Unmanned Aerial Aehicle (UAV)

Done By:

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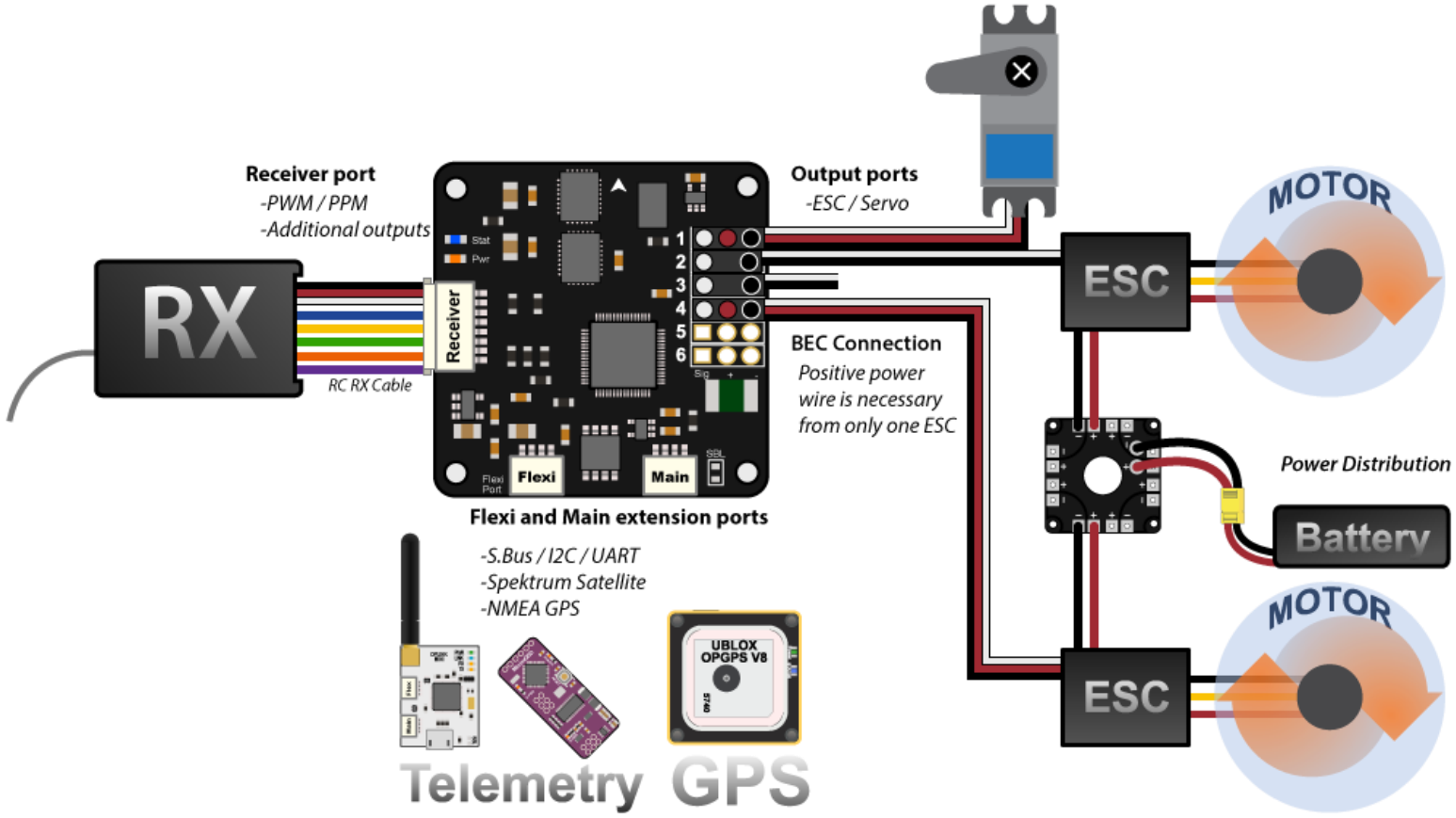
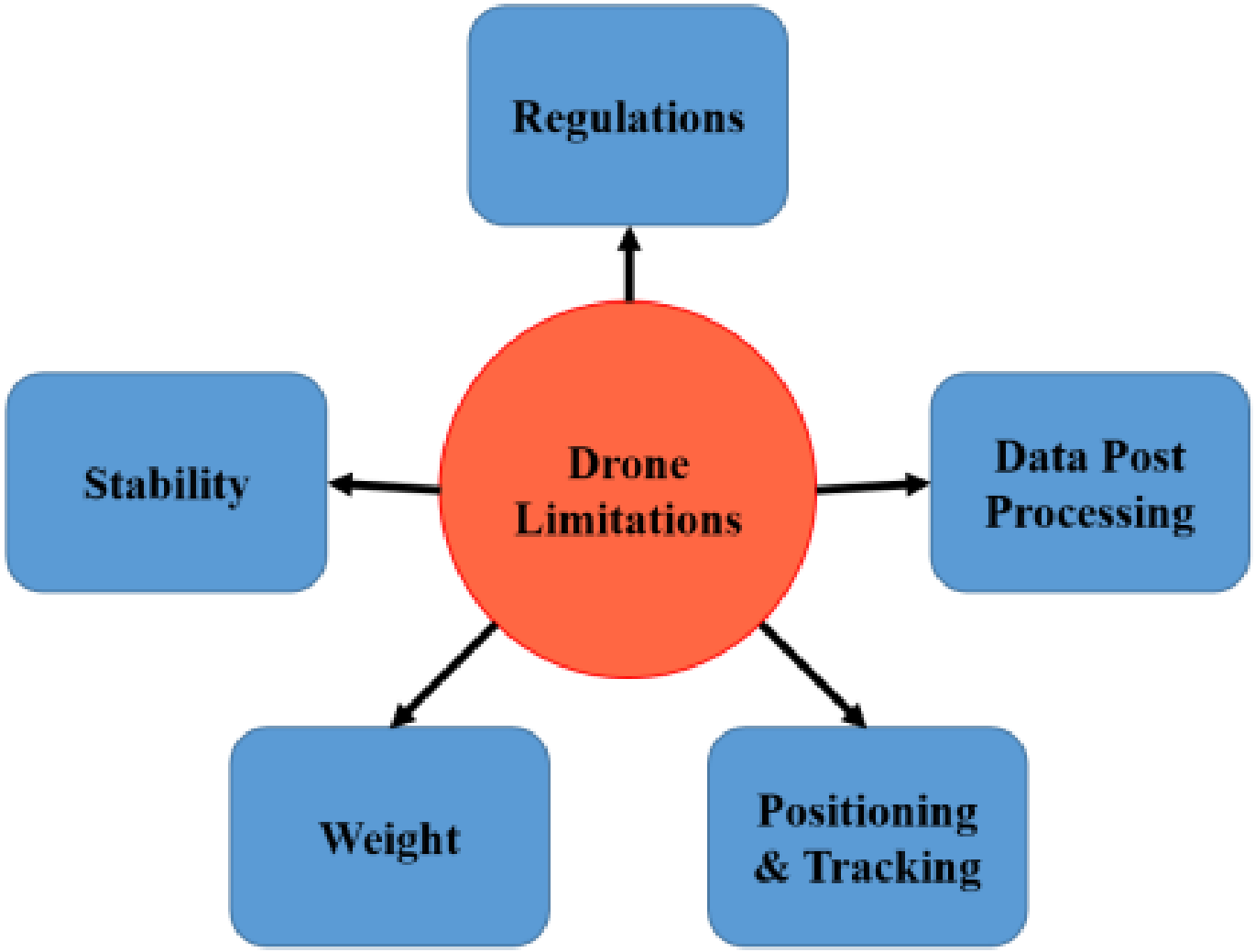
History of the robot

With the start of the Cold War, UAVs began to be used as ISR systems, with limited success as weapons delivery platforms. Development continued throughout the Vietnam War, but interest soon waned once hostilities ceased. The 1991 Gulf War renewed interest in UAVs, and by the time the Balkans Conflict began, military intelligence personnel were regularly incorporating UAV ISR information into their analyses. Currently, UAVs effectively provide users with real-time ISR information. Additionally, if the ISR information can be quickly understood and locations geo-registered, UCAVs can be used to strike time-sensitive targets with air-to-surface weapons.

Basic System Architecture

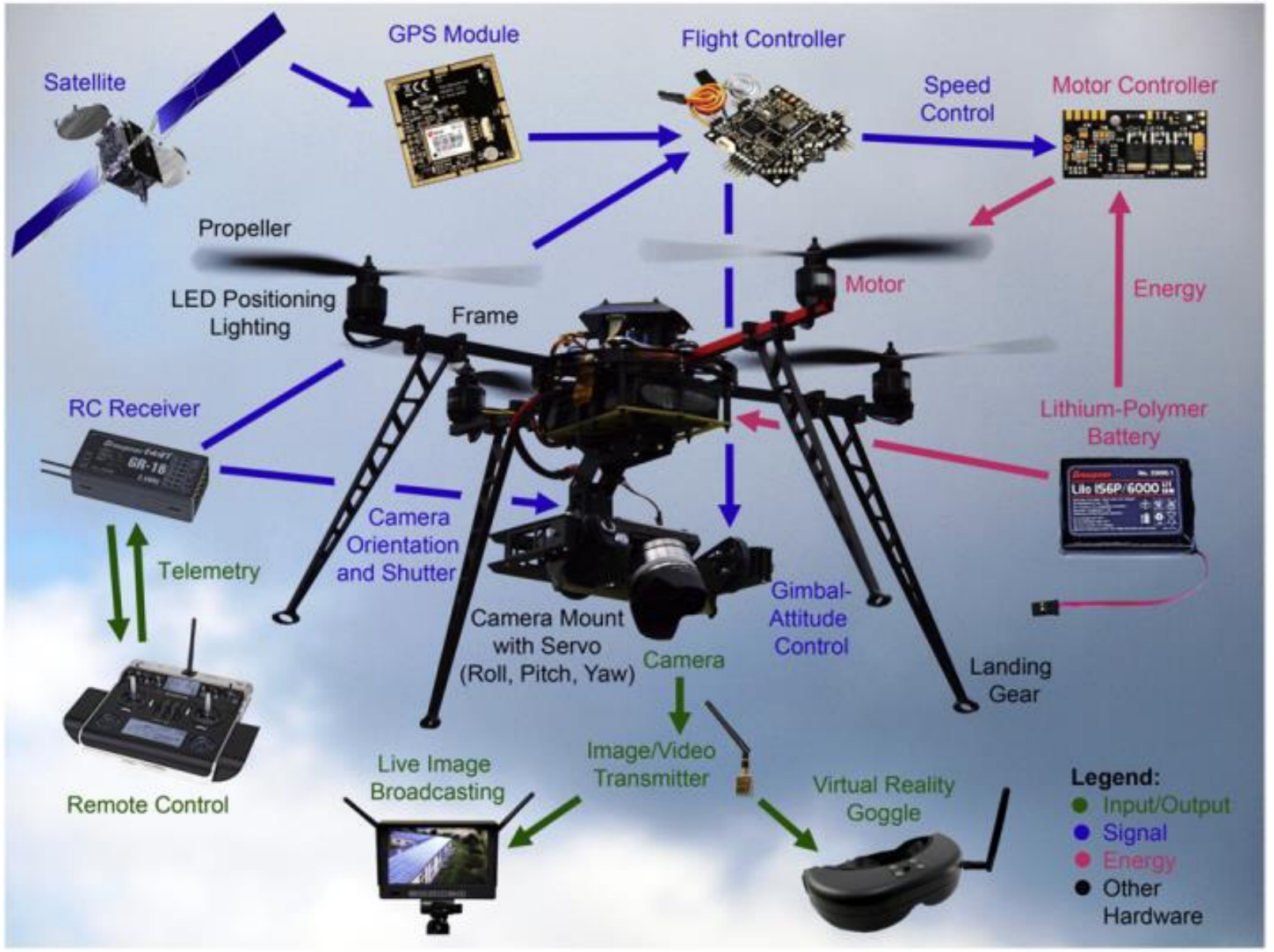


Basic System Architecture

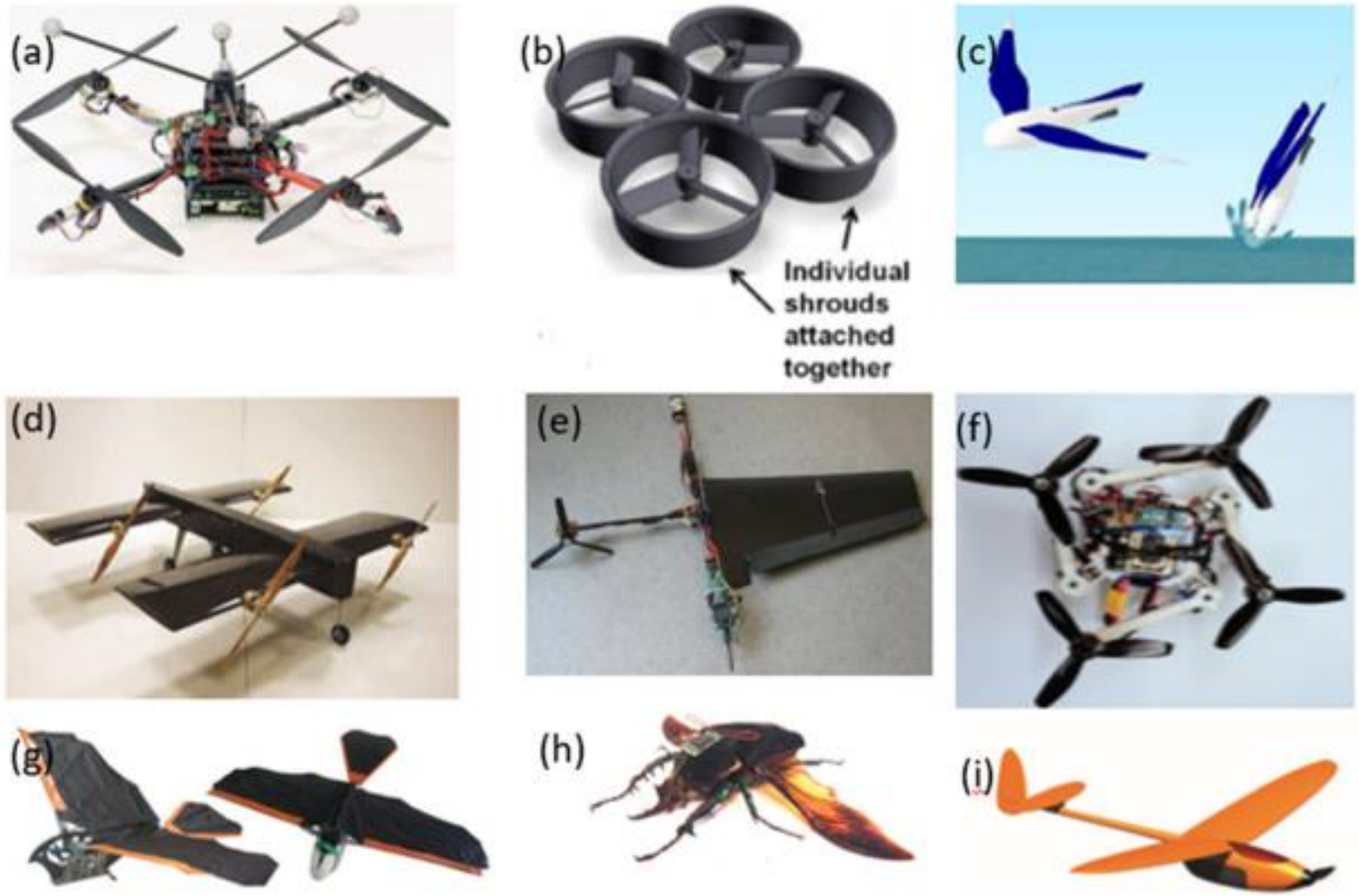


Basic System Architecture

These are the essential parts that are used to make and initiate a quadcopter drone.



1) Robot Design Vs Task



1) Robot Design Vs Task

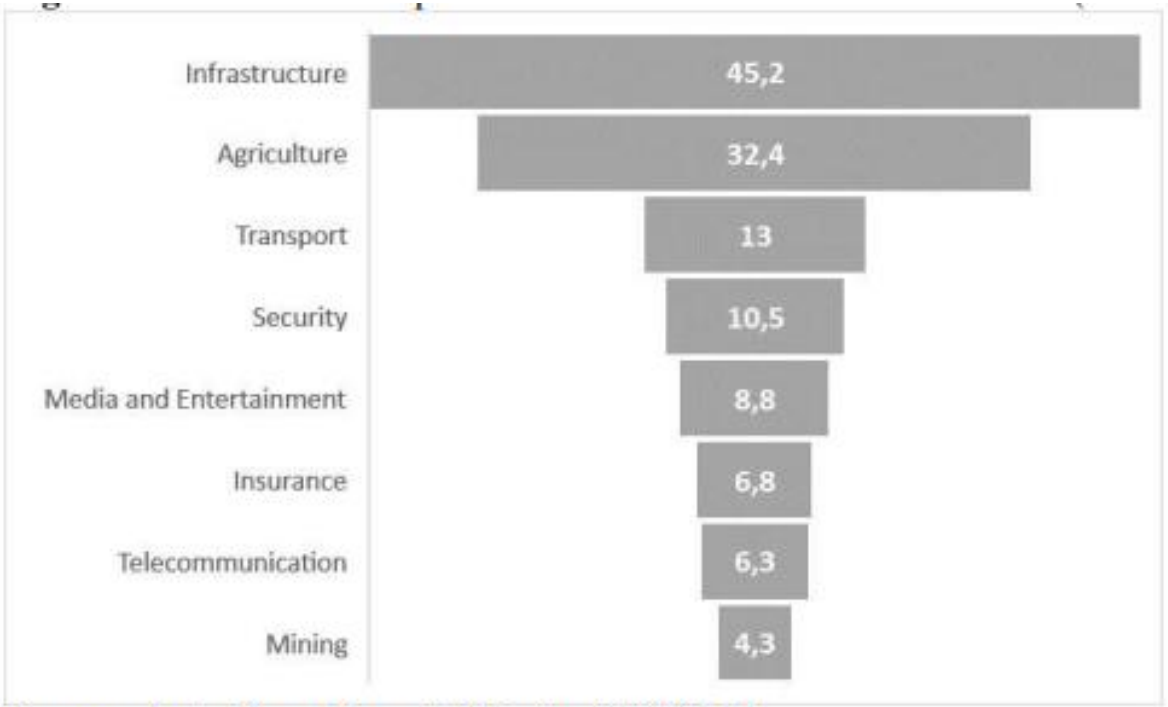
Category	Advantage	Disadvantage
Tilt Propeller	-Increased stability. -Carries both advantages of HTOL and VTOL. -Complete body tilting isn't required. -Hence, it is more suitable for flying within wrecked buildings.	-Requires more actuators for tilting transition. -Mathematical modelling becomes more complex. -Consumes more energy during transition.
Ducted-Fan	-Capable of achieving superior speeds (even to fixed wing UAVs), with VTOL capability.	-Require complex flight control algorithms, due to the non-linear actuators aerodynamic.
AquaMAV	-Operates in various mediums (fly in air, dive into the water, effectively move in water and retake off into the air).	-Structure has to be modified, as the wings must be folded before diving into the water. -- -This slows the craft speed and thus, an underwater propulsion system is required.
Tilt-Wing	-Combined features of FW and RW UAV. -Long flight duration at high speeds. -VTOL advantages with hovering and quick orientation capabilities.	-Increased complexity in the mechanical and control systems. -Increased energy consumption during tilting transitions.
Mono-Copter	-Single winged, designed after falling maple seeds. -Small structure, with the advantage of flying within confined spaces such as corridors.	-Restricted to indoor flying. -Dynamic stability needs improvement.
Foldable & Self deploying	-Ideal for emergency applications that require immediate deployment when necessary. -Typically deployed in less than 0.3 s.	-Limited applications due to small structure (<13 cm diameter). -Material cannot be strained in the folding procedure. -Resilience against collisions need to be improved.
Flapping Wing	-Capable of achieving unique manoeuvrability. -Extremely light.	-Due to the light material used, it cannot handle external disturbances. -Poor flying efficiencies.
Controlled Insect	-Utilises a variety of sensors that are connected to the body to collect data from the muscles that control the airflow, which can be applied to the flight controller in insects that weigh nearly 3 g.	-The data collected is only limited to small insects and cannot be applied to larger flyers. -Mechanical development is highly complicated.
Solar Powered Fixed Wing	-Longer endurance flights, lasting up to 8 h on a clear sunny day.	-It is only compatible to fly under clear skies. -Slow cruise speed.

1) Robot Design Vs Task

Types	Advantages	Disadvantages	Example
Fixed wing	Long range Endurance	Horizontal take-off, requiring substantial space or support Inferior maneuverability compared to VTOL (Vertical Take-Off and Landing)	
Tilt wing	Combination of fixed wing and VTOL advantages	Expensive Technology complex	
Unmanned Helicopter	VTOL Maneuverability High payloads possible	Expensive Comparably high maintenance requirements	
Multicopter	Inexpensive, Low weight Easy to launch	Limited payloads Susceptible to wind due to low weight	

Source: adapted from Heutger, 2014 and Kelek, 2015

1) Robot Design Vs Task



Source: adapted from Mazur & Wisniewski, 2016: 4

Goverment
- Law enforsment (Police, civil security)
- Border security
- Coastguard

Fire Fighting
- Foret fires
- Other major incidents
- Emergency rescue (i.e. Mountain rescue)

Energy Sector
- Oil and gas industry distribution infrstructure
- Electric grids / distribution networks

Agriculture, Forestr and Fishery
- Environment monitoring
- Crup dusting
- Optimising use of resources

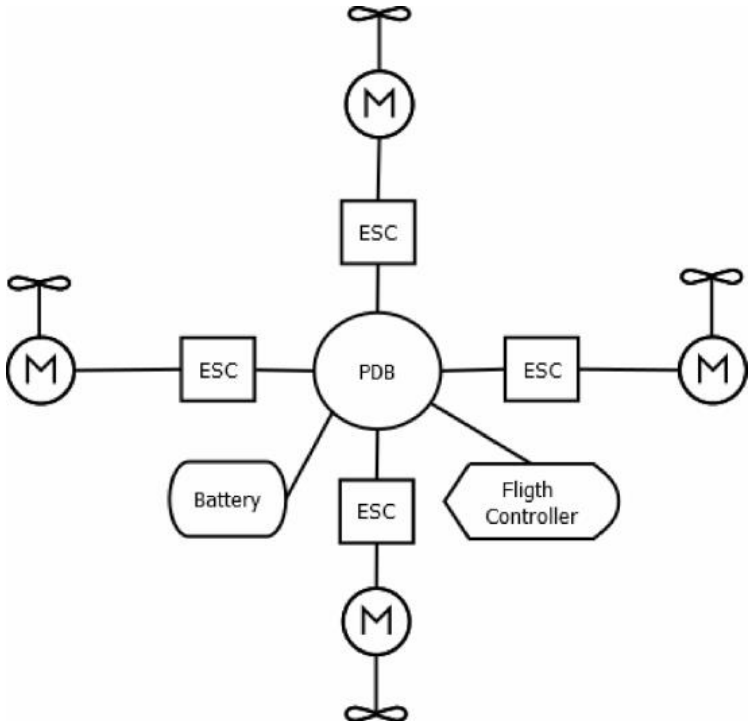
Earth Observation and Remote sensing
- Climate monitoring
- Seismic events
- Major incidents and polution monitoring

Communication and Broadcasting
- VHALE platforms as proxy satellites
- MALE/SMUAC as short-term, local communication coverage

Source: adapted from Frost & Sullivan, 2007: 7

2) Actuators and Locomotions

4X Racerstar Racing Edition 2212 BR2212 980KV 2-4S Brushless Motor



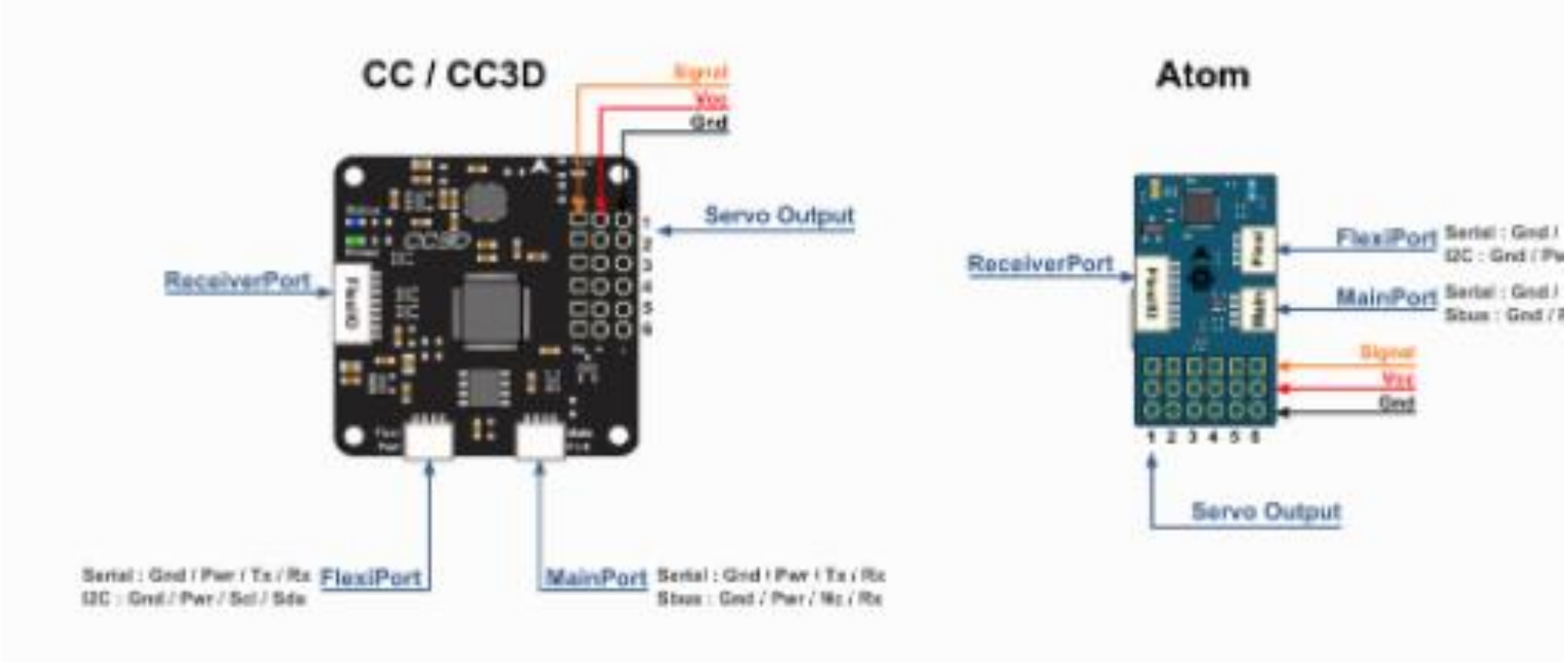
2) Actuators and Locomotions

The Gimbal stabilizer stabilizes the camera and make it fixed on one position no matter what direction the UAV moves to.

2 Axis Brushless Gimbal Stabilizer

3) Navigation System & Controller

Flight Controller



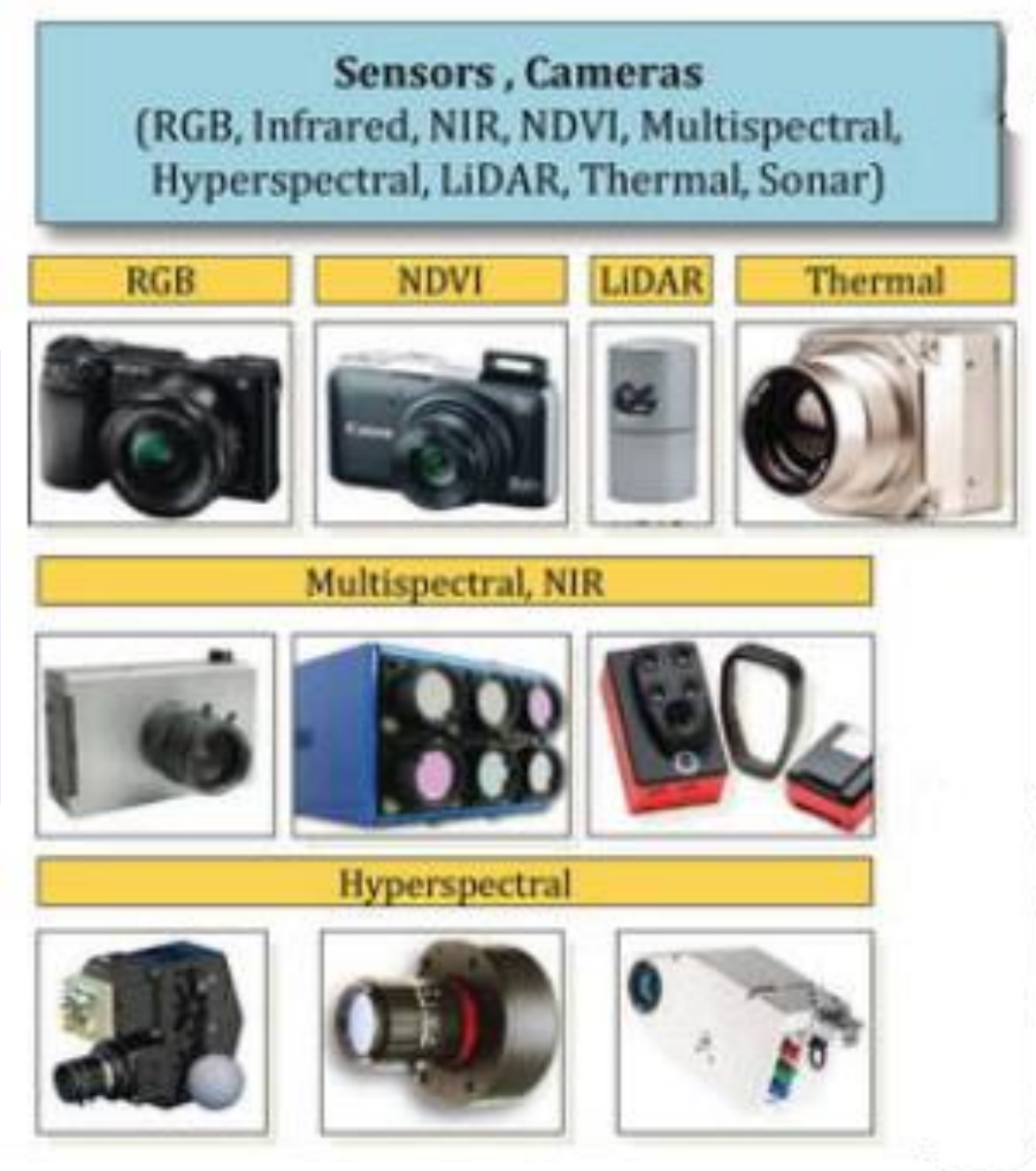
3) Navigation System & Controller

- Radiolink M8N GPS SE100

3) Navigation System & Controller

Multi-Channel FS-i6S 2.4G 10CH AFHDS 2A Transmitter With FS-iA10B Receiver

4) Data Collections



5) Data Transmission

RFD900x-US Telemetry Bundle

6)Power System Management

Gens Ace 2200mAh 11.1V LiPo Battery

6)Power System Management

- Multistar High Capacity 5200mAh 4S 10C Multi-Rotor Lipo Pack
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6)Power System Management

APM Power Module V1.0 Vision 30V/90A with BEC for RC Model

LIST OF UAV Company (Service / Manufacture/ Components) Locally

- Vortex Edge Sdn Bhd
- Poladrone
- Avetics
- Dragonfly Robotix