



# REVIEW ON ONE MANNED AIRCRAFT

**Dr. Sumathy Muniamuthu**

Associate Professor,

Department of Mechanical Engineering, Vel Tech, Tamilnadu, India

**Karthikeyan T, Poovazhagan V, Poovarasam D, Ramki P**

Students, Department of Mechanical Engineering,

Vel Tech, Tamilnadu, India

## ABSTRACT

*In the modern world, the travel a smaller distance makes a lot of time due to the traffic congestion that takes place. To overcome problem, an alternative mode of transport is to be made for the travel which would be the Airways. But the air transport which is being used is for commercial purpose travels a longer distance and carries the passenger of an average of 150 numbers. To make an aircraft, this can be used for a single man to travel a shorter distance by using the Quad copter technology. This helps the people to operate with ease and will help to travel the places by simple instructions.*

**Key words:** Airways, Quad copter, Traffic Congestion

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## 1. INTRODUCTION

In the modern world, the travel a smaller distance makes a lot of time due to the traffic congestion that takes place. If an accident happens, the traffic congestion arises. In such a way there are many drawbacks due to the population of the roadway transport. To overcome this problem, there is a necessity to move towards a different mode of transport to travel which would be the Airways. But the air transport which is being used is for commercial purpose travels a longer distance and carries the passenger of an average of 150 numbers.

## 2. LITERATURE SURVEY

Currently all are travelling by **Roadway Transport** to travel a shorter distance but it takes a huge time period to travel and everyone using the private transport in the shorter roads, the traffic congestion arises which make the people more suffer. If a road accident happens, it becomes high and can even take hours to overcome the specified place of accidents. The

roadways make a huge pollution to the environment. Hence the alternate way is to use the air transport.

The two different kind of are being used presently, they are Aero planes and helicopters. While considering the **Aero plane**, they require are used for commercial purpose and carries the passengers at a huge number and travel a larger distance. The major drawbacks of aero plane are it is huge in size and it consumes a large amount of fuel for the travelling purposes. Hence they cannot be used for travelling smaller distance.

If consider the **Helicopter** as the source of travelling, they are more complicated to control by the normal people. They should be handling with care if there is any disturbances arises, they lost the control and can result in huge accidents. They consume a lot of fuel for travelling and considering the safety purpose, it is very less while considering the other technology.

But if reviewed the past, the **Vertical Take Off and Landing (VTOL)**<sup>[1]</sup> is one of the aircraft which resulted in an attempt over for the one manned aircraft where if could not attain the altitude which was being expected. The major drawback is about its weight and the design where the supply of air to take off is not being considered. The VTOL have-not becomes the success and the major reasons are above stated.

### 3. PROPOSED METHOD

#### 3.1. QUAD COPTER THEORY

**Quad copters** have become the recent trend to solve many problems and presently it has become a large applicant for many research sectors and departments. It is ease to operate and to control and fly through air and make as a good application for many problems.<sup>[2][3][4]</sup>

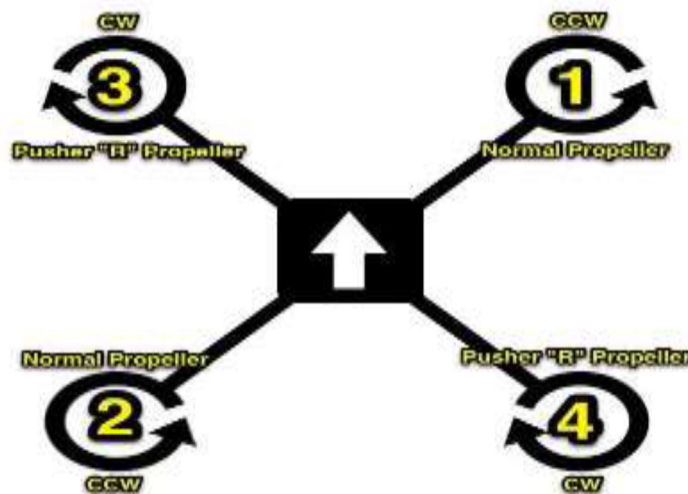


Figure 1 Schematic diagram of the Quad Copter

#### 3.2. QUADCOPTER FLIGHT DYNAMICS

Quad copter operates within two frames of reference. First is its own frame of reference which is termed as body frame whereas the second is measured relative to world frame of reference which is termed as inertial frame. In case of body frame, the rotor axes are pointing in positive z direction with the arms pointing in x and y directions (Fig 2) while in case of inertial frame, the gravity pointing in the negative z direction (Fig 3).<sup>[2][4]</sup>

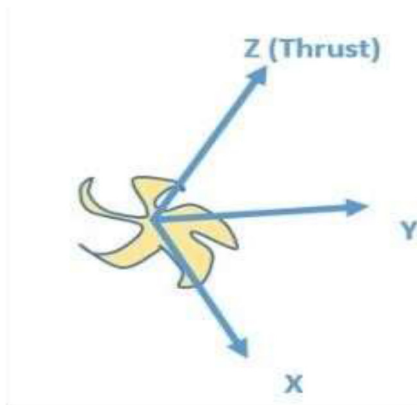


Figure 2

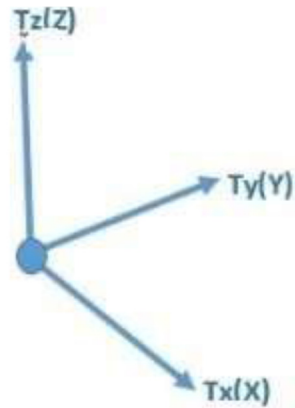


Figure 3

Quad copter is lifted up high in the air with the help of propellers. These propellers convert rotational motion into thrust and this can be explained with the help of Bernoulli's principle and Newton's third law. Every action has equal and opposite reaction

### ***Bernoulli's principle***

Bernoulli's principle states that for an inviscid flow of no conducting fluid, and increase in the speed of fluid occurs simultaneously with a decrease in pressure or a decrease in the fluid's potential energy.

### ***Newton's third law***

An air foil is the shape of the wing or blade as seen in the cross section, when moved through a fluid produces an aerodynamic force. Due to airfoil shape of the propeller, the air moves faster over the top than under the bottom which results in a greater pressure difference below the airfoil than above it. This pressure difference in turn produces the required thrust.

## **4. FLIGHT CONTROLLER**

To maintain balance, the aircraft should continuously take measurements from the sensors and make adjustment accordingly to the speed of the rotors to keep the body level. Flying capabilities and cost are the two main factors to be considered while selecting flight controller. Flying capabilities consists of following basic factors-

- *Gyro stabilization*: It is the ability to keep the copter stable and level under the pilot control.
- *Self-leveling*: It is the ability to automatically adjust itself during any orientation so that the copter stays level.
- *Altitude hold*: It is the ability to hover at a certain distance from ground without having to manually adjust the throttle.

## **5. INDENTATIONS**

By using the aircraft model, the design of the one manned aircraft is being made in the similar aspects. The one manned aircraft has five different parts. They are:

1. Rotors
2. Propellers
3. Base
4. Platform
5. Envelope frame

The rotors and the propellers follow the principle of the aircraft. By the rotation of the rotors and propellers makes the thrust energy from the free space and pushes it over the ground and helps to get lifted up. The base is the portion where the aircraft makes the contact with the ground. It is very important as it avoid the unnecessary contact of the propeller blades with ground. It gives full support and helps in holding the entire mass concentration of the aircraft over the small area. The platform and the envelope shield are made to comfort for a man to travel on the aircraft. The controlling part is made on the platform at a certain height for to be operated by the people.

## 6. CALCULATIONS

### Thrust Calculations

The force normal to the propellers required for providing motion to the Aircraft is termed as thrust. This force is generated with the help of rotors which spin at a certain angular velocity. In general, the thrust generated by a particular rotor is,<sup>[4]</sup>

$$T = \rho A V_r^2$$

Where,

$\rho$  = real time air density of air (Kg/m<sup>3</sup>)

A = Cross sectional area of the propellers.

$V_r$  = Instantaneous peripheral velocity of rotors

### Motor calculations:

The motors should be selected in such a way that it follows following thrust to weight relationship.<sup>[4]</sup>

$$\text{Ratio} = \text{Thrust} / \text{weight} = ma / mg$$

$$= a / g$$

Thus, vertical takeoff and vertical landing (VTOL) is possible only when,  $(a / g) > 1$  or in other words, the total thrust to total weight ratio should be greater than 1 so that the aircraft can accelerate in the upward direction. In this case, assuming that,

$$\text{Total Thrust} = 1.5 * (\text{Total weight of Aircraft} + \text{The External load On the Aircraft})$$

Hence, each motor gives the thrust force which of one fourth of the total thrust to be developed

$$\text{Thrust at each motor} = \text{Total Thrust} / 4$$

The external or the additional load will be about nearly 200 kg at an approximately if assuming the weight of the human at an average of 75 kg, a pay load of 30 kg, twin parachute of 7.5 kg each, the emergency power supply of battery as a fuel of nearly 20kg and other accessories of 10 kg are being considered.

To achieve the good working, there is a necessity to reduce the weight of the external frame, weight of the propeller and addition of huge loads which may cause the instability and leads to huge accidents. The regular change of battery will helps to travel the distance without any interruption at the regular interval.

## 7. CONCLUSION

By creating the one manned aircraft, it is possible to travel a smaller distance in a quicker. It would help the public to overcome traffic congestion. The power demand may be little higher than the normal roadway transport, but it would be very useful when it come to the usage. In

future, it can be equipped with auto piloting application, location accessing with the GPS tracking system and further it can be developed to move in the roadway and if problem arises and made to fly in the air and also a future advancement in making the vehicle to move in all modes of transport.

## REFERENCES

- [1] A C Robetson ET AL, Vertical Takeoff Flying Platform, Patent US2953321, Sept. 20, 1960.
- [2] Mohd Khan, Quadcopter Flight Dynamics, International Journal of Scientific & Technology Research Volume 3, Issue 8, August 2014 ISSN 2277-8616
- [3] Øyvind Magnussen & Kjell Eivind Skjønhaug, Modeling, Design and Experimental Study for a Quadcopter System Construction, University of Agder, 2011
- [4] Er. Naser.F.AB.Elmajdub and Prof. Dr. A.K. Bhardwaj, Design Control System of an Aircraft. International Journal of Electrical Engineering & Technology, 7(5), 2016, pp. 89–122.
- [5] Abbas, Y. K. Development the Oil System of Aircraft. International Journal of Advanced Research in Engineering and Technology, 6(2), 2015, pp. 30-37.
- [6] Danish Zaffar Wani, Shemyla Khan, Haiqa Riyaz and Ubaid Illahi, Solving Congestion by Designing of Traffic Signal At T-Intersection (Qamarwari Chowk) In Srinagar, J&K. International Journal of Civil Engineering and Technology, 7(3), 2016, pp.385–391.
- [7] Danish Zaffar Wani, Shemyla Khan, Haiqa Riyaz and Ubaid Illahi, Solving Congestion by Designing of Traffic Signal At T-Intersection (Qamarwari Chowk) In Srinagar, J&K. International Journal of Civil Engineering and Technology, 7(3), 2016, pp.385–391.
- [8] Prof.A.V.Javir, Ketan Pawar, Santosh Dhudum, Nitin Patale and Sushant Patil, Design, Analysis and Fabrication of Quadcopter, Journal of The International Association of Advanced Technology and Science, Vol. 16, ISSN-3347-4482.