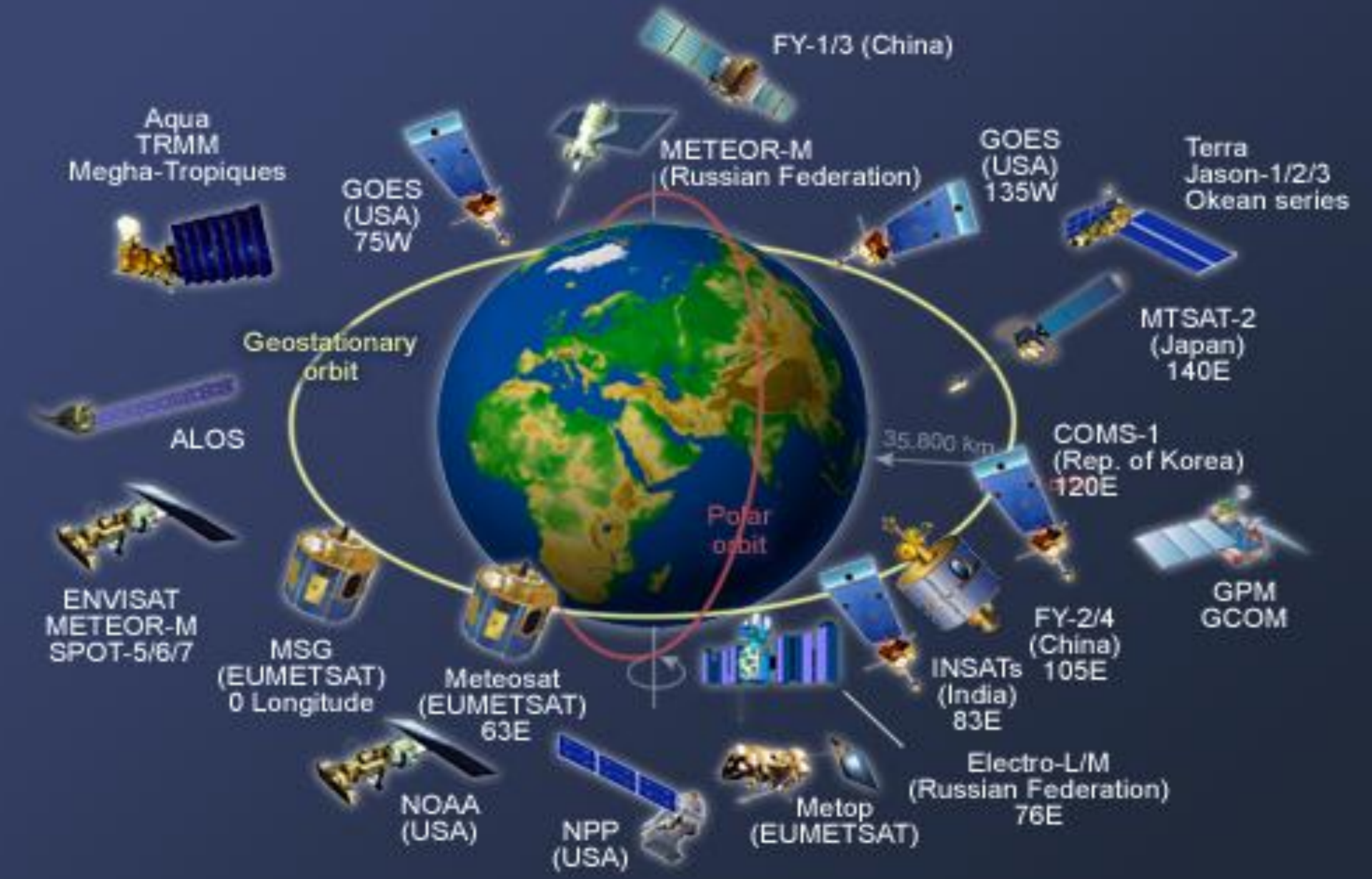
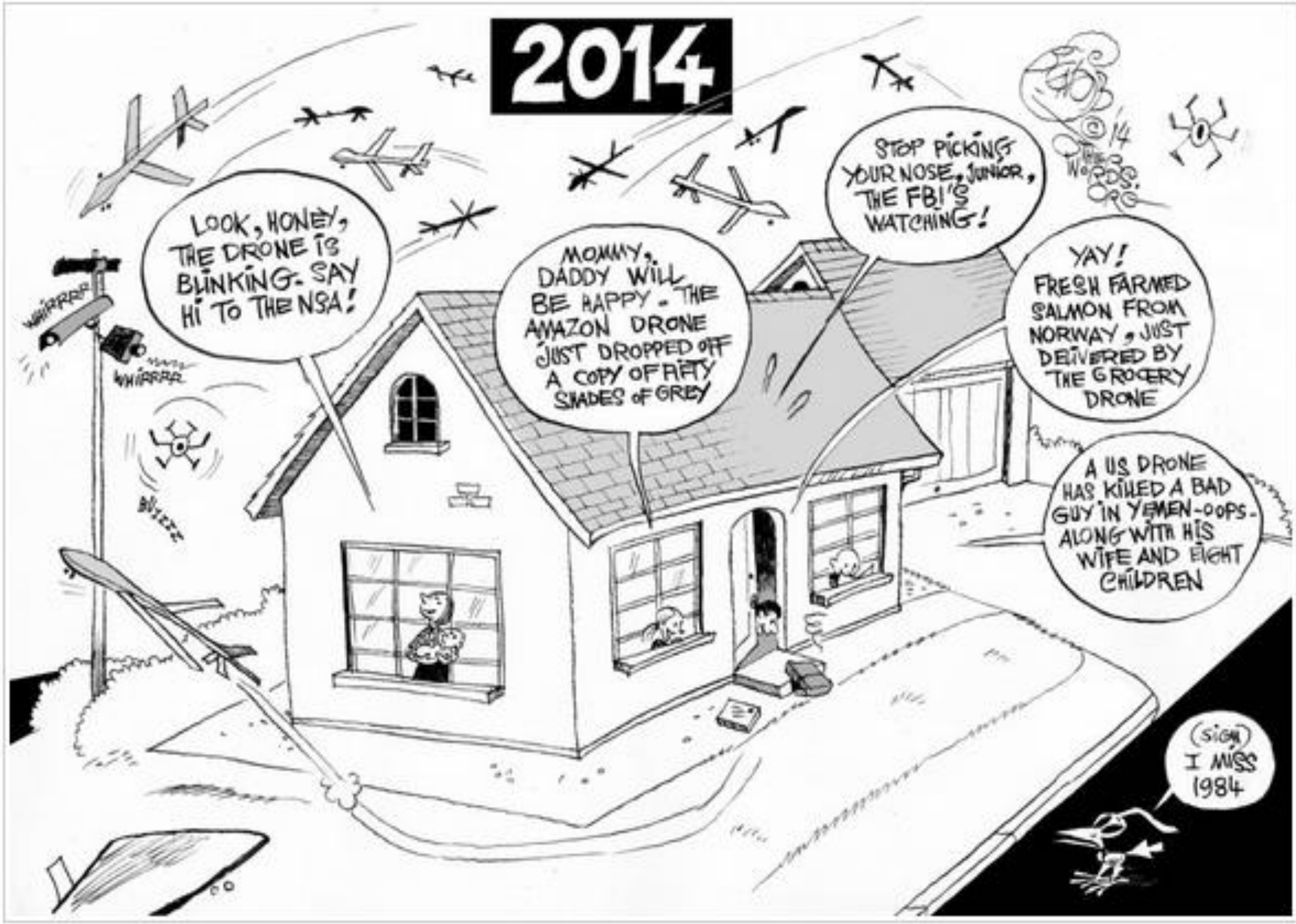
CLICK HERE TO KNOW MORE

The Global Operational Satellite System





Drone City, an OtherWords Cartoon by Khalil Bendib

Geospatial Technology: Utility Mapping using Unmanned Aerial Vehicle

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GEOSMART ASIA 2015

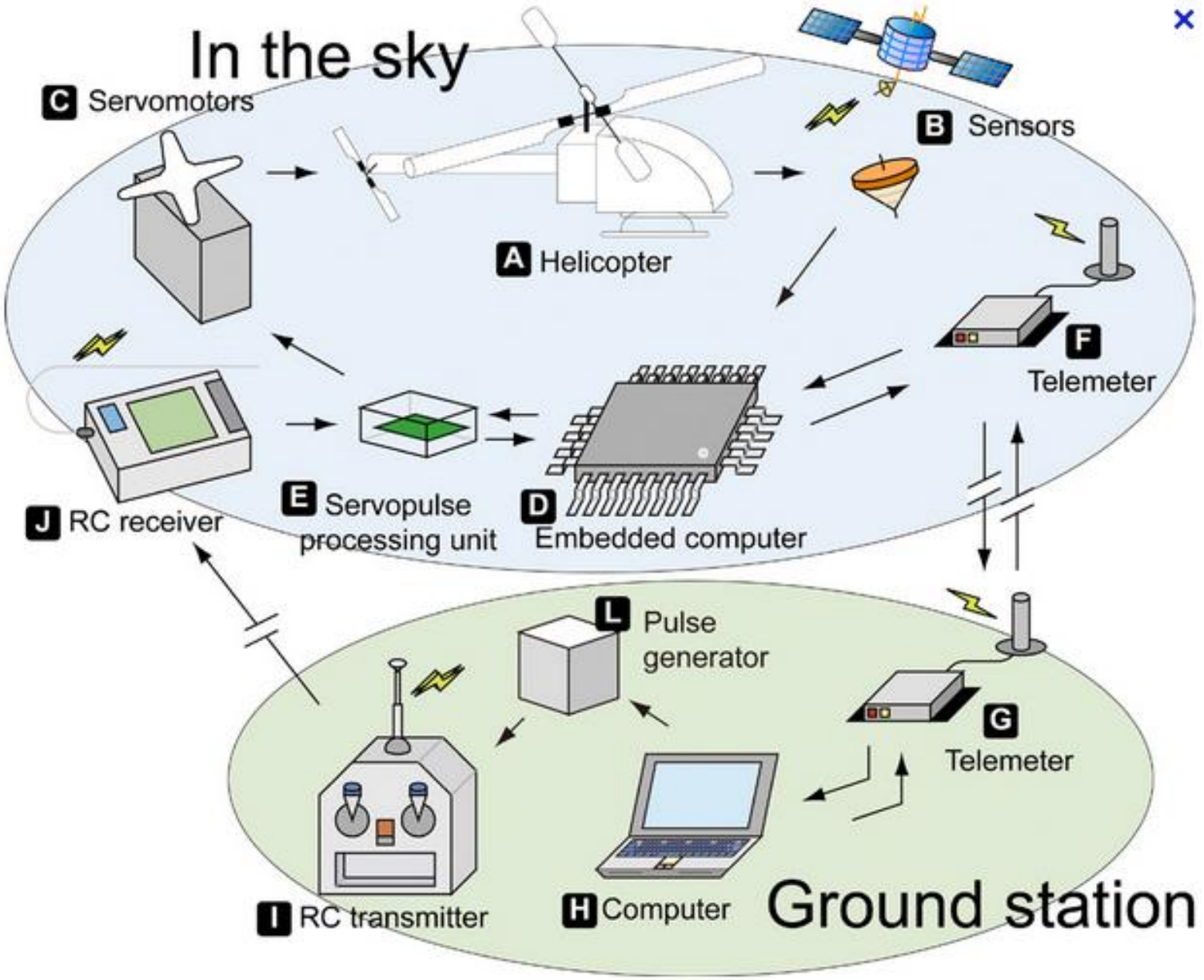
Table of Contents

INTRODUCTION

- Around the globe, Unmanned Aerial Vehicle (UAV) have been used for various civilian applications such as:
  - mapping urban, suburban areas etc
  - utilities mapping (eg transmission line, gas pipeline etc)
  - monitoring & security
  - change detection
  - modeling cultural heritage
  - documentation of archaeological site
  - resource management etc …..

INTRODUCTION…..

- The term UAV/DRONE is commonly used in the Computer Science, Robotics and Artificial Intelligence, as well as the Photogrammetry and Remote Sensing communities.
- Other terms such as Remotely Piloted Vehicle (RPV), Remotely Operated Aircraft (ROA) or Remotely Piloted Aircraft (RPA) and Unmanned Vehicle Systems (UVS) can also infrequently be found in the literature.
- The term Unmanned Aircraft System (UAS) is also being used.
- The FAA has adopted the generic class UAS which stands for the whole system, including the Unmanned Aircraft (UA) and the Ground Control Station (GCS).


In the sky
C Servomotors
B Sensors
A Helicopter
F Telemeter
J RC receiver
E Servopulse processing unit
D Embedded computer
L Pulse generator
G Telemeter
I RC transmitter
H Computer
Ground station

SOPHISTICATED SETUP

Predator Ground Control Station (GCS)

SIMPLE SETUP

Classification of UAVs

- There is a wide variety of UAV depending on their size, endurance, range and flying altitude that are clearly defined by Unmanned Vehicle Systems (UVS) International Association.

Category name	Mass [kg]	Range [km]	Flight altitude [m]	Endurance [hours]
Micro	< 5	< 10	250	1
Mini	< 25/ 30/ 150	< 10	150/ 250/ 300	< 2
Close Range	25 - 150	10 - 30	3000	2 - 4
Medium Range	50 - 250	30 - 70	3000	3 - 6
High Alt. Long Endurance	> 250	> 70	> 3000	> 6

EXAMPLES OF MICRO FIXED-WING UAV

Gatewing/ Belgium/ TerraTek/ Fixed Wing

Avian/ China/ EnviroLand/ Fixed Wing

Ebee/ Swiss/ TerraTek/ Fixed Wing

Pteryx Pro/ Poland/ AG/ Fixed Wing

EXAMPLES OF MULTI-ROTOR UAV

Mikrokopter

Quadkopter

Hexakopter
- aerial photographs
- measurements (air-quality, temperature)

Oktokopter

Aibotix X6

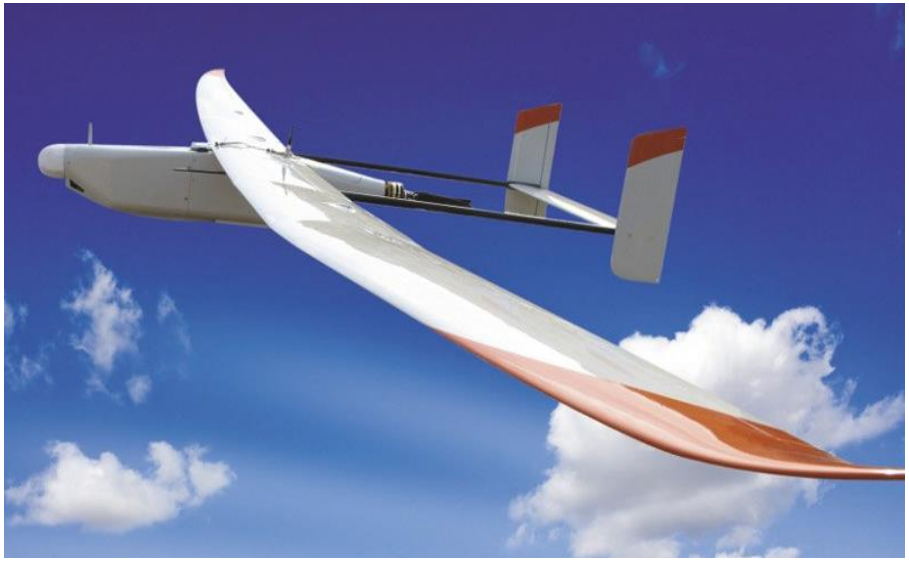
Microdrones UAV

ExaPix

Aeryon Small Unmanned Aerial Systems

EXAMPLES OF MEDIUM UAV

Swiss Drone TC1235/ Swiss/ AG/ Heli



Elimco E300/ Spain/ PUDC/ Fixed Wing

Schiebell S100/ Austria/ Galaxy/ Heli

Swiss UAV S350/ Swiss/ - / Heli

LATEST UAV: DSMM 2015

Multi-rotor UAV/Swiss DRONE 70kg

Ground Control Station

UTM & TNB UAV RESEARCH COLLABORATION

- Universiti Teknologi Malaysia:
  - Knowledge of geoinformation such as aerial photogrammetry, GPS, GIS, RS, geomatic eng. etc
  - Experience using UAV for research at undergraduate & postgraduate
  - Consultation project using UAV
- Aerodyne Geospatial:
  - Development of UAV
  - Involved in many consultation project & community service

Unmanned Aerial Vehicle (UAV)

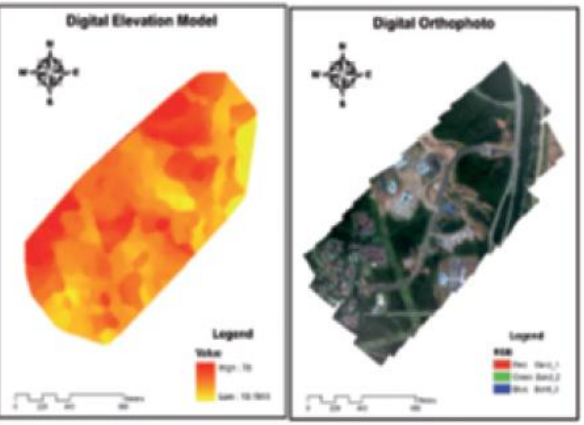
Faculty of Geoinformation & Real Estate

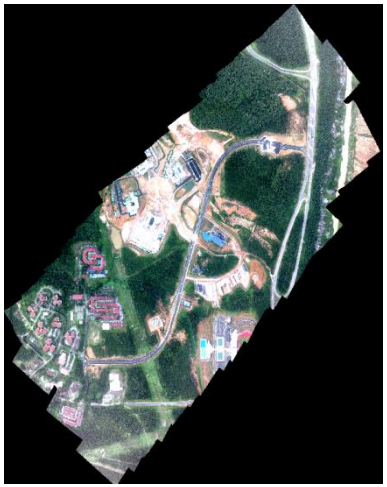
Mikrokopter Hexakopter (2011)

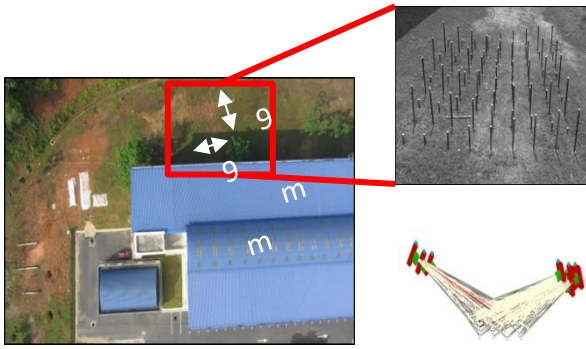
Helang UAV (2013)

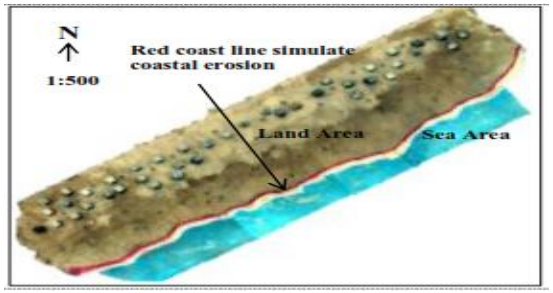
Walkera Tali500 Hexakopter (2015)

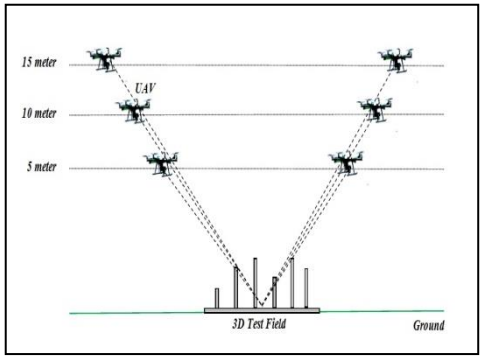
UTM: Examples of UAV output

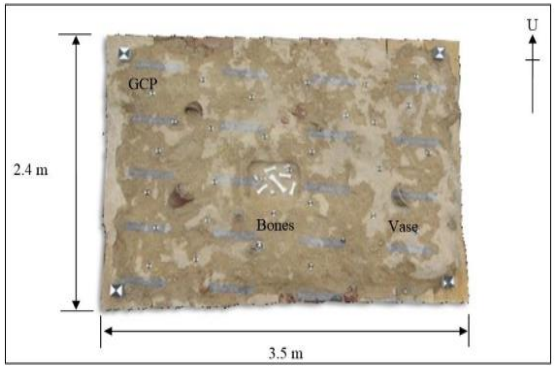


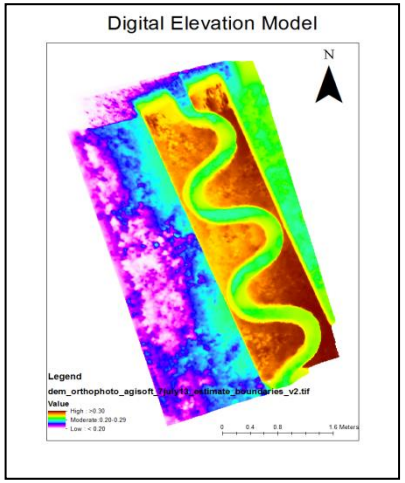




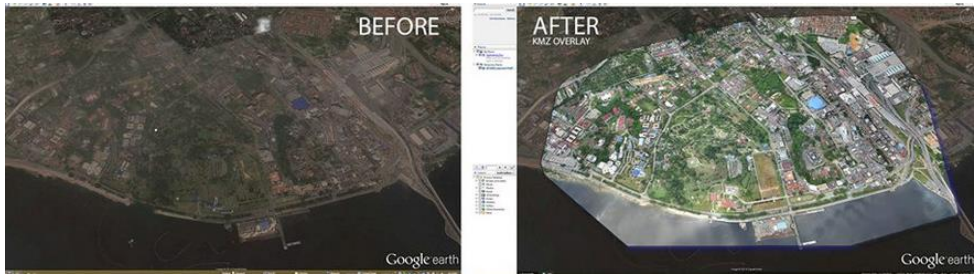




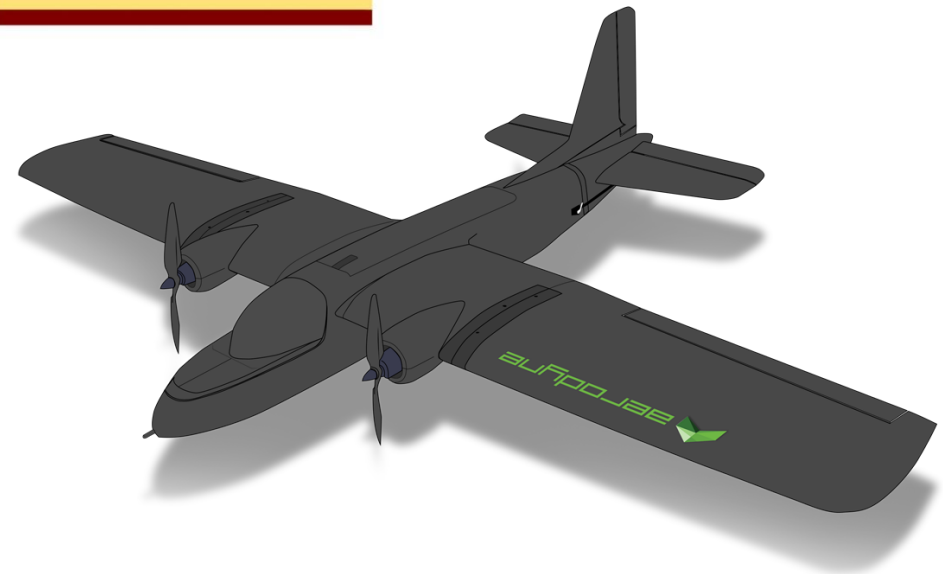




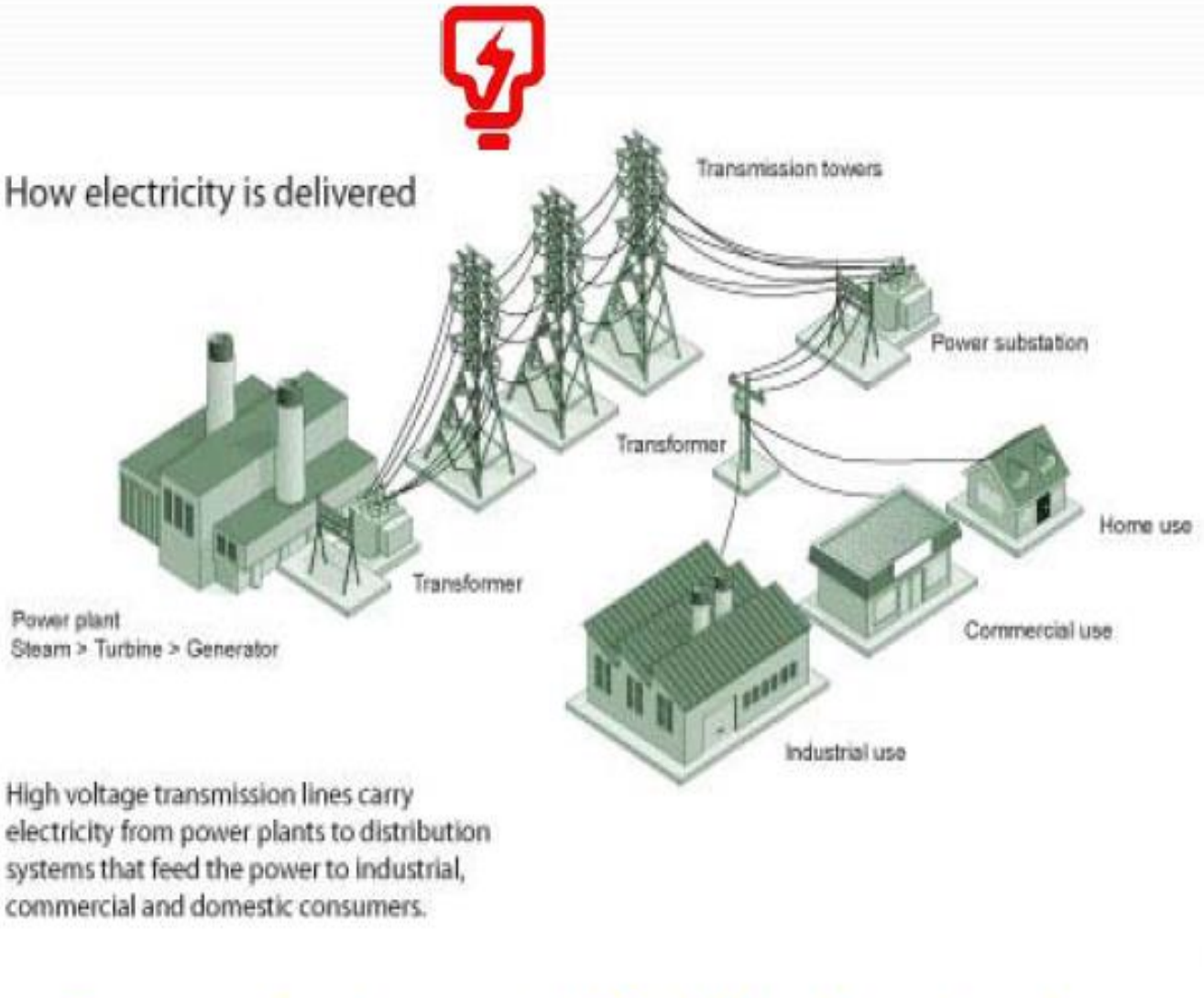
Areodyne: Examples of UAV output



Aerodyne Geospatial Sdn Bhd
www.aerodyne.co



TNB: UTILITY PROVIDER



Transmission and Distribution System

TNB RESEARCH & TRANSMISSION

- In Malaysia, Tenaga Nasional Berhad (TNB) is a utility company that supply electricity for the nation.
- It is the largest electricity utility in Malaysia and a leading utility company in Asia.
- TNB comprises of several departments that include TNB Research Sdn Bhd, TNB Transmission and others.
- TNB Transmission is utilizing the Geographical Information Technologies (GIT) such as Remote Sensing, Global Positioning System and GIS for planning new transmission line route.
- The used of GIT really does help in planning works for selecting new route for transmission line and searching for new substation site.

Route Selection Process

Preliminary Route Identification

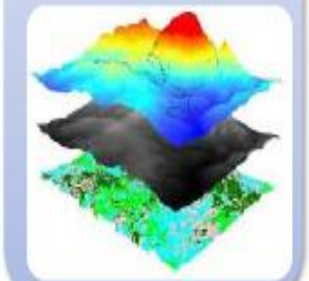
Need for new route from System Planner

Connecting starting point to end point

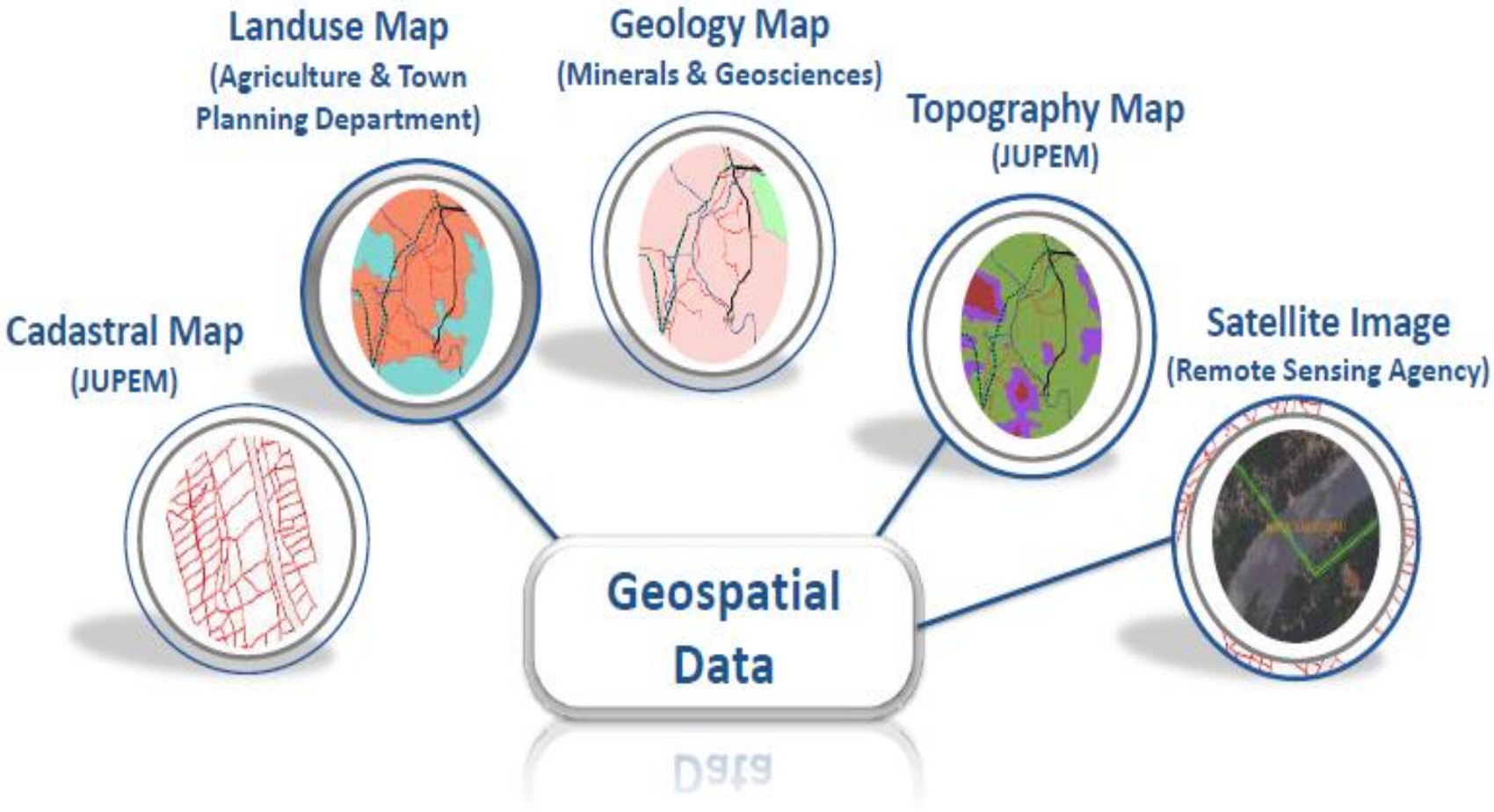
Data Acquisition

Acquire geospatial data from relevant agencies

Using GIS as the data environment



Data Acquisition



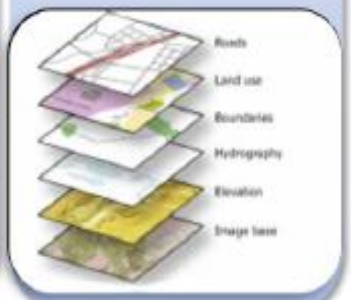
Geospatial Data obtain from various relevant agencies

Route Selection Process

Route Analysis

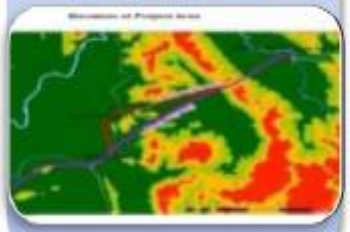
Using GIS for desktop analysis route selection

Analysis base on selected parameters as layer



Multiple Route Option

Few route option will be produce from GIS geoprocessing analysis



Route Selection Process

Site Verification

Site verification to determine route feasibility

Route will be reviewed and deviated if the route is not suitable

Finalizing Route

Most optimal route will be selected

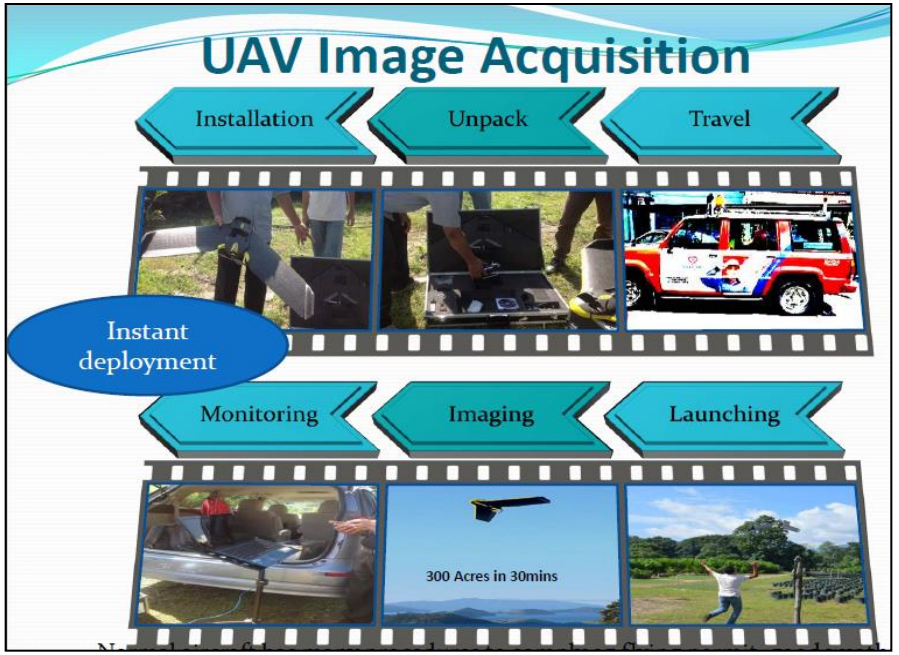
Route will be review if it does not meet Engineering's requirement

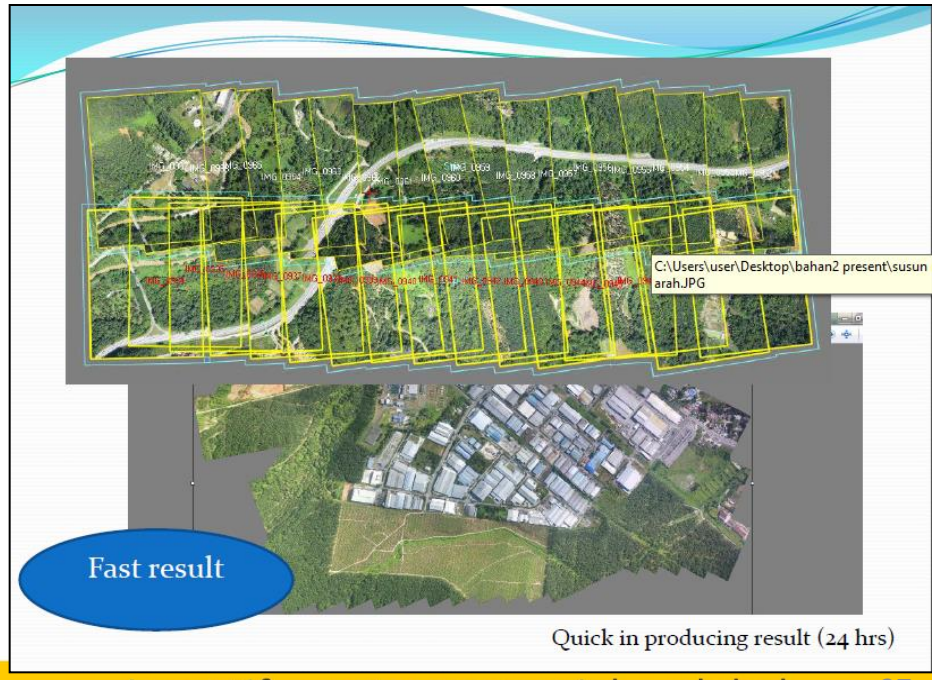
TNB RESEARCH & TRANSMISSION

- The TNB Research Sdn Bhd also is utilising GIT for their research activities.
- TNBR & TNBT have used digital data, however, the use of digital data is very expensive.
- These two entities are considering current technology of UAV/DRONE system for acquisition of geospatial data.
- **WHY UAV/DRONE???**
- UAV technology is known for their easy movement, great flexibility and low costs, is promised to be a great aerial sensor for capturing remote sensing data.
- Other advantages, the data is free from cloud cover and rapid data acquisition and processing.

WHY UAV/DRONE???


05 Banjir Besar Kuantan mrrizalpage.blo
Ease for hard to reach places
Accessibility


UAV Image Acquisition
Installation
Unpack
Travel
Instant deployment
Monitoring
Imaging
Launching
300 Acres in 30mins


C:\Users\user\Desktop\bahan2 present\susun arah.JPG
Fast result
Quick in producing result (24 hrs)

Minimum cost to operate

Lesser cost than normal photogrammetry using conventional aircraft
Bigger aircraft has lengthy procedures

PROBLEM STATEMENT

- There are approximately 10,000km of transmission lines of various voltage (eg. 66kV, 132kV, 275kV, 500kV) in the country.
- These transmission lines passed through developed area, forest area etc.
- TNB need to map the existing transmission.
- Also TNB need to plan and select the correct and best route for transmission line which could save time and cost.

Transmission Voltage
- 500kV
- 275kV
- 132kV

[redacted] Bengkel dgn PT

Interconnection
- 250kV HVAC Plentong-Singapore
- 300kV HVDC Gurun-Klong Ngae, 300MW
- 132kV HVAC Chuping-Sadao, 80MW
- 33kV AC Gerik-Betong, 5MW (new)
- 132kV HVAC Rantau Panjang-Golok, 100MW (new)

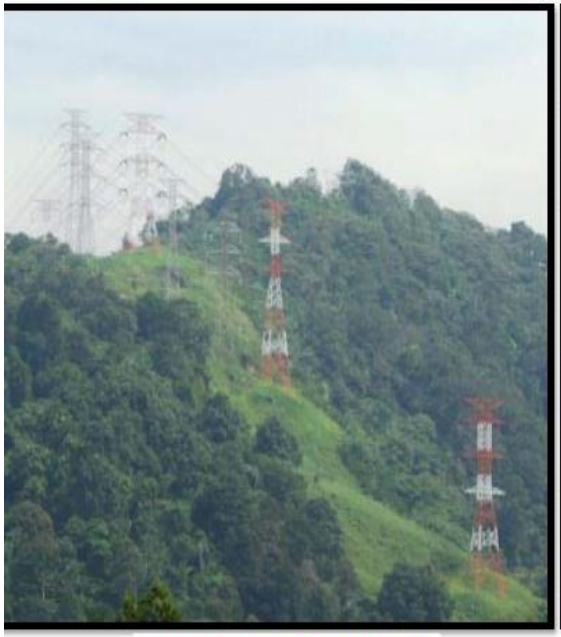
Interconnection Data

Two major methods in supplying electricity

Overhead Lines

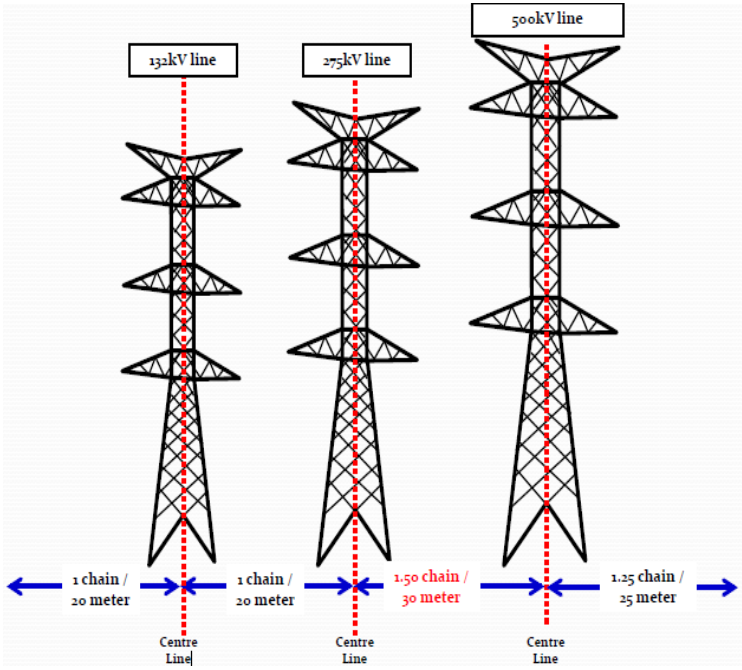
Underground Cables

Transmission Line in the Forest Area



Damansara, SELANGOR

Along Karak Highway, PAHANG


132kV line
275kV line
500kV line
1 chain / 20 meter
1 chain / 20 meter
1.50 chain / 30 meter
1.25 chain / 25 meter
Centre Line
Centre Line
Centre Line


500kV
275kV
275kV
132kV


66 kV
132 kV
SSPT-Chenderoh-talian 66kV & 132kV
Tx foto2.png

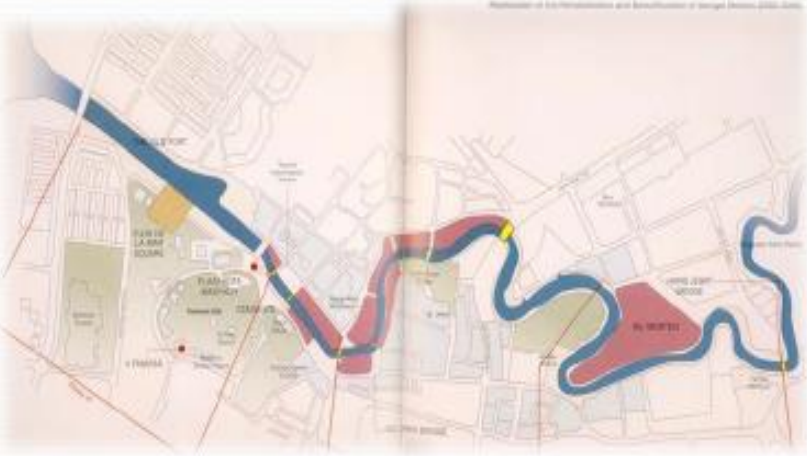

PMU AVETANI, Bentong

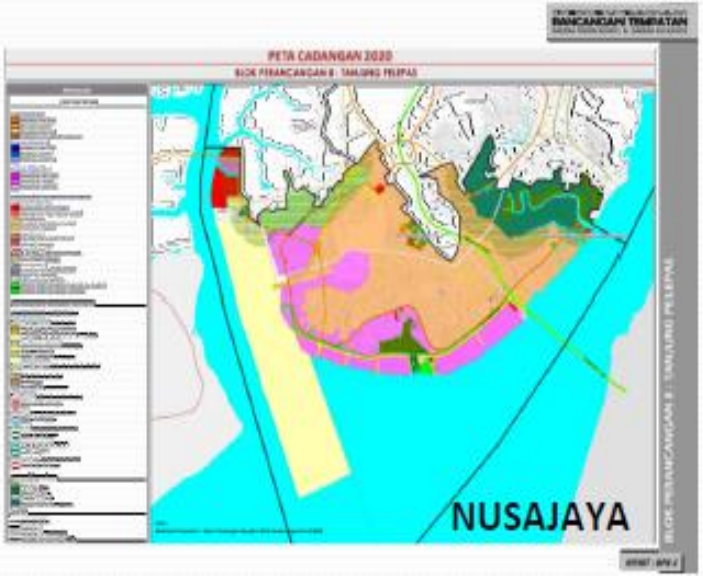

PMU NEW RAWANG, Rawang

Developed Area

PENGERANG
(RKK DAERAH KOTA TINGGI)

SUNGAI MELAKA





PROBLEM STATEMENT…..

- Also there are several questions that need to be answered by TNB such as follows:
  - How TNB can avoid from the problem of protest from the public?
  - How TNB can solve the problem if the transmission line has to pass through developed area?
  - How TNB can play it's role to developed the country power infrastructure if there is no suitable route available?

Public Protest

Tension runs high between TNB and Sg Terentang villagers - The Star, October 2010

NEARLY 20 policemen stood guard as contractors of Tenaga Nasional Berhad went to work at a hot spot to build a high tension tower, surrounded by dozens of villagers of Sungai Terentang in Rawang, opposed to the project.

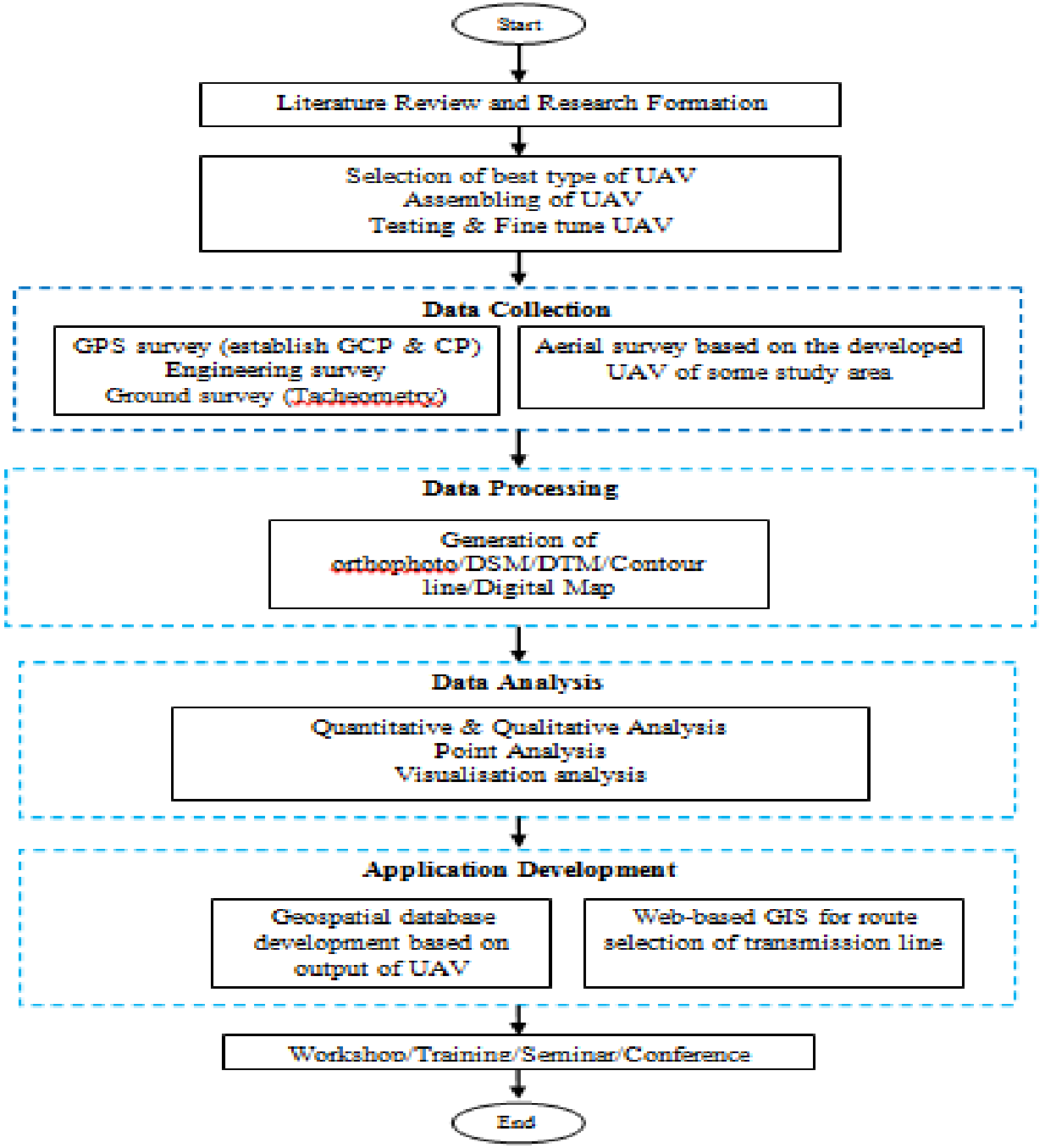
OBJECTIVES OF STUDY

- The main objectives of the study are as follows:
  - To identify the suitable GIT including UAV technology that can be used in transmission line route selection, including its accuracy based on the criteria below:
    - The usage of the data, either for planning, preliminary and detail engineering design or construction.
    - Land use type such as urban area, rural area, forest, etc.
    - Soil type (for engineering requirement).
    - Land management and acquisition.

OBJECTIVES OF STUDY…..

- To compare the accuracy of each input data that will be used in route selection system.
- To develop a GIT guideline for transmission line route selection including on land, shore line (costal area) and water bodies such as the sea, river and lake.

METHODOLOGY



DELIVERABLES

- 5 units of UAVs
  - 3 fixed-wing UAVs
  - 2 multi-rotor UAVs
- Modified 4WD vehicle or VAN as Ground Control Station
- Geospatial Information Technology (GIT) guideline for TNBR & TNBT (e.g Platform, payload, sensors, image quality, accuracy, procedure, regulations (DCA, DSMM etc).
- Training TNB staff using both type of UAVs
- Workshops/Seminar/Conference
- Inception, Progress & Final Reports

CONCLUSION

- Based on knowledge and experince related to UAV, UTM and Aerodyne Geospatial are confident to deliver the end product which consist of 5 UAVs, GIT guideline etc.
- It is hope the developed UAVs could assist TNB for their research, route selection of transmission line, mapping project etc.
- Able to train TNB staff method of developing UAV and use it for mapping.
- Gain better knowledge of developing small/light weight/low cost UAVs and better experience of deploying UAV for TNB's applications.

THANK YOU

GEOSMART ASIA 2015