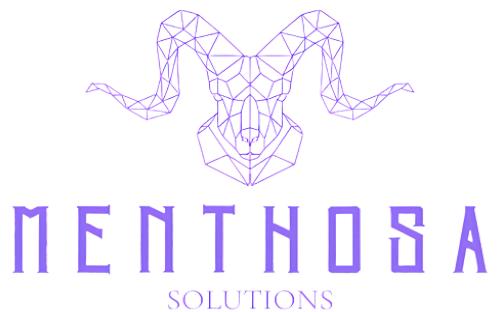
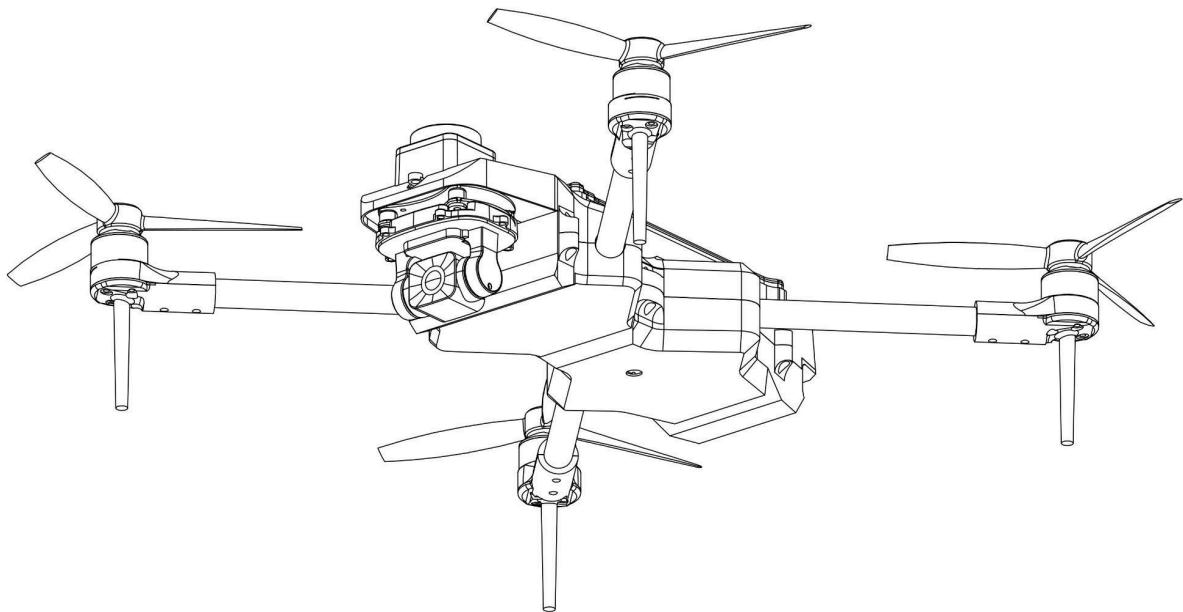


# Suparna Flight Manual

v1.1 May 14, 2024



 **Searching for Keywords**

Search for keywords such as “battery” and “install” to find a topic. Press Ctrl+F on Windows or Command+F on Mac to begin a search.

 **Printing this Document**

This document supports high resolution printing.

**Revision Notes**

<b>v1</b>	01-April-2024	Initial Version
<b>v1.1</b>	14-May-2024	Added Flight Modes and Updated General Flight Precautions

# Using this Manual

## Legend

 Warning

 Important

 Hints and Tips

 Reference

## Read Before the First Flight

Read the following documents before using the **Suparna**:

1. Disclaimer and Safety Guidelines
2. Quick Start Guide
3. User Manual

It is recommended to watch all tutorial videos on the official Menthosa website and read the disclaimer and safety guidelines before using for the first time. Prepare for your first flight by reviewing the quick start guide and refer to this user manual for more information

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 The operating temperature of this product is 0° to 40° C. It does not meet the standard operating temperature for military grade application (-55° to 125° C), which is required to endure greater environmental variability. Operate the product appropriately and only for applications that meet the operating temperature range requirements of that grade.

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# Flight Modes

This section will be about the various flight modes of the drone.

# Flight Modes

## Flight Modes

Drone features 6 unique flight modes. These flight modes decide how much of the control is done by the drone's autopilot/flight-controller.

1. **Loiter :** Loiter Mode automatically attempts to maintain the current location, heading and altitude. The pilot may fly the drone in Loiter mode as if it were in a more manual flight mode but when the sticks are released, the vehicle will slow to a stop and hold position. This is the default mode of drone and is most recommended for beginners.

**!** Drone requires a good estimate of its current position to hover at current location. Thus all pre-flight checks/precautions must be done/taken before flight.

2. **Guided :** This is an autonomous mode where pilot input is at its minimum limited to only yaw inputs. Drone is controlled via the Ground Control Station (GCS) by clicking on the map displayed in the GCS and giving waypoints to the drone to fly to. The drone will automatically face the waypoint.

 This mode is only available in outdoor environment.

3. **Auto :** In this mode the drone follows a set of pre-defined waypoints called a mission. Here the drone navigates between each waypoint in a straight line and as it approaches each waypoint follows a smooth curving path towards the next waypoint (S-Curve). No pilot input is required. The drone will automatically face the waypoint.

 This mode is only available in outdoor environment.

4. **Land :** As the name suggests this mode triggers the drone to go into landing sequence and the drone will start descending at a constant speed and automatically disarm the motors once landing is detected. This mode restricts the throttle inputs of the pilot but other inputs are allowed to maneuver the drone at time of landing.

**!** This mode is also a failsafe mode and whenever a failsafe is triggered this mode is unchangeable. In all other cases this mode is changeable.

5. **RTL/RTH :** Return to Launch/Home mode triggers the drone to return its launch/home/takeoff location. Drone will return to the location where it was armed. Therefore, the home position is always supposed to be your drone's actual GPS takeoff location, unobstructed and away from people. This mode restricts the throttle inputs of the pilot but other inputs are allowed to maneuver the drone at time of landing.

 This mode is only available in outdoor environment.

**!** This mode is also a failsafe mode and whenever a failsafe is triggered this mode is unchangeable. In all other cases this mode is changeable.

6. **Stabilize/Full Manual :** This is a full manual mode and can only be used by an experienced pilot who knows what they are doing. This mode is strictly prohibited for beginners. Drone's autopilot has minimal input in this mode and maximum inputs are from the pilot's command.

**!** This mode is given as a way to debug the drone's mechanical aspects (like - Center Of Gravity ) or to test custom flight control algorithms and is not recommended to be used in regular flight.

 When drone is flown in this mode it will show unexpected behavior . Obstacle avoidance is disabled and the drone will collide with any obstacle if no pilot intervention is done. **Please use this mode if you know what you are doing, as no warranty will be given for any collision done in this flight mode.**

 To minimize risk of collision in this mode, please fly drone in a clear and outdoor area.

# Pre Flight Checks

This section brief about basic preflight checks of the aircraft.

# Pre Flight Checks

## Battery Checks

Drone is powered by a 4 cell (4S) 4500mah Li-ion battery.

- It is recommended that the battery is fully charged up to 16.80 Volts, before each flight for optimal performance and charge only using the charger provided in the box.
- If battery is not fully charged then,
  -  If the voltage is below 11.5 Volts, the drone will not arm because of Battery Failsafe.
  -  If voltage is above maximum rating of 16.8 Volts, do not proceed any further, remove the battery and contact Mentosa Solutions as the battery may damaged.
  - In any other case the drone will be able to fly.

## Structure Checks

Drone has several moving parts which are held together by a rigid and lightweight carbon fiber chassis so before flight it is mandatory to see if any moving part is loose or not.

- **Motor mounts** - The BLDC motors placed on these mounts are fastened using 4 Nuts. There are 4 of these on each drone.
  - It is to be ensured that the motors are not loose and the nuts are fastened.
  - The mounts do not have any cracks on them which may cause structural integrity problems.
    -
- **Landing Gears** - Drone has 4 landing gears which give it a stable place to land, ground clearance to the payload and keeps it horizontally stable.
  - It is to be checked if there are cracks, chipping or any other kind of damage.
    -

- **Propellers** - Drone use the propellers to fly
  - Are properly fastened on the motors.
  - No chipping on the surface of the props.
  - Direction of the propellers is correct.
- **Payload** - The drone has a 1 axis gimbal camera as its primary payload and optionally a 500g secondary payload can be mounted under the drone. Make sure all the payloads are mounted properly.
- **Drone Cover** - The drone has a lightweight cover on its chassis which is fastened using 6 nuts. Make sure the cover is not damaged.

## Flight Area Checks

The drone is equipped with a 360 degree obstacle avoidance and has a tolerance of 2m. At 1.5m distance from the obstacle drone will try to move away from the obstacle.

Drone has GPS for outdoor operations, it has an accuracy of 2.5m.

There are 2 scenarios for this check -

- **Indoor** : Drone requires at least 4m x 4m clearance for optimal indoor operation.
- **Outdoor** : Drone requires open area where there are no buildings close by of heights ~25m and above as this will hinder GPS accuracy of the drone.
- **!** When flying outdoors please refer  [DGCA-Digital Sky](#) platform for UAV flights as per your location and always check central and state restrictions.
- **!** Never try to box the drone from every direction as this will cause catastrophic failure and will result in unintentional behavior from drone. This may cause critical injuries.
- **!** Drone is not equipped with a distance sensor on top side hence it will not detect ceilings. When in indoor flight, the pilot must always give altitude manually and

observe for any abrupt altitude changes . If not done carefully it may lead to a crash and may cause injuries.

## GCS Software, C2 Link and Controller Checks

- The Ground Control Station (GCS) Software is the application which is used to command and control the drone.
- Before each flight, it should be updated to the latest version.
- C2 link is the command and control link between the GCS and the drone. Drone has 3 modes for communication - 5G, WiFi and Hotspot.
- **5G Mode** - Drone is using an on board 5G dongle to connect to the private network.
- **WiFi Mode** - Drone will be connected to the wifi, using the web interface .
- **Hotspot Mode** - Drone will be creating its own network and Pilot can connect to it.
- Make sure the GCS and drone are on the same network for C2 link to get established.
- A joystick controller is provided which can be used to fly the drone manually.
- It is to be connected before each flight to the GCS.



For connecting to drone via various C2 links refer to the Suparna C2 links manual.

## Pre-Arm Checks

After the preflight checks are performed and all the conditions are satisfied the pilot must move forward to pre-arm checks.

These are a list of flight critical conditions which are necessary to arm the drone.

Failing any one of the conditions will result in a Pre-arm check failure which will be displayed by the GCS.

The checks are as follows-

- **GPS (Outdoor)** - If the GPS is not able to get a good lock it will result in the GPS failure, please move the drone to an open location.
- **Compass** - The compass is affected by high Electromagnetic fields, if the drone is in a high EMF region it will cause compass failure. Move the drone to a low EMF region.
- **Proximity** - The drone's obstacle avoidance system checks for any obstacle which is in 60cm of proximity. This check will fail if any obstacle is detected within the 60cm radius of the drone. Please remove the obstacles.
- **GCS** - The Ground control station has a good C2 link with drones via the GCS software. If it fails, the pilot will lose all communication with the drone. Check the drone and GCS networks.
- **Battery** - The voltage level is further checked by the drone. If the battery is less than 11.5 Volts this check will fail. Please charge the battery.
- **Visual Odometry (Indoor)** - The drone uses a vision system to navigate in indoor mode or GPS-denied areas. If the vision system is unable to function properly this check will fail. Please refer to the full manual for the complete vision system operation range.

- **Safety Switch -** If all of the above checks are passed, the final check is of the Safety switch. It is a safety mechanism to avoid unintentional arming of drones. For passing this check the pilot needs to press the safety off switch in the GCS software. After which an aural tone is heard and a Ready to Arm message will be displayed on GCS.



For further safety, this switch is turned ON automatically, every time the drone is landed.

## Take off and General Flight precautions

After successful pre-arm checks, the drone is ready for take-off. There are 2 methods of arming the drone-

- Using GCS software : The arm button in the control panel can be clicked for a 1 tap takeoff. Here the drone will take-off to an altitude of 1 meter and will switch to Guided Mode. The pilot can switch to loiter mode between the takeoff to control the drone.



It is recommended to use this in outdoor environments and with good GPS fix.

- Manual : Pilot can manually take off the drone using the joystick-
- Switch to Loiter mode.
- Bring the left stick (throttle) of the controller to the bottom right position and hold it there.
- Drone will give an aural signal and all the propellers will start moving.
- Move the stick to extreme bottom position and slowly raise it to middle position and slightly nudge the stick to upward position.
- Drone will take off and hover in its position.
- For increasing altitude nudge the stick upwards. The drone will maintain its position vertically wherever the pilot leaves the stick.
- To decrease the altitude, nudge the stick downwards.
- The drone will hover in its position if no command is given.



If secondary payload is attached to the drone. The drone might take more throttle input during take off.

Before taking off there a few things that pilot must observe:

1. When in an indoor environment, observe the 3D map data coming onto the GCS software central screen. If the map is skewed or is not in a regular shape of the drone's surroundings. Then, it means the drone has lost its local position and will show unintentional behavior. The drone must be restarted by removing and reinserting the battery(power cycle).

**!** The drone must not be displaced ones it is powered ON as the 3D map will get distorted hindering drones performance.

2. Another parameter is the Ground velocity of the drone, shown in the central dashboard of GCS software. The GCS will not arm the drone if it is greater than 0.3 m/s. But if somehow it is skipped. The pilot must always check this parameter if it shows any value above the threshold of 0.3 m/s. Stop the takeoff sequence and use the Reboot drone button to reboot the flight controller of the drone. The reasons for ground velocity misbehaving are -
  - a. Low Light conditions, the vision system does not have enough light to function optimally. Move to a better lit area.
  - b. Optical Flow sensor blocked. There is a downward facing vision sensor under the belly of the drone. If it is blocked/hindered it might report wrong values. Clean the sensor with a soft cloth or remove the blockage.

**!** When secondary payload is attached to the drone, the optical flow sensor is blocked hence no indoor flight will take place.

 If the drone misreports the Ground velocity and still the takeoff sequence is done, the drone will fly in random direction without pilot's control. This is highly dangerous and may cause damage and injuries. Immediately disarm the drone.

3. Dynamic Obstacles around the drone during takeoff. The drone's obstacle avoidance starts once an altitude of 50 cm is detected; if any object breaches the 1.5m cut-off during takeoff the drone might not takeoff in a smooth manner. So to avoid this pilot must make sure no dynamic obstacles move around the drone before takeoff.
4. When in an outdoor environment, the pilot must observe for any GPS/Compass glitch that may happen during takeoff. If the position on map (central screen of GCS) shifts randomly that may indicate GPS/Compass glitch, immediately abort takeoff sequence. Reboot the flight controller via the Reboot Drone button.

 For the best outdoor flying experience, takeoff once the GPS satellite count is about 15, this ensures the best accuracy.

 When the drone is in Land mode pilot must always pay attention to the drone and must be ready to maneuver the drone in case drone shows lateral movement/unexpected drifts while landing. Since the obstacle avoidance is disabled when height less than 50 cm is reached, the drone may collide with any nearby object.

## Failsafe configurations

The drone has multiple Fail safes which makes the drone robust ensuring safe flight every time.

The Fail Safes (FS) have behavior depending on the flight environment:-

- **Indoor**

- **Battery FS:** If the battery voltage falls below 11.5 Volts mid-flight drone will go into Land mode and will do a control descent, pilot has control to maneuver drone's roll, pitch and yaw movement.
- **GCS FS:** If the C2 link fails and GCS is unable to communicate with the drone, then the drone will wait for 3 seconds for the link to get reestablished, if no link is there then the drone will go into Land mode. If the link is reestablished before timeout normal operation will resume.
- **EKF (Estimated Kalman Filter) FS:** The drone has a multi-sensor system that enables its indoor/GPS denied flight, if a single or a multiple sensor failure happens then the drone's EKF state will go into critical failure mode and drone will go into Land mode.

 If EKF FS has been triggered that means drone's stable flight capabilities are hindered. Even though the drone will Land it is not a guarantee the Landing is done in a smooth manner, some lateral movements may occur, and the pilot must observe the drone at all times and be ready to maneuver.

- **Outdoor-**

- **Battery FS:** If battery voltage falls below 12.5 Volts, the drone will trigger 1st Level of Battery FS where it will go into RTL mode. The drone will go to an

altitude of 25m(AGL) and will come back to its takeoff/launch location using GPS.

- The 2nd and final level occurs if the battery falls below 11.5 Volts and the drone is still in RTL mode. In this situation the drone will trigger critical battery FS and go into Land mode. Hence, the drone will Land before coming to the launch site.

 For best battery life it is recommended to charge the battery to 100% before next flight whenever a Battery FS is triggered.

- **GCS FS:** The drone will go into RTL mode and go to an altitude of 25m(AGL) before coming back to the launch site. There is a 3 second timeout window in which if the drone is able to reconnect to GCS normal flight resumes.

 When flying in Hotspot mode, drone is tested to have a range of ~150m in 2.4Ghz mode in open areas.

- **EKF FS:** Same as in an indoor environment.
- **Fence FS:** The GCS software has the ability to define a Geo-fenced area breaching which will cause the drone to go into Land mode and the drone will do a control descent. The Geo-fence has a ceiling parameter which will prevent the drone from going beyond a certain altitude breaching which will cause the drone to Land.

**!** If you are flying close to a no fly zone. It is mandatory to use the Geo-fence to prevent the drone from flying into the restricted zone. If the drone is flown in a no-fly zone without setting Geo-fence, Menthosa Solutions bears no responsibility for any legal proceedings.

 The drone is not waterproof. If the drone goes into land mode during any failsafe and the drone gets wet it is not the responsibility of Menthosa Solutions as the drone cannot maneuver when in a critical FS. Although it is covered in the warranty, a thorough inspection of logs will be done before proceeding.

## In Case Crash Happens

- The drone is equipped with multiple sensors and is capable of avoiding a crash via enforcing Failsafes.
- But in case a crash-like situation happens, the pilot must not panic and try to take control of the drone by Landing the drone; by switching to Loiter mode and then to Land mode.
- If the drone is still out of control and cannot be recovered, a Disarm button is given in GCS software and is mapped onto the joystick. Pressing this button 3 times quickly (under 1.5 secs), will cause the drone to disarm.
- In case the drone is unresponsive to all of this and crashes there is a Failsafe for Crash which will automatically turn off the drone motors upon impact. In this situation, recover the drone and please remove the battery as soon as possible.

**!** Contact Menthosa Solutions for further assistance.

**!** Using Disarm button mid-flight will cause all the motors to stop spinning and drone will free fall, which may lead to catastrophic failure of the drone and may cause injuries. Please use this in an emergency situation only.

**🚫** Using the Disarm button in a non-emergency situation is strictly prohibited. If a critical damage is done to the drone in this situation, the warranty will be voided and full replacement/repair amount will be charged.

# Software Installation

This section is brief about Software Installation and Usage.

## Installation

### Organization Registration and Verification

As drone operation is a crucial task and to know who is flying the Aircraft we have onboard the user with valid details. We are aggressively working to digitalise the process and improve system delivery.

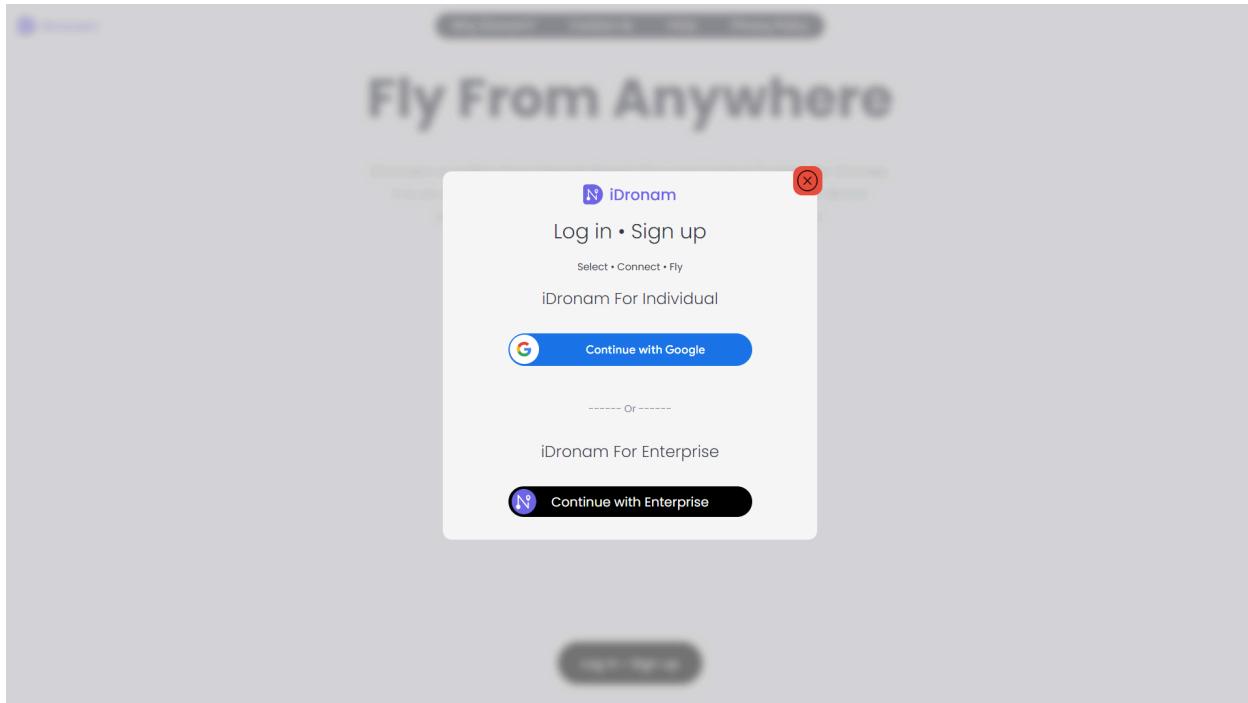
This section brief You about the Registration and Verification of Organisation :

- Open [iDronam](#)

The screenshot shows the homepage of the iDronam website. At the top, there is a navigation bar with links for "Why iDronam?", "Contact Us", "FAQs", and "Privacy Policy". Below the navigation bar, the main heading "Fly From Anywhere" is displayed in a large, bold, dark font. A subtext below the heading reads: "iDronam is India's first Internet Based Ground Control System for Drones. It is an end to end solution for monitoring and controlling of drone over the internet with cloud backed smart algorithms." There is a "Scroll Down For More" link. Below this, a large blue banner with white text says "Designed for Enterpri". At the bottom of the page, there is a "Log in • Sign up" button.

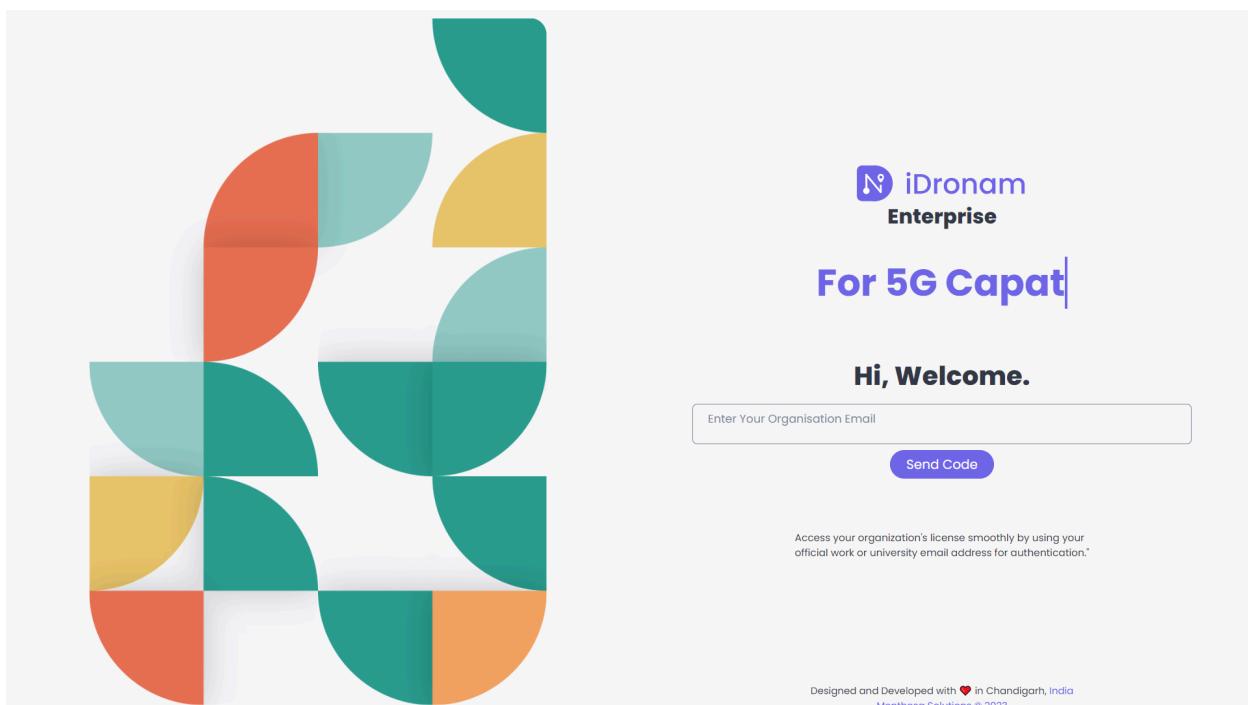
! iDronam is a Cloud Based App that have vast variety of options for Enterprise, Agriculture, Individuals and Developers.

- Click on “Login/Signup”



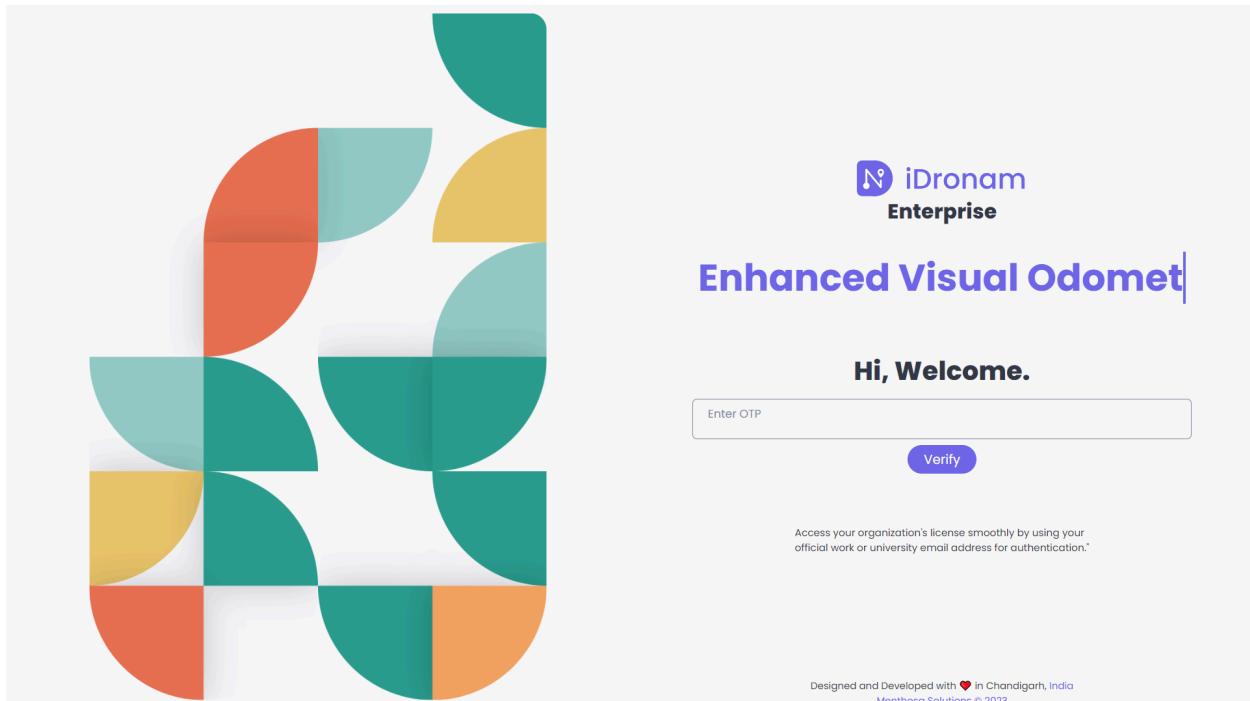
! Currently, iDronam Offers Individual and Enterprise Services Enterprise Contains more features and drone use cases. Click on iDronam for enterprise if you are eligible for the same.

- Click on “iDronam for Enterprise” and enter your Enterprise mail.



! iDronam Enterprise only Supports valid enterprise Emails and do not supports Normal Email providers like Gmail, outlook, proton and etc.

- After the Organization Email You will receive an OTP to validate the Email.



! Enter the Correct OTP to validate the email.

- After the correct OTP if you are a new user you have to register your organization.

The screenshot shows a registration form for 'iDronam'. At the top, there's a logo with a stylized 'N' icon followed by the text 'iDronam'. Below the logo, the heading 'Register Your Organisation' is displayed. A note below the heading states: 'Your organization is not currently registered with iDronam.com to utilize enterprise mode. To enable enterprise mode, please complete the registration process for your organisation. If you believe this communication is erroneous and your company is already registered, kindly contact sales@idronam.com for further assistance.' The form consists of several input fields arranged in a grid:

Organisation Name *	Organisation Registration Number	Organisation Domain *
Contact E-mail *	Organisation Address *	City *
State *	Pincode *	Country * India

At the bottom of the form is a blue button labeled 'Register Organistaion'.

! Organization verification is a one-time process accessible to any member within your organization. Once verified, future members can skip these steps and directly register, streamlining the drone flying process.

! At Menthosa, we simplify onboarding by identifying organizations through their domain names (e.g., "abc.com"). This approach ensures efficient data collection for aerial operations and research, facilitating safety measures for Indian Aerospace, both internally and for legal compliance.(Read Our [Privacy Policy](#)).

- If you are a New Enterprise User You have to fill out the Organisation details.

The screenshot shows a registration form titled "Register Your Organisation" from the iDronam website. The form includes fields for Organisation Name (Menthosa Solutions Pvt Ltd), Organisation Registration Number, Organisation Domain (.com), Contact E-mail, Organisation Address, City, State, Pincode, and Country (India). A "Register Organistaion" button is at the bottom.

Your organization is not currently registered with iDronam.com to utilize enterprise mode. To enable enterprise mode, please complete the registration process for your organisation. If you believe this communication is erroneous and your company is already registered, kindly contact sales@idronam.com for further assistance.

Organisation Name \* Menthosa Solutions Pvt Ltd

Organisation Registration Number

Organisation Domain \* .com

Contact E-mail \*

Organisation Address \*

City \*

State \*

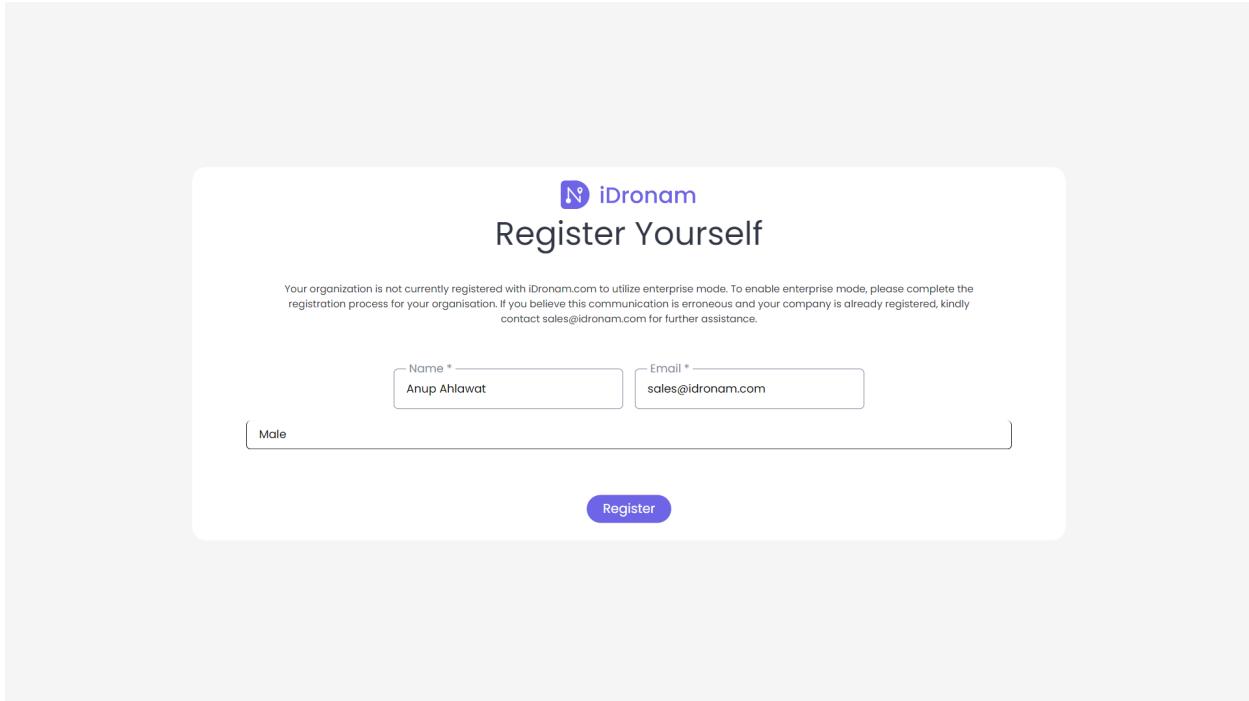
Pincode \*

Country \* India

Register Organistaion

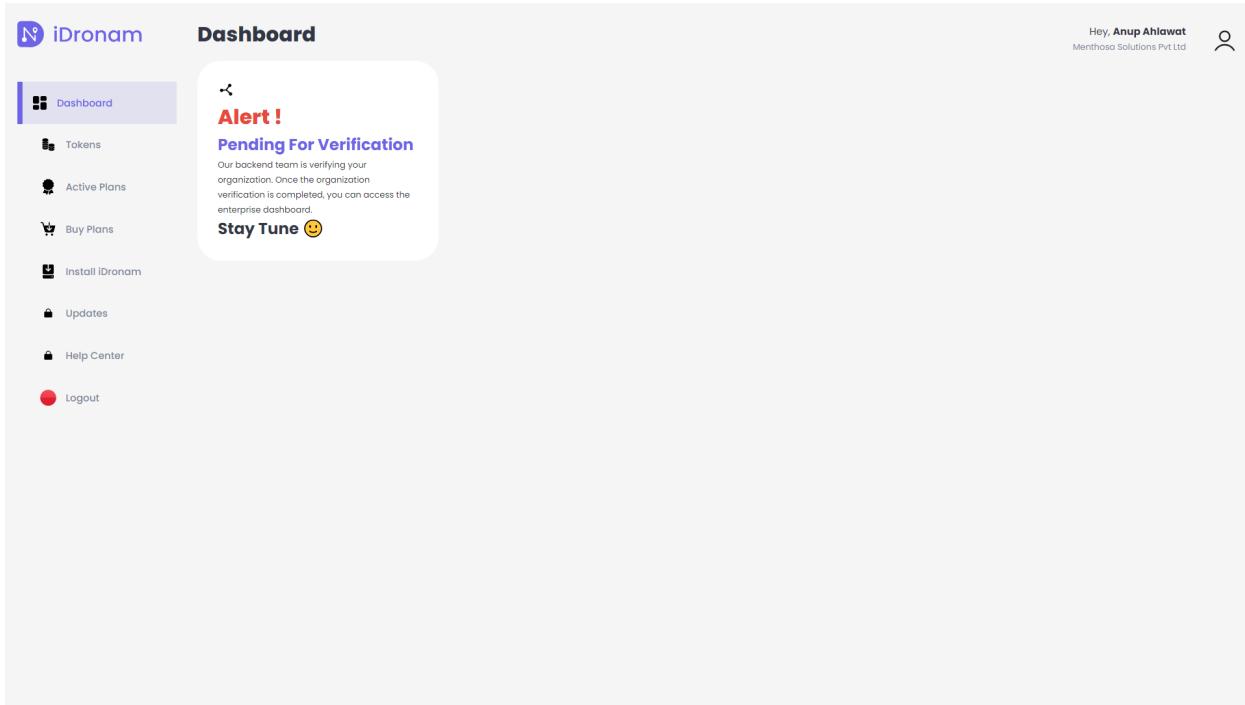
**!** Organisation Verification is a One time process. And should be Done by a Highest designated person.

- After Successful Organisation Detail You have to register Yourself.



! An Organisation can have any number of users..

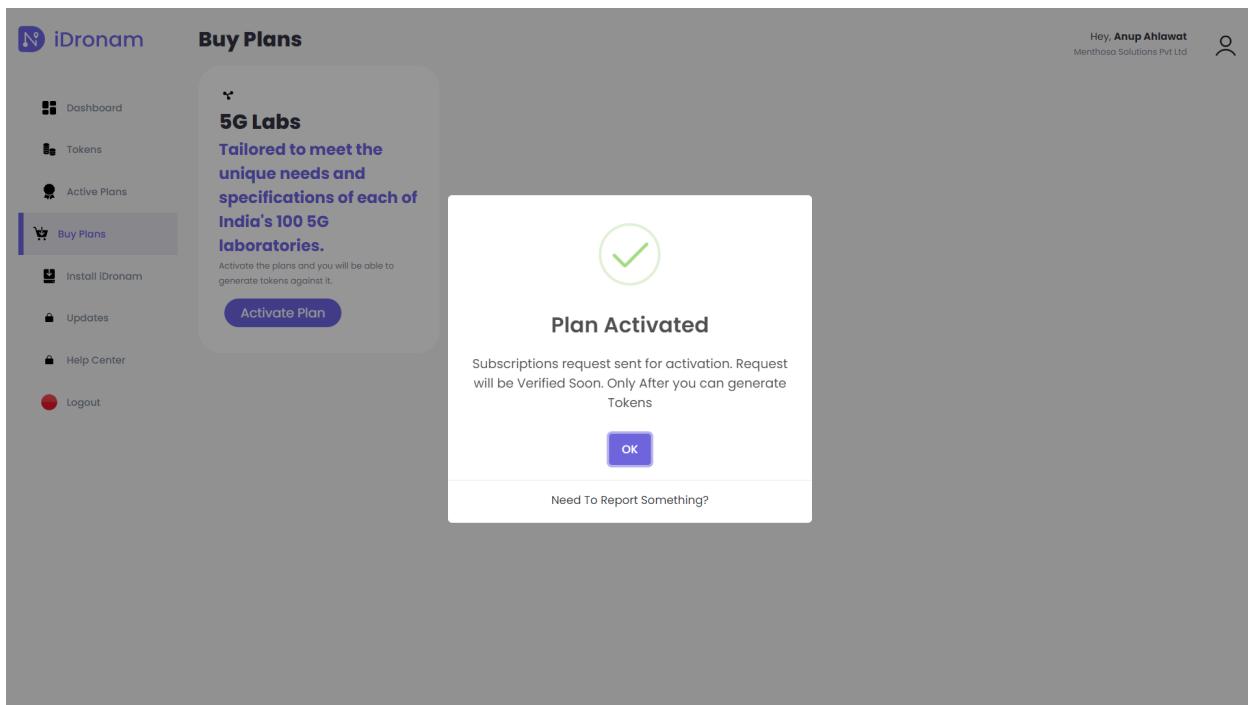
- After a Successful Registration You have come across the dashboard.



! After Successful Registrations. Please provide some time to our backend team to verify your organization. Once the organization is verified you can install and generate tokens.

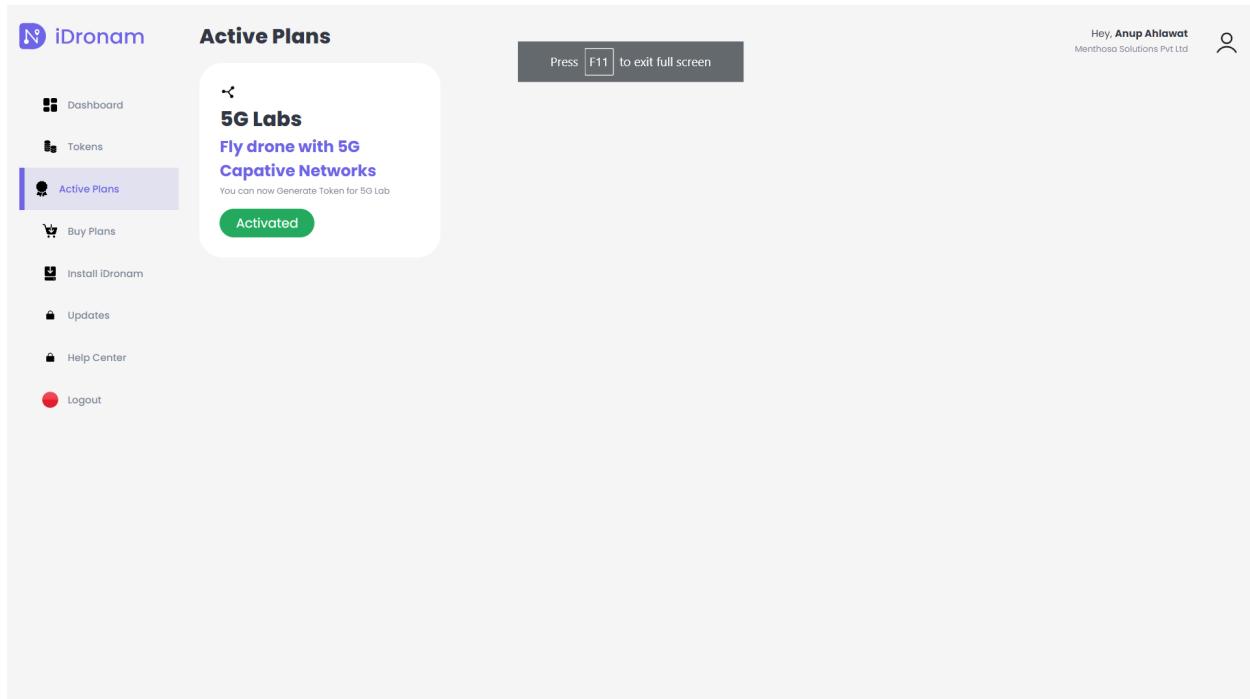
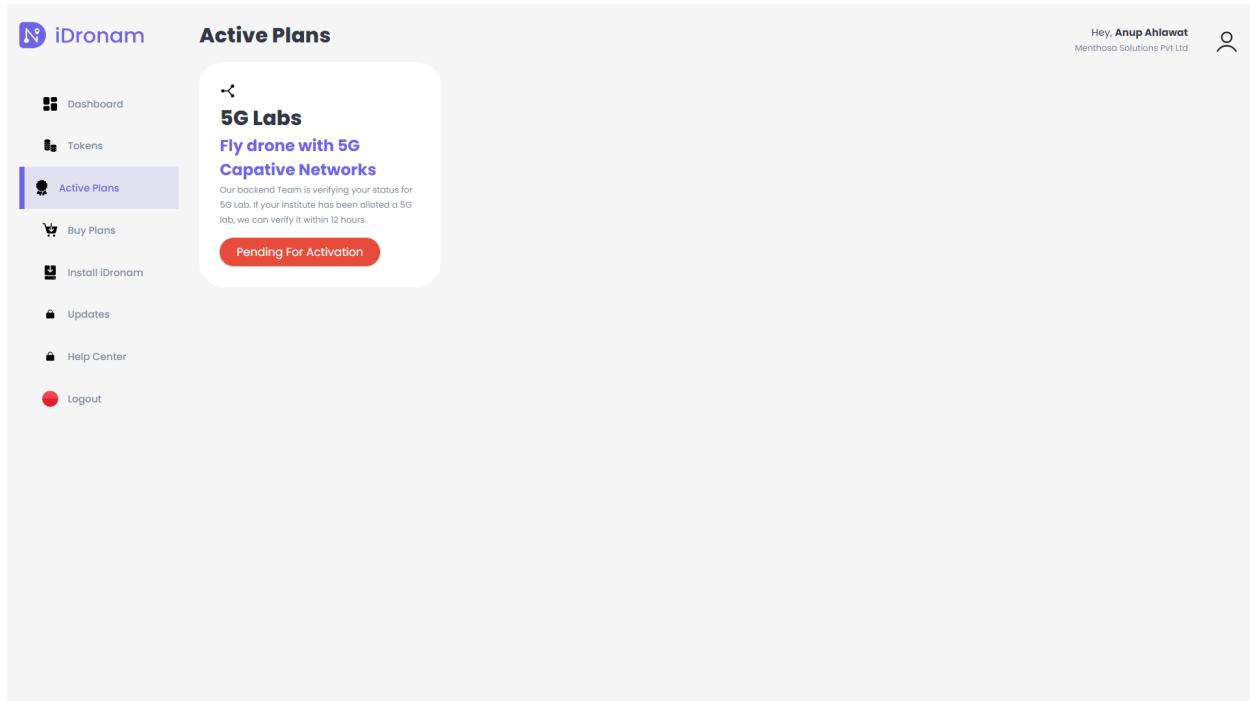
## Activating Plans

- Go the “Buy Plan” Menu and Activate the Respective Plans



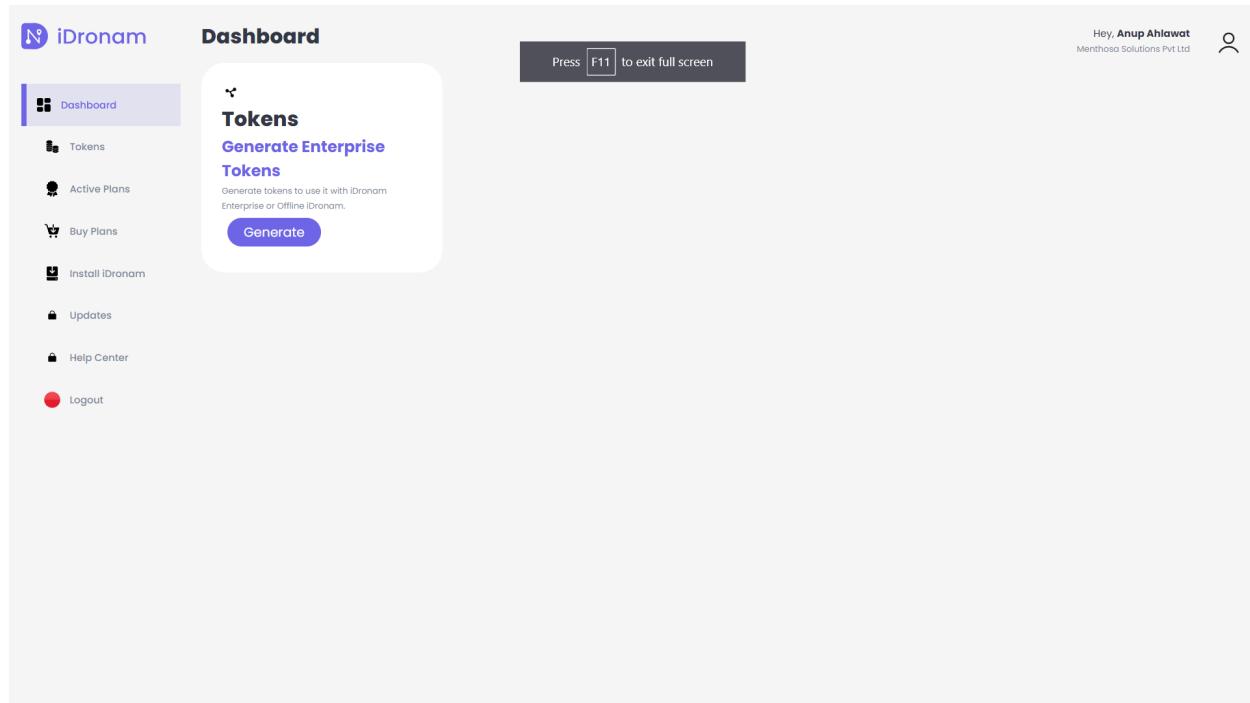
! You can activate the desired plan in between the organization verification. Your organization and plans will be verified at the same time.

- Click On “Active Plan” to see all plans You have Activated or Purchased.



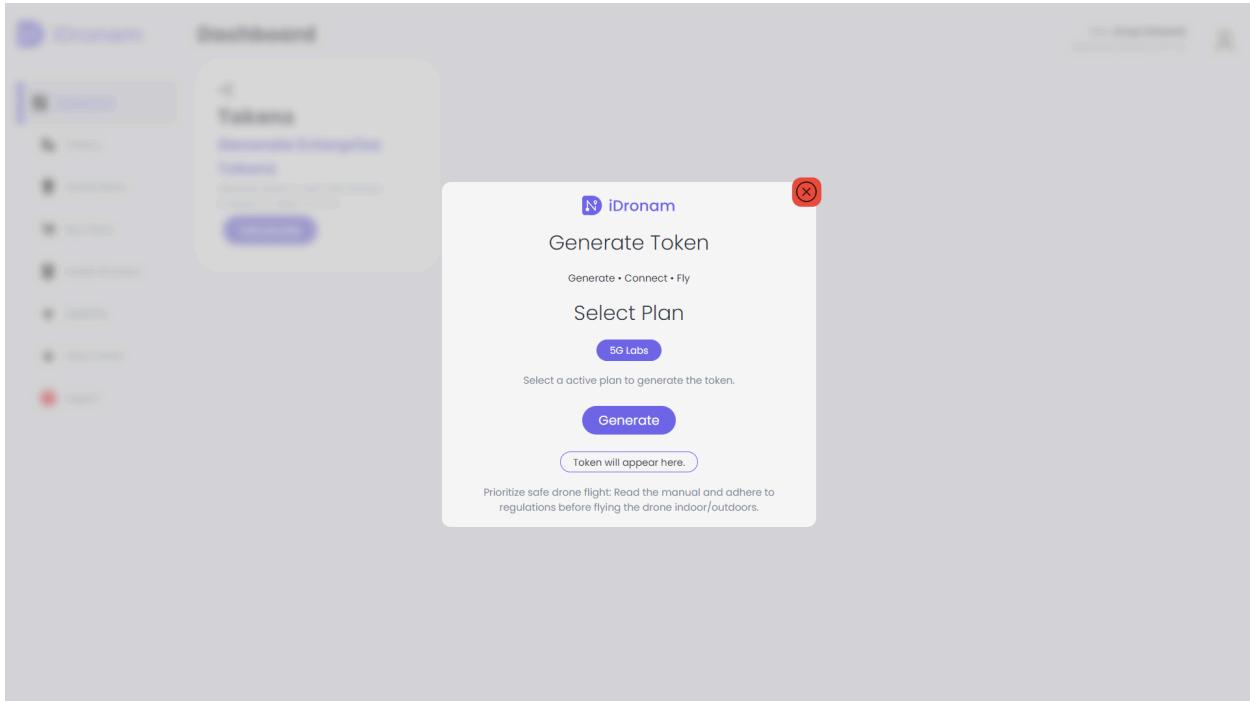
## Generate Tokens

- Once the organization is verified you will see the generate token button on the dashboard.



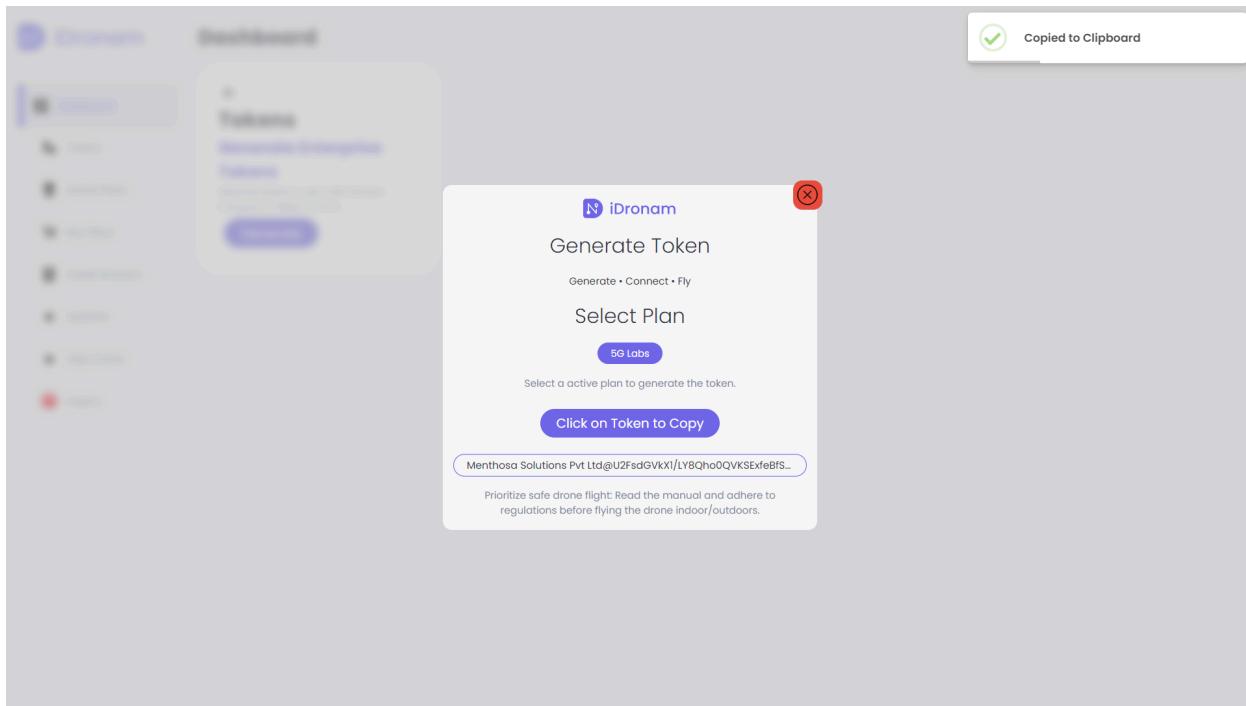
! You will be able to see Generate token button once your organization is verified.

- Click on Generate token and a token Generator window will appear, Select a valid plan and click Generate Token a Respective Token will be generated.



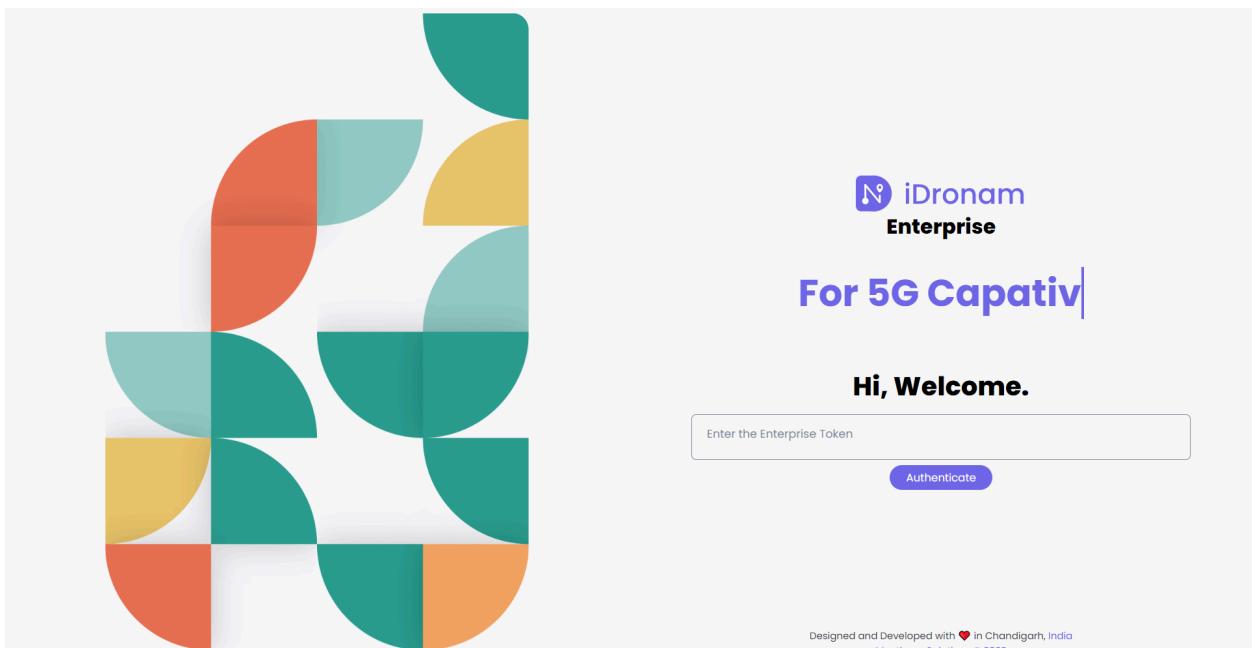
! For “5G Labs” Plan You will be able to generate at max 4 token that can be associated to 4 different devices and Each devices can associate with at max 4 pilots so “5G Lab” plan can be used by max 16 persons at a time.

- You can now click on the token to copy it.

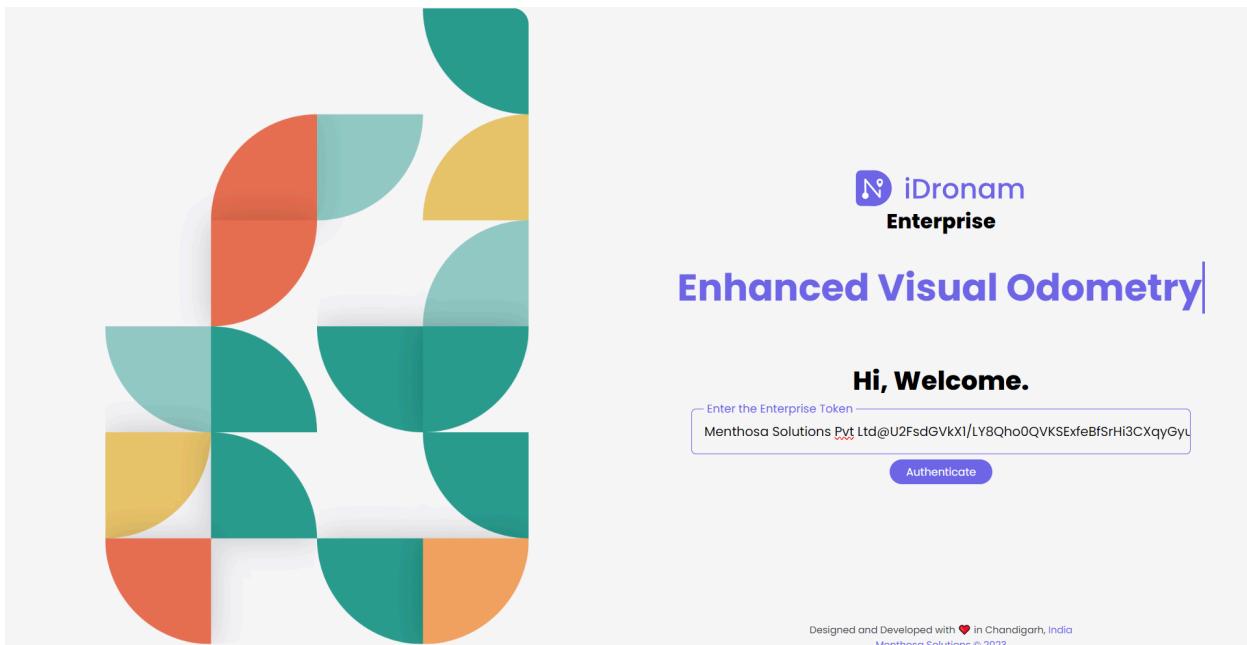


## Install iDronam For Enterprise

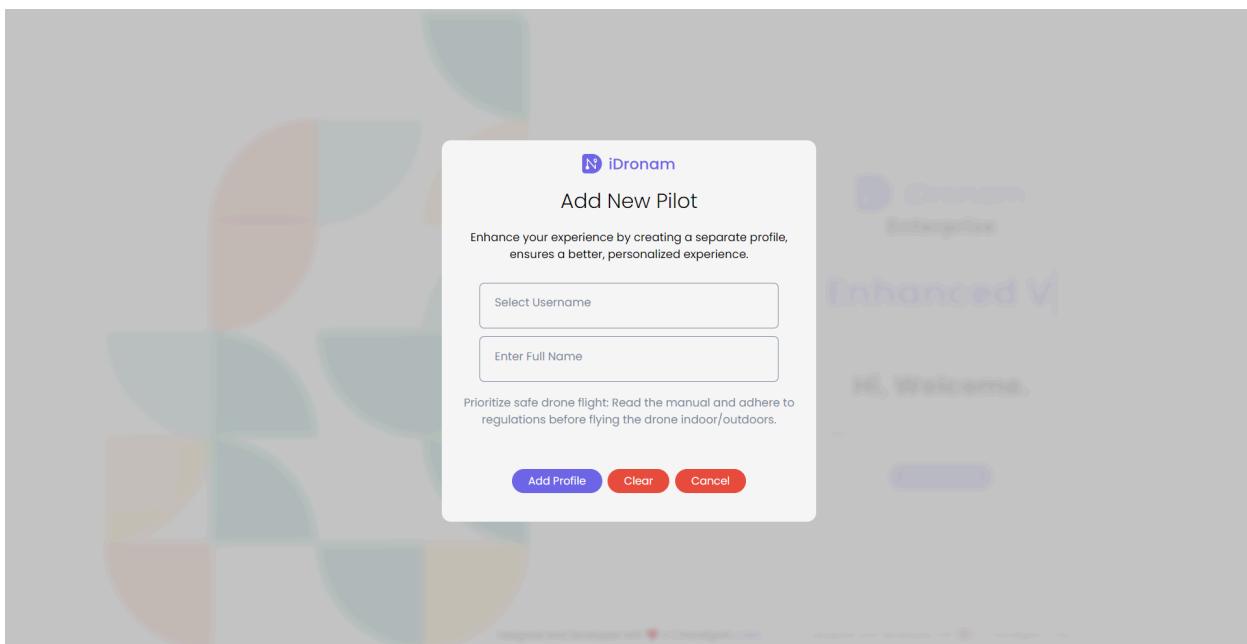
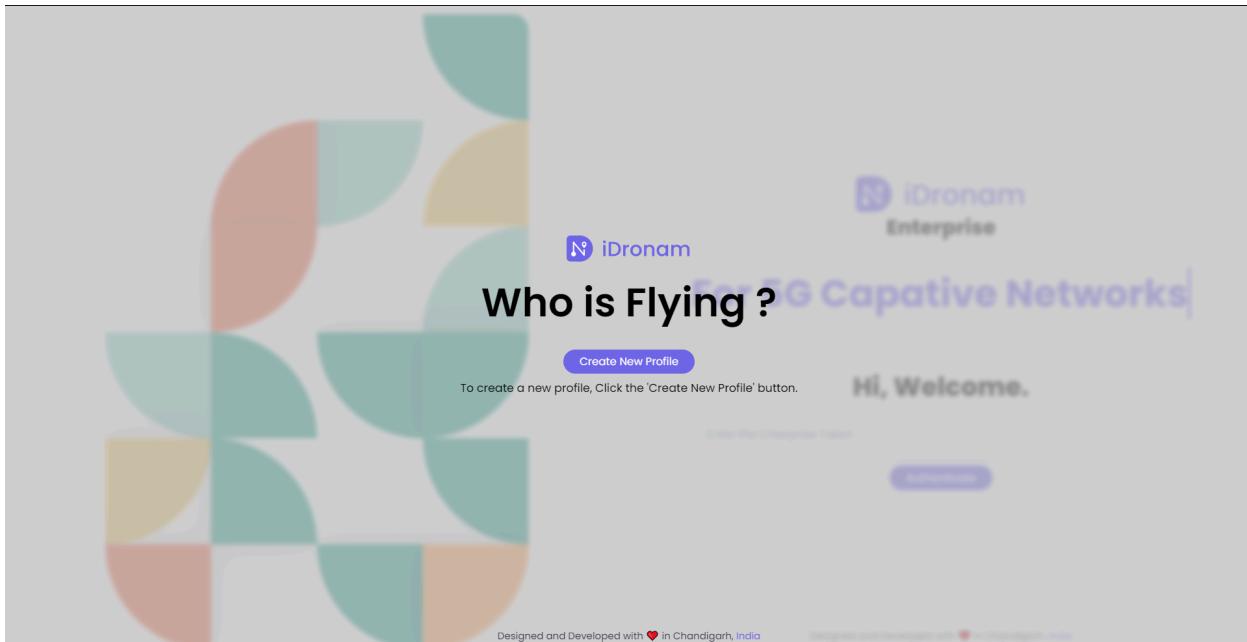
- Go to the “**Install iDronam**” and download a copy of software and install it.
- Once installed, search and open “**iDronam-Enterprise**”.
- Paste the token In the Enterprise Token Box and click “**Authenticate**” to Activate iDronam-Enterprise on this Device.

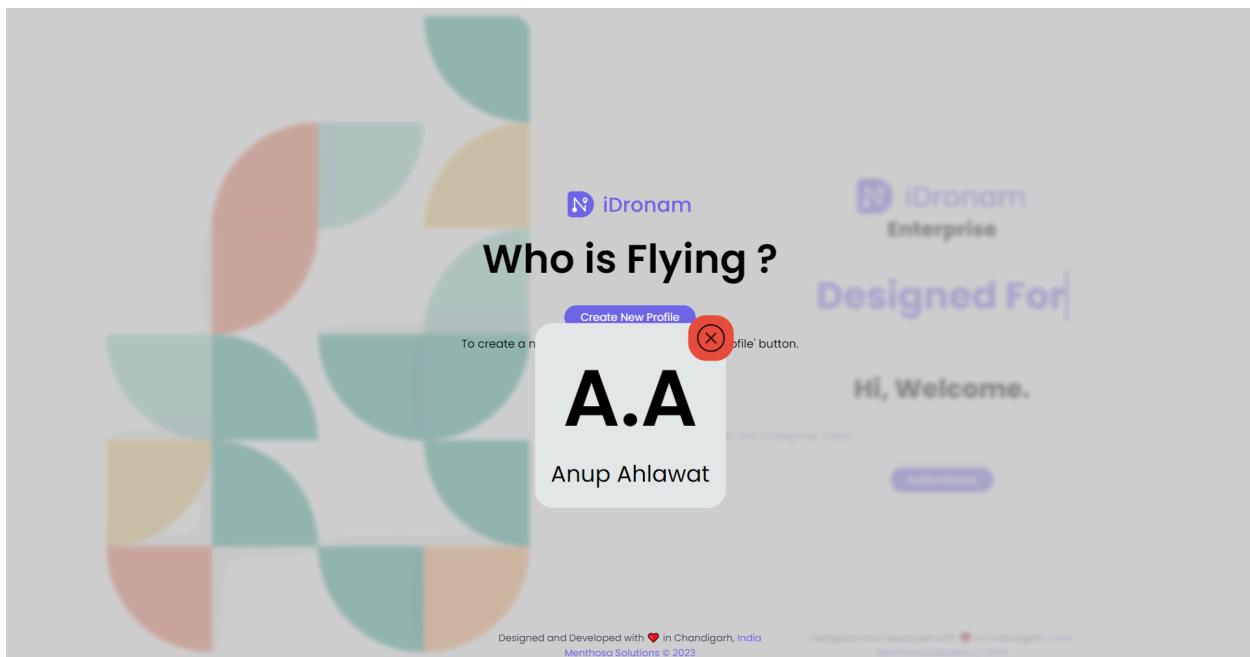
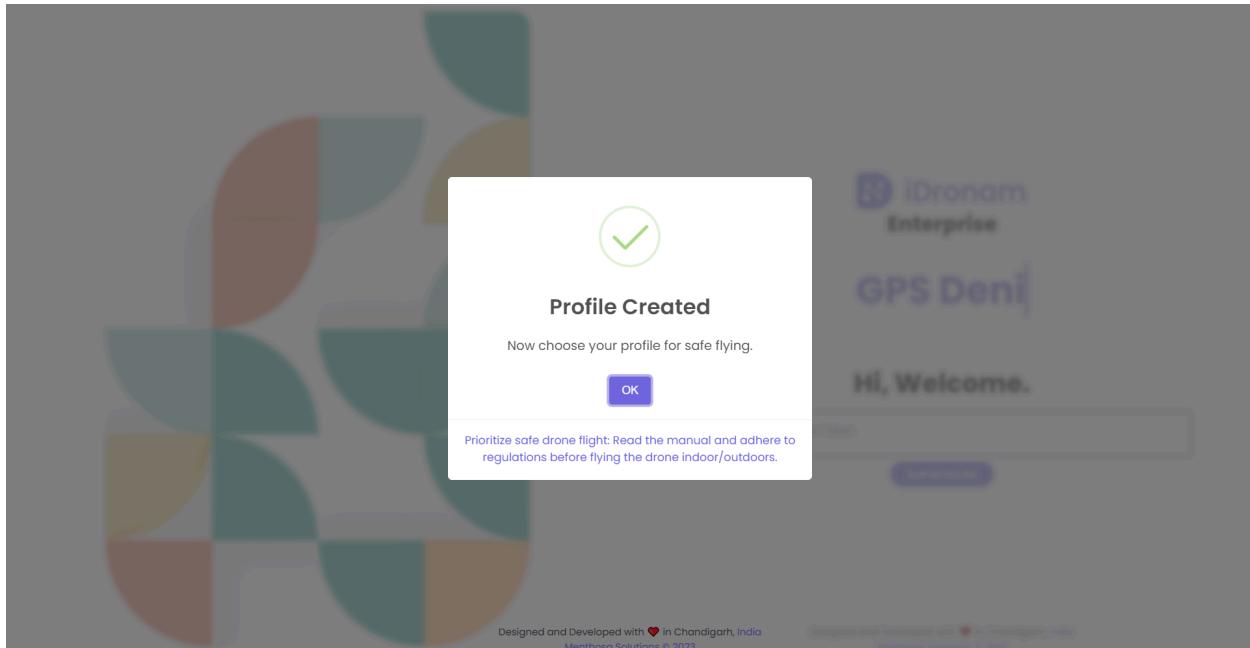


- It Looks Like this



- After Successful Authentication You can Create Pilot Profile and Actual Fly the Drone





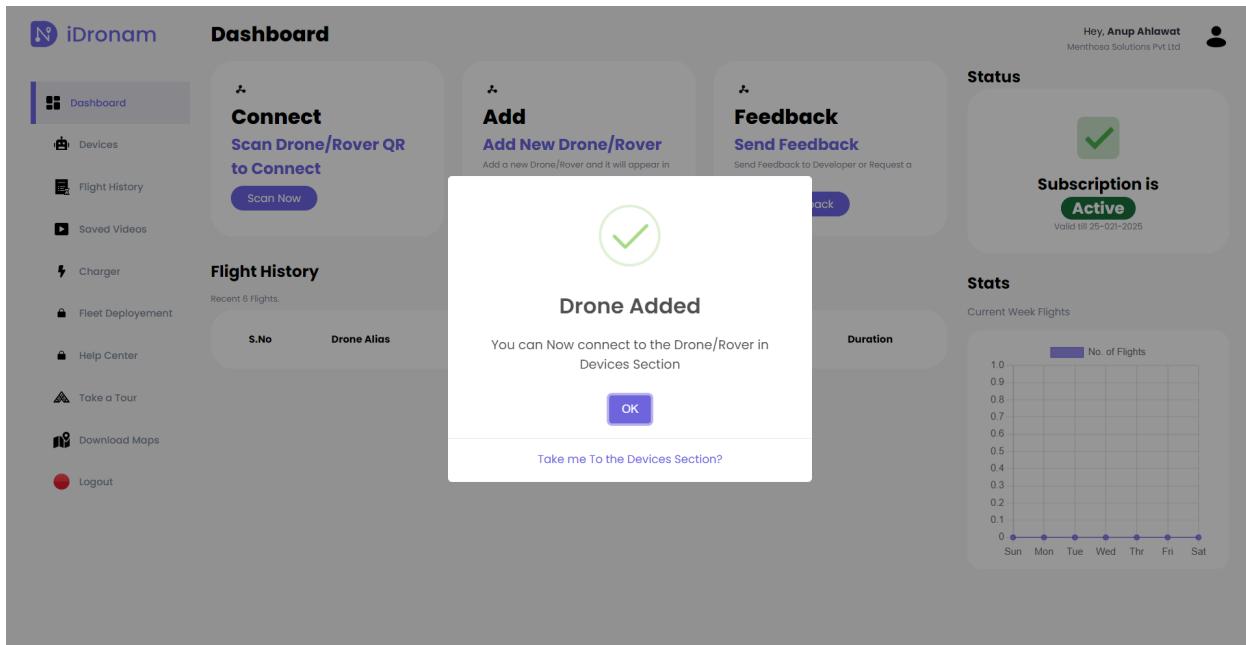
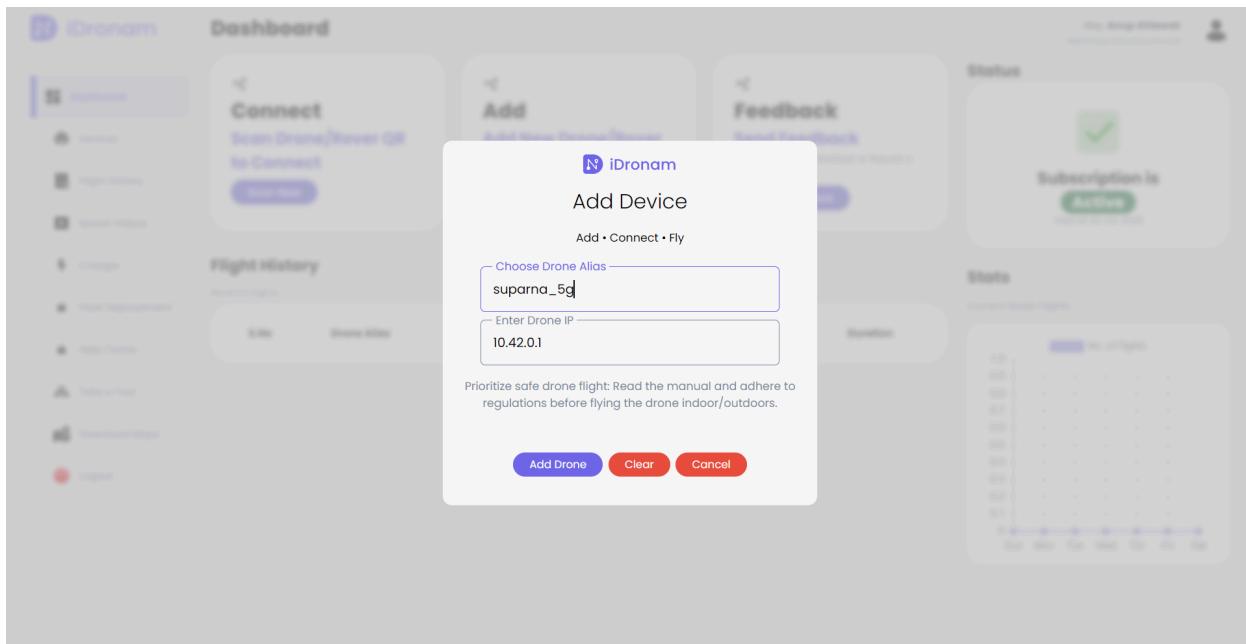
## iDronam Suparna : Flight Manual

- Click on the Profile to Explore Dashboard

The screenshot shows the iDronam Suparna dashboard. On the left, there's a sidebar with icons for Dashboard, Devices, Flight History, Saved Videos, Charger, Fleet Deployment, Help Center, Take a Tour, Download Maps, and Logout. The main area has several sections:

- Connect:** Scan Drone/Rover QR to Connect. Includes a "Scan Now" button.
- Add:** Add New Drone/Rover. Includes a "Add New" button.
- Feedback:** Send Feedback. Includes a "Send Feedback" button.
- Status:** Subscription is Active (Valid till 25-02-2025).
- Flight History:** Recent 6 Flights. A table with columns: S.No, Drone Alias, Drone, Date, Start Time, End Time, Duration. A "See All" link is at the bottom.
- Stats:** Current Week Flights. A line chart titled "No. of Flights" showing zero flights from Sunday to Saturday.

- Click on the “Add” to add a device i.e Drone/Rover.



## iDronam Suparna : Flight Manual

- Go to the Devices to See All Add Devices.

The screenshot shows the iDronam mobile application interface. At the top, there's a header with the iDronam logo and a user profile section. Below the header, the main title is "All Devices". On the left, a sidebar menu includes "Dashboard", "Devices" (which is selected and highlighted in purple), "Flight History", "Saved Videos", "Charger", "Fleet Deployment", "Help Center", "Take a Tour", "Download Maps", and "Logout". The central content area displays a card for a device named "suparna\_5g" with version "10.42.0.1". It shows the device is "Subscribed" and was "Added On: 1-04-2024 - 11:26". A blue "Connect" button is at the bottom of this card. To the right of the device card, there are two sections: "Status" and "Stats". The "Status" section shows a green checkmark and the message "Subscription is Active" with a validity date of "Valid till 25-02-2025". The "Stats" section is titled "Current Week Flights" and features a line chart with a single data point at zero flights across all days of the week (Sun to Sat).

\*\*NOW YOU ARE ALL SET TO CONNECT TO THE DRONE AND MAKE IT FLY

# How to Fly ?

How to take a flight (**Outdoor Mode**)

## How to Fly?

### How To Fly ?

To understand flying we have Prepared the tutorials for the user for indoor and outdoor mode.  
Please Refer to the Tutorials for better understanding at

- Flying tutorial will be Presented soon at [iDronam](#) under the resources section.

# References

References for Better Understanding

## References

### References

1. <https://digitalsky.dgca.gov.in/airspace-map/#/app>

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