"Multirotor UAV in project 14.B37.21.1243"

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UAV developed in MIIGAiK

- SCB "Impulse"

- SCB "Krechet"

SCB "Krechet" is working on several platforms for use in cartographic monitoring

№	Features	Krechet Aircraft	Krechet Aerostat
1	Deployed size, length*width*height, mm	1800*1500*430	2000*2000*4000
2	Transport size, length*width*height, mm	350*1500*430	400*400*400
3	Speed of level flight, km/h	40…100	0..max wind speed
4	Operating altitude, m	60…1000	0…300
5	Flight duration, min	Up to 50	Unlimited
6	Maximum take-off weight, kg	3,5	8
7	Maximum payload, kg	1,2	5
8	Working temperature, °C	-25°.. +50°C	-20°.. +50°C
9	Wind speed at launch, not more than, m/sec	8	12
10	Wind speed at an altitude of 300 m, not more than, m/sec	15	12
12	Size of landing area, not less than, m*m	2*30	3*3
13	Servicemen	2-3	2-3
14	Engine (electric power), item	1	-

Feature	Quadcopter "Schmidt"	Hexacopter "Juggernaut"	Octocopter Topocopter "Dreadnought"	
Deployed size, length×width×height, mm	350x350x270	825x825x325	1100×1100×450	
Transport size, length×width×height, mm	350x350x150	825x300x325	1100×1100×250	
Speed of level flight, km/h	0÷55	0÷45	0÷50	
Operating altitude, m	5÷250	10÷350	10÷450	
Maximum altitude, km	2	2	2	
Flight duration, min	Up to 25	Up to 20	Up to 20	
Maximum take-off weight, kg	2,5	6	10	
Maximum payload, kg	0,8	2,5	4	
Take-off weight, kg	1,4	3	5	
Working temperature, °C	-25 ÷ +50	-20 ÷ +40	-25 ÷ +50	
Wind speed at launch, not more than, m/sec	6	8	10	
Wind speed at an altitude, not more than, m/sec	8	10	12	
Size of landing area, not less than, m*m	1×1	2×2	3×3	
Servicemen	1-2	1-2	2	
Engine (electric power), item	4	6	8	
Additional route camera (resolution) (Control of the axes)	No	No	Yes, (752x582), (2 axes)	
Portable	No	Yes	No	
Application	Monitoring, security forces	Monitoring	Cartography, Monitoring	

Multirotor UAV, which is developed in SCB MIIGAiK «Krechet», – octocopter «Dreadnought». This drone can be used to receive snapshots, applicable in map (or site plan) creating/updating, forming of digital terrain model, making 3D-models of buildings and objects, thermographic maps, panoramic surveying and also monitoring of natural and manmade emergencies development.

Functions & elements of ground control

When we use multirotor UAV in cartographic monitoring, it must be considered as a complex with its equipment (instrumentation) and payload. Its called UAS – Unmanned Aircraft System. UAS consist of payload and ground control.
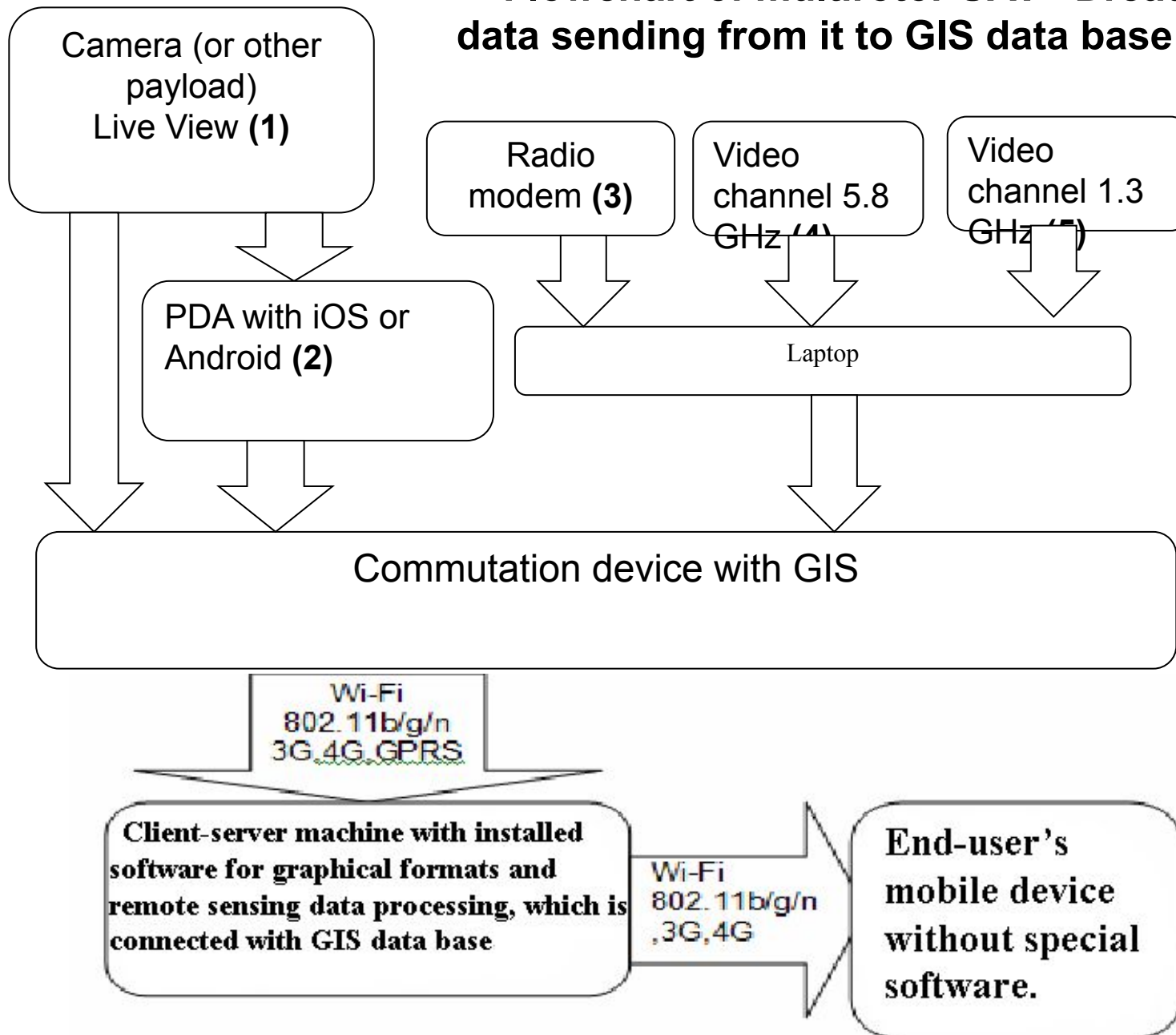What is it for?

- Automatic flight control;

- Flight navigation;

- Flight task input and processing;

- Setting up a wireless link with an operator;

- Data receiving, processing and storage (Video and Telemetry);

- Input of UAV control signals.

Data, which is receiving by operators

Flowchart of multirotor UAV «Dreadnought» data sending from it to GIS data base & end-user

Camera (or other payload)
Live View **(1)**

Radio modem **(3)**

Video channel 5.8 GHz **(4)**

Video channel 1.3 GHz **(5)**

PDA with iOS or Android **(2)**

Laptop

Commutation device with GIS

Wi-Fi
802.11b/g/n
3G,4G,GPRS

Client-server machine with installed software for graphical formats and remote sensing data processing, which is connected with GIS data base

Wi-Fi
802.11b/g/n
,3G,4G

End-user's mobile device without special software.

What can you find in UAV payload?

- Digital camera (including Video camera)

- Thermographic camera

- IR-camera

- Radiolocation equipment (Sonar)

- Geiger counter

Examples of UAV "Dreadnought" survey:
Altitude: 100 meters
Camera: Canon 550D
Camera lens: 18 mm
Overlap: 65%
Flight duration: 8 minutes
Flight speed on a route: 5 meters/sec

Geodesic range

3D terrain model. Perspective view

Some tests were carried out in IR-survey

Survey of fires in Smolensk region, near town Gagarin, with wide-angle camera lens

The ways of multirotor UAV usage in environment monitoring:

- Cartographic monitoring
- Topographic survey
- Multispectral survey
- Thermographic survey
- Geology
- Cadastre (stereo image)
- Emergency control
- Tasks of agro-industrial complex
- Snapshots for 3D modeling
- Agriculture: control of farms & fields condition
- Ecological monitoring:
  - radiation;
  - chemical pollution;
  - bacteriological pollution.

Usage of results in studying & education

- Experience of UAV development, its usage and data processing embeds in educational program of MIIGAiK.

- One of the main tasks of our project (ГИОК ДЗЧС) is a development of special educational courses.