aircraft structure of sufficient conductivity to dissipate possible static charges.
- A resistance of less than 1 ohm, when clean and dry generally ensures such dissipation on larger objects.
- Higher resistances are permissible in connecting smaller objects to airframe structure

All isolated conducting parts inside and outside the aircraft, having an area greater than 3 square inches. And a linear dimension over 3 inches that are subjected to appreciable electrostatic charging, due to precipitation fluid or air in motion should have a mechanically secure electrical connection to the aircraft structure of sufficient conductivity to dissipate possible static charges. A resistance of less than 1 ohms when clean and dry generally ensures such dissipation on larger objects. Higher resistances are permissible in connecting smaller objects to airframe structure.

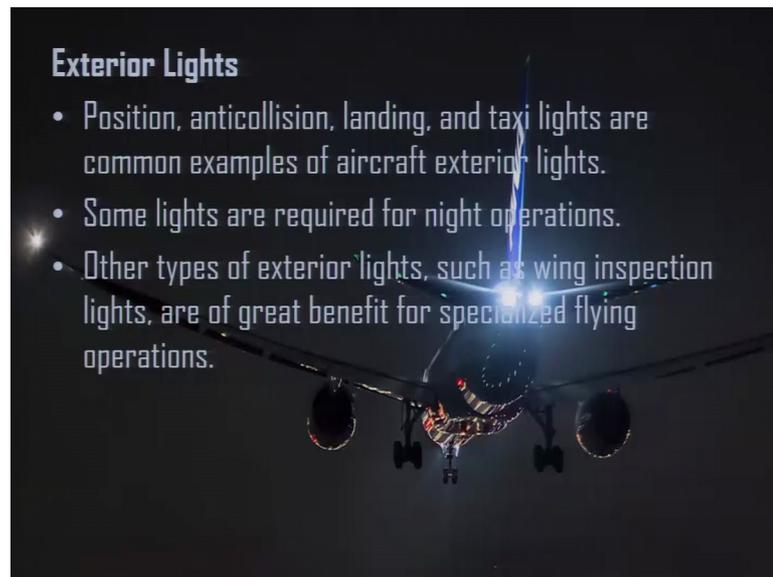
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Now, coming to aircraft lighting systems, there are various lights in an aircraft outside the aircraft inside the aircraft different types of lights. We will just have a brief idea of the different lights on an aircraft. Aircraft lighting system provide illumination for both exterior and interior use, lights on the exterior provide illumination for such operations as landing at night.

Inspection of icing conditions and safety from midair collision. Interior lighting provides illumination for instruments, cockpits, cabins and other sections occupied by crew members and passengers. Certain special lights such as indicator and warning lights indicate the operation status of equipment.

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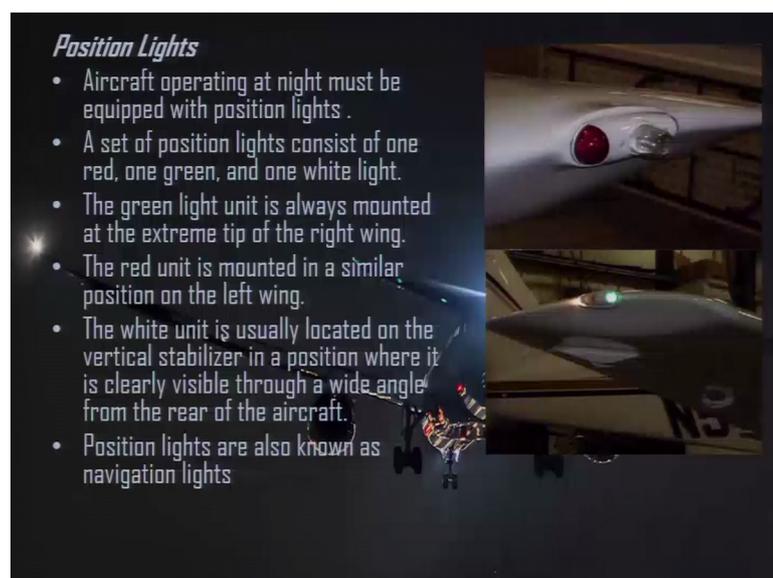


Exterior Lights

- Position, anticollision, landing, and taxi lights are common examples of aircraft exterior lights.
- Some lights are required for night operations.
- Other types of exterior lights, such as wing inspection lights, are of great benefit for specialized flying operations.

Coming to exterior lights, position, anti-collision, landing and taxi lights are common examples of aircraft exterior lights. We have position lights, anti-collision lights, landing lights, taxi lights on outside an aircraft. Some light are required for night operation, some other types of exterior lights are wing inspection lights. And these wing inspection lights are of great use for specialized flying operation.

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Position Lights

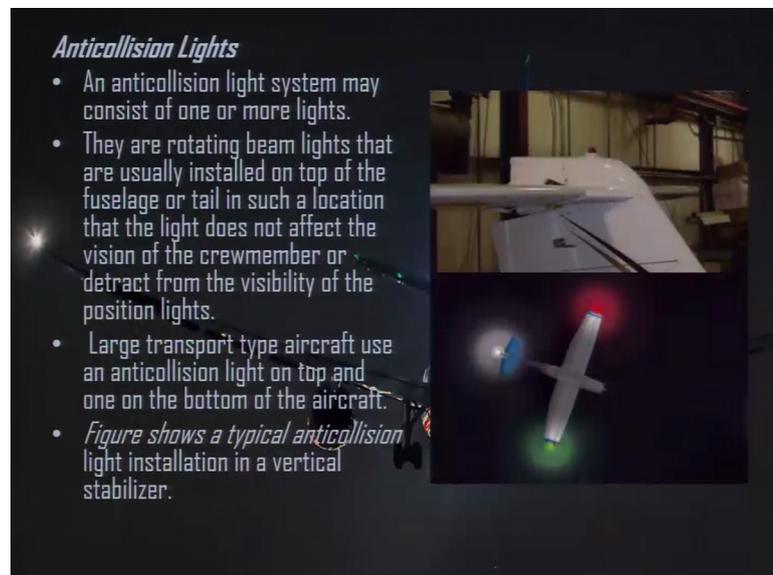
- Aircraft operating at night must be equipped with position lights .
- A set of position lights consist of one red, one green, and one white light.
- The green light unit is always mounted at the extreme tip of the right wing.
- The red unit is mounted in a similar position on the left wing.
- The white unit is usually located on the vertical stabilizer in a position where it is clearly visible through a wide angle from the rear of the aircraft.
- Position lights are also known as navigation lights

Position lights aircraft operating at night must be equipped with position lights. We also call them as navigation lights, a set of position lights consist of one red one green and

one white light. The green light unit is always mounted at the extreme tip of the right wing.

The green light is on the extreme tip of the right wing, the red unit is mounted in a similar position on the left wing. Green position light, green navigation light on the right-wing tip red navigation light or red position light on the left-wing tip. The white unit is usually located on the vertical stabilizer in a position. Where, it is clearly visible through a wide range from the rear of the aircraft. Position lights are also known as navigation lights.

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Anti-collision lights, an anti-collision light system may consist of one or more lights. They are rotating beam lights that are usually installed on top of the fuselage or tail. In such a location that the light does not affect the vision of the crew member or detract from the visibility of the position lights. Large transport type aircraft use an anti-collision light on the top and one on the bottom of the aircraft.

In the figure, you can see this is the vertical stabilizer and on the vertical stabilizer you have this this is the anti-collision light. In an aircraft you can see in this bottom figure, the navigation light on the left side left wing tip, red, red light green light on the right-wing tip and white light on the top of the vertical stabilizer.

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Landing and Taxi Lights

- Landing lights are installed in aircraft to illuminate runways during night landings.
- Landing lights of smaller aircraft are usually located midway in the leading edge of each wing or streamlined into the aircraft surface.
- Taxi lights are designed to provide illumination on the ground while taxiing or towing the aircraft to or from a runway, taxi strip, or in the hangar area.

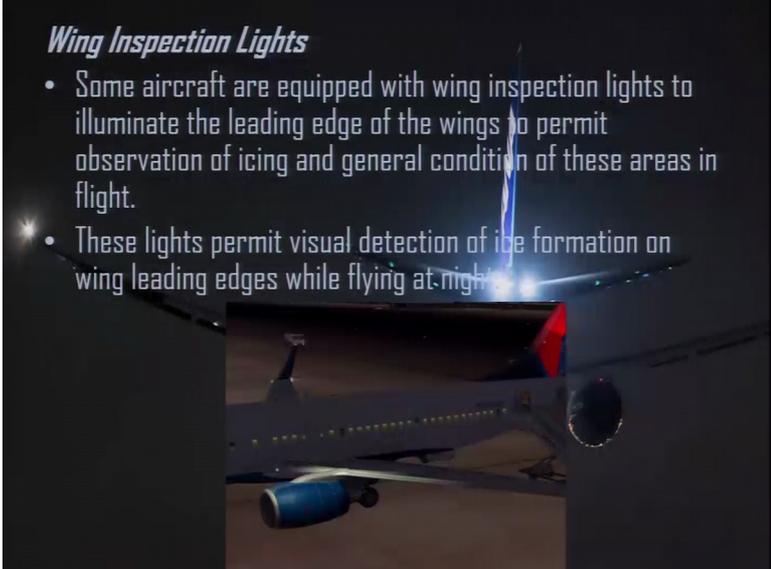


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Wing Inspection Lights

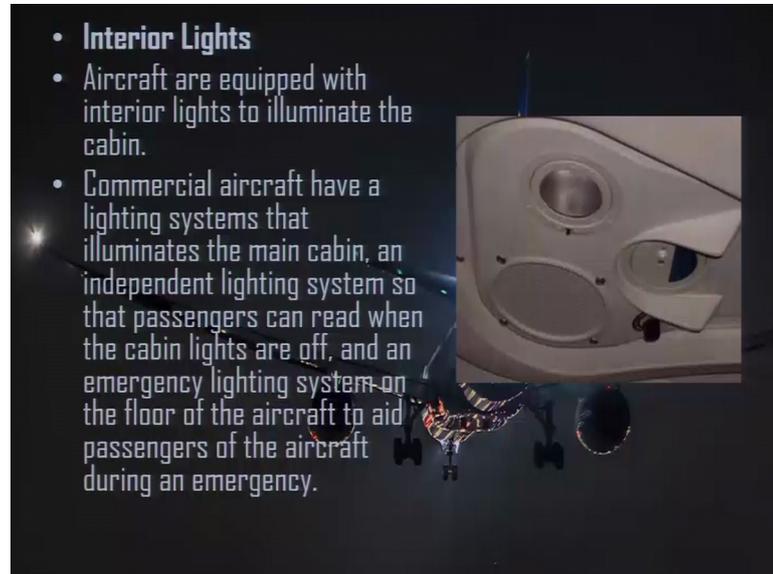
- Some aircraft are equipped with wing inspection lights to illuminate the leading edge of the wings to permit observation of icing and general condition of these areas in flight.
- These lights permit visual detection of ice formation on wing leading edges while flying at night.



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condition of these areas in flight. These lights permit visual detection of ice formation on wing leading edges, while flying at night.

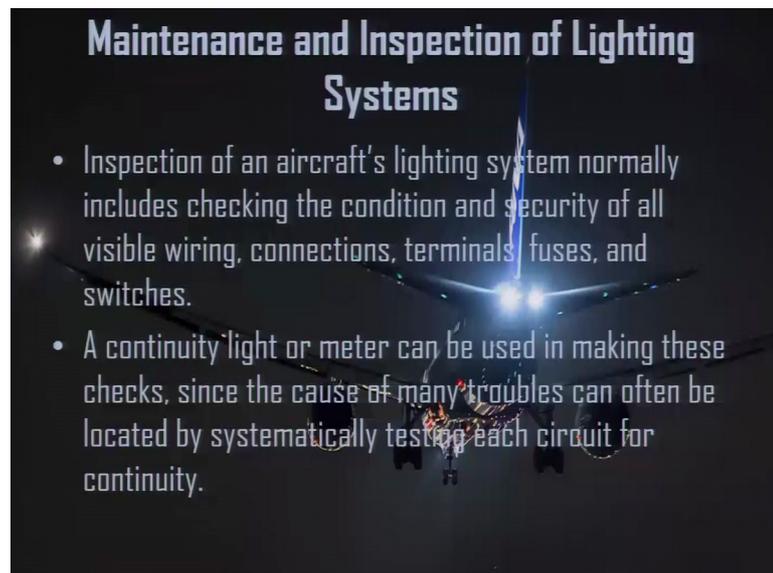
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- **Interior Lights**
- Aircraft are equipped with interior lights to illuminate the cabin.
- Commercial aircraft have a lighting systems that illuminates the main cabin, an independent lighting system so that passengers can read when the cabin lights are off, and an emergency lighting system on the floor of the aircraft to aid passengers of the aircraft during an emergency.

Now, coming to interior lights aircrafts are equipped with interior lights to illuminate the cabin. Commercial aircraft have a lighting systems that illuminates the main cabin an independent lighting system. That passengers can read when the cabin lights are off. And an emergency lighting system on the floor of the aircraft to aid passengers of the aircraft during an emergency.

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Maintenance and Inspection of Lighting Systems

- Inspection of an aircraft's lighting system normally includes checking the condition and security of all visible wiring, connections, terminals, fuses, and switches.
- A continuity light or meter can be used in making these checks, since the cause of many troubles can often be located by systematically testing each circuit for continuity.

Now, the maintenance and inspection of lighting systems, inspection of an aircraft's lighting system normally, includes checking the condition and security of all visible wiring, connections, terminals, fuses and switches. General inspection is to visually see the condition and security of wiring which is visible the connections which are visible terminals, fuses and switches.

Then a continuity light or meter can be used in making these checks. Since the cause of many troubles can often be located by systematically testing each circuit for continuity. One is the visual check another check is the continuity check, which you can do with the help of a meter, the continuity meter. And this check may be of use to identify the faults in the various wirings. This was all about the aircraft electrical system.

Thank you.