

A Project report on

**AIRCRAFT EXTERNAL LIGHT SYSTEMS**

Submitted in partial fulfillment of the award of the

**BACHELOR OF SCIENCE**

**IN**

**AERONAUTICS (Avionics)**

By

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### **BONAFIDE CERTIFICATE**

This is to certify that project report titled "AIRCRAFT EXTERNAL LIGHT SYSTEMS", is a bonafide record of work carried out by ku.ANJALI NITIN HEDAOO during the final semester from February 2021 to May 2021 under my guidance, in partial fulfillment of the requirements for the award of Bachelor of Science in Aeronautics ( Avonic ).

**Prof. Mr. SURESH KUMAR**

**Principal**

## DECLARATION

We hereby declare that the project entitled —'Aircraft External Lights Systems". which is being submitted Project Of 6th semester in avionics to wings college of aviation and technology, Pune is an authentic record of our genuine done under the guidance of prof. Dr.

Suresh Kumar and prof. Pankaj salunkhe

Date-

Place- Pune

Anjali .N. Hedaoo

## ACKNOWLEDGEMENT

It is our pleasure to be indebted to various people, who directly or indirectly contributed in the development of this work and who influenced our thinking, behavior, and acts during the course of study.

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Anjali .N. Hedao(2018-A-019)

Mansi .M.Deshpande(2018-A-013)

PROJECT NAME

## AIRCRAFT EXTERNAL LIGHTS SYSTEM

PROJECT RECORD BOOK

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Class & Branch :

- B.Sc. Aeronautics 3<sup>rd</sup> Year

Semester :

- 6<sup>th</sup> Semester

Stream:-

- Avionics

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## ABSTRACT

Aircraft lighting system provides illumination for both exterior and interior use. Lights on the exterior provide illumination for such operation as landing at night, inspection of icing condition, and safety from midair collision. Interior lighting provides illumination for instrument, cockpits, cabins, and other sections occupied by crewmember and passengers. Certain special lights, such as indicator and warning lights, indicate the operation status of equipment.



Fig no. 1.1

## INTRODUCTION

The lighting system provides interior and exterior illumination of the aircraft. In addition, Lights provides information and guidance to passengers in normal and emergency situation. External lights, in general terms, serve one of the three purposes:

- 1)To make the aircraft more visible too their aircraft
- 2)To improve pilot visibility during critical phases off lights

OR

- 3)To provide illumination for some other specific purposes

# AIRCRAFT LIGHTS

Planes are equipped with a variety of lights that are used for navigation, safety and to improve visibility during flight or when taxiing on the ground. The external lights on the aircraft fall

into two categories. The first is navigation lights or beacons that are always illuminated while the aircraft is in operation. As the second type includes take off and landing lights that are used to improve visibility when the plane is close to the ground.

The lighting systems include:-

- 1) Exterior lighting
- 2) Flight compartment lighting
- 3) Passenger compartment (cabin) lighting
- 4) Service lighting
- 5) Emergency lighting

## EXTERIOR LIGHTING

### Description

The exterior lighting system is controlled from the EXTERNAL LTS panel or the LANDING LTS panel, and consists of the following:

- 1) Navigation lights;
- 2) Beacons lights;
- 3) Anti-collision lights;
- 4) Logo lights;
- 5) Wing inspection lights;
- 6) Landing lights; and



7)Recognition/taxi lights

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## NAVIGATION LIGHTS:

The navigation lights are located in each wing tip, fuselage tail cone tip, and at the tip of the stabilizer fairing. A wing tip assembly contains two navigation lights that work simultaneously.



Wing tip navigation light Fig no.1.2

### APPLICATION:

- \* Navigation lights gives the information of aircraft position, heading and status.
- \*When taxing or flying in the night when it is more difficult to tell the direction the plane is going without them.
- \*The position lights shows your position and relative direction.
- \*Make it possible for an outside observer, such as the pilot of another aircraft, to determine which direction the plane is flying.

### BEACON LIGHTS:

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APPLICATION:

\*The Aircraft Beacon Lights are red in color and either flash or rotate to provides a pulsating warning lights. \*The beacon lights is normally turned on prior to engine start and turned off after engines have been shut down. \*Constantly, working beacons lights help the ground engineers




### External Lighting

The anti-collision lights consist of the two wing tips strobe light, located in the wing tip assembly, and one strobe light at the tip of the fuselage tail cone, co-located with the navigation light.

The A/COLL switch control the anti-collision strobe light.

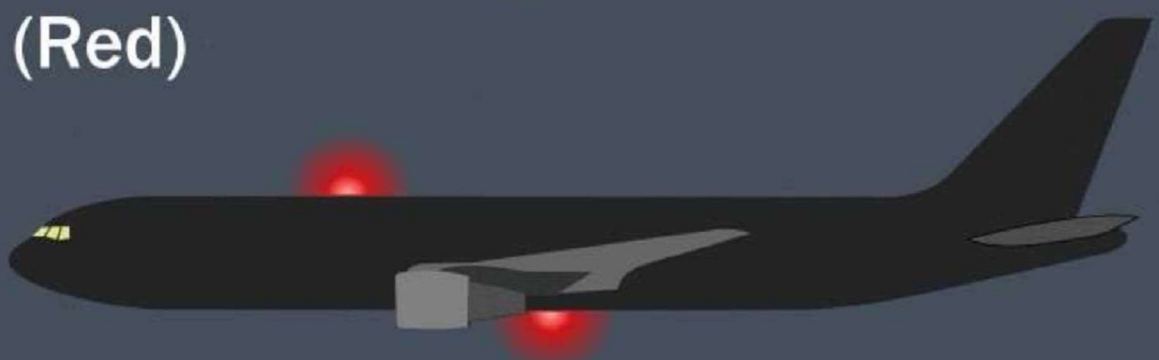
## Anti-Collision Lights (White)



- On each wingtip
- Sometimes on tail
- Often called strobes

aerosavvy

## Anti-Collision Lights (Red)



- Top and bottom of aircraft
- Often called rotating beacons

aerosavvy

Fig no. 1.5 : Anti Collision light (White & Red) APPLICATION:

\*The strobe lights is a safety light to warn of their aircraft, especially in congested areas.

\*A white strobe light is second type of anti-collision light that is also common.

## LOGO LIGHTS:

The logo lights are located on top of the aircraft engine pylons. When selected, these lights illuminate the aircraft's vertical stabilizer.

The LOGO switch controls the logo lights.



Fig no. 1.6 – Logo light

## APPLICATION:

\*The logo lights is used to see if there are any other aircraft crossing the taxiway or apron.

\*It's just better to have a big, bright, illuminated area, instead of the few small light.

\*ATC and the pilot can visually identify the companies name.

## WING INSPECTION LIGHT:

There are two wing inspection lights located on fuselage, forward of each wing root.  
The WING-INSP switch control the left and right wing inspection light.



Fig no. 1.7: Wing Inspection lights

#### APPLICATION:

\*wing inspection lights also known as ice inspection lights or wing scan lights.

\*give your pilots the illumination they need to check for ice formation and other hazards.

#### LANDING LIGHTS:

There are four landing lights on the aircraft. Two lights are located in the nose, and one light is located in each wing, at the root.

The NOSE switch, located on the LANDING LTS panel, control both nose landing lights simultaneously.

The LEFT switch and the RIGHT switch, located on the LANDING LTS panel, control each wing landing lights respectively.

NOTE: Turning on the left or right landing light turns on the respective side recognition/taxi lights.

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Fig no.1.8 - Landing lights

**APPLICATION:**

\*Landing lights are installed in aircraft to illuminate runways during night landings.

\*Landing lights are directed by the parabolic reflector at an angle providing a maximum range of illumination.

**TAXI LIGHTS/RECOGNITION:**

There are two taxi lights, co-located outboard of the wing landing lights.

The RECOG/TAXI LTS switch, located on the LANDING LTS panel, control the taxi light.





Fig no. -1.9 : taxi light

APPLICATION:

\*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 hanger area.

\*Taxi lights are also mounted in the recessed areas of the wing leading edge, often in the same area with a fixed landing light.

## COMPONENT USED IN PROJECT

The proposed Aircraft lighting will include:

- 1) Plywood.
- 2) LED (Light Emitting Diode) of Red, White and Green colors.
- 3) Two Transformer of 4V and 12 V.
- 4) 5 Toggle switches.
- 5) Single conductor wire for connection.
- 6) Printed outline of the aircraft diagram of "A1 Size"

### Detailed Description Of Components.

Now we are going to discuss the details of the components that we have been used in our project one by one.

- Plywood

We have used the 12mm plywood. The Size of the plywood is 3ft \*2ft of our project.

- Led (light emitting diode)

A light emitting diode (LED) is a semi conductor light source that emits lights. When current flows through it. Electron in a semi conductor re-combine with electron holes, releasing energy in the form of photons.

The color of the light (corresponding to the energy of the photons) is determined by the energy required for cross the band gap of the semi-conductor. White light is obtained by using multiple semi-conductor or a layer of light emitting phosphor on the semiconductor device.

**ANODE:-**The anode is now defined as the electrode at which electrons leave the cell and oxidation occurs.

**CATHODE:-**Cathode as the electrode at which electron enters the cell and reduction occurs.

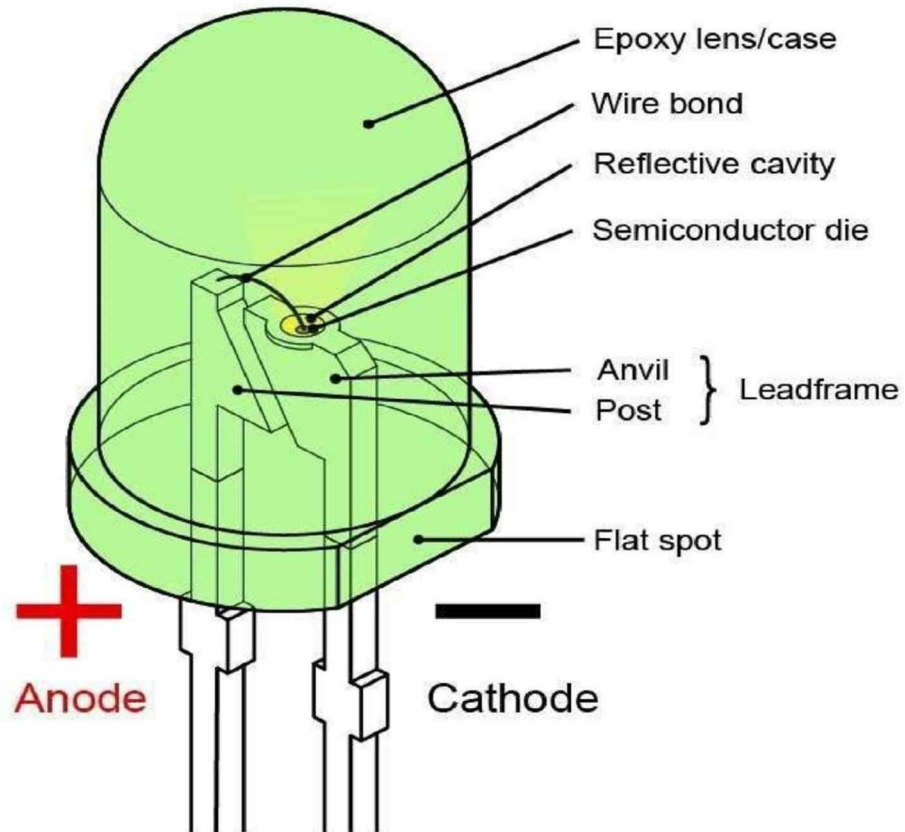


Fig no. -1.10 ; LED

In this project we have used Red, White, Green Leds. Where Red leds indicates beacons light and two navigation lights. White Leds indicates Strobes/Anti-collision lights, Landing and Taxing Lights.

An done Navigation light. Green Leds indicates Navigation Lights.

▪ Transformers:-

A transformer is a passive electrical device that transfers electrical energy from one electrical circuit to another, or multiple circuit. A varying current in any one coil of the transformer produces a varying magnetic flux in the transformer core, which induces a varying electro motive force across any other coils wound around the same core.

Electrical energy can be transferred between separate coils without a metallic (conductive) connection between the two circuits.

Transformer are most commonly used for increasing low AC voltages at high current

(step-up transformer) or decreasing high AC voltages at low current (a step-down transformer) in electric power application, and for coupling the stages of signal processing circuits. Transformer can also be used for isolation, where the voltages in equals the voltages out, with separate coils not electrically bounded to one another.



Fig no. 1.11 - Transformers

We have used two transformer in this project

□ 4 V

12 V

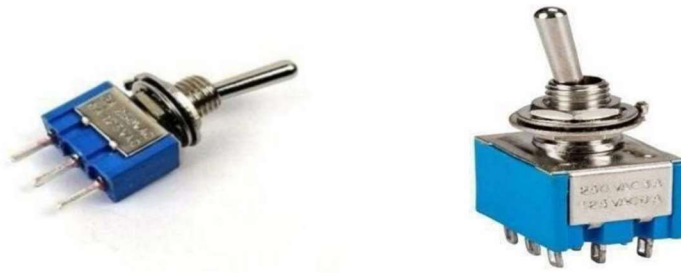
4V transformer is used to operate the landing lights, Taxing lights, Navigation lights. 12V Transformer is used to operate the Strobe/Anti-collision Light and Beacon light. Though the strobe light and beacon light are flashing/ blinking lights so we have made the small circuits to operate the leds in flashing conditions.

### Toggle Switches

A toggle switch or tumbler switch is a class of electrical switches that are manually actuated by a mechanic all over, handle, or rocking mechanism.

We have used 53 PDT Mini Toggle switches in our project to operate the led s.

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(a) (b)

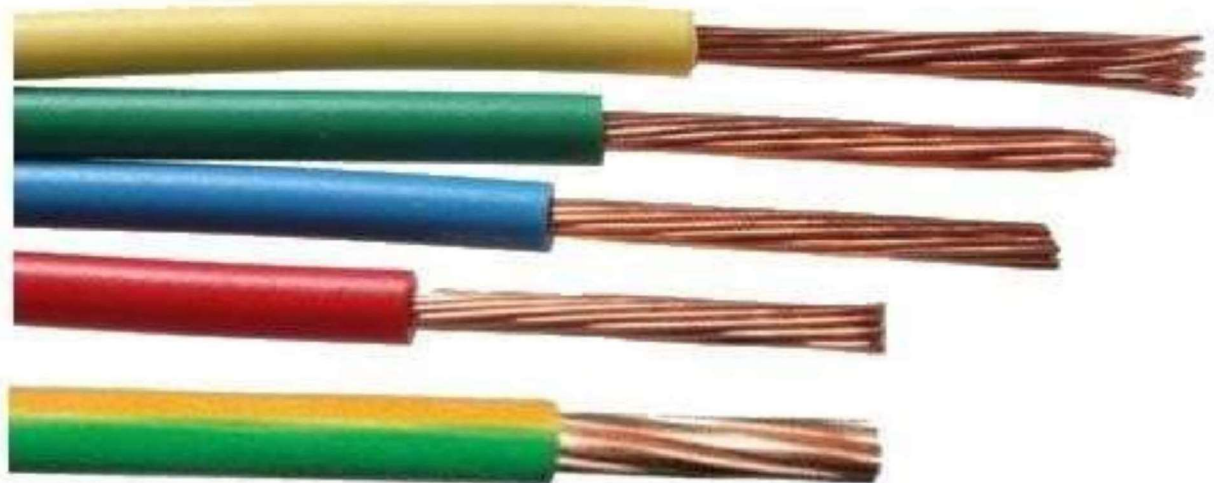
Fig no. – 1.12 : Toggle switch

> Single Conductor Wire

Singles stranded wire is made of multiple thin strands of wires that form together one conductor.

The stranded design offers flexibility thus they are suitable for applications where wires need to be bent or twisted. Electrician prefer stranded over solid because it is easier to route through pipes in walls due to its flexibility.

Fig no.1.13

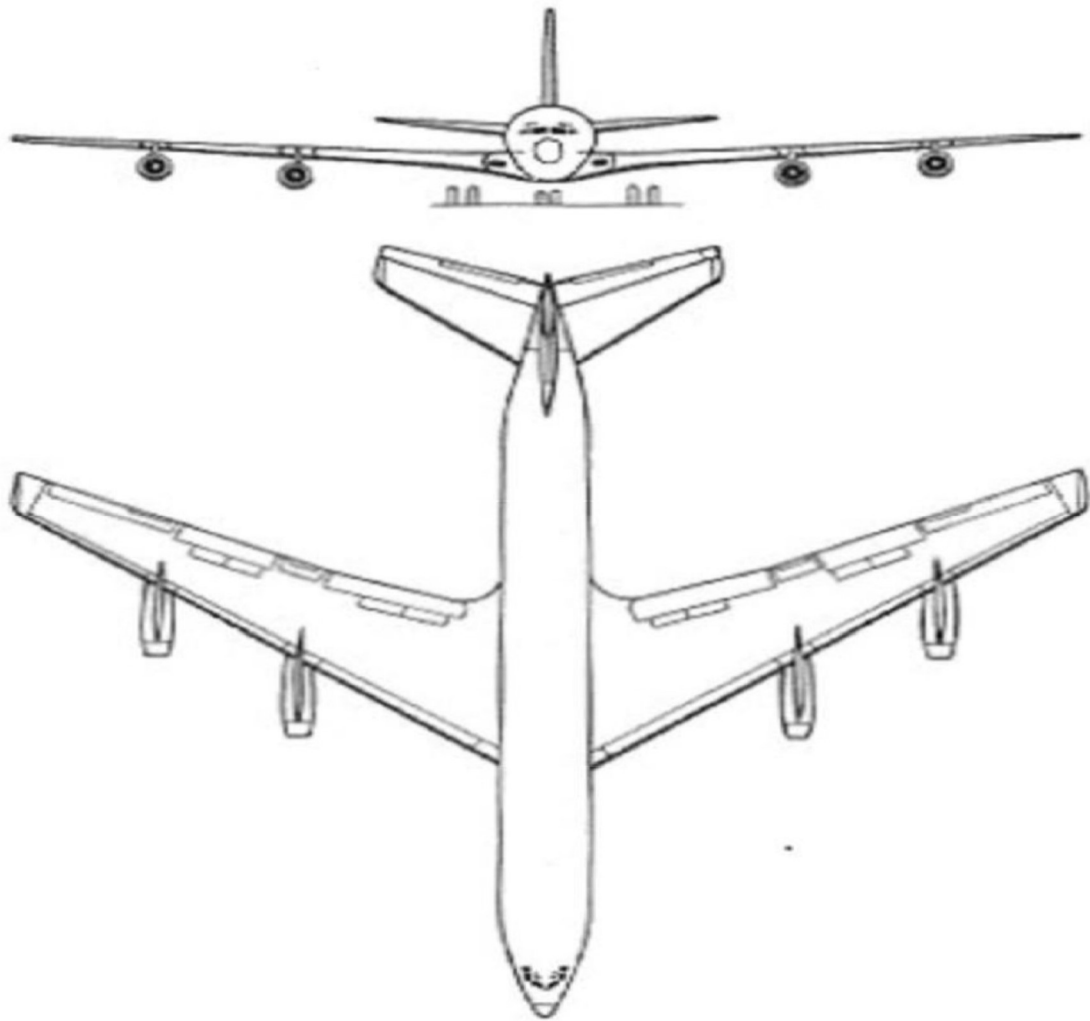


## Single Stranded Wires

Stranded wire is used when higher resistance to metal fatigue is required. Such situations include connections between circuit boards in multi-printed-circuit board devices.

PRINTED OUTLINE OF AIRCRAFT DIAGRAM

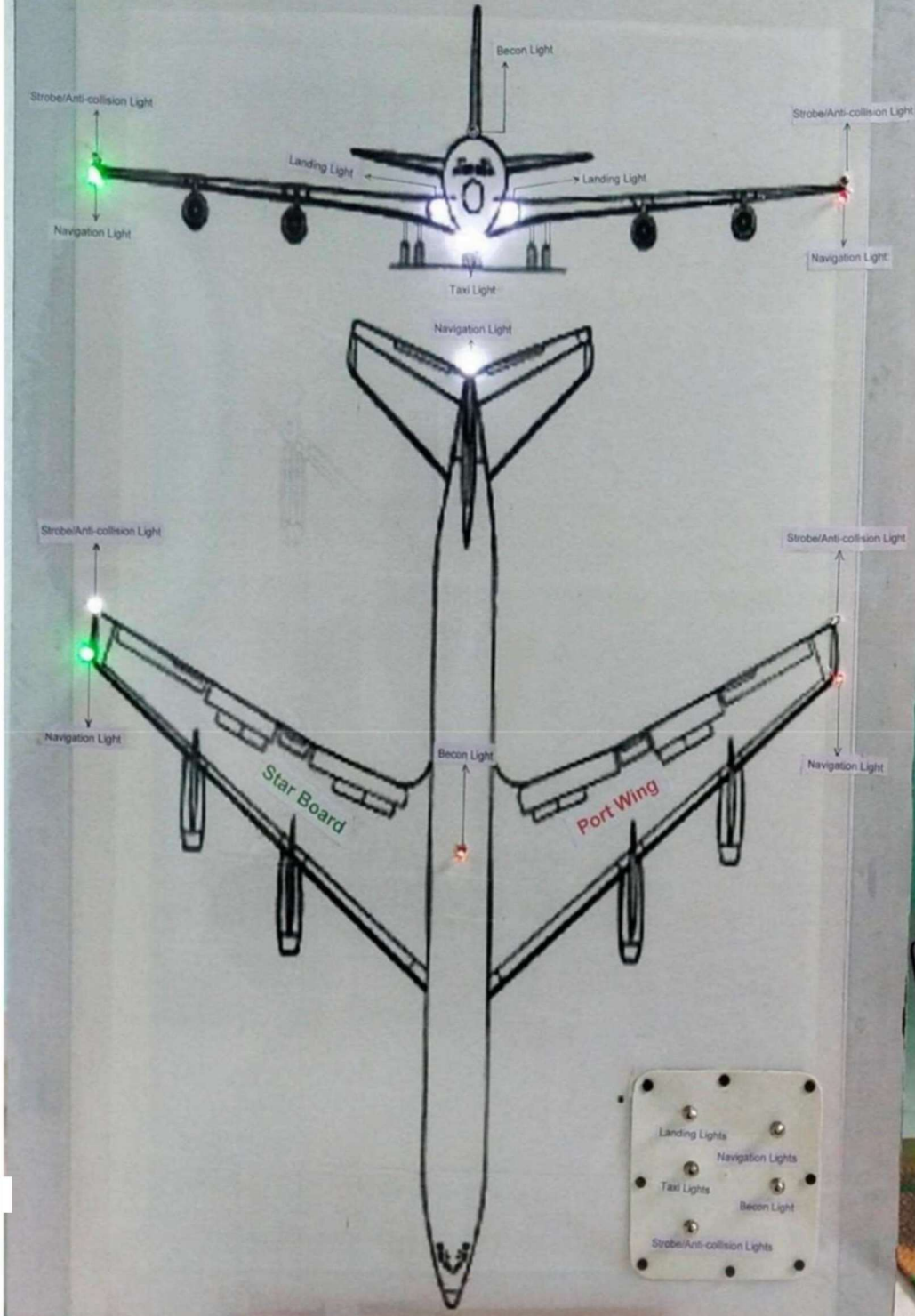
We have used the printed sheet of aircraft to do this project. The size of the print is A1 size. The sheet shows that view of the aircraft and Front view of the aircraft. The printed is pasted on the plywood sheet.



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# Aircraft External Lights System



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## PROJECT PROCEDURE

- i. Procedure of our project is first we have took a sheet of plywood and cut in the size of 3ft\*2ft.
- ii. After Cutting the sheet we have pasted the Printed sheet of the aircraft on that panel. iii.  

After that we have we have drill the panel on the points were we are going to place the led to show the lights.
- iv. The led bulb are used in this project are in colors Red, Green, and White. Were red led is used is to show navigation lights on port wing and beacon lights on the fuselage. White led is used for strobe light, landing, taxing and navigation on the tail of the aircraft and the green led is for Navigation lights on the star board side the aircraft wings.
- iv. Used the 53 PDT mini toggle switches to operate the led lights in on and off condition.  

For toggle switch we have used a fabric box cover to place the switch on it.
- v. We have used the standard wire to give the connection.
- vi. To operate and to make the strobe and beacon light in flashing condition have use the 12 V transformer and we have  

4V transformer for Navigation lights, Landing Lights and Taxi lights. viii. All the connection in the project is series we have made one circuit diagram which shows the connection and wiring of the project.
- vii. We Have used the AC Supply as the main Source of current (I). viii. The lights will be operated by Toggles switch to indicate the specific lights have been shown this project.

The main purpose of the project is to explain the students where are the aircraft external lights located and to explain where the light shave been located on the aircraft.

## PROJECT CIRCUIT DIAGRAM

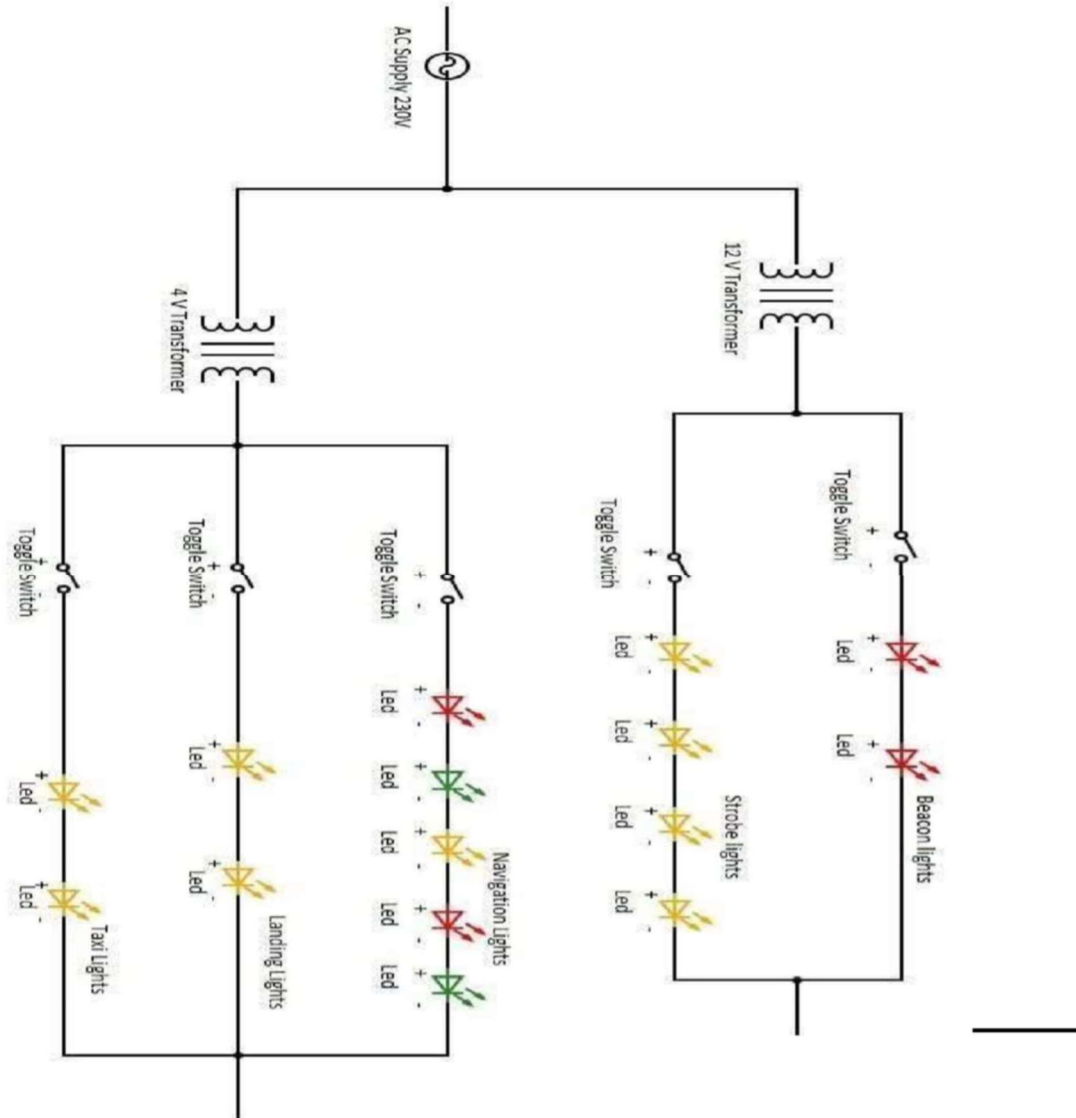


Fig no. \_1.14 CIRCUIT DIAGRAM

- i. Circuit diagram explain the connection given in the project.
- ii. As we have mentioned above in the procedure we have used AC supply as the main source of supply.

We have used the two transformers of 4V and 12V. As the 4 V

Transformer is for the navigation, Landing and taxiing lights and 12V transformer is for the strobe light and beacon lights. In this project connection are in series

- iV. As the transformer flow the current to the switch and when switch is operates In on condition the led blinks and off condition the led switch offs.
- iV. The main use of transformer in this project to control the flow of current. If the current flows in the high Volt the it can Fuse the leds . So we have used the transformer.
- V. So as shown in the circuit the current is flow from the AC supply to the transformers from the transformer the current is flown to the leds and the leds started blinking. vii. On 12V transformer 2 switches are operated. viii. On 4V transformer 3 Switches are operated.
- vi. The input of transformer is high so the transformer helps to reduce the current flow. vii.

After completion of all the connection we have cover the panel form side an back though the connection should not cause lose contact.

### CONCLUSION :

In this Project we have shown the Aircraft Lights System and the uses of lights on aircraft, we have tried to show the purpose of lights used on the aircraft and how they are operated on aircraft while aircraft is on ground and flying. We have also shown the simple circuit which is easy to understand the motive of our project.

In this project, we have shown external light so fan aircraft which areas follows:1. Navigation lights

2.Strobe/Anti-collision lights

3.Beacon lights

4.Landings lights

## 5. Taxiing lights

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