# UAV principles & Components

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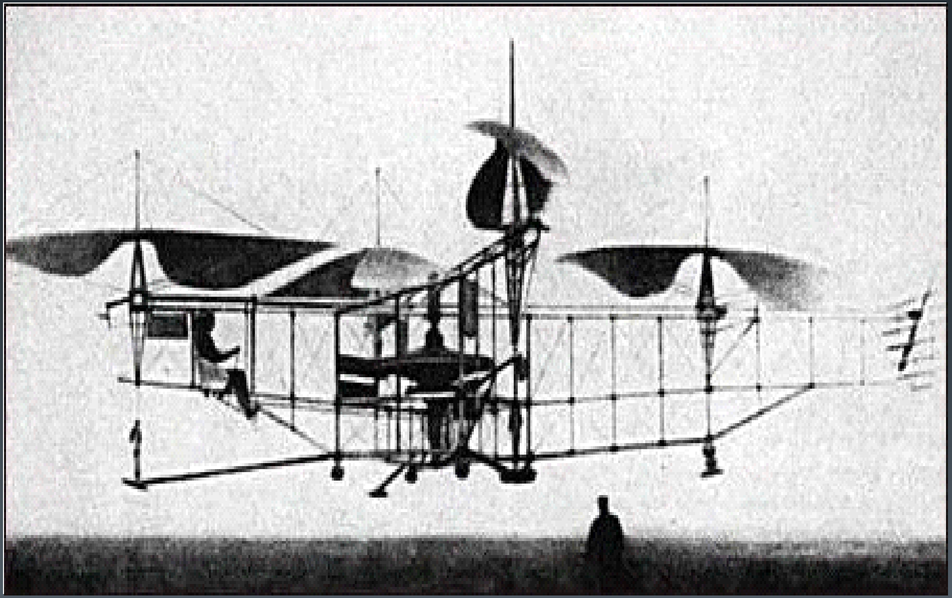
- Importance of UAVs in Remote Sensing
- Conclusion

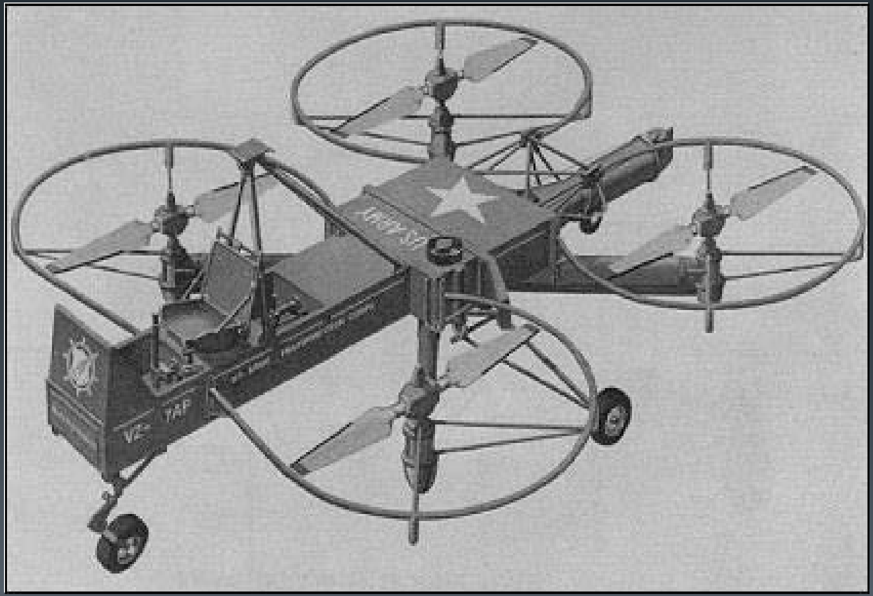
# Introduction to UAVs

Also known as Unmanned Aerial Systems/ Drones

Oemichen-1920



De Bothezat Helicopter-1923



# Introduction to UAVs

Fixed Wing UAV

Rotary wing UAV (RUAV)/Multirotor

# Rotary Wing UAVs

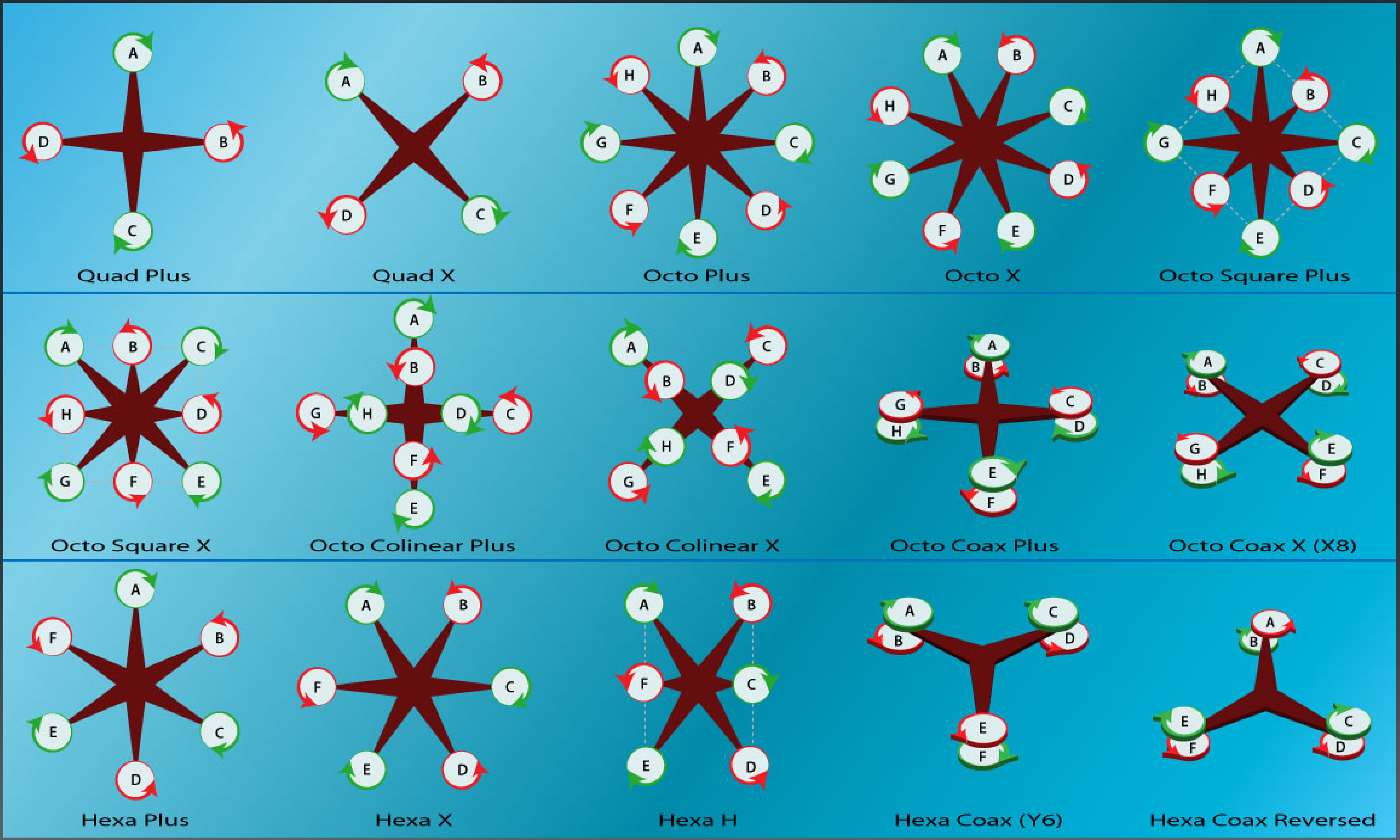
# Basic Equation

The weight of copter should be half of the total thrust generated by the motors for hover condition at 50% of throttle

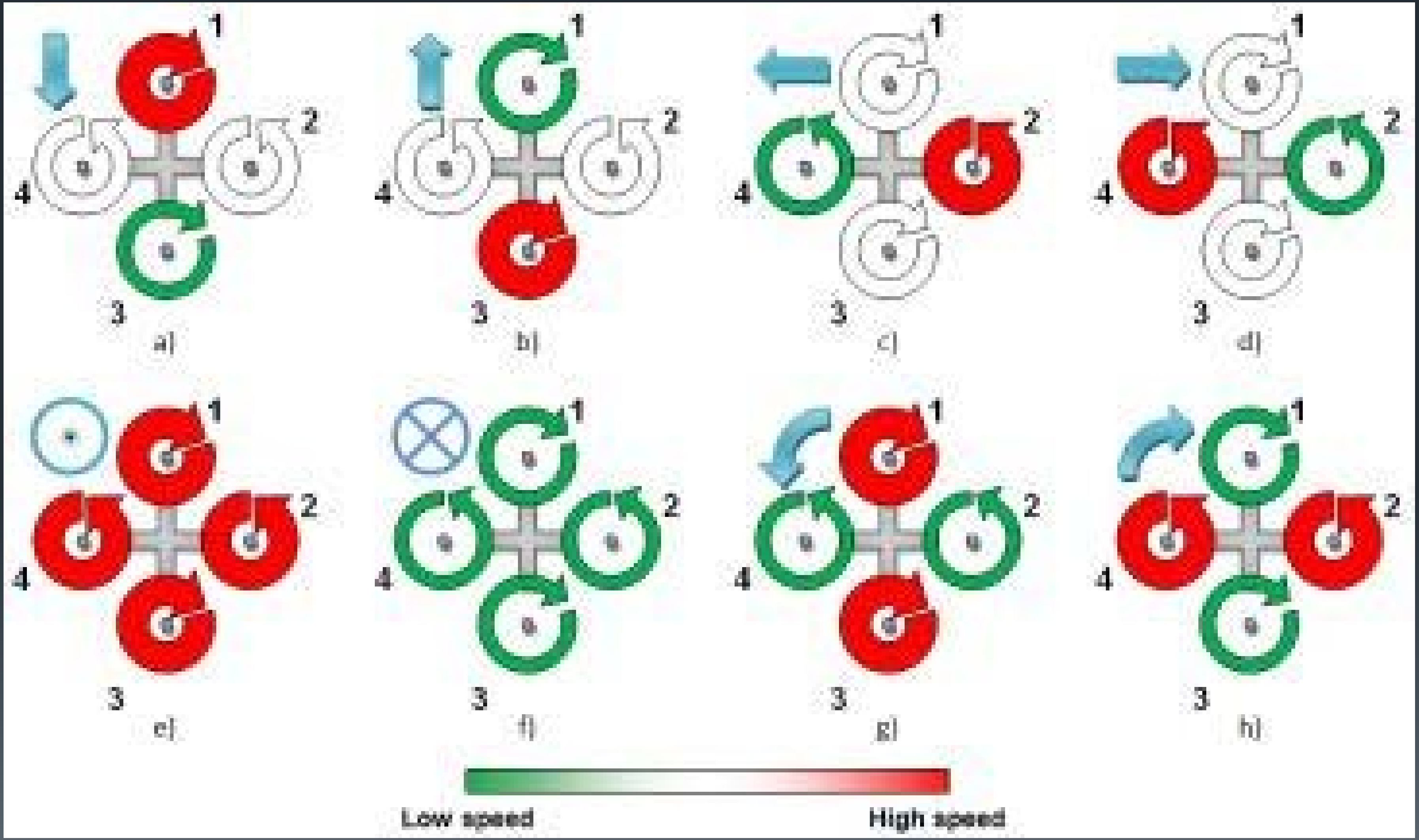
Total Thrust = 2 x All uplift weight (AUW)

**based on above criteria the components for copter are selected.**

# RUAV Configuration



# How does it move?



# Parts of RUAVs

A multirotor can be divided into seven main sections:

- Frame
- Propulsion
- Power
- Radio control system
- Flight Control system
- Ground Station
- On-screen display

and a payload is used based on requirements.

# Components of RUAV-Frame

A Symmetric Hex copter frame

The weight of the assembled frame is about 3.5 kgs and the diagonal distance is about 80 cms.

# Components of RUAV-Propulsion

Motor

Propellers


Motor: Kv350, Propeller: 13x4.5 inches, ESC: 20A
The combination provides a maximum thrust of 2100 gm per rotor.

Electronic Speed Controller (ESC)

# Components of RUAV-Power



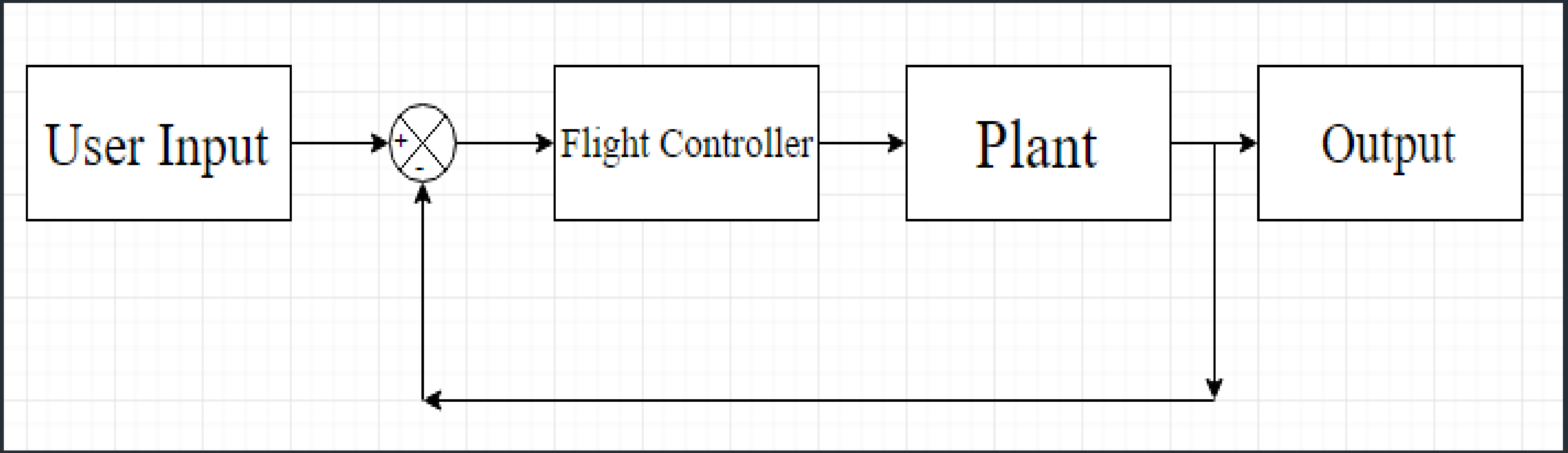
6 cell LiPo battery with 10,000 mAh capacity was used, that has given a flight time of up to 30 mins based on weight of payload.

# Components of RUAV-Radio control system


| Sl. No. | Purpose | Frequencies used |
|---|---|---|
| 1. | Video Streaming | 1.2-1.3 GHz, 2.4 GHz, 5.8 GHz |
| 2. | RC Control | 433 MHz, 2.4 GHz |
| 3. | Telemetry | 433 MHz, 915 MHz, 2.4 GHz |

The frequencies which were used are : 433 MHz for command transmitter,
2.4 GHz for ground station and 5.8 GHz for live video transmission of onboard camera

# Components of RUAV-Flight control system



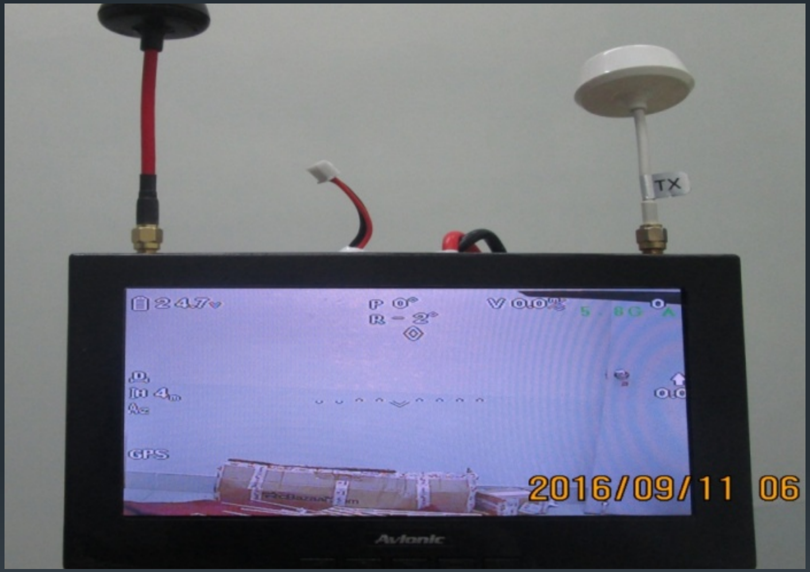

DJI NAZA V2.0 flight controller was used in this project.

# Components of RUAV-Ground station & OSD

Ground station system


2.4 GHz data link is used for ground station system with laptop as the display.

On screen display unit-OSD




5.8 GHz data link is used to receive live video feed from the onboard camera along with other telemetry data.

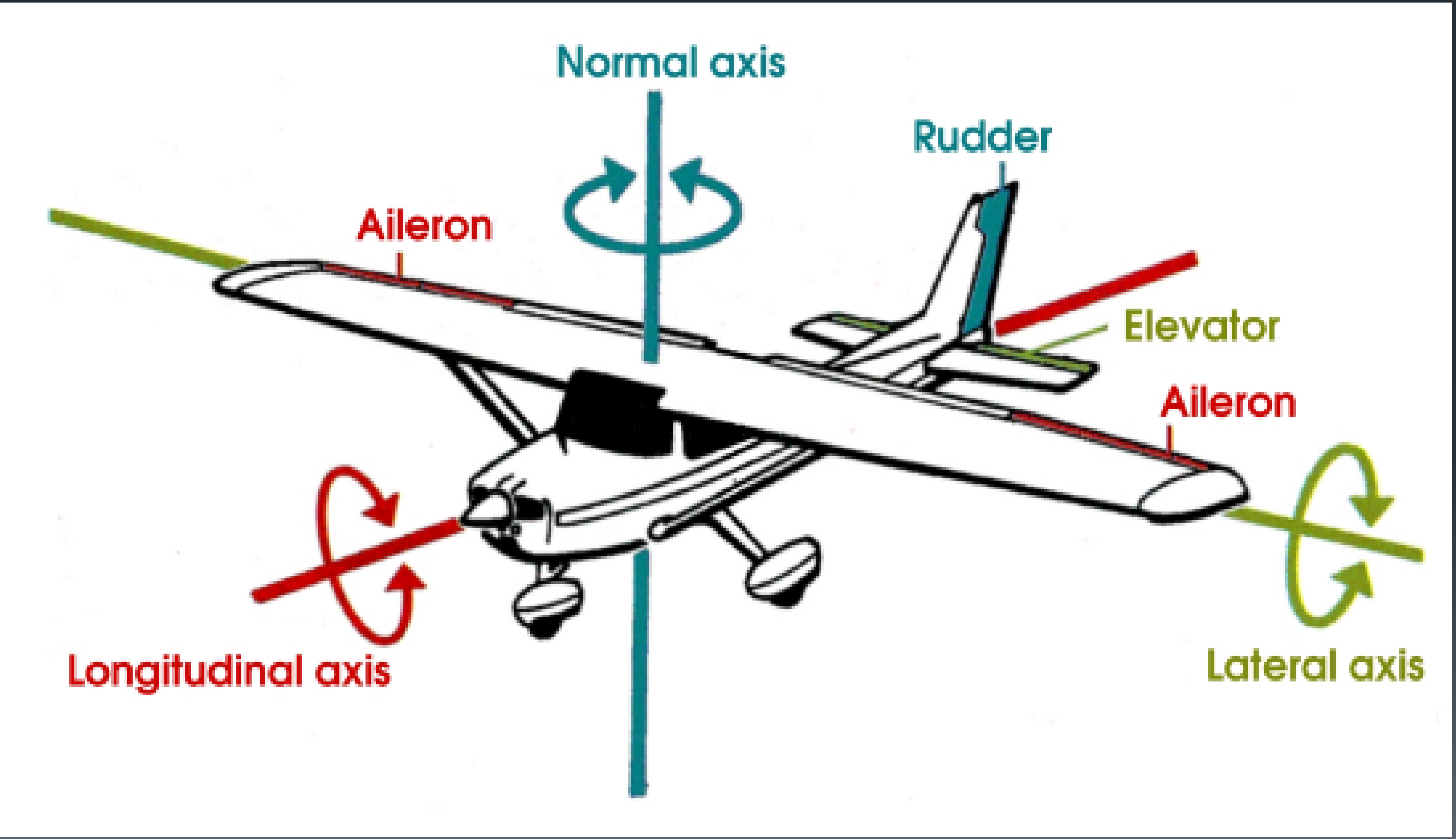
# Components of RUAV-Payload


A YI action camera as payload


A dummy payload of 1.5 kgs weight

# Fixed wing UAV

# Fixed wing UAV-basics



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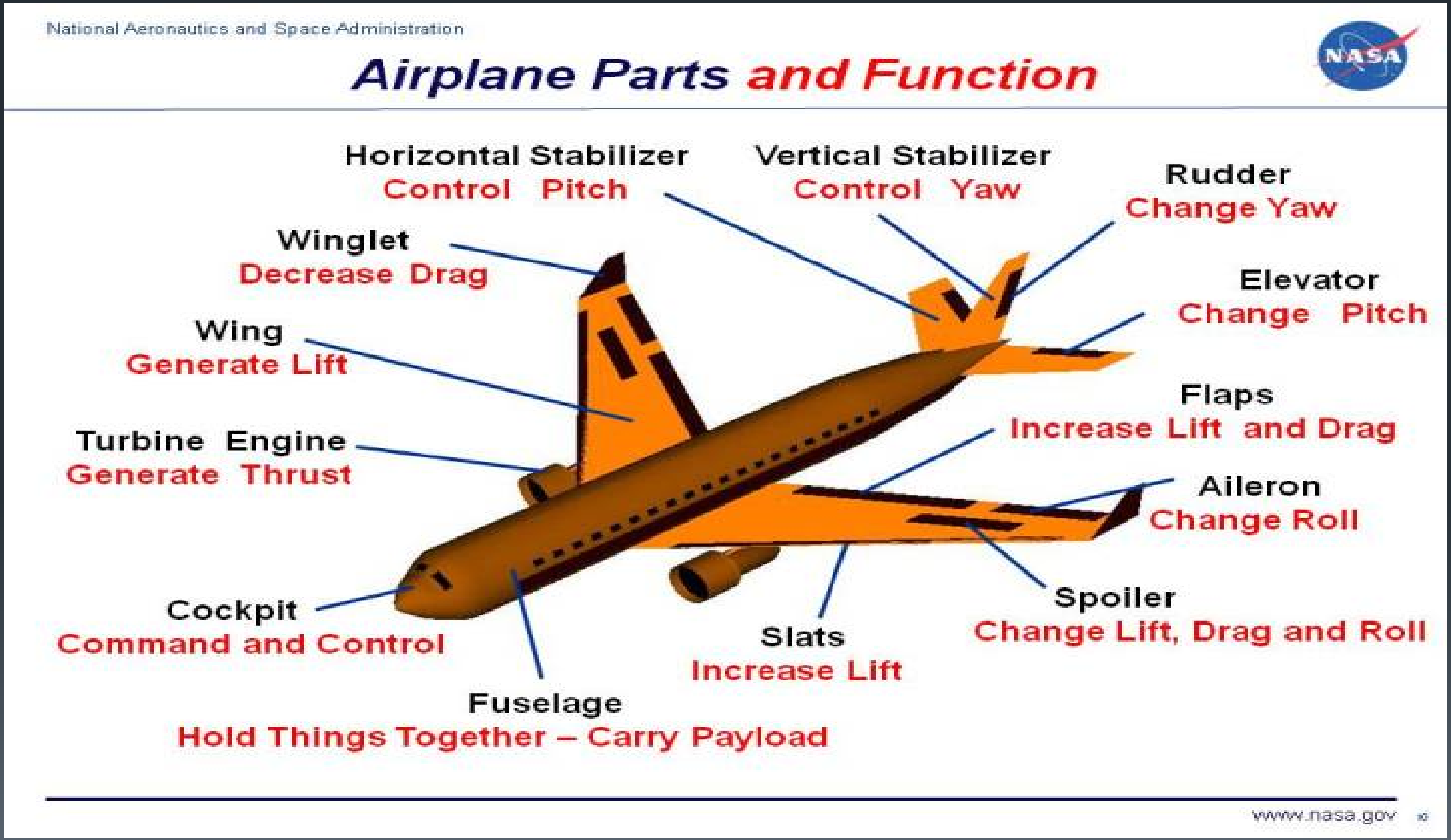
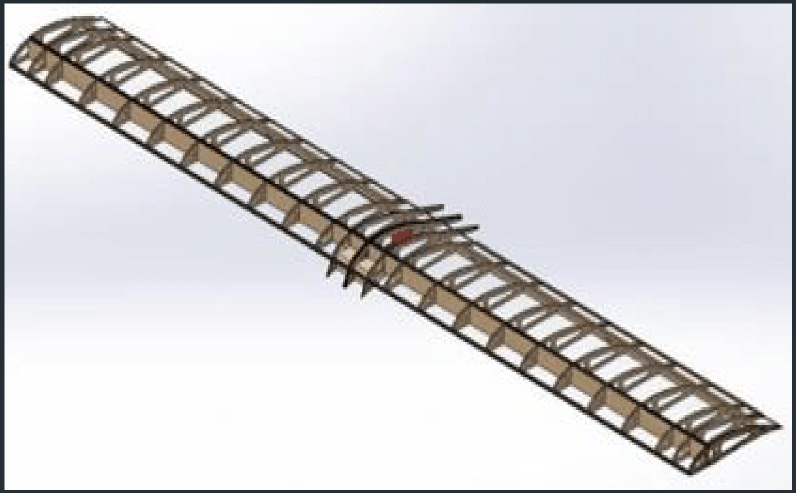
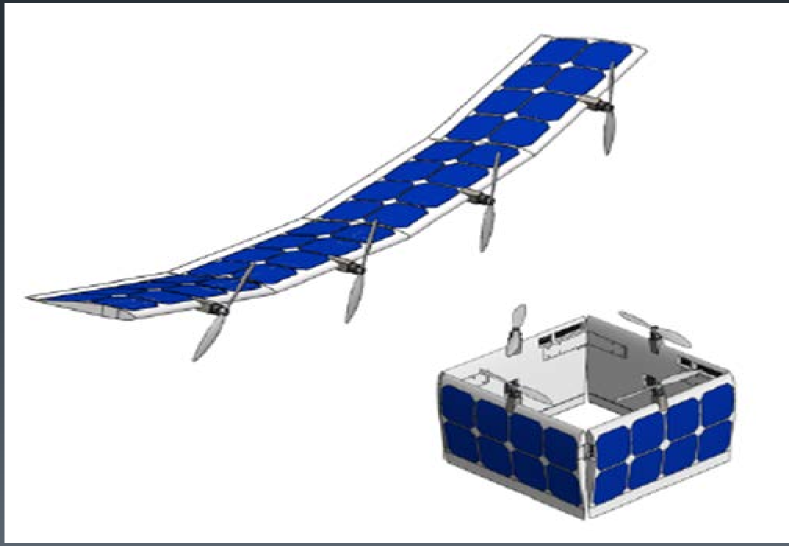
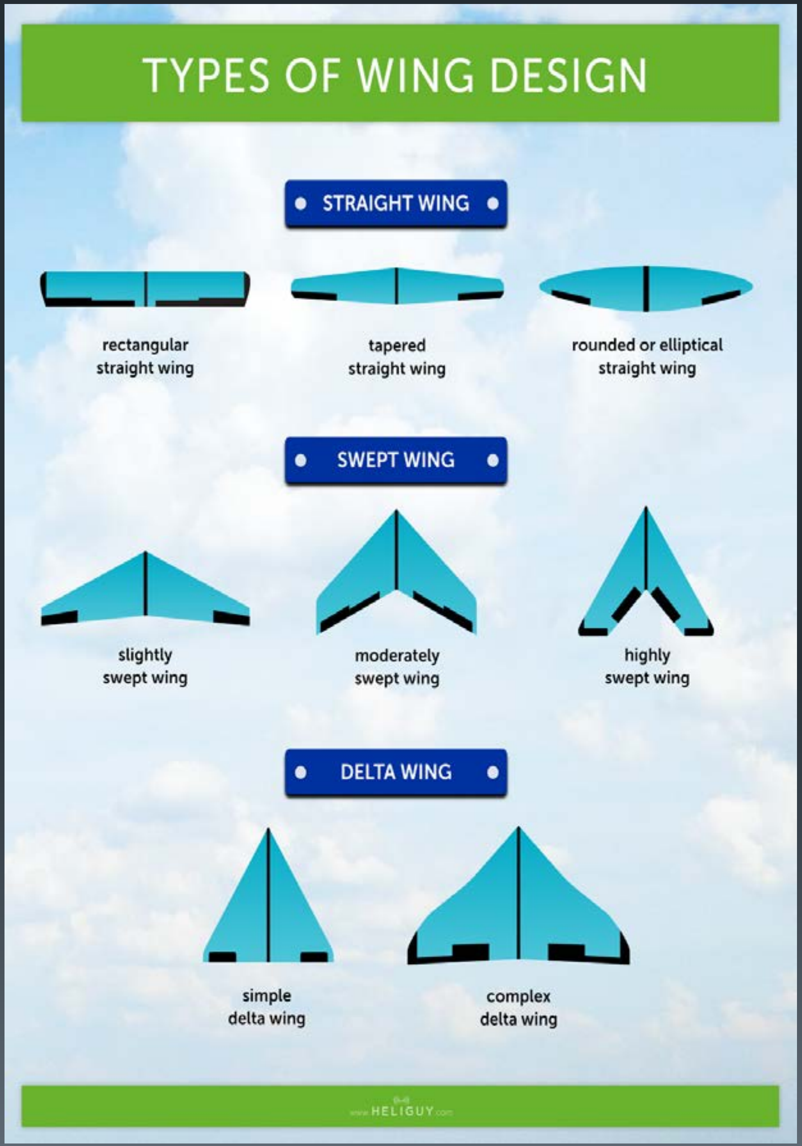


# Types of Fixed Wing UAVs







# Fixed Wing UAV Launch/Takeoff Mechanisms

Runway takeoff

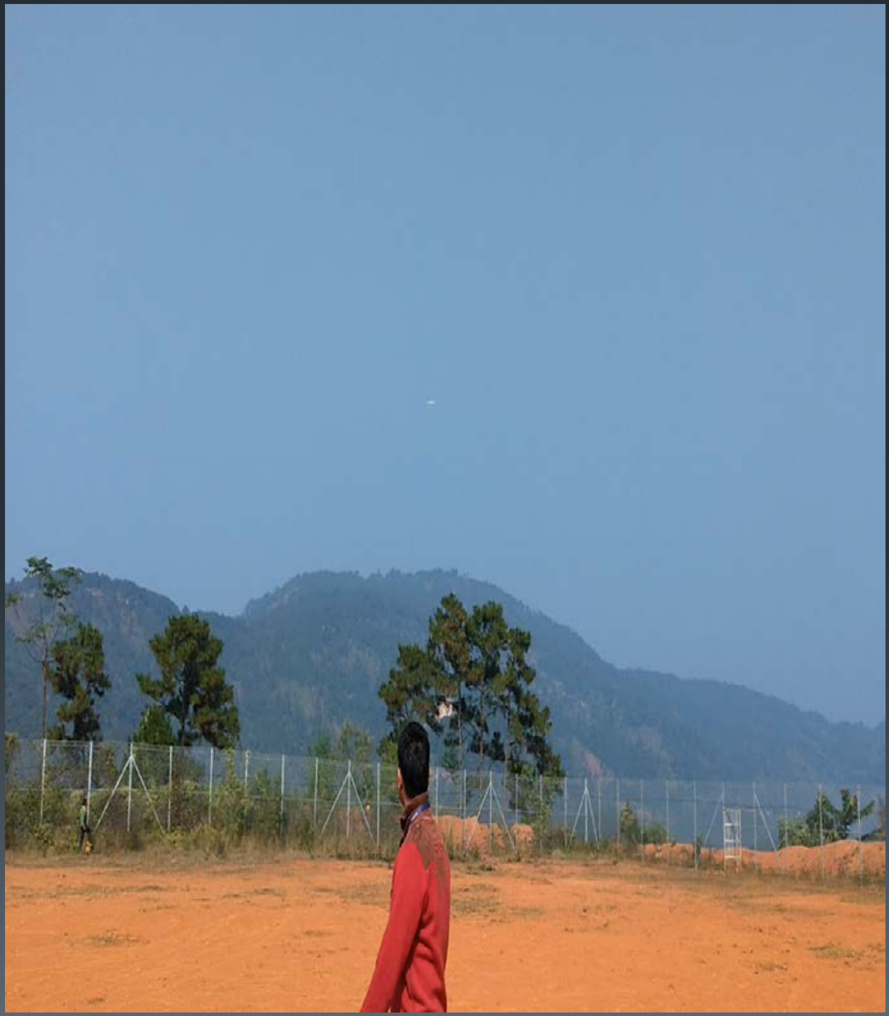
Catapult launch

Hand launch

# Fixed Wing UAV Landing Mechanisms

Parachute landing

Runway landing



# UAV experiments at NESAC

# NESAC-UAVs


DJI Inspire 1


Assembled Hex Copter
2016/09/11 06:55

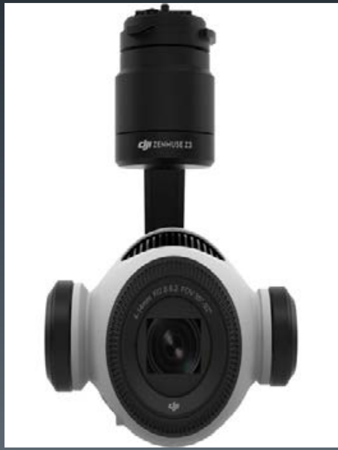

DJI Matrice 600


Assembled Fixed Wing

# UAV systems at NESAC- Sensors

**12 Mpx optical sensor-Zenmuse X3**

**12 Mpx optical sensor with up to 2X zoom-Zenmuse Z3**



**4 Band multispectral sensor**

Specs:

1. 4 monochromatic bands (Green, Red Red Edge and NIR) 1.2 Mpx each
1. 1 RGB sensor 16 Mpx
2. Total weight about 70-80 gms

# 3D Printing facility at NESAC

**Specifications**:
**Build volume:** 215 X 215 X 300mm
**Materials supported:** PLA, Nylon, ABS, PVA etc.
**Max. resolution:** 20 micron
**File formats supported:** OBJ, STL etc.


**Applications:**
Printing of spare parts for existing UAVs
Printing of small experimental UAVs

**Quad Copter:**

**Dimension:** 100 X 300 X 70 mm
**Material:** Nylon

Quad copter

# Integration of NAVIC VTS with UAV

NAVIC VTS Unit



UAV tracking on browser using NAVIC VTS

NAVIC VTS Integration with UAV

# Use of Unmanned Aerial Vehicle (UAV) Remote Sensing (UAV-RS) for the States of North Eastern Region

- **Objectives:** To setup UAV-RS facility for all the State Remote Sensing Application Centre (SRSAC) of NER
- **Current Status: Completed**

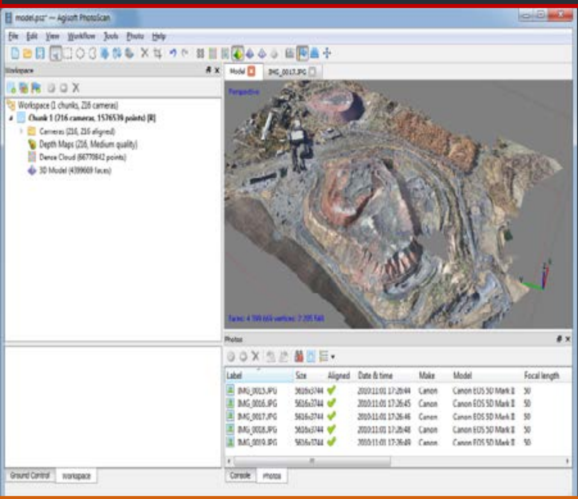
  All the SRSACs have been provided with one UAV along with one UAV data processing software and 2 weeks hands on training on UAV operations, data collection and data processing. More than 25 officials had participated from SRSACs and NEC.

- **Financial Status:** Total sanctioned amount of **Rs 75 Lakhs** have been received and utilization certificate have been submitted.

## Utilization

•All SRSACs have been using the UAV for various developmental activities in their respective states

•NESAC has also conducted more than 30 surveys for different line departments e.g. NEEPCO, NIRD, DC offices etc., for different applications e.g. town planning, embankment breach studies at Majuli Island etc.



AgiSoft Photo Scan Pro


Participants during UAV training

DJI Matrice 100

# UAV Applications & Limitations

## Applications

- Quick disaster assessment
- Crop estimation & damage assessment
- City/town planning
- Traffic management
- Aerial movies & videography-Film industry
- Industrial inspection-solar parks, wind parks, power line etc.
- Structural analysis- archaeology & heritage monument inspection
- First responders in accident, fire or crisis

## Limitations

- Limited payload capacity
- Limited flight endurance
- Less area coverage
- Suitable for small study area
- Can not be operated during rain

# Importance of UAVs in Remote Sensing

- Effective for real time mapping, survey and monitoring activities with high spatial and spectral resolution data.

- UAV data can be applied in combination with satellite data to produce better results e.g. Getting high-resolution images of interested area, getting localized images of satellite shadow zones.

- The potential of UAV product in the form of very very high-resolution (VVHR) images has enabled to gather detailed spatial information in studying unplanned settlements.

- UAVs can perform an efficient Survey for disaster prone or physically inaccessible areas, quick damage assessment of landslides, floods and earthquakes for enabling relief measures.

# Conclusion

- Fast evolving technology
- Gaining popularity
- Practical applications
- Research topics


THANK
YOU