IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

DRONE PARASITE

AI Powered Mobile Jammer Mounted Drone

PHASE II REPORT

Submitted by

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in partial fulfillment for the award of the degree of

MASTER OF ENGINEERING

IN

AERONAUTICAL ENGINEERING

NEHRU INSTITUTE OF ENGINEERING AND TECHNOLOGY

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ABSTRACT

Designed is an AI Powered Mobile Jamming Drone that can trace down mobile signals, create a swarm and localize mobile jamming so that it does not affect others. Like in a condition where a special jammer that can be activated to cut all signals at a specific locations in a critical situation. In terror operations mobile phones play a major role in helping the enemies to give instructions, etc. The UAV aerial model drone can trace and jam mobile signals at sites if they have been held by enemies under dangerous situations.

Up until now localizing the mobile jamming system to work only for particular range was not available and due to this the whole area gets jammed affecting the security personnel.

The UAV Aerial Drone uses Artificial Intelligence along with GPS and Cell Tower Triangulation and Multilateration techniques to trace mobile phones and then deploy itself to the location and turn the mobile signal jammer ON with the appropriate range so as to block all mobile communication at the site.

This unmanned aerial vehicle (UAV) drone Model can be used in Warfare in such a manner that if a Site has been held by enemies and terrorists and communication is being done by them using Mobile phones with their handlers, these Drones can be deployed where the Drone automatically traces the mobile signal present and places itself on their site and jams the network so as to prevent further communications.

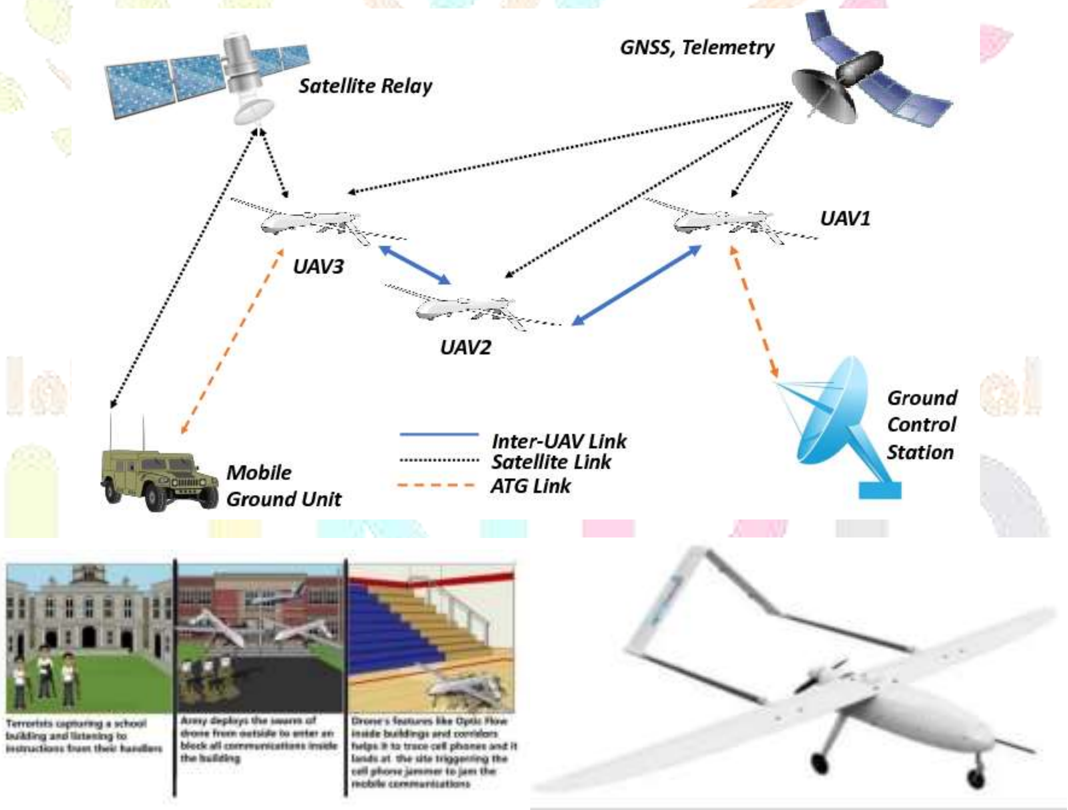
1.1 INTRODUCTION

Drone technology has experienced a great evolution during the recent past years. Drones are more formally known as unmanned aerial vehicles (UAVs) or unmanned aircraft systems (UASes). Several innovations aimed at the improvement of the drone technology in various fields. The aim of this work is using a drone to interference signals of a building or vehicle in a mobile condition. An AI Powered Mobile Jamming Drone that can trace down mobile signals, create a swarm and localize mobile jamming so that it does not affect others.

1.2 CONCEPT

The Drone uses Artificial Intelligence along with GPS and Cell Tower Triangulation and Multilateration techniques to trace mobile phones and then deploy itself to the location and turn the mobile signal jammer ON with the appropriate range so as to block all mobile communication at the site.

FIG 1.2 UAV DRONE MODEL



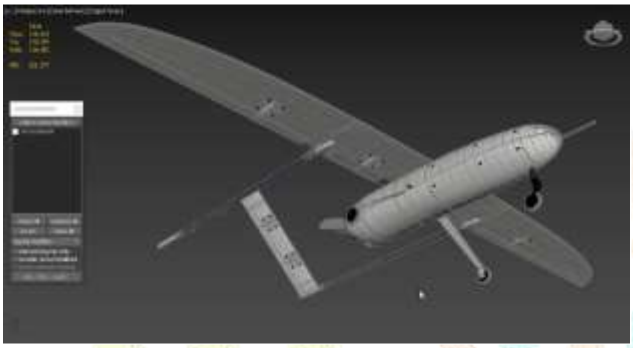
This Model can be used in Warfare in such a manner that if a Site has been held by enemies and terrorists and communication is being done by them using Mobile phones with their handlers, these Drones can be deployed where the Drone automatically traces the mobile signal present and places itself on their site and jams the network so as to prevent further communications.

1.3 OPERATIONS

Swarm Drone can cover up the building using this method and make sure that that the site gets completely signal jammed.

The Model will consist of three Elements :

- Mobile Signal Jammer,
- Cell Phone Detector and
- AI Enabled Flight Controller as a Central Commander for Autonomous Flying.



1.3.1 BLOCK DIAGRAM OF THE MODEL

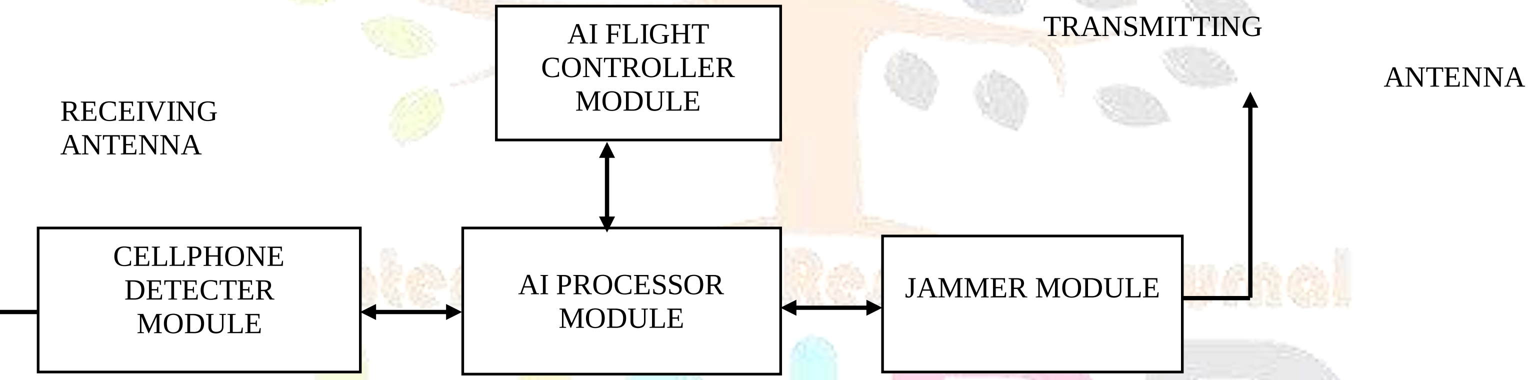


FIG 1.3 BLOCK DIAGRAM OF THE MODEL

1.4 AI FLIGHT CONTROLLER MODULE

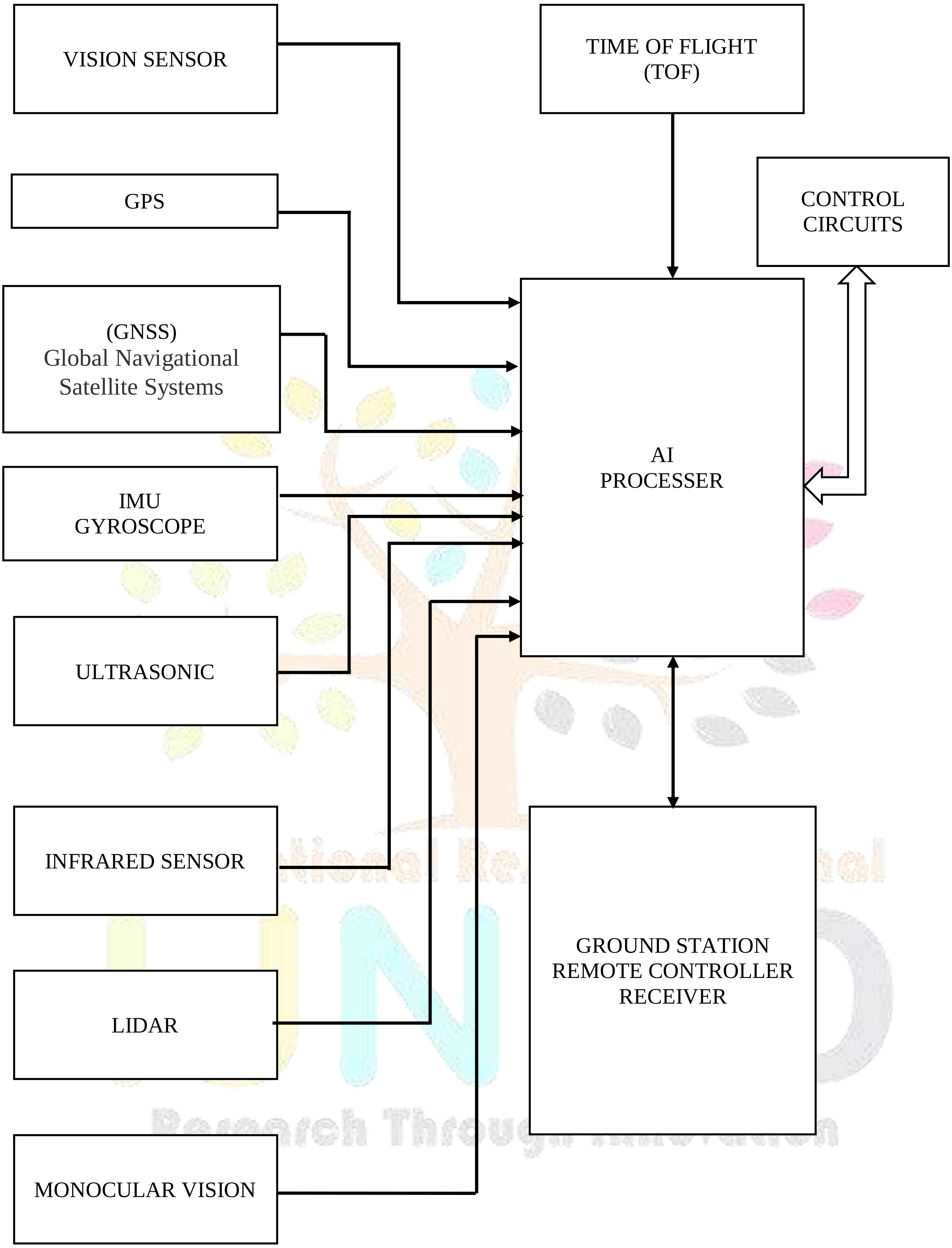


FIG 1.4 AI FLIGHT CONTROLLER MODULE

1.4.1 Gyroscope Stabilization, IMU And Flight Controllers

Gyro stabilization technology gives the UAV drone its smooth flight capabilities. The gyroscope works almost instantly to the forces moving against the drone, keeping it flying or hovering very smoothly. The gyroscope provides essential navigational information to the central flight controller.

The inertial measurement unit (IMU) works by detecting the current rate of acceleration using one or more accelerometers. The IMU detects changes in rotational attributes like pitch, roll and yaw using one or more gyroscopes. Some IMU includes a magnetometer to assist with calibration against orientation drift.

The Gyroscope is a component of the IMU and the IMU is an essential component of the drones flight controller. The flight controller is the central brain of the drone.

1.4.2 Radar Positioning & Return Home

The latest drones have dual Global Navigational Satellite Systems (GNSS) such as GPS and GLONASS.

Drones can fly in both GNSS and non-satellite modes. For example, DJI drones can fly in P-Mode (GPS & GLONASS) or ATTI mode, which doesn't use GPS. Highly accurate drone navigation is very important when flying, especially in drone applications such as creating 3D maps, surveying landscape and SAR (Search & Rescue) missions.

When the drone is first switched on, it searches and detects GNSS satellites. High-end GNSS systems use Satellite Constellation technology. A satellite constellation is a group of satellites working together giving coordinated coverage and are synchronized so that they overlap well in coverage. Pass or coverage is the period in which a satellite is visible above the local horizon.

UAV Drone GNSS On Ground Station Remote Controller. The radar technology will signal the following on the remote controller display;

- The signal that is enough drone GNSS satellites have been detected and the drone is ready to fly
- Display the current position and location of the drone in relation to the pilot
- Record the home point for 'Return To Home' safety feature

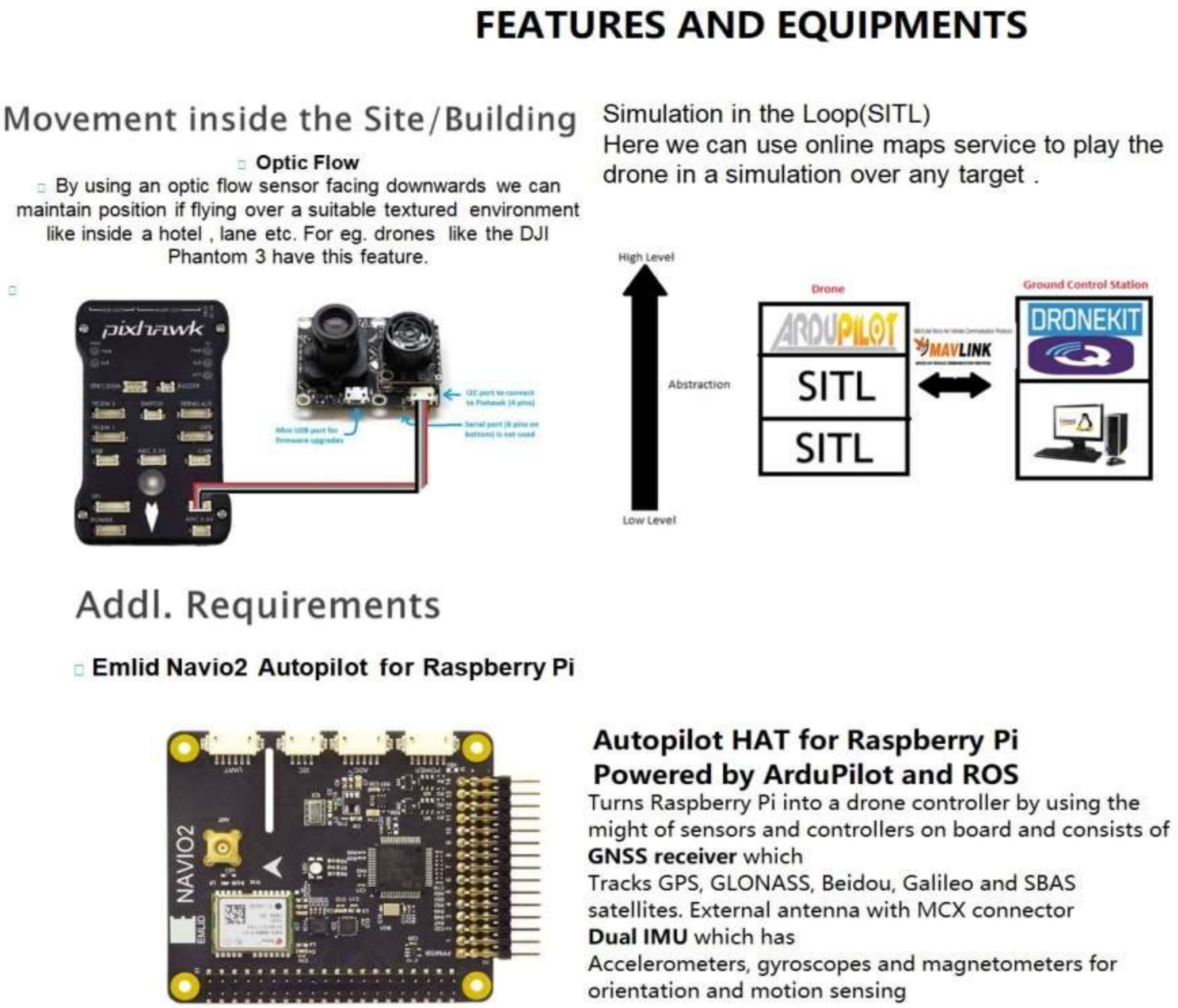


FIG 1.4.2 AI Powered control system

1.4.3 Return to Home drone technology

Most of the latest UAVs have 3 types of Return to Home drone technology as follows;

- The pilot initiated a return to home by pressing a button on Remote Controller or in an app
- A low battery level, where the UAV will fly automatically back to the home point
- Loss of contact between the UAV and Remote Controller, with the UAV flying back automatically to its home point

The latest high tech drones are now equipped with collision avoidance systems. These use obstacle detection sensors to scan the surroundings, while software algorithms and SLAM technology produce the images into 3D maps allowing the drone to sense and avoid. These systems fuse one or more of the following sensors to sense and avoid;

- Vision Sensor
- Ultrasonic
- Infrared
- Lidar
- Time of Flight (ToF)
- Monocular Vision

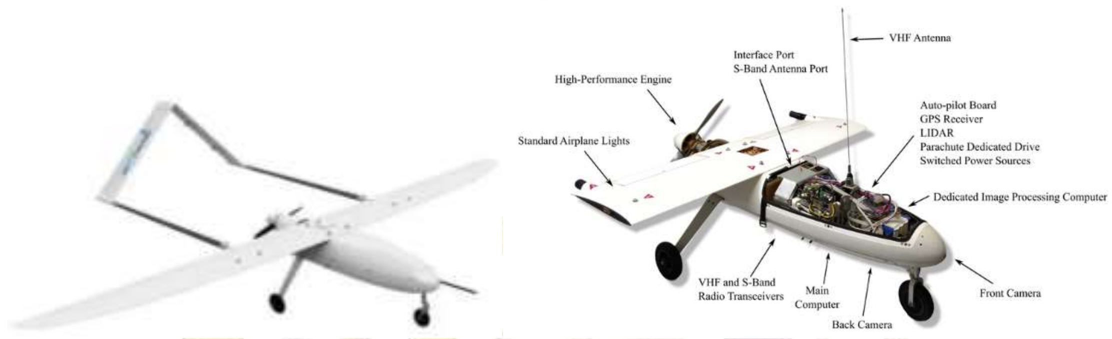


FIG 1.4.3 Return to Home drone technology

1.5 DESIGN OF UAV AERIAL MODEL

This is a design of a UAV which allows us to manipulate its mission profile dynamically while in the air. It has two flying modes that can be set according to mission requirements.

- Mode 1: Long-range mode
- Mode 2: High-speed mode

These two modes are achieved by changing the wing sweep.

1.5.1 Working: Mission profile for this UAV can be varied according to the mission requirement. Mode 1 is used for long-range mission profiles and Mode 2 is used for short but high-speed mission profiles.

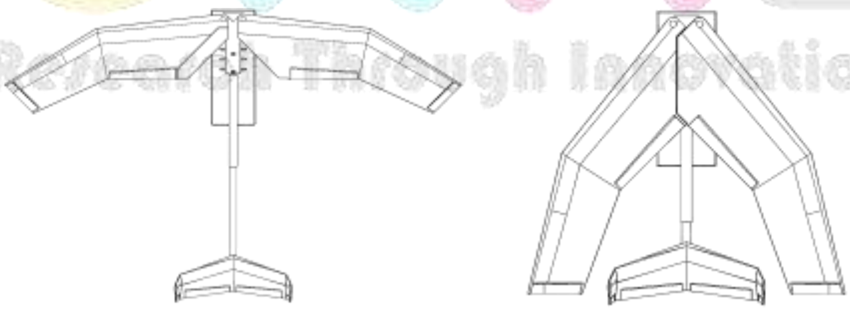


FIG 1.5 working mode

1.5.1.1Mode 1:

This mode has a higher aspect ratio and thus helps to increase lift generation. The main purpose of this mode is to increase the wing surface area to generate more lift. The UAV functions more like a glider while in this mode. It helps to get higher values of glide ratio.

Say, if 20:1 is the glide ratio of an aircraft, it means that it can glide up to 20 km while at a distance of 1 km above the ground before eventually touching down. Using this principle, it can drastically increase the range, keeping the power requirements low.

1.5.1.2 Mode 2:

This mode has a higher sweep angle and thus helps to decrease drag generation. The sweep angle helps the UAV to travel at higher speeds without worrying too much about turbulence when speed abruptly changes. [10] Stability is another crucial role played by the swept-back wings. In an aircraft wings, there is a low pressure area on top of the wings than on the bottom. Meaning, the airspeed on top of the wing is slower and thus helps to generate the lift. But as the velocity of aircraft starts to increase, the airflow on top of the wing increases abruptly which leads to vibration of the body. In case of swept-back wings, it creates an imaginary increase in the wingspan. Thus, the air is under an illusion that the velocity of the aircraft is less than its actual velocity. This results in fewer vibrations, thereby increasing the lateral stability.

1.5.2 Parameters:

Designed as a high performance unmanned aircraft is capable of up to 26.5 hour endurance with the 4 kg payload. With a small footprint of 3.3 meter wingspan, it can handle up to 11.5 kg of combined fuel and payload weight. Modular composite structure, fast assembly, large access hatches, removable payload bay, are the key features of this innovative design.

Available as an airframe ready for the autopilot and payload integration.

1.5.2.1 Initial Sizing:

The initial sizing/weight of the UAV is 23.29 kg

1.	Endurance	20 hrs
2.	Range	100 km / 60 miles
3.	Payload	approx. 10 kg
4.	Ceiling	4500m/15 000 ft

Table I. Initial Sizing

1.5.2.2 Specifications:

Parameter	Value
MTOW	21.5 kg
Empty Weight (excl fuel and payload)[1]	10 kg
Wing Span	3.3 m
Length	2.27 m
Wing Area	0.79 m^2
Powerplant	2.5 hp
Max Payload	10 kg
Takeoff method	Catapult, Runway or car top launch
Environmental protection	Sealed against rain, snow

Table II.

1.5.2.3 Performance:

Parameter	Value
Endurance[2]	20+ hours
Cruise Speed	22 m/s
Stall Speed (with high lift system)[3]	13 m/s
Max Level Speed	36 m/s
Takeoff run[4]	30 m
CL max (45° flap deflection)	1.7
CL max (clean wing)	1.3

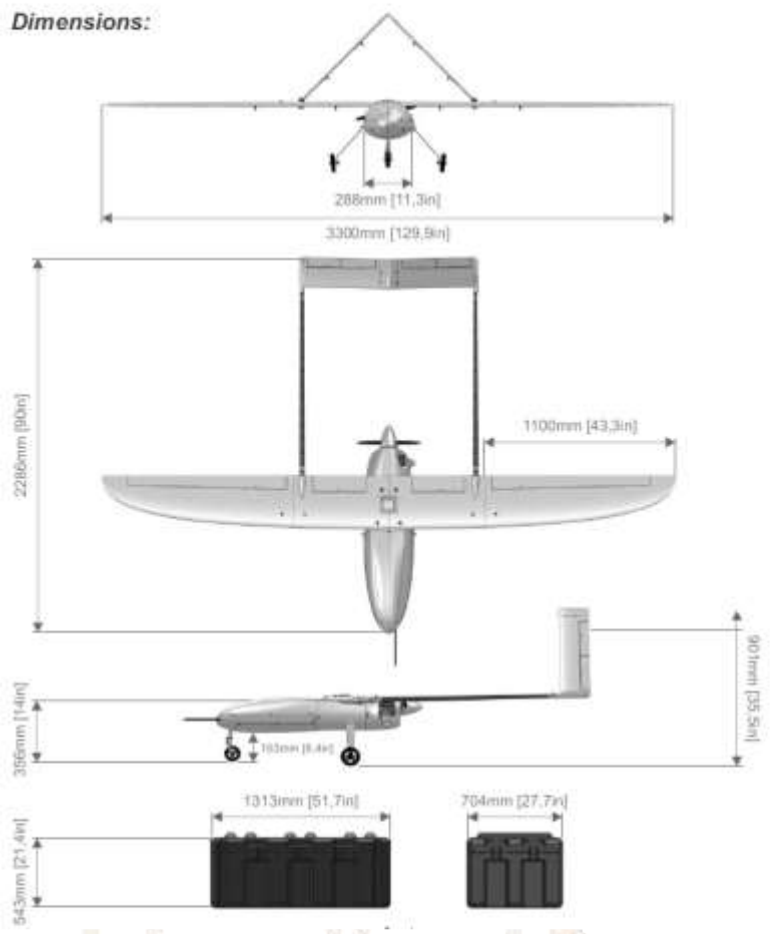
Table III.

1.5.3 Requirements:

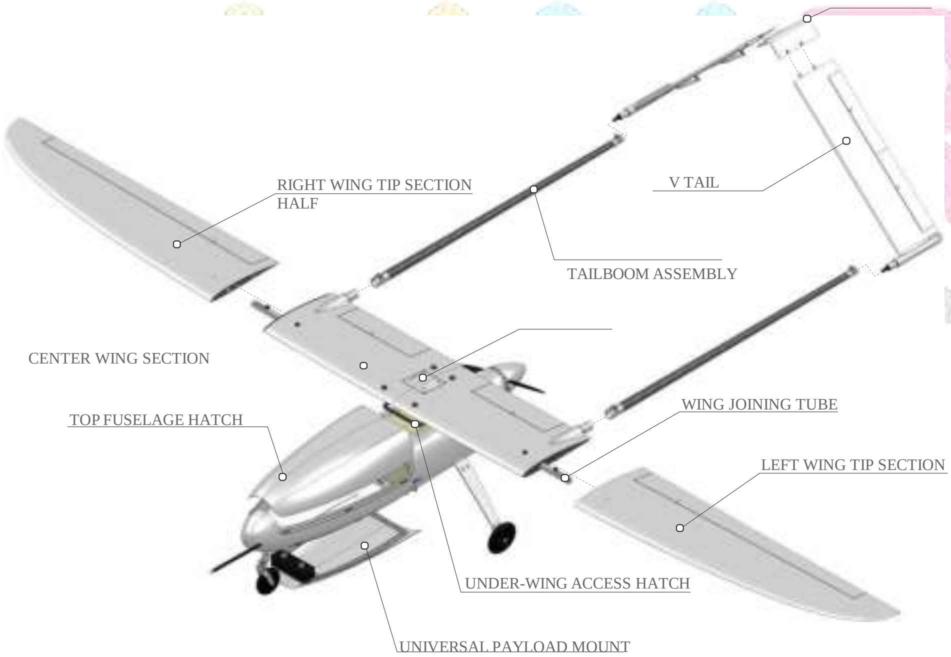
1. Configure UAV
    - Select your engine type and onboard generator
    - Select takeoff method
    - Select landing gear type
    - Select fuel tank volume and fuel level sensors
    - Select Pitot type
    - Select transportation packaging type
    - Add additional accessories, spare parts and options
2. Getting autonomous
    - Integrate the autopilot and data-link system of your choice
    - Install payload of your choice

3. Start performing your mission

1.5.3.1 Dimensions:

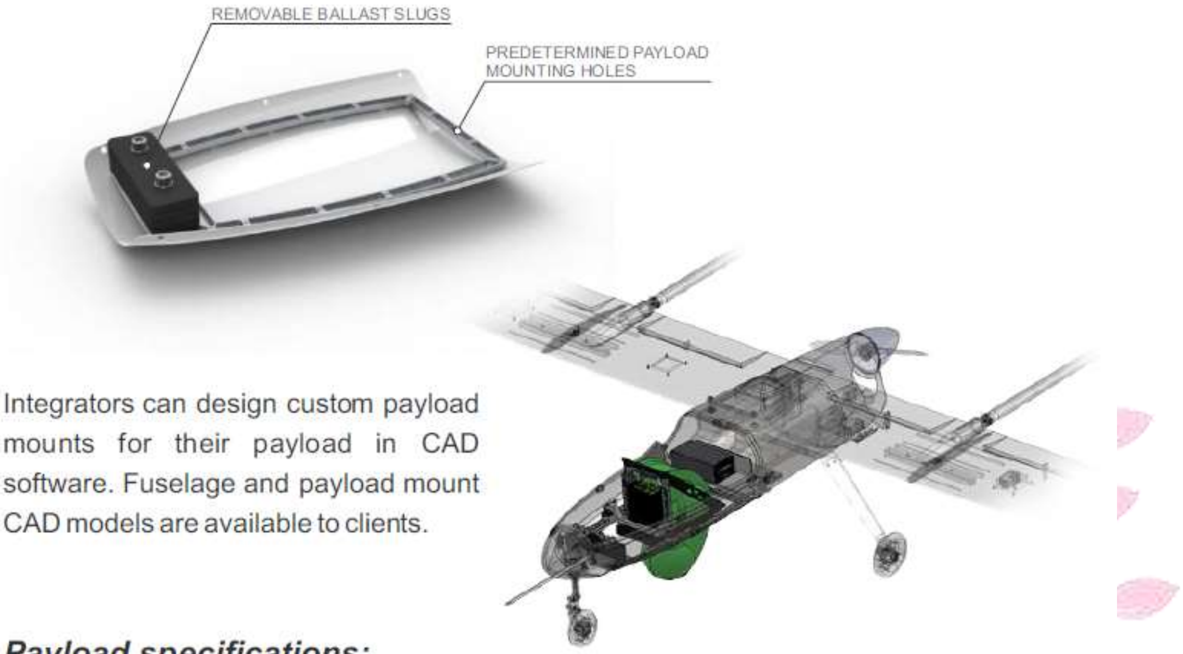


1.5.3.2 Modular design:



1.5.3.3 Universal Payload Mount:

The universal payload mount has predetermined mounting points that are precisely machined in aluminum frame as well as removable ballast slugs that will simplify the payload integration process considerably.



Payload specifications:

Parameter	Value
Fuselage volume available for payload	20 liters
Maximum payload weight	10 kg

1.5.4 Components selections:

DC brushless Motors

The motors spin the propellers to provide the drone with lifting thrust. drone almost use brushless DC motors, as they provide thrust-to-weight ratios superior to brushed DC motors. Motors are typically given two ratings: Kv ratings and current ratings. The Kv rating indicates how fast the motor will spin (RPM) for 1V of applied voltage. The current rating indicates the max current that the motor may safely draw. So, for our project we select Brushless DC motor of type (MT 2204-2300 Kv). Also, there are two type of brushless motor in-runner as show in Fig(3.1.1) and out-runner as show in Fig (3.1.2) and everyone has some specifics, the In-runner brushless dc motor have low torque and high speed ,but out-runner have high torque and low in speed , so we need high torque and the speed is not necessary so we will use out-runner brushless motor.

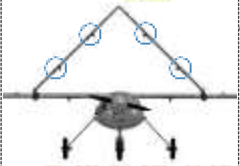

Launch Systems

	**Portable Pneumatic Catapult.** Takeoff from unprepared area in broad wind conditions. Powerful and reliable pneumatic launcher with advanced safety features. Training available at company's facilities as well as at client's facilities.
	**Car Top Launcher.** Takeoff from car. Simple, small and low-cost solution for reliable automatic takeoff from unprepared area. Integrated and safe engine starter.

Landing Gear Upgrade

	**Heavy Duty Landing Gear.** Land on unprepared fields. High shock absorbing capacity, large inflatable wheels.

Various Accessories and Upgrades:

	**4-servo V tail upgrade.** Each tail plane control surface is split in two equal sides, each having own servo - total of 4 servos for the tailplane. This option increases reliability of the system in case of a tailplane servo failure.
	**Pitot-Static tube.** Combined Pitot-Static tube provides both dynamic and static pressure measurements in a single package. Can be mounted and removed using two screws for simple UAV transportation.
	**Heated Pitot-Static tube.** Heated Pitot-Static tube for operationsat low temperatures. Low-power design with smart fault detectionsignal output. Swappable with standard Pitot-Static tube.
	**Push-pull connectors for wing.** Preinstalled Fischer 102 Seriespush-pull industrial connectors between the center and the tip wingsections.
	**Rugged Transportation Case.** Rugged and watertight transportation case for maximum protection of the Penguin B UAV. Supplied with additional internal case for small components, sparebolts, screwdrivers and tools.

Autopilot Configuration files:

	**Cloud Cap Technology Piccolo Autopilot configuration File. Available at no cost.** Validated for autonomous flight, autonomous catapult takeoff and autonomous runway landing using laser altimeter.
	**Procerus Technologies Kestrel Autopilot configuration file.** Validated for autonomous flight, autonomous catapult takeoff and autonomous runway landing.

Ground Control Station:

	**Portable Ground Control Station.** Universal portable ground control station for Penguin B and other UAVs. Dual display functionality, advanced safety features and hot-swappable lithiumbattery cartridges. User-configurable for any autopilot system. Data-links, software and Panasonic Toughbook need to be purchased separately. See separate datasheet for details.

Engine Options

	3W 28 CS engine upgrade. Upgrade to a more powerful 3W 28 CS engine. Shorter takeoff run from runway, ability to takeoff form unprepared runway, improved climb rate.

Fuel System

	**7500 cc fuel tank.** Large glass fiber fuel tank for maximumendurance. With carbureted engines, 12-15 hours endurance canbe achieved. With EFI engine 20+ hours can be achieved.

General equation

WGL = WE+ WF+ WPL+ WCrew

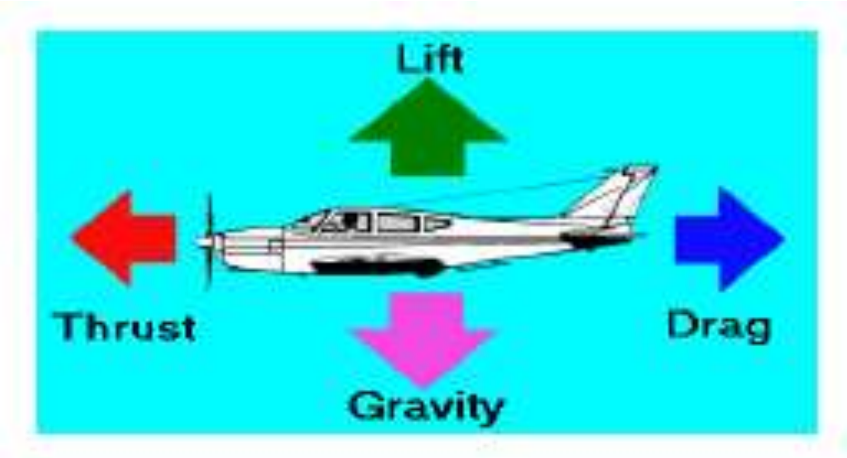
- WGL = Ground launch.
- WE = Empty weight.
- WF = Fuel weight.
- WPL = Payload weight.
- WCrew = Crew weight.

By apply this equation we get:

In drone the Fuel weight and Crew weight will equal zero. so,

WGL = WE + WPL

The main forces act on a drone body shown in figure

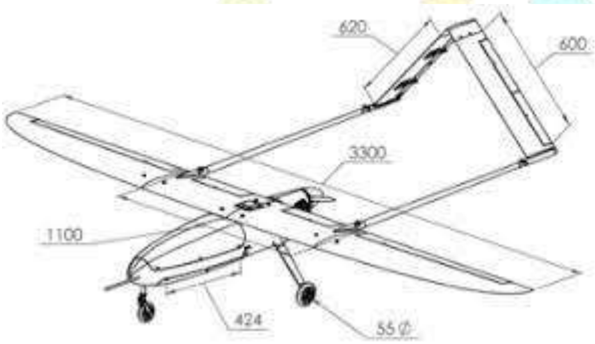


• Lift force: The force generated by the propeller of the plane and its vertical direction to the surface of the propeller of the plane.

• Gravity force: The force of gravity resulting from the mass of the plane and its direction to the center of the earth.

• Thrust force: It is the power generated by the brushless DC motors that push and move the plane.

• Drag force: Is an impedance force for the movement of the plane and is reversible the thrust force.



So,

From that we can find the We and it will equal:

From datasheets we will collect the weight for every component

1- Wight of battery = 207gm

2- Wight of DC motors =100gm

3- Wight of ESCs =100gm

4- From Fig (3.2.2) weight of frame= 300 gm.

So, We = 707 gm

To find WPL:

1- Wight of video link = 22g

2- Wight of camera = 8 g

WPL = 30 gm

So, the WGL will equal:

WGL=737gm.

4.2 – Estimation of brushless DC motor

WGL = 737gm

The total thrust =1474 gm

Thrust for each motor = Total thrust / Number of motors

= 368.5 gm

In our motor the maximum thrust = 450 gm, So we are in the safe side.

4.3- Estimation of the battery

Battery = current * Flight time

Assume Flight time = 8 min

Note that: 1S =1 Cell =3.7 volt

3S = 11.1 volt

Power total = I V

I = 11.5 Ampere

So, Battery that need =

6130 mA

So, actual flight time will equal

2.8 min.

Frame Design

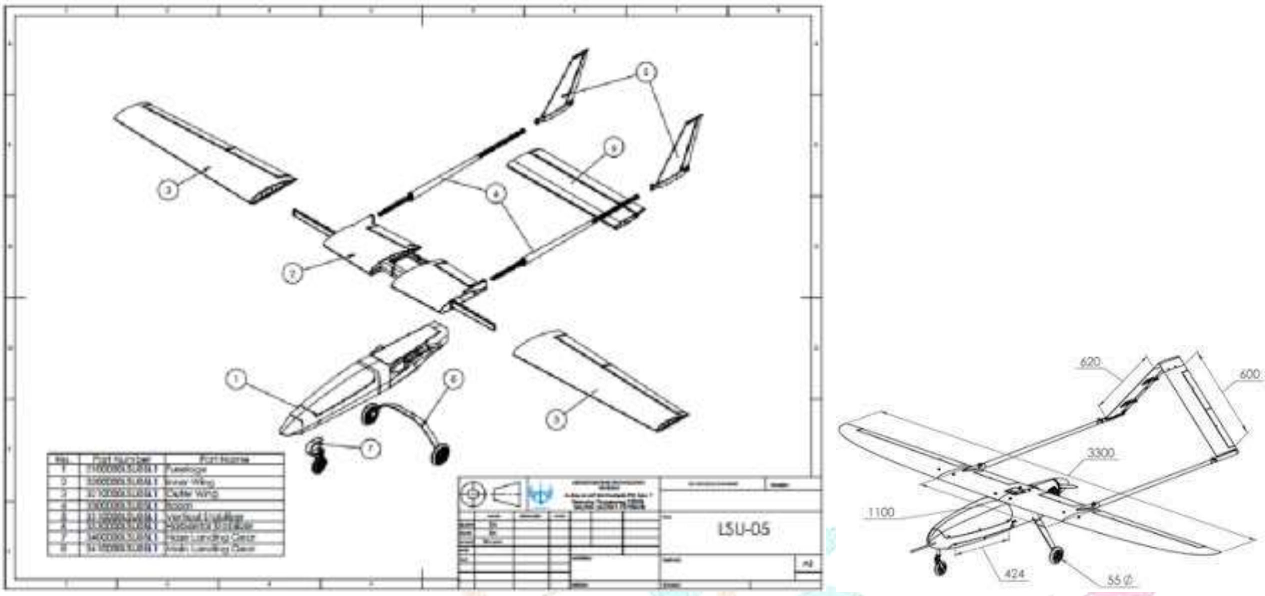
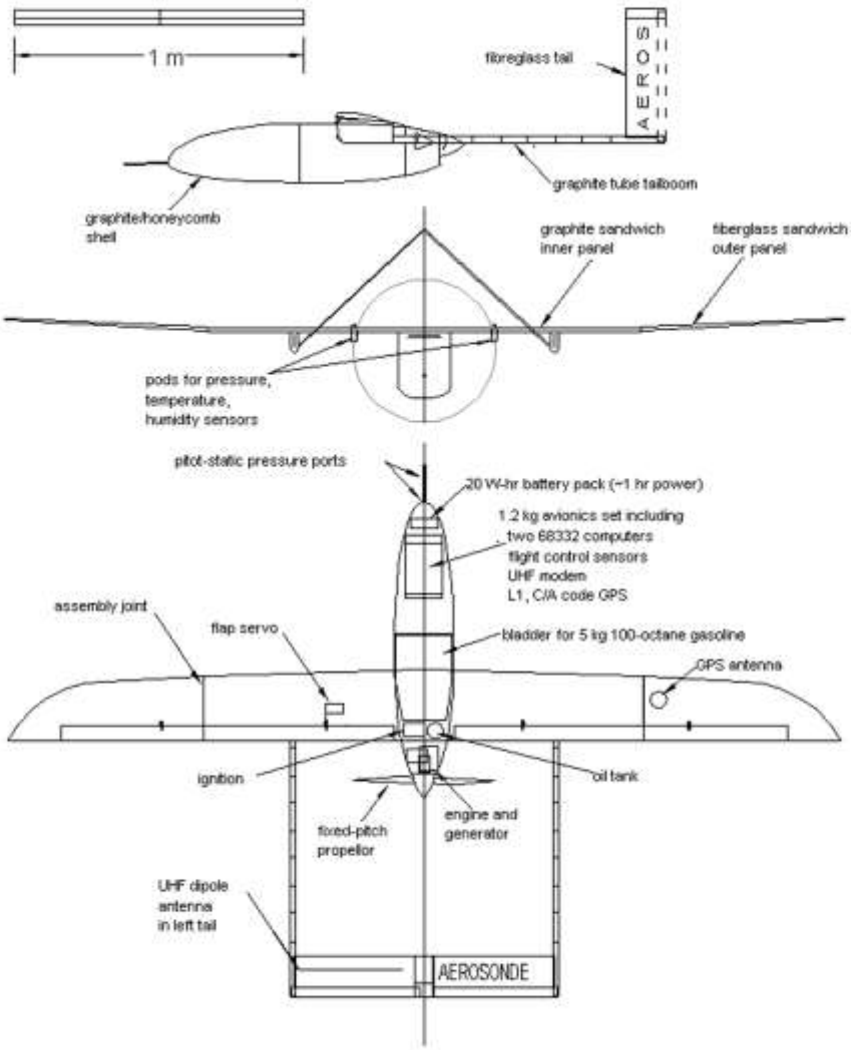
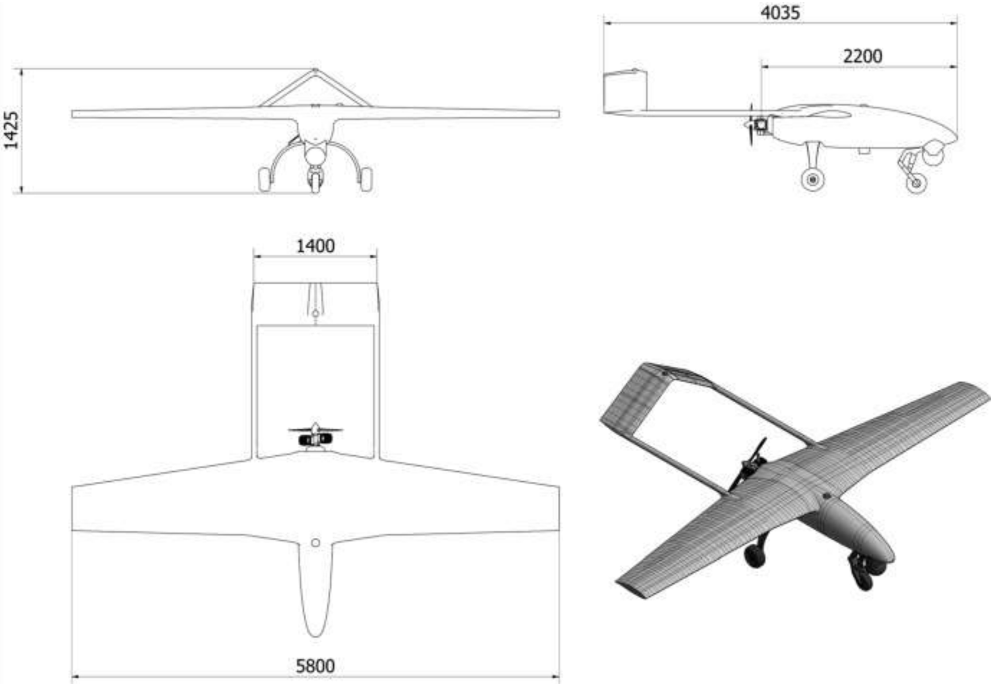
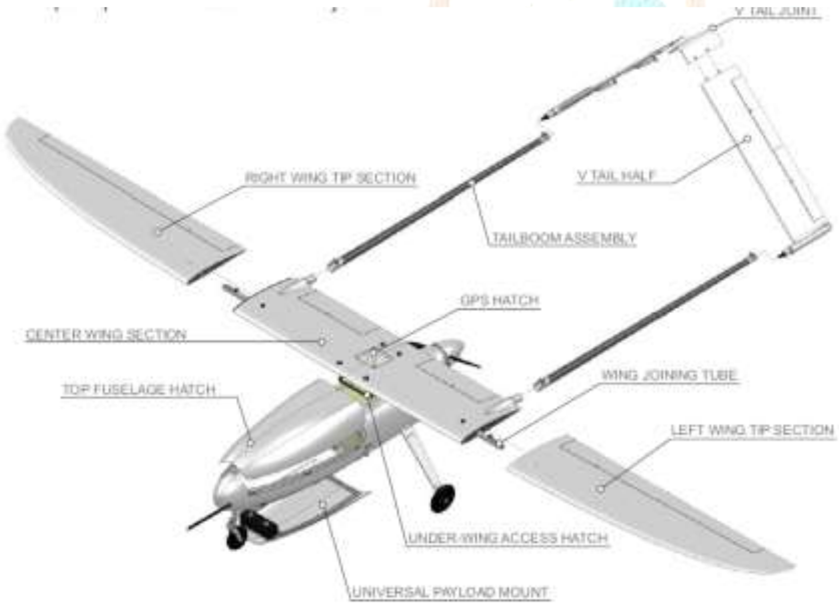


FIG 1.5.4 Frame Design







The difficulty lies in choosing the suitable material for the manufacture of the drone, since it is necessary to get a material that has a degree of strength and hardness to bear the impact of motors in addition to the weights that will be on the Drone such as the camera, battery and other things and also must be used Weight to be able to take off without any problems.

We can divide frame in two partitions the first is select the material and the second is to select the dimensions which mean we should use an angel 90 between of the two axis's because it will make the drone more balance. And about the length of drone the suitable option is make it small to get more stable.

The most common frame of drone manufacturing used from aluminum, carbon fiber or balsa wood and we select PLA material for print by using 3D printing.

After the use of PLA material we encountered a problem which is that the body was not solid enough so we decided to use part of acrylic to make the body of drone more stable and more hardness as shown in figure (1) the sketch diminution and figure(2) shows the front view of the acrylic part . Size of drone depending on the main function that the drone will doing so it will be 24cm width , 25 cm for length and 10 cm for height as show in figure (3) and it is a suitable solution because the length of every propeller 8 in and with this area the propeller will not touch each other .

To avoid any wrong uses from user during these two functions

1. Takeoff

2. Landing we decide to addition two parts made from acrylic they will be like supports as shown in figure (4) with all dimensions and figure (5) shows the front view of the part.

In our Drone CATIA V5 software has been used to design .

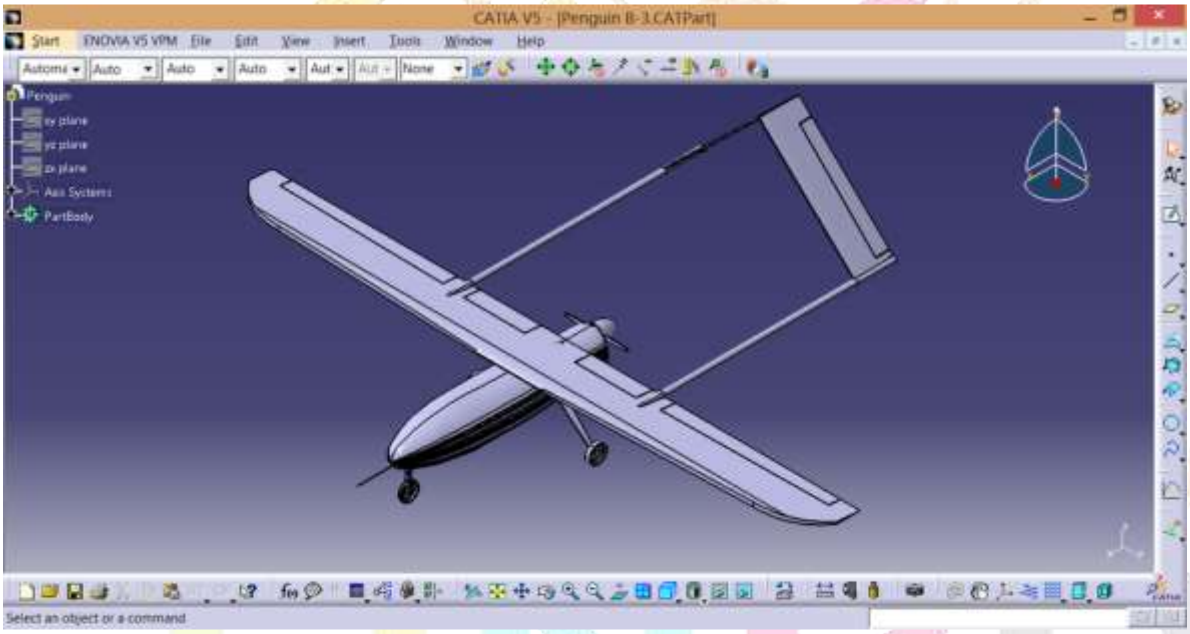


Fig (1)

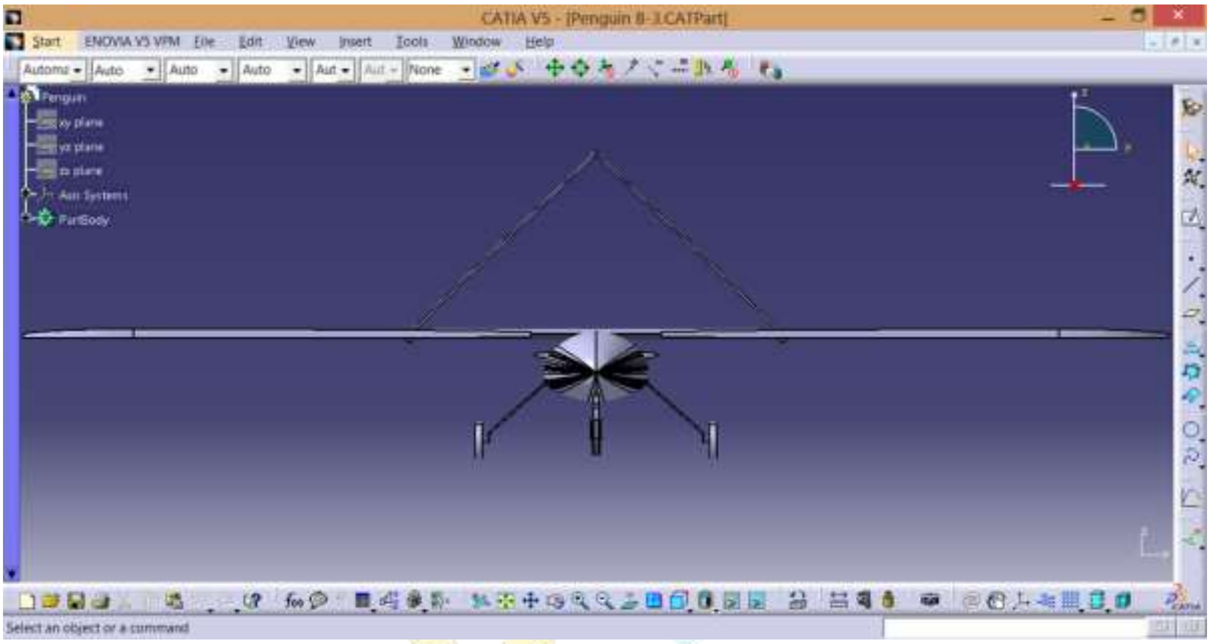

CATIA V5 - [Penguin 8-3.CATPart]
Start
ENOVIA V5 VPM
File
Edit
View
Insert
Tools
Window
Help
Penguin
xy plane
yz plane
zx plane
Axis Systems
PartBody
Select an object or a command

fig (2)

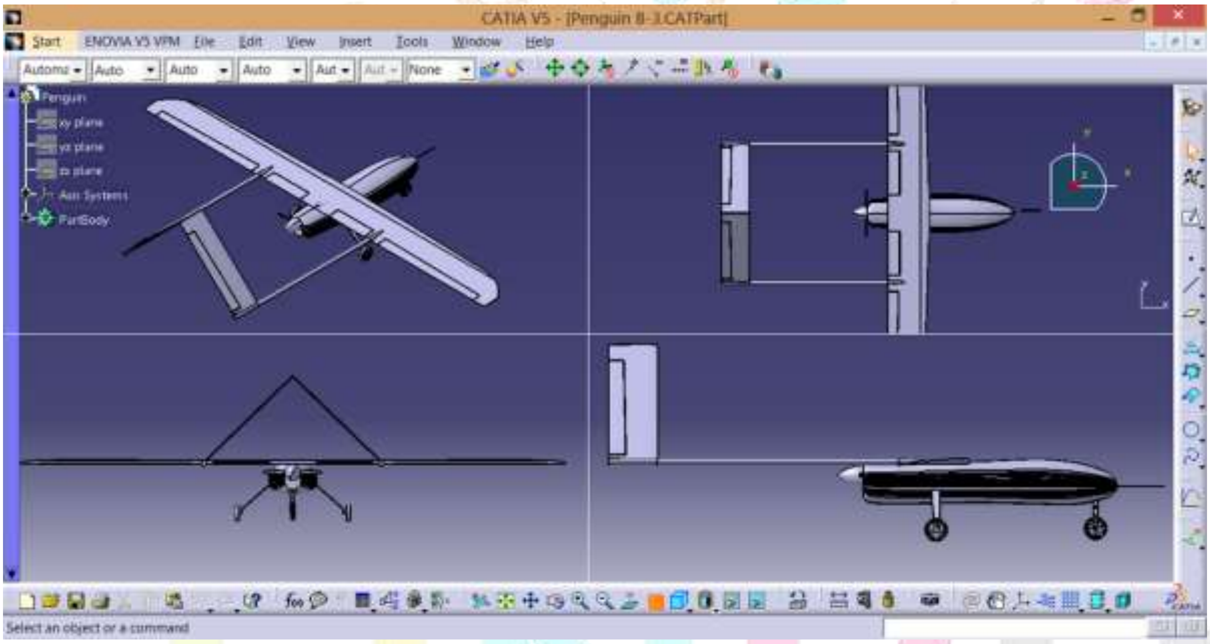

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fig (3)

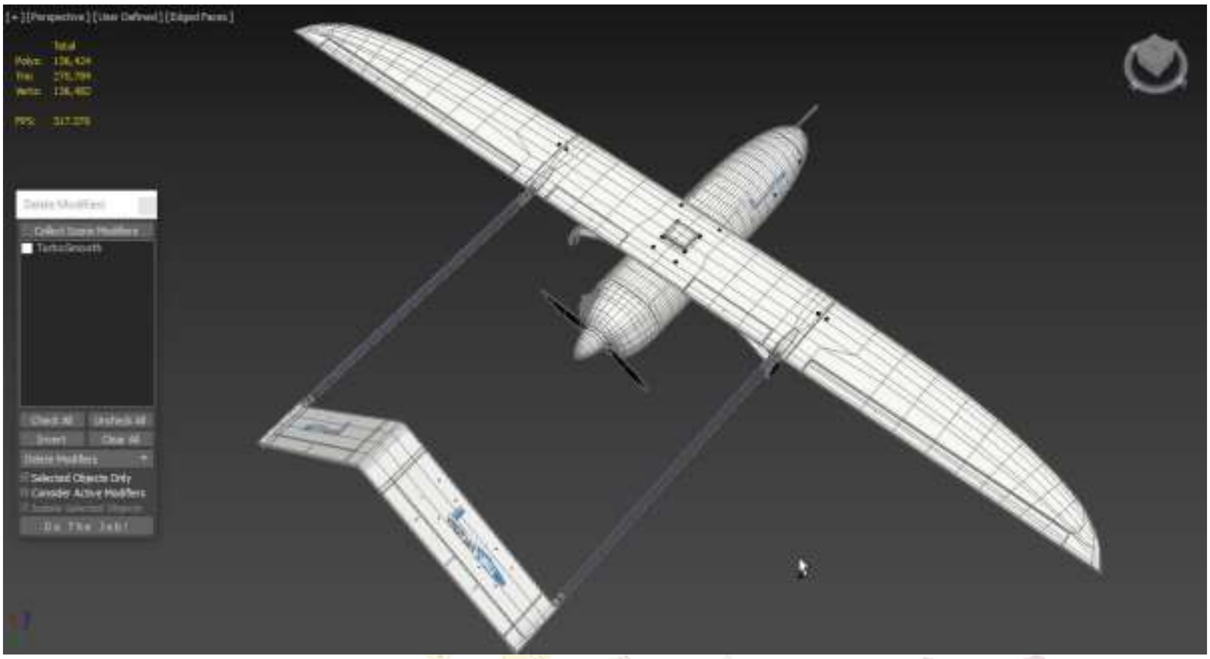


fig (4)

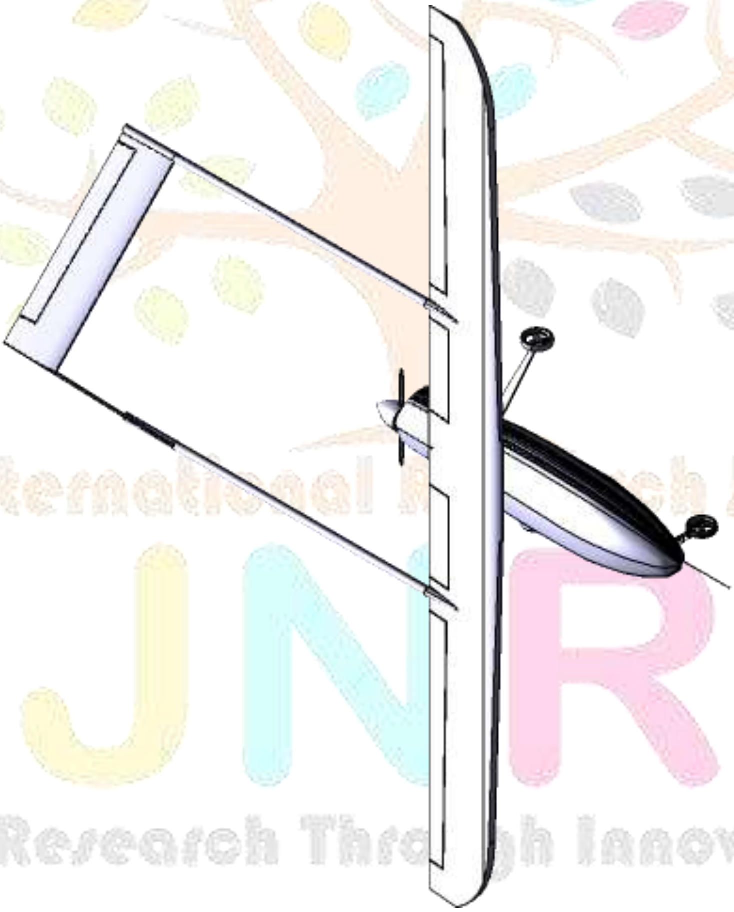
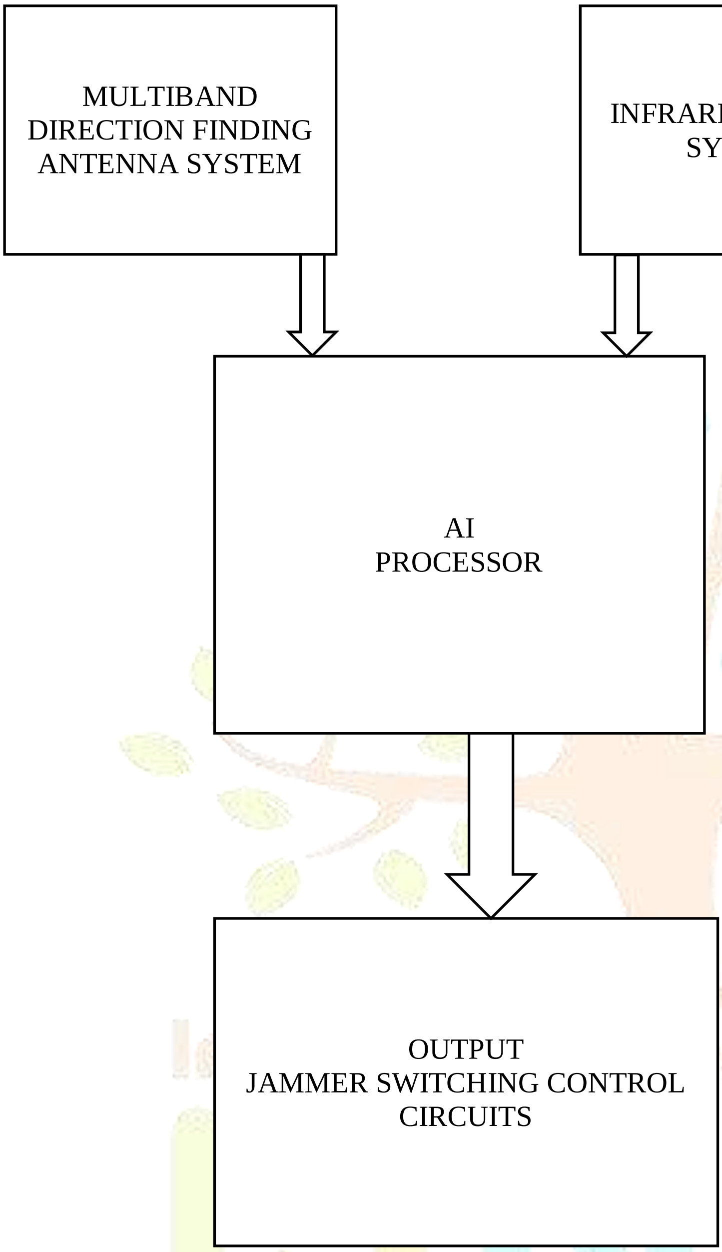


fig (5)

1.6 MOBILE JAMMER MODULE



- The Module will be having a high speed scanning receiver which utilizes a multi-band DF (Direction Finding) antenna system allowing security personnel to locate nearby cell phones in standby mode or during active voice, text or data RF transmissions.

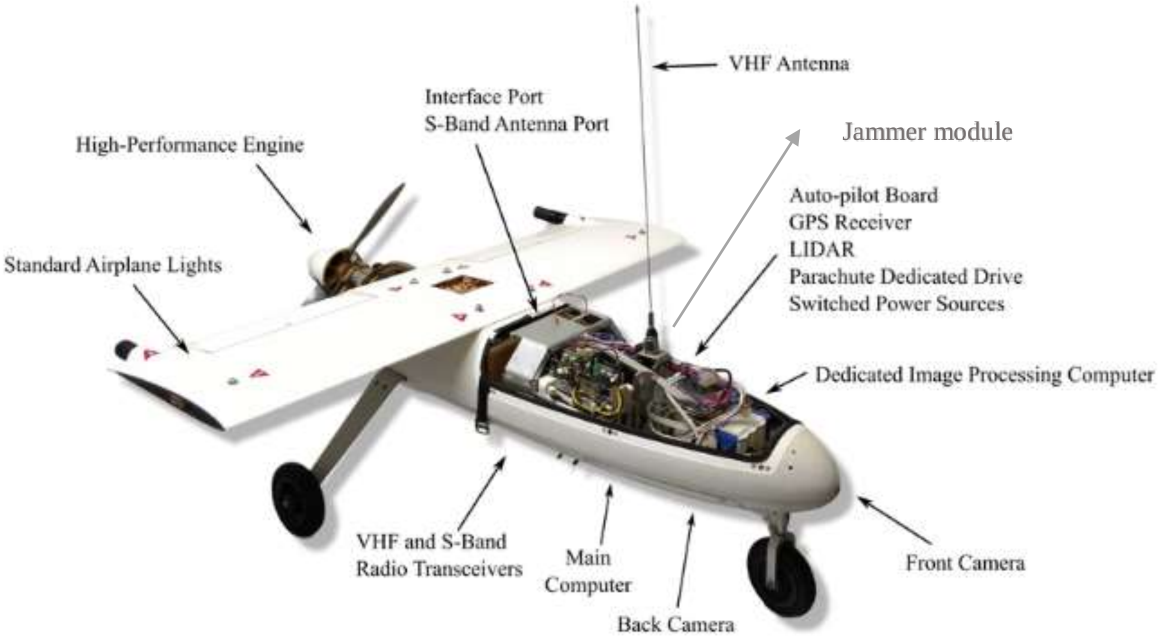
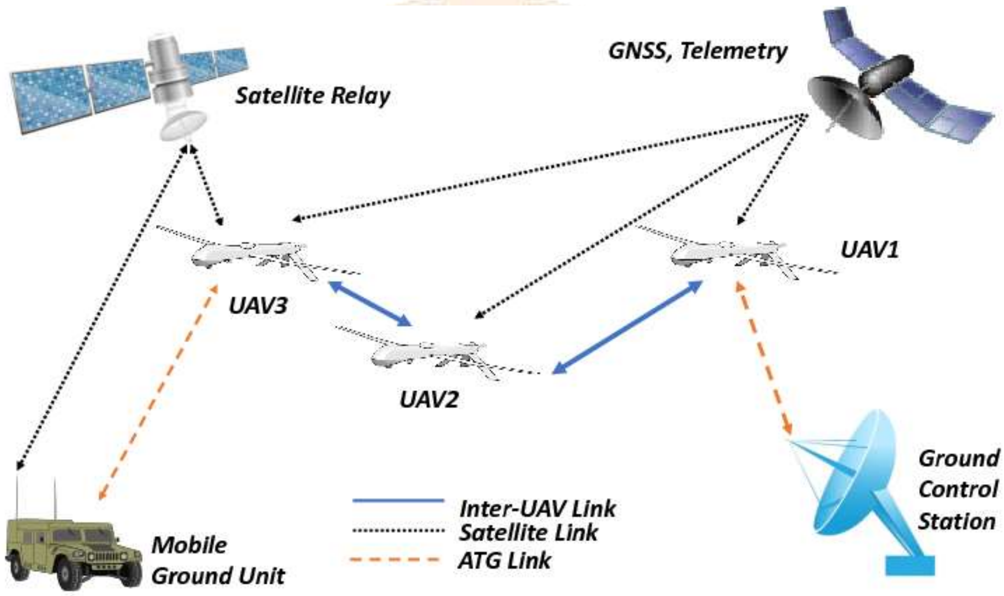
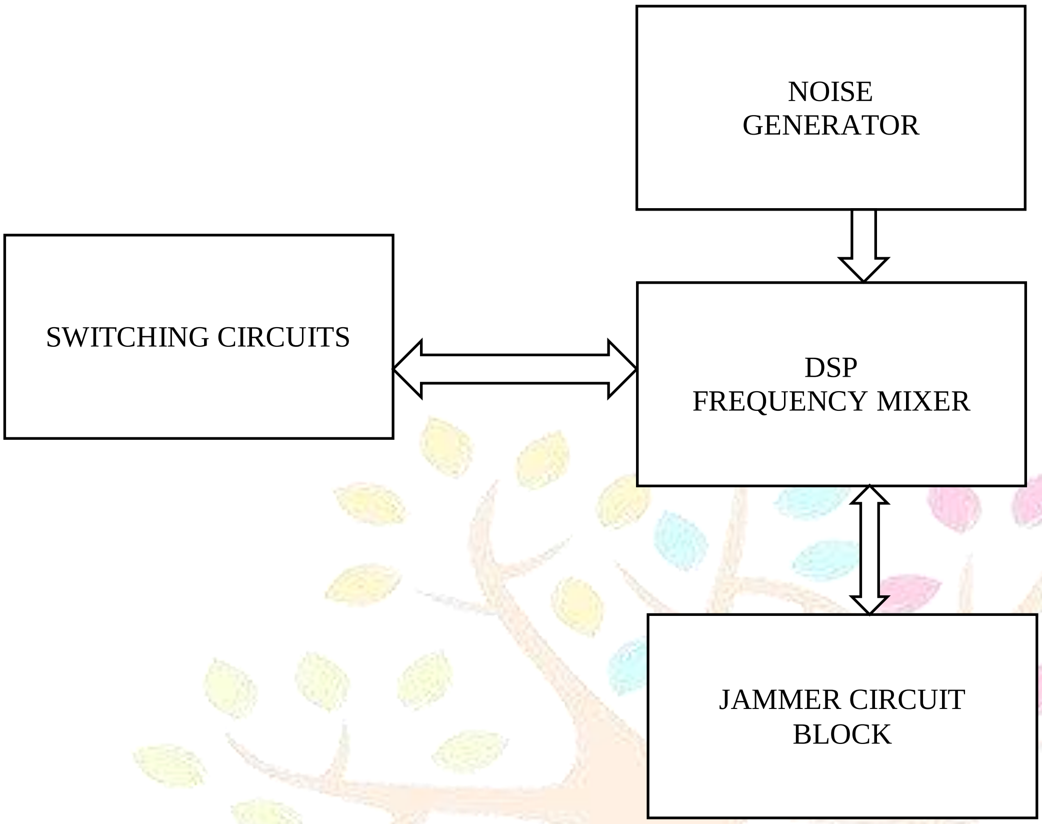


Fig 1.6 MOBILE JAMMER MODULE

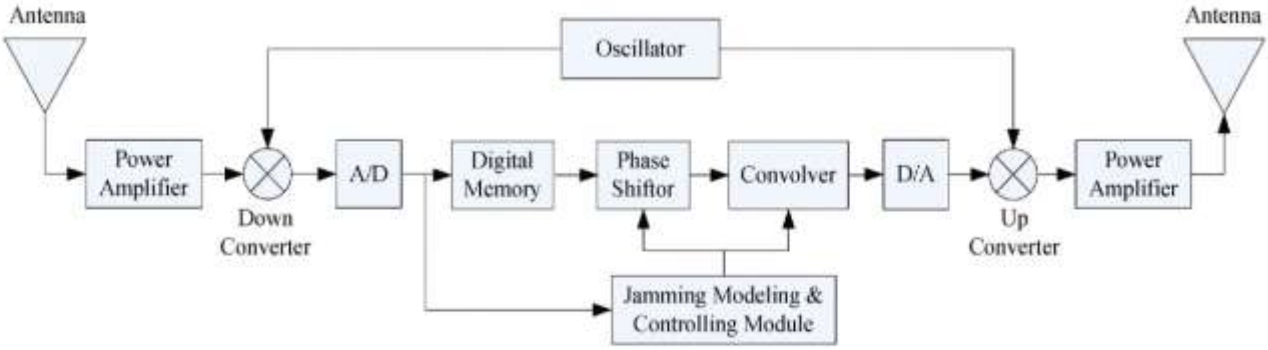
- The Module will detect each cellphone by RF frequency allowing for detection and identification of multiple cellphones.
- The switching of the jammer will be done by using an IR Sensor beneath the drone which will turn it on as soon as the drone lands on a site.
- The flight controller would be having proper number of channels so as to input the jammer device with the appropriate port.



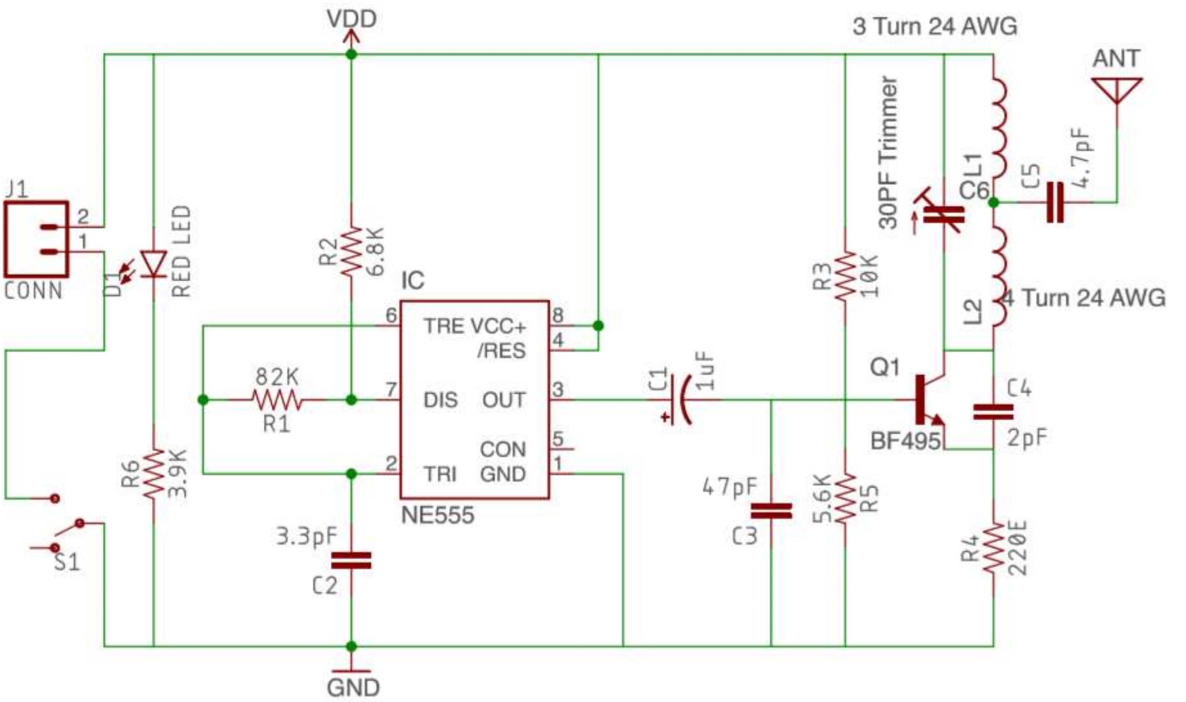
1.7 JAMMER MODULE

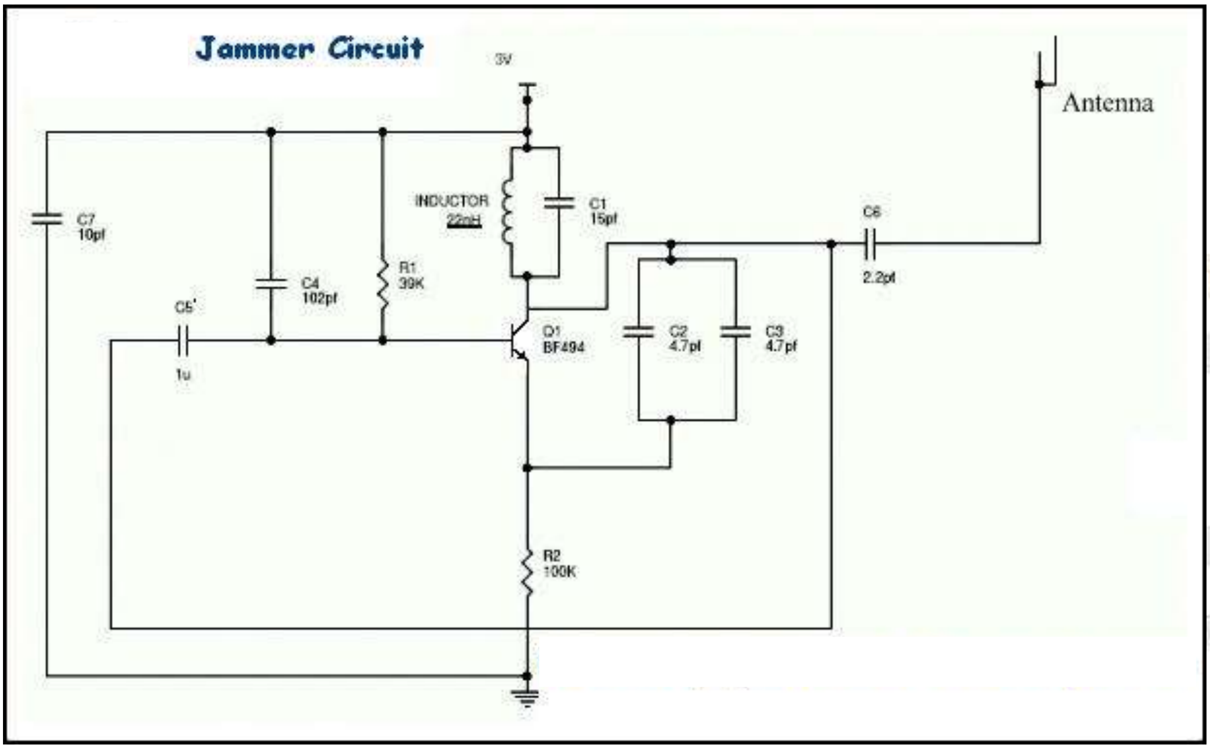


1.7.1 JAMMER CIRCUIT BLOCK



1.7.2 JAMMER CIRCUIT SCHEMATIC DIAGRAM





For any jammer circuit, it's essential to have three important sub circuits.

- RF amplifier
- Voltage Controlled Oscillator
- Tuning circuit

1.7.3 Cell Phone Signal Jammer Working

- RF amplifier circuit comprises transistor Q1, capacitors C4, C5, and resistor R1. This RF circuit amplifies the signal generated by the tuned circuit. The amplified signal is given to the antenna through capacitor C6. It blocks DC and allows only the AC component of the signal to be transmitted.
- When transistor Q1 is turned ON, the tuned circuit at the collector turns ON. The tuned circuit consists of capacitor C1 and inductor L1. This acts as an oscillator with zero resistance. It produces very high frequency with minimum damping.
- When the circuit is ON, voltage is stored in the capacitor. Once the capacitor is completely charged, it allows charge to flow through the inductor. When current flows through the inductor, it stores magnetic energy corresponding to the voltage across the capacitor. At a certain point, the inductor reaches its maximum and the charge or voltage across the capacitor turns to zero.
- Now the magnetic charge through the inductor decreases and the current charges the capacitor in opposite or reverse polarity. The process repeats and after a while, the inductor charges the capacitor and becomes zero.
- This process runs till internal resistance is generated and the oscillations stop. RF amplifier feed is given through capacitor C5 to the collector terminal before C6. The capacitors C2 and C3 generate pulses in a random fashion (noise) at the frequency generated by the tuned circuit.
- The RF amplifier boosts the frequency generated by the tuned circuit. The frequency generated by the tuned circuit and the noise signal generated by the capacitors C2 and C3 is combined, amplified, and transmitted.

1.7.4 Mobile Frequency Jamming Calculation

Mobile phones operate at different frequency bands in different countries. For Canada, the 1900 MHz band is the primary band, particularly for urban areas. 850 MHz is used as a backup in rural areas. The USA uses 850 and 1900 MHz bands, depending on the area. Europeans tend to use the GSM 900 and 1800 bands as standard. Middle East, Africa, Asia, and Oceania also use these frequency bands. In Russia and some other countries, local carriers have licenses for 450 MHz frequency to provide CDMA coverage.

The use of different frequencies makes it difficult to have a jammer for all frequencies. However, the below-mentioned formula can be used to calculate the required values.

F = 1/(2*pi*sqrt(L1*C1))

Depending on the frequencies you need to block, the values of the inductor (L1) and capacitor (C1) can be altered.

For example, if mobile phones in your area work at 450 MHz, you need to generate 450 MHz with some noise to act as the blocking signal.

Now the cell phone receiver will not be able to understand, which signal to receive. We have successfully blocked cell phone signals.

Here, 450MHz is the tuning frequency. Cell phone jammers for other frequency ranges are designed similarly. However, the signal range is very weak. Thus, this circuit works only for a range of 100 m.

1.8 CONCLUSION

The model will be trained using Machine Learning. By using an optic flow sensor facing downwards we can maintain position if flying over a suitable textured environment like combat zone, lane in situations of crisis .In 2008 terrorist attacks had happened in my country similar to the 9/11 Attacks when the terrorists were also communicating with their handlers abroad through their mobile phones which could not be stopped as jamming mobile signals would've affected our police forces and citizens as well. The future generations are projected to feature enhanced autonomy and improve safety standards. SATCOM can be the future communication link for UAVs. SATCOM is being used increasingly in surveys in the aftermath of any disaster.

Further this Drone Model can also be used during civil crisis situations and planned riot control and combat situation.

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