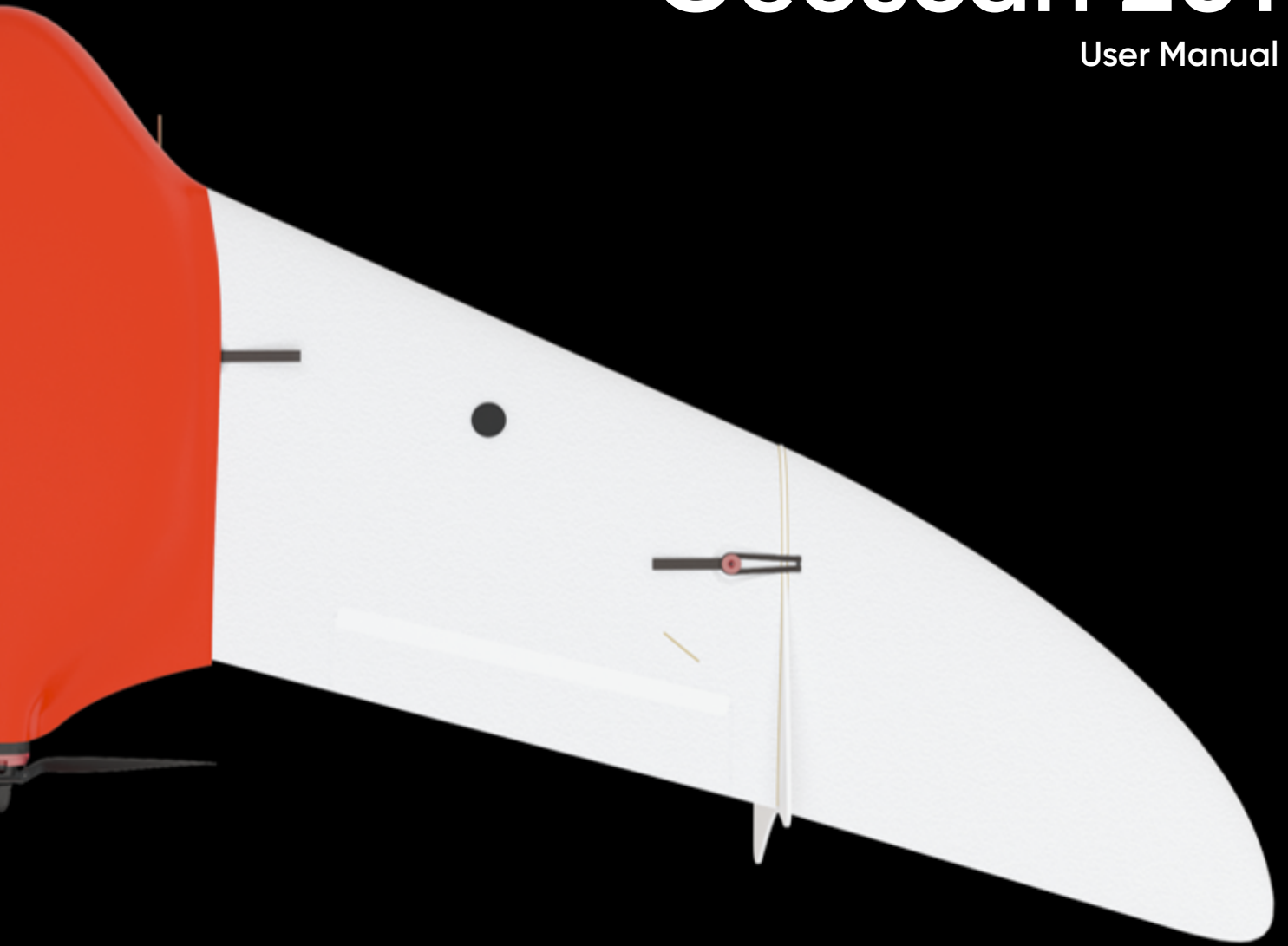


Geoscan 201

User Manual



Updated on February 15, 2024

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Introduction

Thank you for choosing Geoscan 201 UAV!

This manual is designed to describe UAV structure and the operating rules. Carefully read this manual before UAV using.

If you have any questions about UAV, technical service and repair, please contact our support: <https://www.geoscan.aero/en/support>.

We always glad to help you and answer any questions about our products.

The information, specifications and pictures in this manual are relevant at the time of publication. Geoscan Group may change the UAV design or specifications without prior notice.

Do not make any changes to UAV structure by yourself. Any UAV damages or degraded specifications caused by structure changes are not covered by the warranty.

We always work to make our products better and add new features. You can always download the newest version of this manual from our website:

<https://www.geoscan.aero/en/products/201>



This mark highlights important information and recommendations. It is necessary to follow these instructions for people and UAV safety.

Abbreviations

GNSS	Global Navigation Satellite System
UAV	Unmanned Aerial Vehicle
USB	Universal Serial Bus

Main Information



Geoscan 201 is an aerial survey system which consists of unmanned aerial vehicle (UAV), launcher and flight planning software. The system is designed for geolinked photography of objects and territories.

Fields of application

Obtained data can be used for:

- orthophoto mosaic with scale from 1:500 to 1:2000;
- 3D terrain modeling;
- mapping;
- volumetric calculations;
- infrastructural objects monitoring;
- forest and fields health status checks;
- damage control and emergency response (floods, earthquakes, wildfires).

Kit

- Geoscan 201 UAV
- Radio Modem
- Radio Modem's Pole
- Battery Charger in Transport Case
- Launcher in Transport Bag
- UAV Transport Case
- Folding Rack
- Spare Parts
- Documentation
- Topcon B111 GNSS Receiver *
- Payloads: *
 - Sony DSC-RX1RM2 Camera;
 - Sony A6000 Camera;
 - Sony A6000 NIR Camera;
 - MicaSense RedEdge-MX Camera.

* – installed payload depends on delivery kit

Maintenance Service

Visually inspect UAV for a damage after each flight.

If propeller blades or fins are damaged, you can replace them by yourself using spare parts and tools from the kit.

If aircraft or system structural damages are detected, please contact support.

After 80 flights it is recommended to send your UAV to the manufacturer for inspection and maintenance.

Storage

Geoscan 201 with battery should be stored in UAV transport case. The launcher should be stored in launcher's bag. The storage place should be dry at the temperature range from +5 to 25 °C and relative humidity no more than 80%

UAV service life – 2 years.

Batteries should be stored in a cool and dry place without direct sunlight at the temperature range from +5 to +25 °C and a relative humidity of 80% without condensation.

Optimal temperature range is +5 to 10 °C. Optimal storage charge level should be close to 19 V (see [Battery and Charger](#) section for details).

Battery service life – 1 year.

Safety Rules

Follow these operating instructions for UAV safe use:

- UAV launch and maintenance can be held only by persons, who trained according to the theoretical and practical training of Geoscan 201 unmanned aerial system control.
- Follow dealer's and/or manufacturer's recommendations and instructions for use of the equipment, as given in this manual and received during operation period.
- Before the flight it is necessary to inspect the flight area and make sure that the planned flight path passes not less than 100 m above the terrain and high-rise objects (mountains, towers, pipes, transmission towers, etc.).
- There should be no high objects in $\pm 30^\circ$ takeoff sector. Max safe height of an object should be no more than $0.1L$ if L is the distance from takeoff point.
- Before straining the catapult rubber cords, make sure that the safety lock is plugged in. Safety lock must stay plugged in until the launch moment.
- DO NOT launch the UAV, if any damage is detected.
- DO NOT stay in propeller rotation plane after battery connection.
- DO NOT exceed UAV's altitude, mass and flight time operational limits.
- DO NOT launch or fly UAV near high power radio transmitters.
- DO NOT allow unauthorized persons into the UAV launch area.
- DO NOT assemble or disassemble the UAV when the power is on.
- DO NOT short circuit the battery.
- AVOID flying above crowded places.
- Installation and removing of propeller's blades is allowed only when UAV power is off.

- Make sure that the UAV will land away from roads, power lines, ponds and crowded places. Remember about the possible drift of the parachute during the descent.
- Transport UAV only in transport case.
- Hold UAV's fuselage, when you moving assembled UAV to launcher.
- In case if UAV gets into the water, immediately disconnect the battery and dry all structural elements, wires, connectors, electronic equipment.
- DO NOT make any changes in UAV and launcher's construction.

Operational Restrictions

- Operating temperature range: -20 to +40 °C.
"Arctic" modification: -40 to +20 °C.
- Max wind speed: 12 m/s

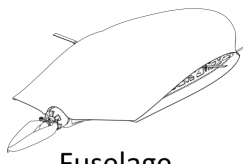
Geoscan 201 UAV is not intended to fly during rain, snow and other precipitation.

The complex can't fly below starting point altitude.

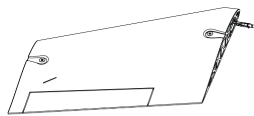
in mountains conditions, find the lowest point of the area for flight mission start. The entire flight route must pass above the starting point.

UAV Assembly

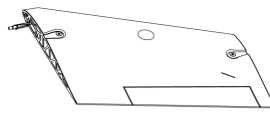
Parts



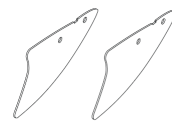
Fuselage



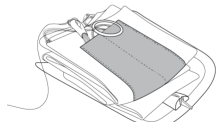
Left wing



Right wing



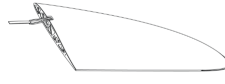
Fins



Parachute



Left wingtip



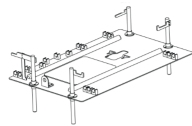
Right wingtip



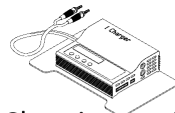
Folding rack



Rods



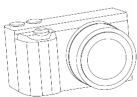
Fuselage stand



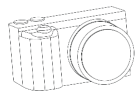
Charging station



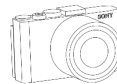
Battery



Sony a6000



Sony a6000 NIR



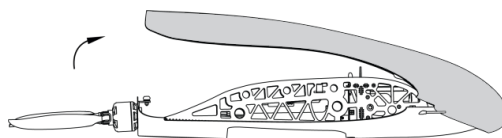
Sony RX1



Repair kit

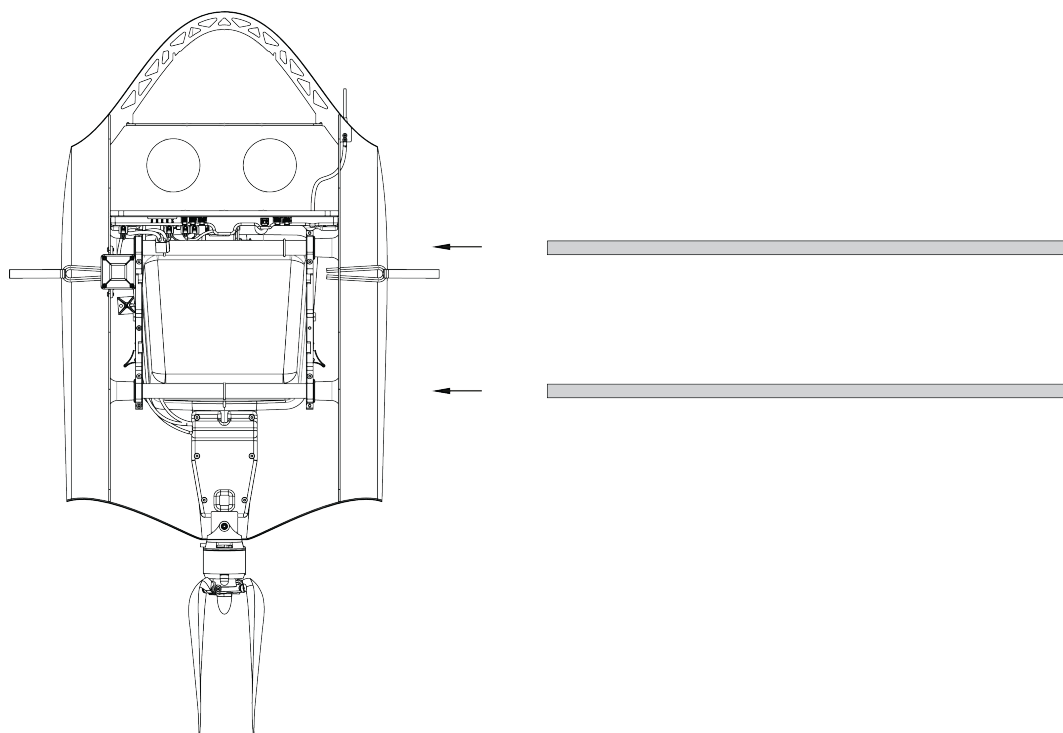
Assembly

1. Open UAV transport case.
Take out UAV folding rack and place it on a flat surface.
Take out fuselage from transport case and place it on UAV folding rack.
2. Remove the top cover by moving the pin, as shown on the picture.



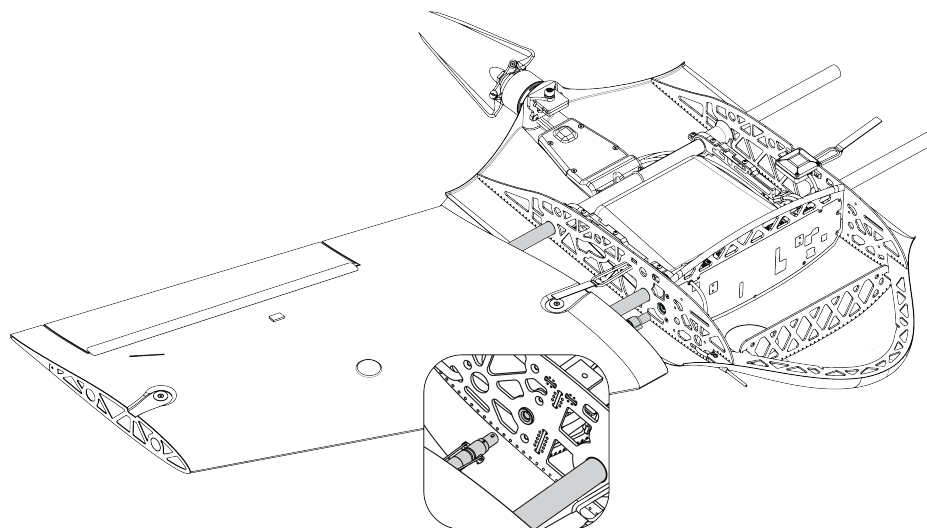
UAV top cover removing

3. Take largest mounting rods (610 mm) and insert them in holes in fuselage.



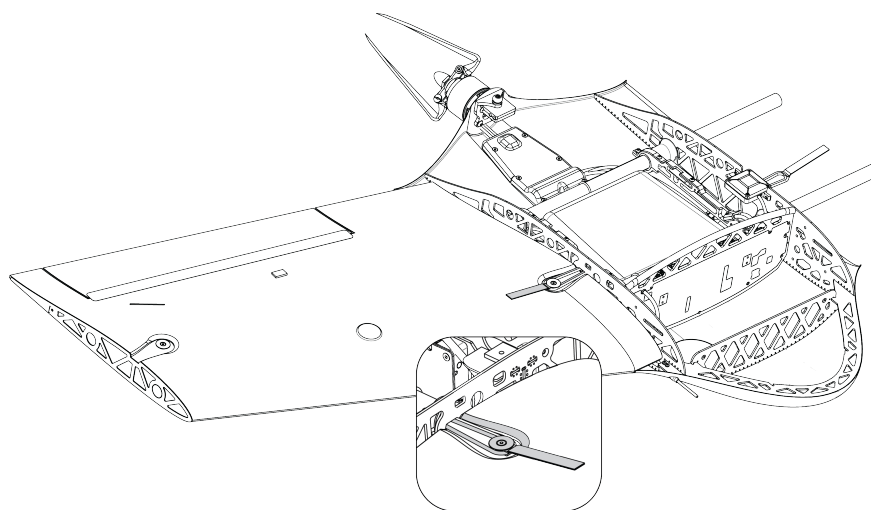
Mounting rods inserting

4. Carefully put the wing on the mounting rods. Leave a gap between wing and fuselage for connect the connector. Put the connector in connector's slot.



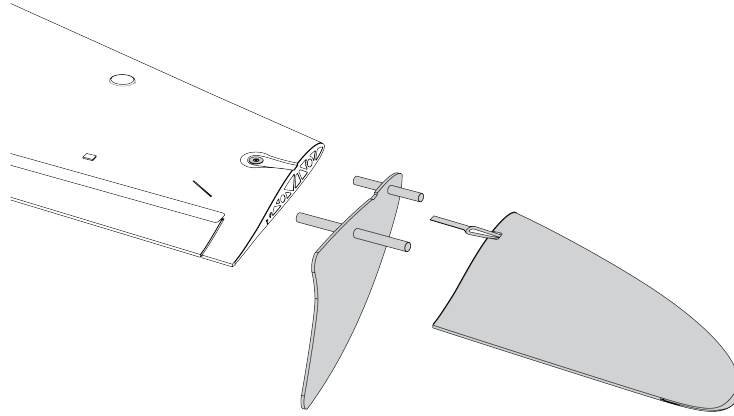
Wing installing on mounting rods

5. Carefully move wing to fuselage and fast rubber locker. Install wing from the other side similarly.



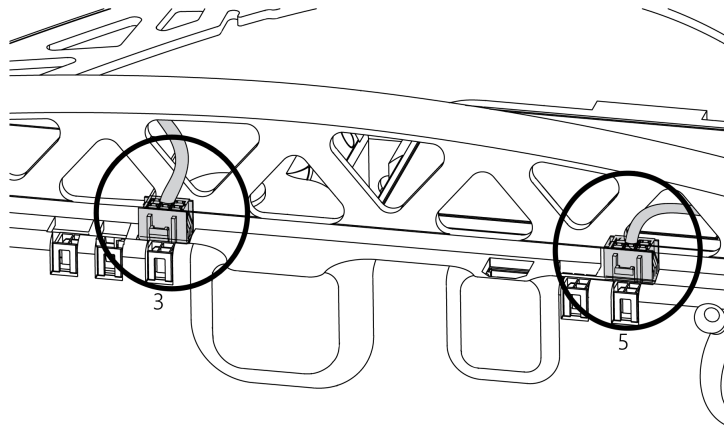
Wing lock

6. Put middle and short-sized rods in wing as shown on the picture.
Place fin and wingtip on rods as shown on the picture.
Carefully put the wingtip on mounting rods and lock it by rubber locker.
Similarly, install fin and wingtip from the other side.



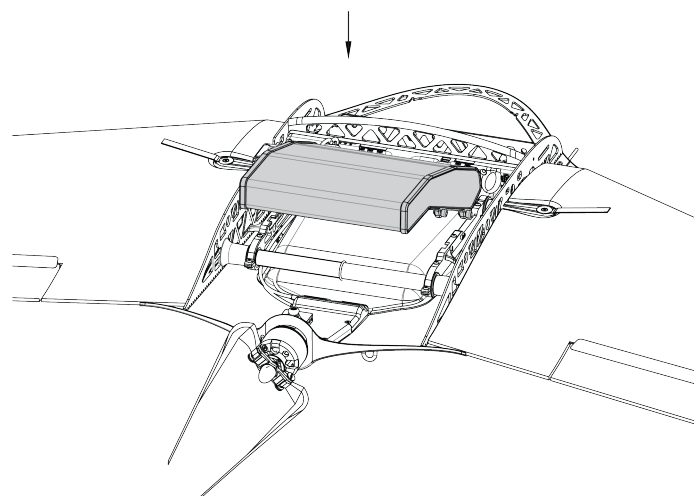
Fin and wingtip installing

7. Place the camera(-s) in UAV slot(-s) and lock it (them) by velcro(-s).
Connect camera's connectors in slots as shown on the picture.
You can operate the camera (for setting or formatting) without disconnecting it from the UAV. Just unlock camera cradle's velcro.



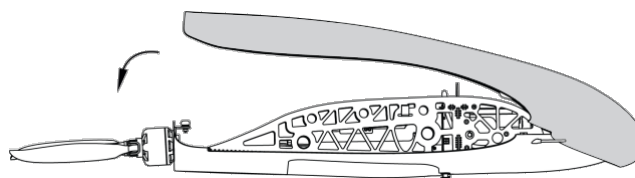
Camera connecting

8. Place the battery by putting front catches in grooves and move the battery forward until that the rear catches clicks. The battery can be ejected by pressing side catchers.



Battery installing

9. Close UAV top cover and make sure that locking pin hold it.



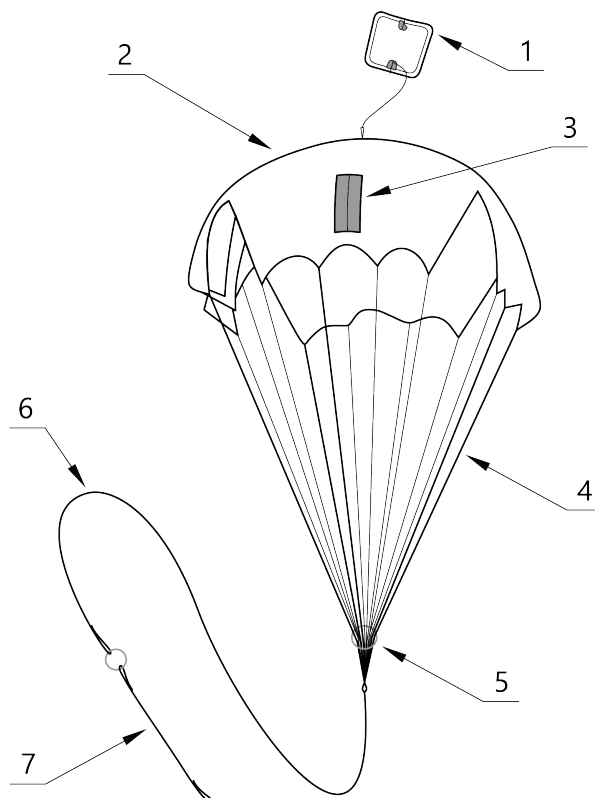
Top cover closing



Propeller blades, wing and elevon surfaces must not be damaged or covered with any kind of paint, dirt or stickers. Changing of UAV parts may cause mid-flight malfunction and damage.

Parashute

Parachute components:



- 1. Parachute compartment cover
- 2. Parachute dome
- 3. Rigging lines' pockets
- 4. Rigging lines

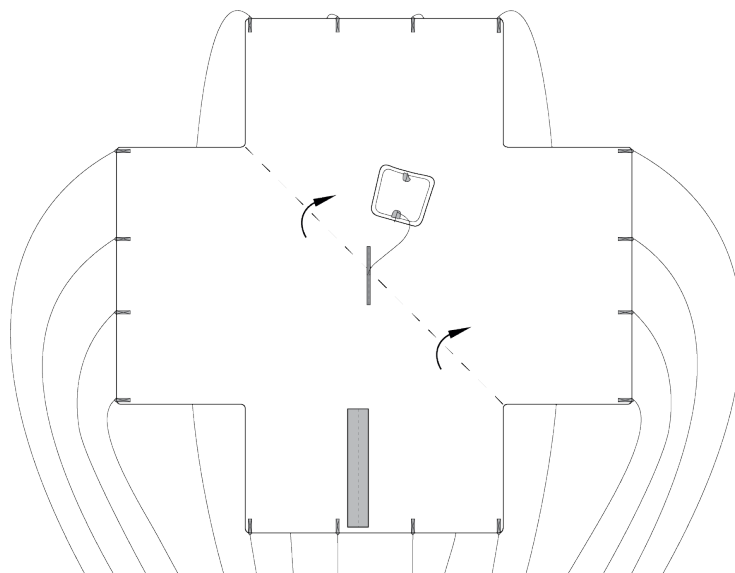
- 5. Locking ring
- 6. Long static line
- 7. Short static line with unhook ring system

Parachute Folding



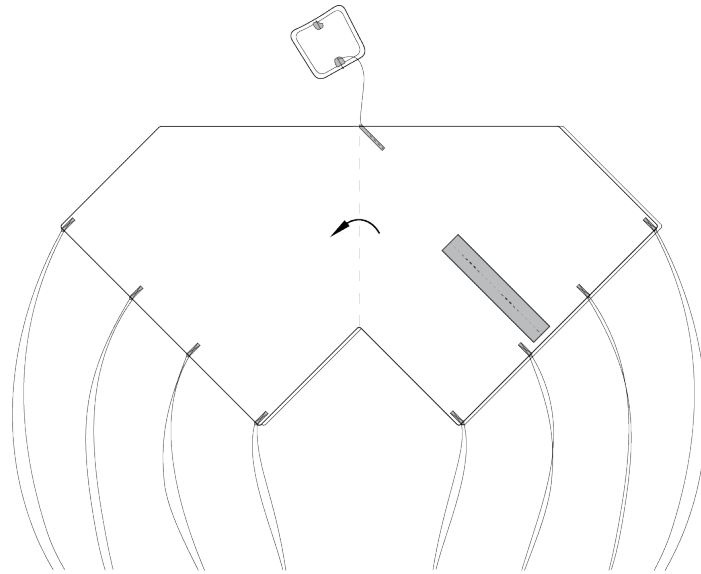
Make sure that the parachute dome, rigging lines and their attachment to the dome are not damaged before laying the parachute. The dome and rigging lines should be dry and clean. Repack the parachute if the previous packaging is more than 10 days ago, or you were carrying UAV in an airplane.

1. Make sure that the parachute doesn't have any damages.
2. Make sure the rigging lines are not tangled.
Make sure that rigging lines are not tangled in the process of parachute laying.
Control rigging lines' pockets position. They must remain on the outside of the folded dome.
3. Smooth the dome and fold it in half, aligning one side with other.



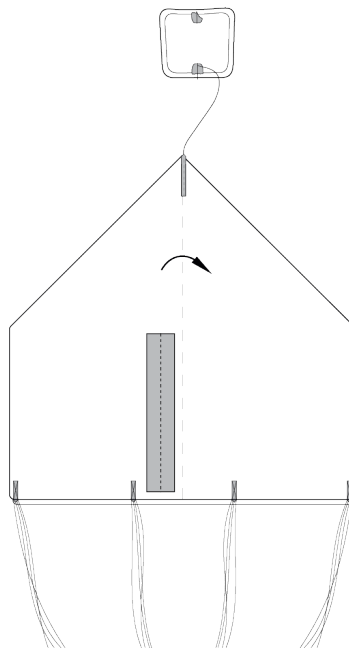
Folding parashute dome in half

4. Fold the dome in half and align the edges.



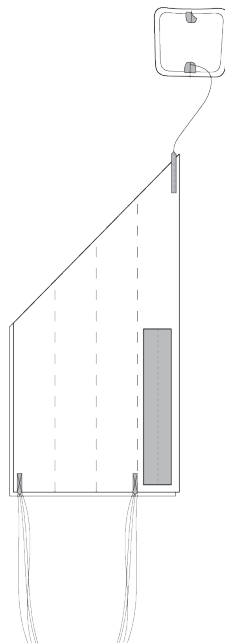
Folding parachute dome in half second time

As the result, the rigging lines should be collected in 4 bundles with 4 rigging lines in each.



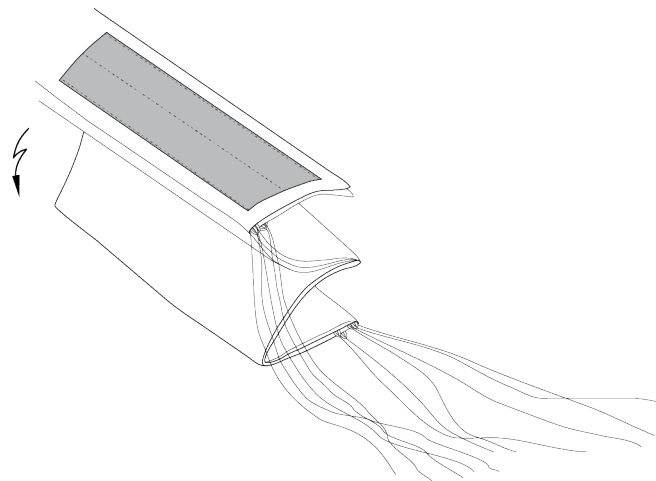
Result

5. Fold the dome in half again. The pockets for laying the rigging lines must be outside.



Folding rigging lines pockets out

6. Fold parachute dome as see on the picture.



Folding parachute dome

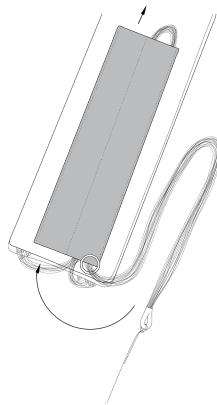
Make sure that in the process of laying the parachute rigging lines are not tangled. Straighten the lines out if it needs.

7. Put rigging lines in the pocket. Measure the length of the bundle of rigging lines exceeding the depth of the pocket. Fold the rigging lines bundle in half and stretch in the pocket, so that the bend of the bundle a few centimeters protruded from the opposite side of the pocket. If necessary, you can eliminate the slack of the rigging lines at the edge of the Dome by pulling them over the bend on the opposite side of the bundle.



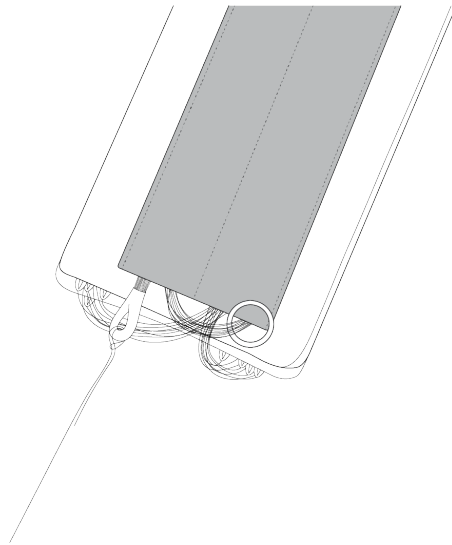
Putting the rigging lines into the pocket

8. Move holding ring to dome. Put straps in empty dome pocket.



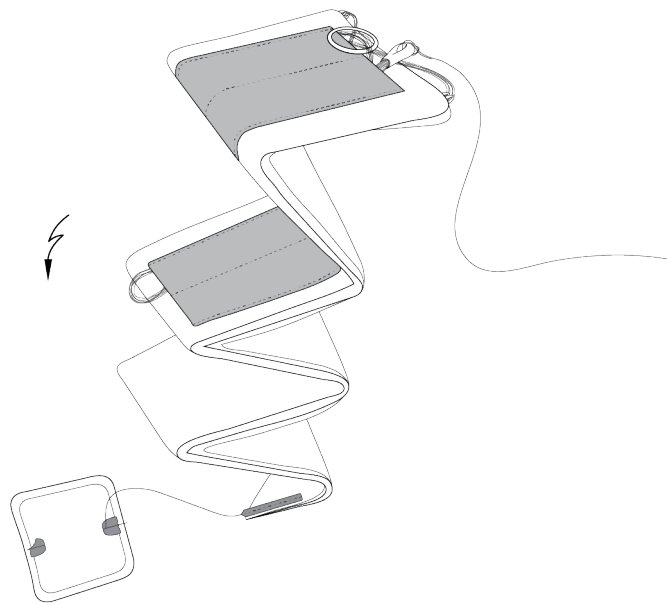
Rigging lines pulling through the pocket

The rigging lines remaining part is positioned between the loops of the rigging lines after laying.



Result

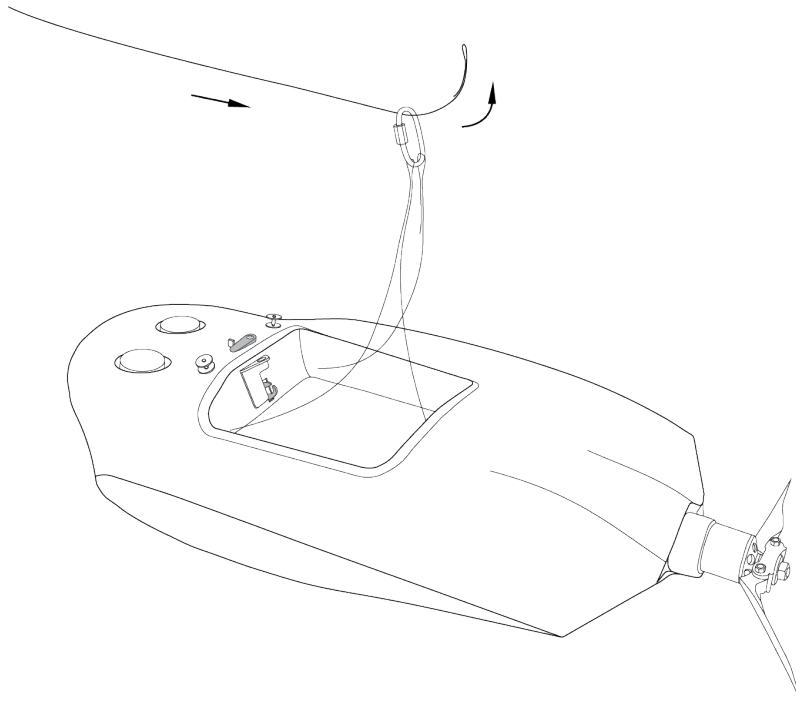
9. Fold parachute dome as see a picture.



Parashute dome folding

Parachute Installing

1. Rotate UAV for the parachute compartment was on top.
2. Pick up the carabiner and straight rigging lines.
3. Put the short static line end in a carabiner as shown on the picture.



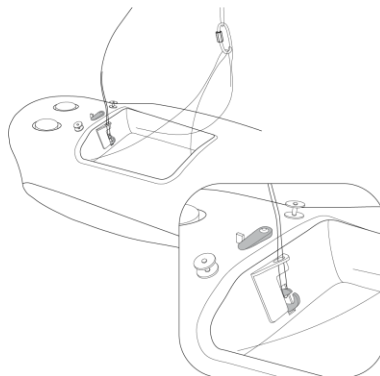
Short static line end in carabiner

4. Put short static line end in unhook system ring as shown on the picture.



Short static line end turning into the ring of detaching system

5. Put short static line end in detach system ring and lock the loop between halves of locker.

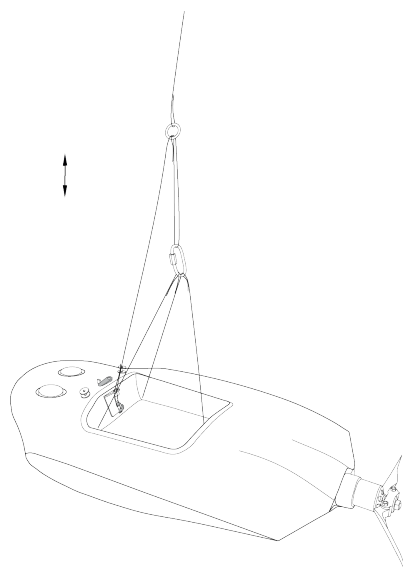


Locking the loop in the lock



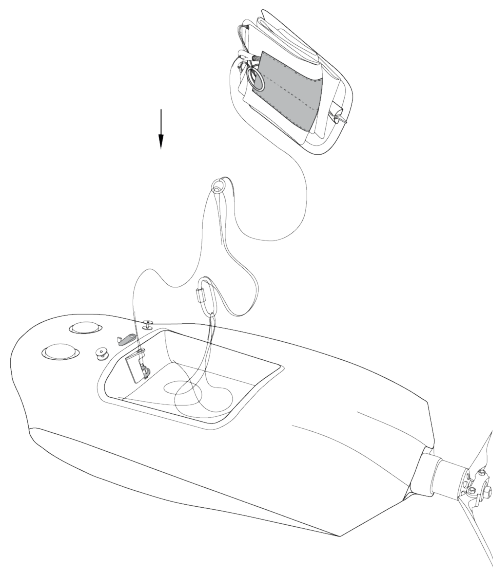
Make sure that detach system is securely locked.

6. Make sure that detach system locker is securely locked: take the parachute dome and make some short sharp jerks.



Detach lock check

7. Carefully pack the ropes of parachute system and rigging lines.
8. Pack the folded parachute. The base of the parachute with the ring was at the bottom of the parachute compartment.



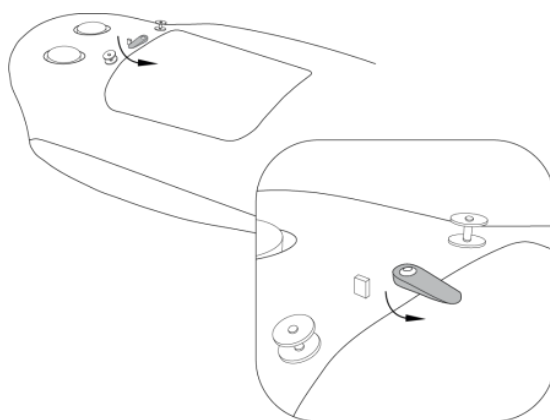
Packing the parachute

9. Put the salient in parachute compartment's cover rear in UAV body's slot and hold down the cover.
Lock the cover by servo horn.



Check that the parachute compartment cover can open. To do that just rotate servo horn. The parachute rigging lines must be free.

10. Close and lock the cover by servo horn.



Parachute compartment's cover locking



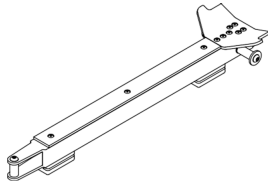
Do not rotate servo horn when power is on!

Launcher

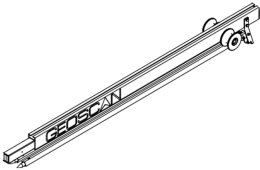
The launcher is a catapult, that speed up UAV at the launch.
UAV delivery kit can include standard launcher with rubber cords tension system or «Arctic» launcher with springs tube.

Standard Launcher

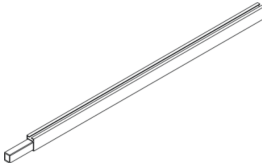
Parts



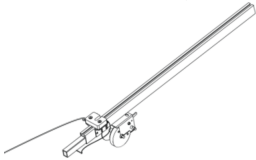
Carriage



Front section



Middle section



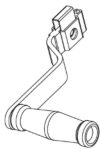
Winding mechanism



Rear section



Rubber bands



Winch reel handle



Stop peg



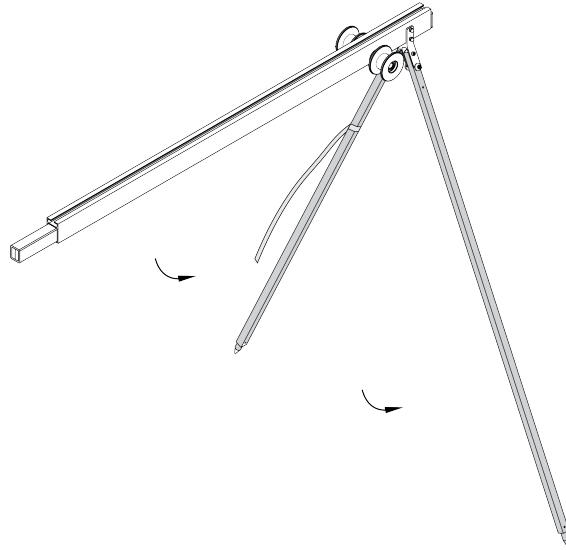
Hammer

Rules of Rubber Cords Use

- Check the condition of the rubber bands regularly. Replace the damaged ring by a spare ring from the spare parts kit, if damages are found.
- Don't keep the rubber cords stretched for a long time. Pull cords directly before placing UAV on the launcher.
- Do not allow long-term exposure of rubber cords in direct sunlight in a warm season.
- Do not allow the rubber cords to freeze in a cold season. Before to installation keep them in a warm place and pull directly before starting. Immediately remove the cords from the launcher and put them to a warm place after the UAV starts.

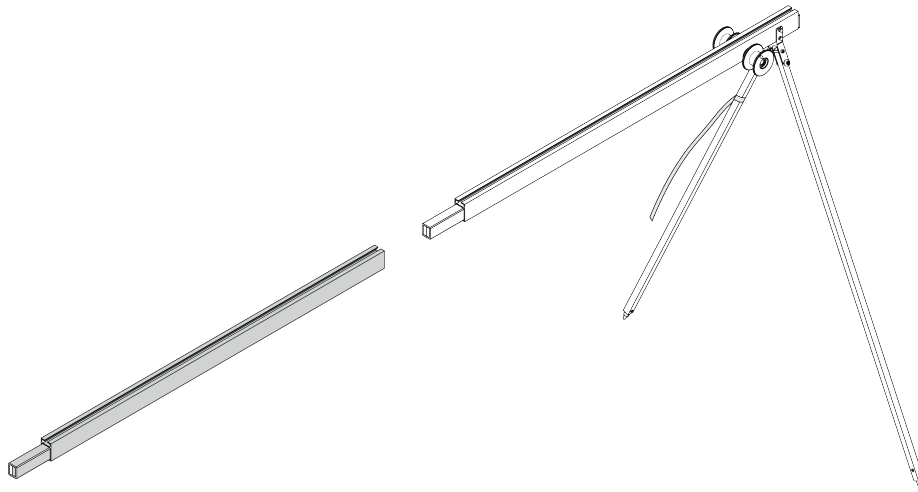
Assembly

1. Take out the launcher parts from transport bag.
2. Unfold the launcher's front supports.
Make sure that they are securely fastened by locks. To fold the supports, pull the locks down.



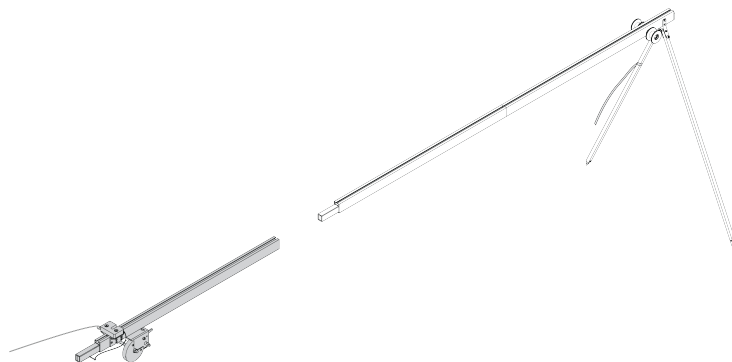
Supports unfolding

3. Attach the middle section of the launcher.



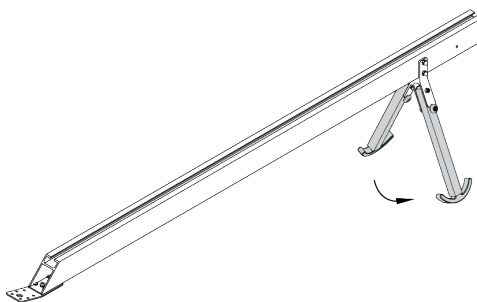
Middle section attaching

4. Attach the section with reel.



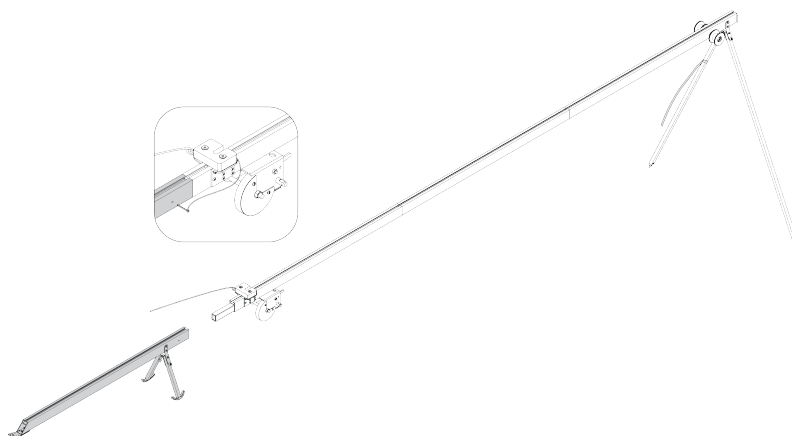
Section with reel attaching

5. Unfold rear section supports.



Unfolding of rear section's supports

6. Attach the rear section to the rest of the launcher. Insert the locking pin to secure the rear part and part with reel together.



Rear part attaching

7. Place the launcher on flat surface, so that the launch would happen against the wind direction.



UAV should be launched ONLY against the wind direction. Otherwise, it can cause crash or obstacle collision. When the wind is not blowing at all, add extra coil of rubber bands from the repair kit on each side of the launcher.

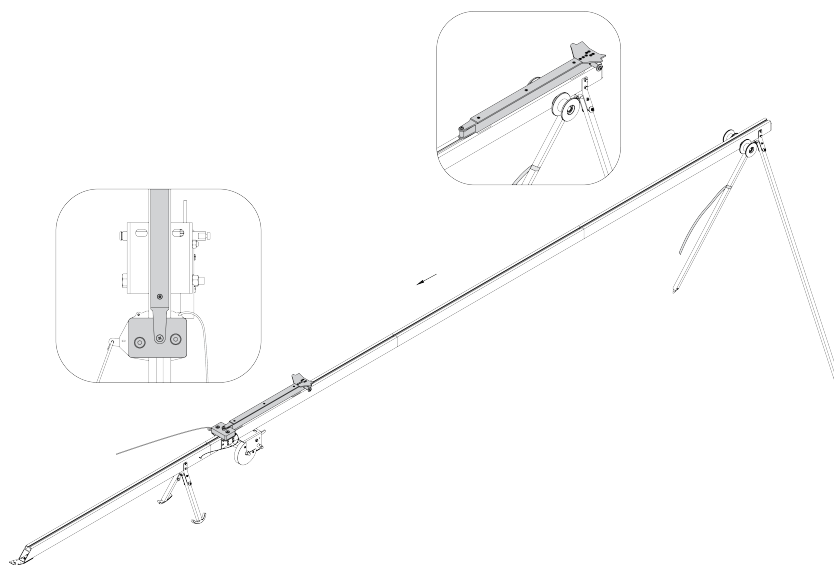
Make sure the launcher stands securely with no pitch to any side. If necessary, push one of the supports in the ground to level it.

8. Put and hammer stop peg into the hole at the launcher's rear part. It avoids launcher displacements.



The stop peg must be hammered to avoid the launcher jumping at the start of the UAV. Make sure the rear part of the launcher does not get deformed when you hammer on the peg.

9. Place the carriage onto the guide of the launcher, so that it could slide along launcher rails.



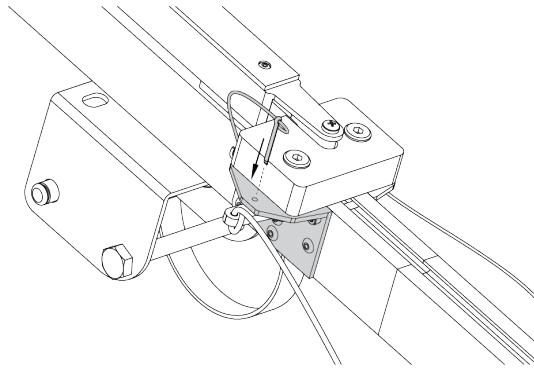
Carriage placing

10. Move the carriage down until it locks in the rear (you should hear 2 clicks).



Before every launch make sure that the carriage free slides on rails.

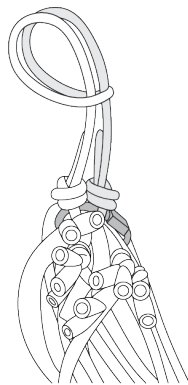
11. Insert the safety pin into the launch mechanism. Release the winch stopper and unwind the tension



Safety pin inserting

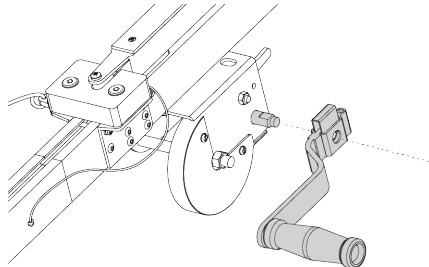
12. Take the rubber bands and straighten them. Make sure that the cords are not overlapped.

13. Fold the rubber bands in a way that puts carabiner to one side and synthetic line ring on the other. Make a loop from this line and hook it to the carriage.



Hooking loop

14. Connect the other end of a rubber band to the winding line with a carabiner. The winding line must pass through the roller. The carbine must be clutched.
15. Attach the next rubber band in a same way.
16. Install the winch reel handle.



Reel handle installing

Preparation to UAV Launch



Pull the rubber cords only after successful launch preparation immediately before a launch. This will increase their shelf life and ensure safety on the launch area.

Tense the rubber cords by rotating the winch reel handle. In case of contact with the cords between the roller and the launcher's parts or break from the roller, it is necessary to stop the tension of the cords. Displaced cable should be placed on the roller. Continue to pull the rubber cords only after that.

On the launcher's middle part engraved "STOP" marker. You must stop the cords stretching, when carabiners will be opposite to it.

Now the UAV can be placed on the launcher.

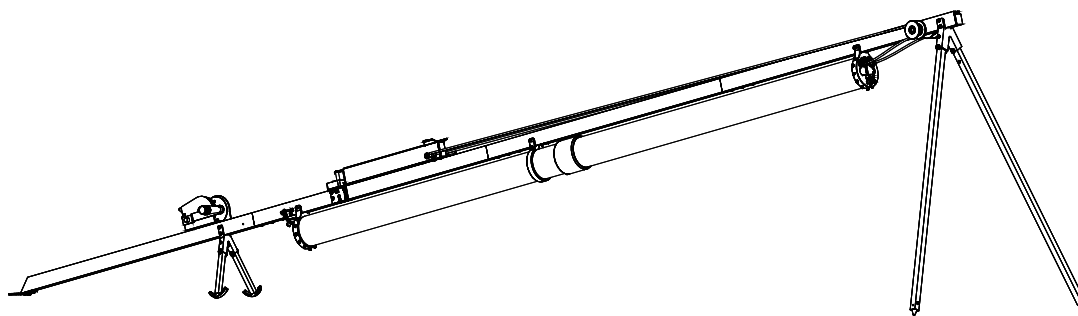


Make sure that the propeller is folded.

See [Launch](#) section for details about full launch preparing.

Arctic Launcher

«Arctic» Launcher is developed for launches in cold conditions. It uses wire springs system for carriage pulling.



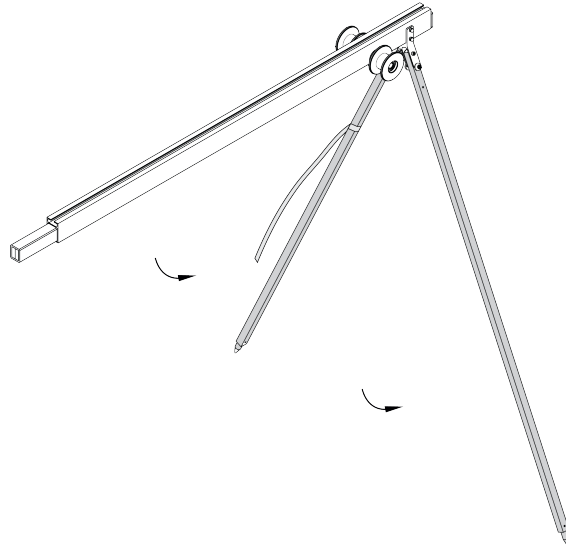
«Arctic» launcher

Rules of Springs Use

- Check the springs for a damage before using.
- Install the springs directly before launch only.
- Do not stretch the springs.
- Use the springs with «Arctic» launcher only.
- Do not leave stretched springs on the launcher for a long time.
- Use soft hair-free material wetted with ethyl alcohol for cleaning.
- Avoid springs contact with dirt and other objects.
- Wire coil springs should be stored in launcher's transport bag in dry place.

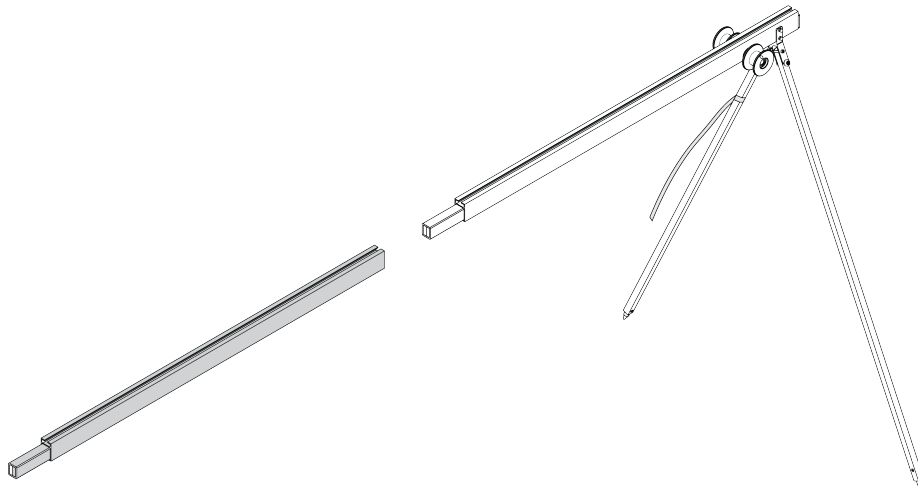
Assembly

1. Take out the launcher parts from transport bag.
2. Spread out the supports on the launcher front part. Make sure that they are securely fastened by locks. To fold the supports pull the locks down.



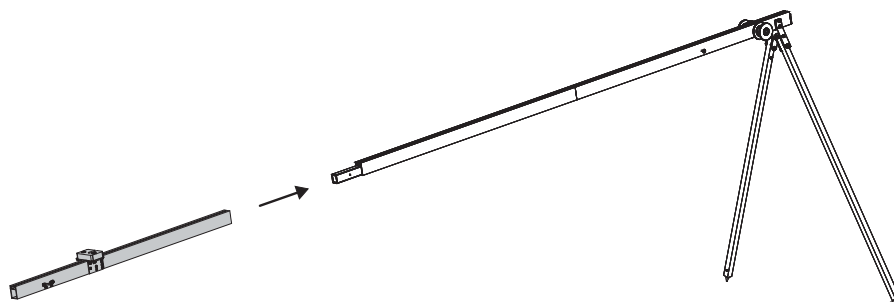
Supports installing

3. Attach the launcher's middle part.



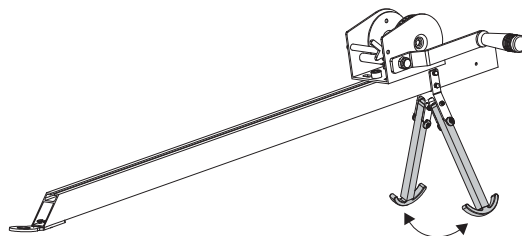
Attaching of the launcher's middle part

4. Attach the part with carriage detaching mechanism and put locking pin.



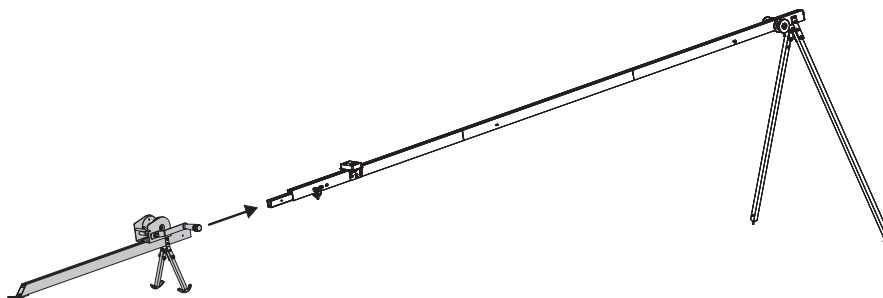
Carriage detaching mechanism's part installing

5. Spread out rear launcher's supports.



Rear supports spreading

6. Attach the rear part with reel to launcher and put locking pin.



Rear part attaching

7. Place the launcher on flat surface. The UAV must be launched against the wind.



UAV launch is allowed only against the wind. It is strictly forbidden to launch the UAV in the direction of the wind. Otherwise, the UAV will not be able to correctly gain altitude and may collide with objects on the way.

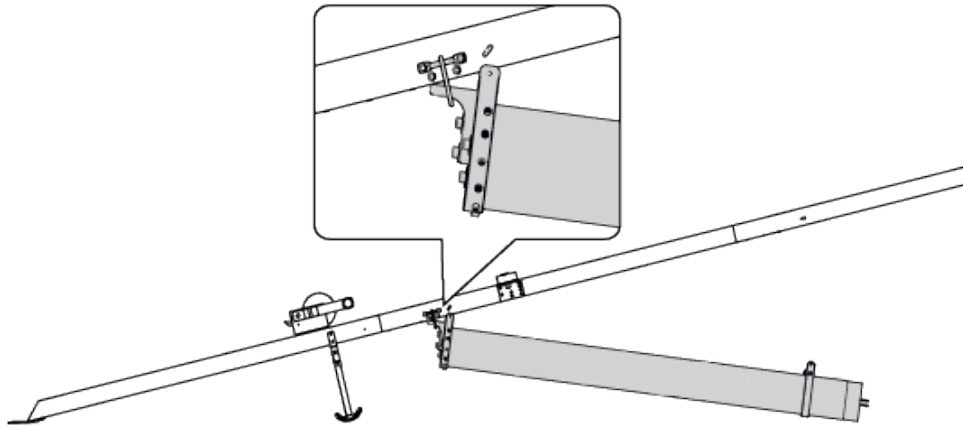
Make sure that the launcher is stable on the ground and that its guide has no roll.

8. Install and hammer stopping peg into the hole at the rear part of the launcher to prevent displacements when the UAV starts.



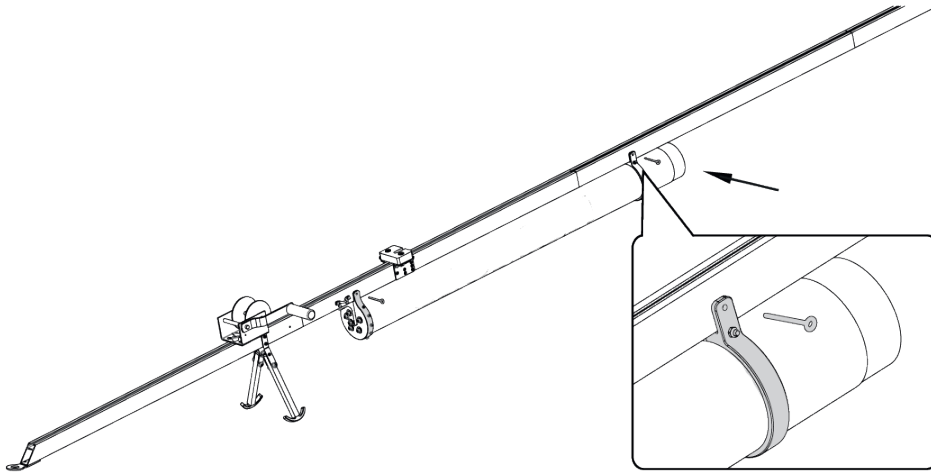
The jerk of the wire springs leads to the throwing of the launcher's rear part, when the UAV starting. You must hammer on the stop peg on the entire length to fix the launcher's rear part. Don't to deform the launcher, when you hammer on the stop peg.

9. Place springs' tube on the bottom of launcher and attach as shown on the picture.



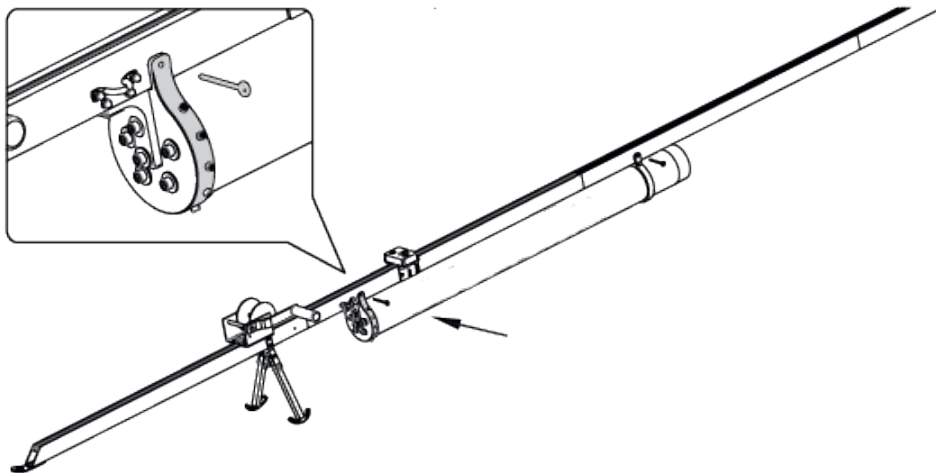
Sprigs' tube attaching

10. Lift front of springs' tube up, match the holes and lock springs' tube by pin.



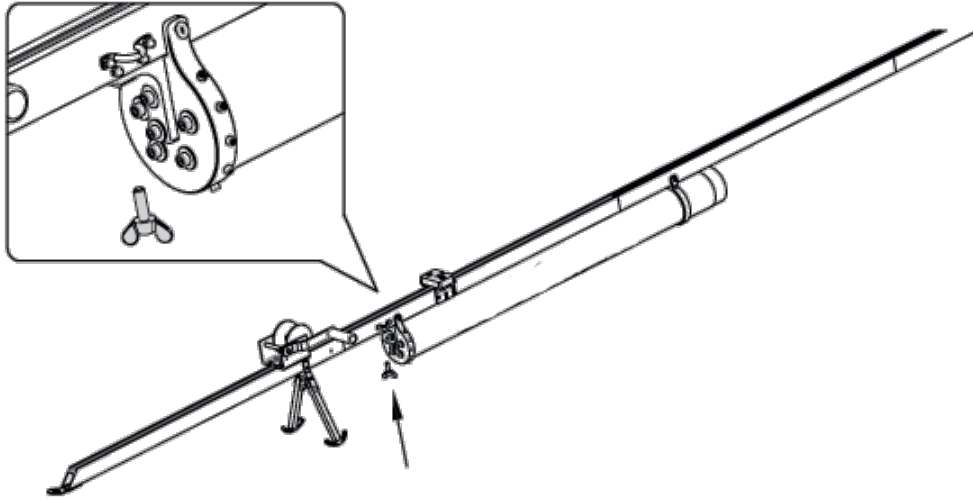
Front tube side locking

11. Connect the holes in rear of springs' tube the same way and lock it by pin.



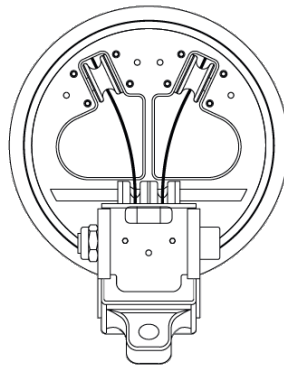
Rear tube side locking

12. Lock springs' tube by nut in rear.



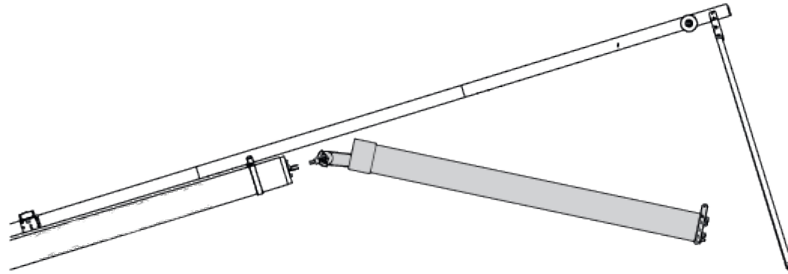
Tube locking by nut

13. Check springs state before install internal springs' tube. They should be stretched without any entangles.



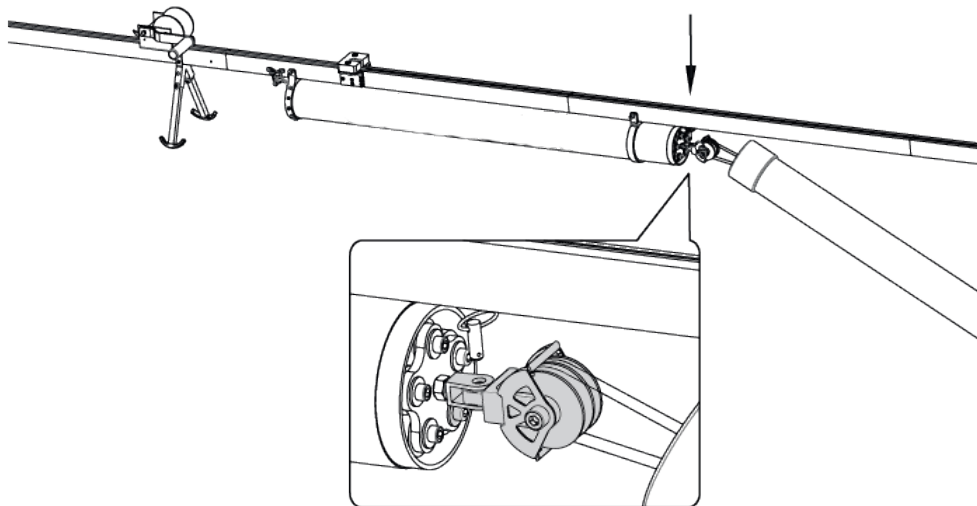
Springs

14. Place front springs' tube in the bottom of front launcher's part and lift it up to rear tube.



Front springs' tube placing

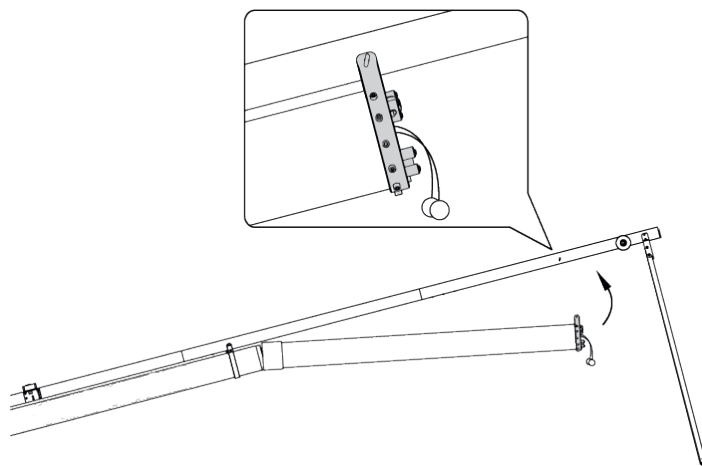
15. Connect front tube with rear tube by mounting screw and hold it by fingers.



Tubes connection

16. Stretch the springs and put rear end of the front tube in rear tube.

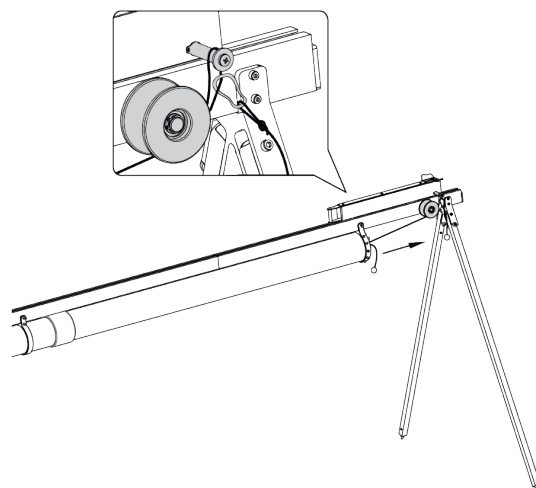
17. Lift the front end of front tube up and lock it by pin.



Front tube locking

18. Place the carriage onto the guide of the launcher, so that it could slide along launcher rails.

19. Attach springs' tube's rope to carriage and safe system's carabiner as shown on the picture.



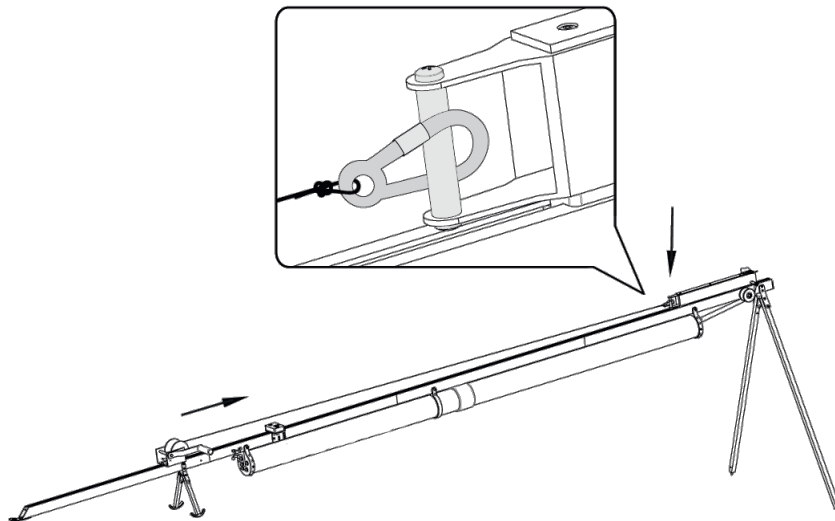
Springs' tube's rope attaching

20. Attach the rope and safe system's carabiner from the other side as the step 19.



Disassembly is performed in reverse sequence.
It is important to attach safety system's carabiners before springs' ropes detaching from carriage.

21. Pull out the reel cable and lock cable's carabiner on the carriage shaft.



Carriage attaching

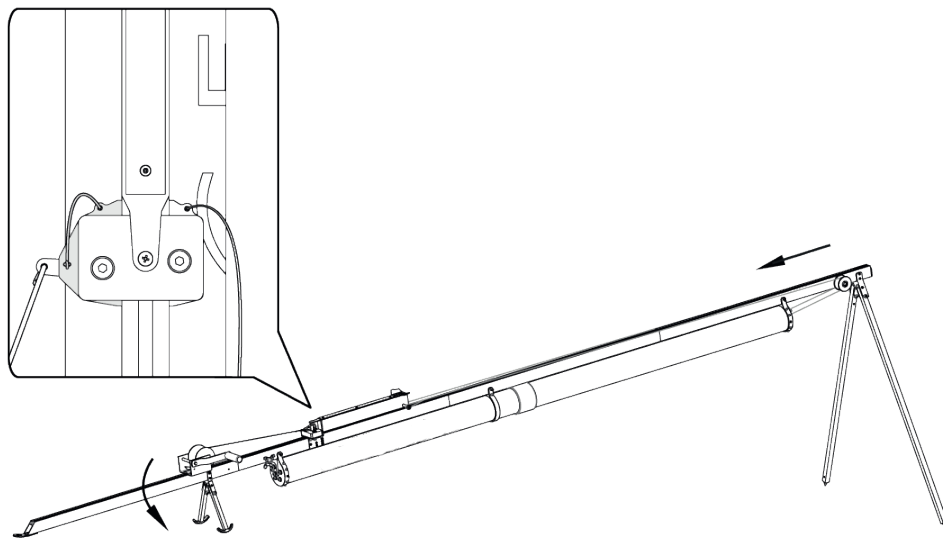
Arctic Launcher Preparing to Start

1. Detach safe system's side carbiners.
2. Tense the reel cable by handle rotating up to 2-clicks of carriage locking mechanism (near «Stop» mark).



It is important to stop reel cable tension immediately after locking. More tension can block launch mechanism.

3. Insert safety pin in launch mechanism. Attach and unfold launch cord.



Safety pin inserting

4. Disconnect the carabiner from rear carriage shaft.

The UAV can be placed on the launcher's carriage.



When you install UAV make sure that propeller blades are folded.

UAV launch is impossible without Geoscan Planner flight mission and successful full pre-launch check. Please see [Launch](#) section for more information.

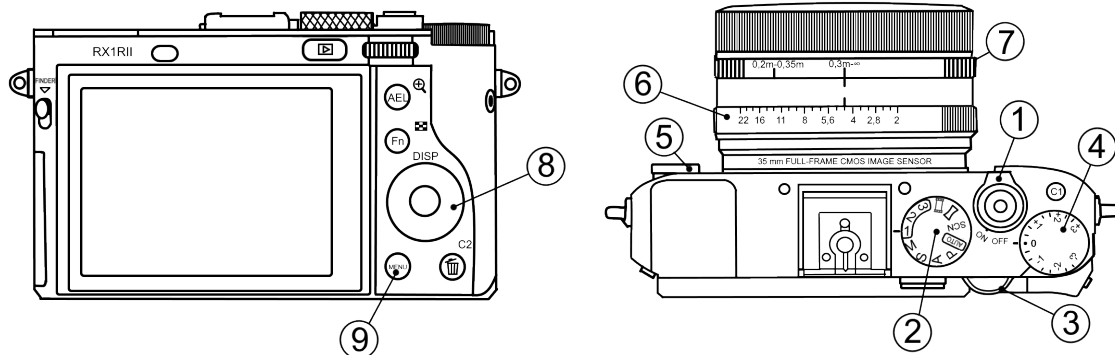
Camera Settings

UAV camera number and type depends on delivery kit. This section describes recommended settings for aerial surveying in normal daylight conditions.

Sony DSC-RX1RM2 Digital Camera

Main Parts

Please, carefully read Camera Operating instructions <https://www.sony.com/electronics/support/res/manuals/4579/45798651M.pdf>, to get full information about functions and control parts before change settings. Basic camera control elements are shown on the picture:



1. ON\OFF Switcher
2. Mode Dial
3. Control Dial
4. Exposure compensation dial

5. Focus Mode Dial
6. Aperture ring
7. Macro switching ring
8. Control Wheel
9. Menu Button

Presets

Geoscan UAVs are equipped with 2 presets for Sony DSC-RX1RM2 cameras.

Use **Mode Dial** near ON/OFF switcher to select preset for your needs.

Preset 1 serves for shooting in normal daylight conditions. The aperture value is fixed, which provides fixed aperture for better orthophoto mosaic generation.

Use these settings for this mode:

- **Mode Dial** in «1» position;
- **Focus Mode Dial** in **MF** position;
- **Exposure Compensation Dial** in **0** position;
- **Macro switching ring** in **0,3m-∞** position;
- **Aperture Ring** in **4,5** (first mark after 4).


Preset 2 – universal set with automatic variable aperture control (Shutter Priority).

Use these settings for this mode:

- **Mode Dial** in «2» position;
- **Focus mode dial** in **MF** position;
- **Exposure compensation dial** in **0** position;
- **Macro switching ring** in **0,3m-∞** position.

The aperture value is not taken into account.

Preset 3 can be used for user settings.

Select settings in menu, go to  camera settings (tab 8) and select **Memory**.


Set **Mode Dial** in «3» position and press button in the middle of **Control Wheel**.

Presets Restoring

Settings of 1 and 2 presets can be restored, if you change them.


For preset 1 restoring:

- Set **Mode Dial** in position **M** (Manual aperture control).
- Set shutter speed **1/1000** by **Control Dial**.
- Select **ISO – Auto** in camera menu..

Press **Menu** button, go to  Camera Settings (Tab 8) and select **Memory**. Set **Mode dial** in «1» position and press middle button of **Control Wheel**.

For preset 2 restoring:

- Set **Mode Dial** in **S** (Shutter Priority) position.
- Set shutter speed **1/1000** by **Control Dial**.
- Select **ISO – Auto** in camera menu.

Press **Menu** button, go to  Camera Settings (Tab 8) and select **Memory**. Set **Mode dial** in «2» position and press middle button of **Control Wheel**.

If you change or reset settings you also need to switch off automatic photo review and shooting by MOVIE button, set max. time before power saving start and reset for file number. Change these settings:

- Switch off **Auto Review** in  User Settings (tab 2) and **MOVIE Button – Movie Mode Only** (tab 6).

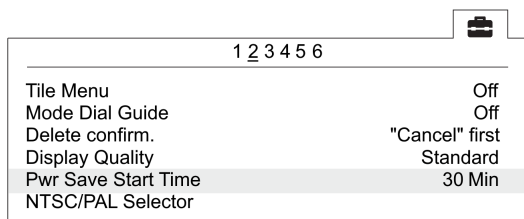
1 2 3 4 5 6	
Audio Level Display	On
Auto Review	Off
DISP Button	
Peaking Level	Off
Peaking Color	White
Exposure Set. Guide	On

Auto review – Off

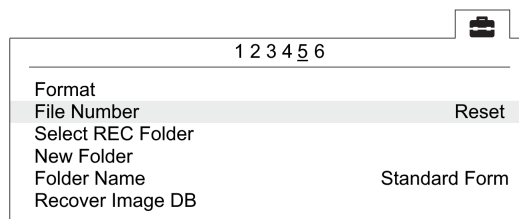
1 2 3 4 5 6	
MOVIE Button	Movie Mode Only
Dial/Wheel Lock	Unlock

Movie mode only for MOVIE button

- In  settings section set **Power Saving Start Time – 30 min.** (tab 2) и **File Number – Reset** (tab 5).




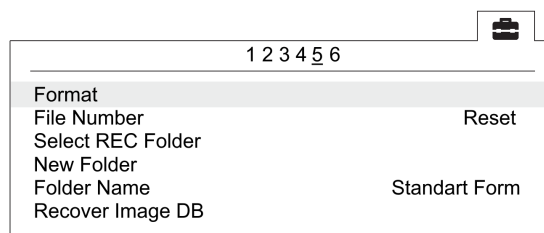
Power saving start time



File number reset

SD Card Formatting

- In  Settings menu (tab 5) select **Format**.



Format option

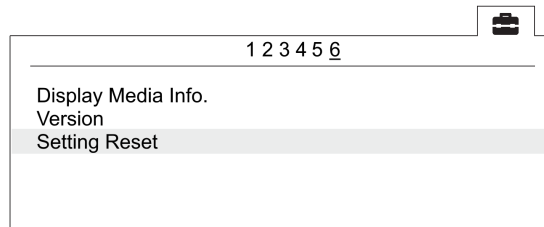


All data on SD card will be deleted!

Settings Reset

Reset of the camera will delete presets' shooting settings (Presets 1 and 2)!

- In  Settings menu (tab 6) select **Setting Reset**



«Setting reset» option



Do not remove the battery during a reset process!

- After camera reboot, you need to set **Time zone and date**, otherwise the settings will not be saved and this menu will appear at every turn on.
- Use ON/OFF switcher to turn the camera off.
- Wait 3 minutes for all settings to be saved (do not disconnect the battery or power cord).



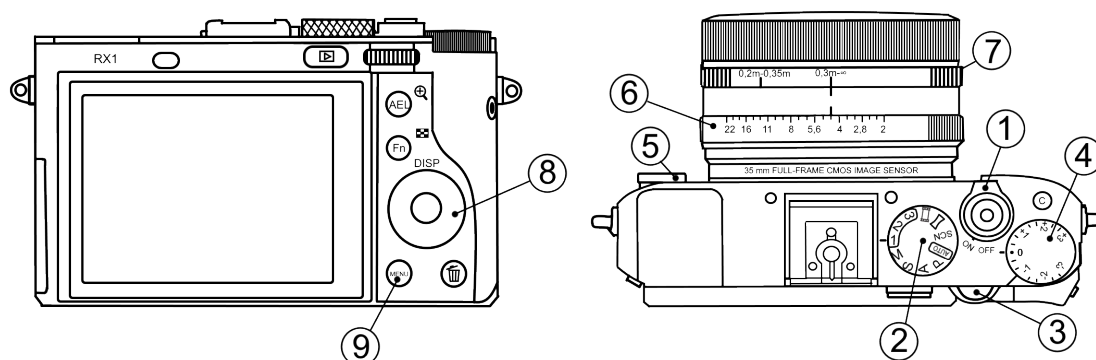
«E:61:00» error may appear on the screen, as the camera is focused to infinity. **This message will not interfere with camera's function.**

Sony DSC-RX1 Digital Camera

Main Parts

Please, carefully read Camera Operating Instructions <https://www.sony.ru/electronics/support/res/manuals/4469/44695786M.pdf>, to get full information about functions and control parts before change settings.

Basic camera control elements are shown on the picture:




1. ON\OFF Switcher
2. Mode Dial
3. Control Dial
4. Exposure compensation dial


5. Focus Mode Dial
6. Aperture ring
7. Macro switching ring
8. Control Wheel
9. Menu Button

Camera Settings


- **Mode Dial** in «1» position;
- **Focus Mode Dial** in **MF** position;
- **Exposure Compensation Dial** in **0** position;
- **Macro Switching Ring** in **0,3m-∞** position;
- **Aperture Ring** in **4,5** (first mark after 4).
- For normal daylight conditions switch **Mode Dial** in **M** (Manual aperture control) position and **Aperture Ring** in **4,5** (first mark after 4) position.
- For cloudy weather switch **Mode dial** in **S** (Shutter priority) position. The aperture value is not taken into account in this mode.

To set camera soft parameters, push **MENU** button, then select parameters according to the following instructions.


- In  User settings menu (tab 1) turn off **Automatic preview** and set **MOVIE Button – Movie mode only** (tab 3).


 1 2 3 4	
FINDER/LCD Setting	Auto
Red Eye Reduction	Off
Grid Line	Off
Auto Review	Off

Turn off automatic preview


 1 2 3 4	
Func. of C Button	ISO
Func. of AEL Button	AEL hold
Func. of Left Button	Not set
Func. of Right Button	Not set
Func. of Down Button	Not set
Smart Telecon./Zoom	Smart Telecon.
MOVIE Button	Movie Mode Only


Movie mode only

- In  Settings menu (tab 2) set **Power saving time – 30 min.**

 1 2 3 4	
LCD Quality	High
Power Saving Start Time	30 min.
HDMI Resolution	Auto
CTRL FOR HDMI	On

Power saving time

- In  Memory Card menu set **File N° - Clear.**

 1	
Format	-
File Number	Reset
Folder Name	Standart Form
Select REC Folder	-
New Folder	-
Recover Image DB	-
Display Card Space	-

Clear file number

Other settings should not be changed from default values.

SD Card Formatting

- Select **MENU** →  **[Memory card]** → **Format**



All memory card data will be deleted!

Settings Reset

Follow these steps to set default settings:

- Select **MENU** →  **[Settings menu]** → **INITIALISATION** → **Reset**



Do not remove the battery during a reset process!

- After camera reboot, you need to set **Timezone and date**, otherwise the settings will not be saved and this menu will appear at every turn on.
- Use ON/OFF switcher to turn the camera off.
- Wait 3 minutes for all settings to be saved (do not disconnect the battery or power cord).

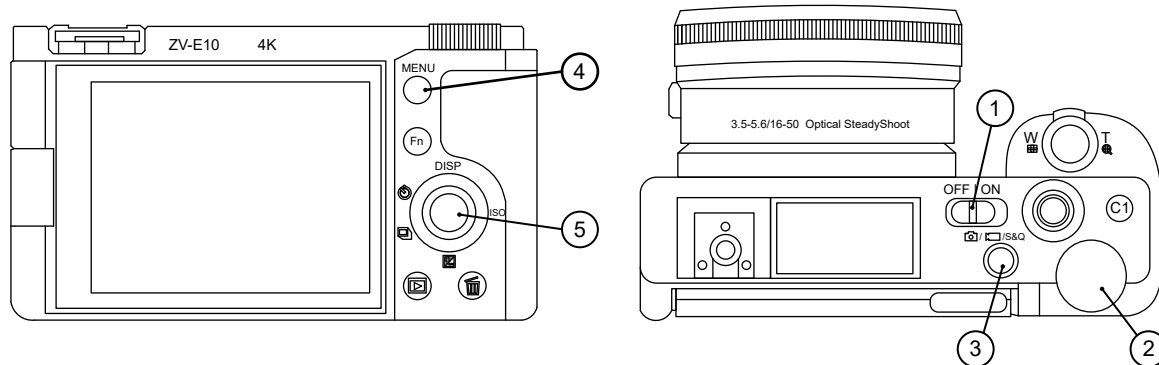


«**E:61:00**» error may appear on the screen, as the camera is focused to infinity. **This message will not interfere with camera's function.**

Sony ZV-E10 Digital Camera

Main Parts

Please, carefully read Camera Operating Instructions <https://www.sony.com/electronics/support/res/manuals/5027/14720adf8b80e68f1cedb3d09c9ffe5b/50278353M.pdf>, to get full information about functions and control parts before make settings. Basic camera control elements are shown on the picture:



- 1. ON\OFF Switch
- 2. Control Dial
- 3. Photo/Video/S&Q Button

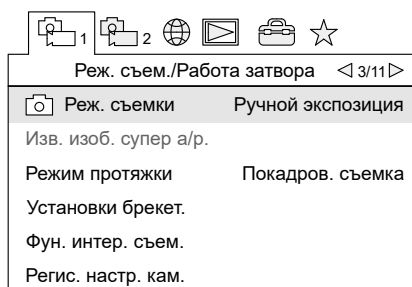
- 4. Menu Button
- 5. Control Wheel

Camera Settings

Make sure that the camera is switched to photo mode. Press **Photo/Video/S&Q** (3) button to switch mode if it needed.

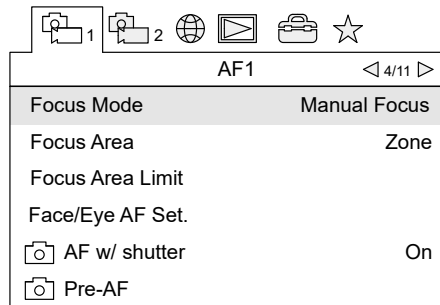
Press **Menu** (4) to access Settings menu.

Press the right side of **Control Wheel** (5) in 1 Photo and Video settings 1 tab to select subsection 3 and set **Shoot Mode – Manual Exposure**.



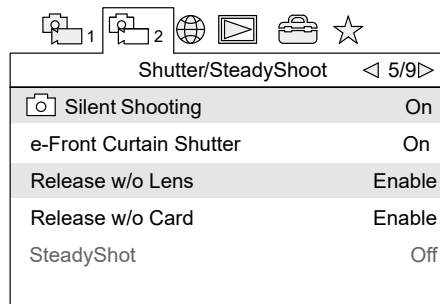
Manual Exposure mode

Press the right side of control wheel to select subsection 4.
Set **Focus Mode – Manual Focus**.



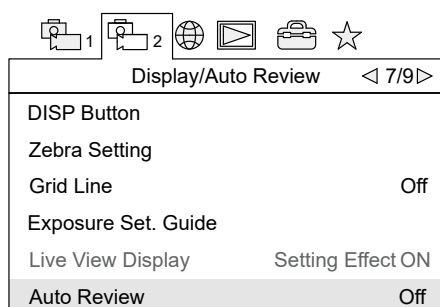
Manual Focus mode

Select subsection 5 in 2 Photo and Video settings 2 tab and turn on **Silent Shooting** and **Release without Lens** parameters.



Silent Shooting and Release without Lens parameters

Press the right side of control wheel to select subsection 7.
Disable automatic reviewing by setting **Auto Review – Off**.



Auto Review – Off

In  settings tab select **Power Setting Option** and set **Power Save Start Time – Off**.



Setup 1 < 1/5 >	
Monitor Brightness	Manual
Gamma Disp. Assist	Off
Volume Settings	7
Delete confirm.	"Cancel" first
Display Quality	Standard
Power Setting Option	

Power Setting Option

Power Setting Option	
1	
Power Save Start Time	Off
Power Save by Monitor	Both Linked
Auto Power OFF Temp.	Standard

Power Save Start Time – Off

Select **File/Folder Settings** in subsection 4 and set **File Number – Reset**.

Setup 4 < 4/5 >	
Format	
Select REC Folder	
New Folder	
 File/Folder Settings	
 File Settings	
Recover Image BD	

File/Folder Settings

File/Folder Settings	
1	
File Number	Reset
Set File Name	DSC
Folder Name	Standard Form


File Number – Reset

Press **Menu** (4) button to exit from Settings menu after all sets.

Select **1/1000** exposure by rotation of **Control Wheel** (5).

Check **ISO – AUTO** parameter. Press the right side of **Control Wheel** (5) to change ISO value if it needed.

SD card Formatting

Select **MENU** →  (subsection 4) → **Format**



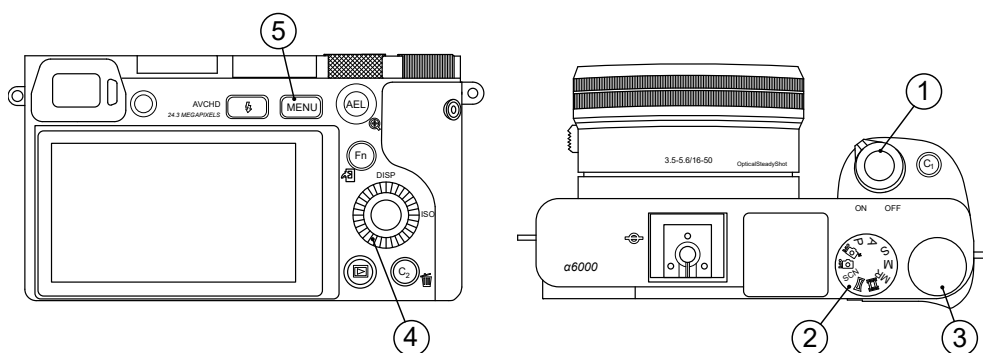
All data on SD card will be deleted!

Sony A6000 Digital Camera

Main Parts

Please, carefully read Camera Operating Instructions <https://www.sony.ru/electronics/support/res/manuals/4532/45320554M.pdf>, to get full information about functions and control parts before change settings.

Basic camera control elements are shown on the picture:





1. ON/OFF Switcher
2. Mode Dial
3. Control Dial

4. Control Wheel
5. Menu Button

Camera Settings


Use the control wheel to set the following parameters:

- Switch **Mode Dial** (2) in **S** (Shutter priority) position.
- Set Exposition – **1/1000** and **ISO – Auto** by **Control Wheel** (4).
- In  Still Shooting menu (tab 2) set **Focus Mode - Manual focus**.




	1	2	3	4	5	6
						
Record Setting						60p 50M
Drive mode						Single Shooting
Flash Mode						Fill-flash
Flash Comp.						± 0.0
Red Eye Reduction						Off
Focus Mode						Manual Focus

Focus Mode



- In  Custom Settings menu (tab 1) disable **Automatic preview**, turn on **Lens-less Shutter** (tab 3) and set **MOVIE** button - **Video mode only** (tab 6).

1 2 3 4 5 6	
Zebra	Off
 MF Assist	On
Focus Magnif. Time	2 Sec
Grid line	Off
Auto review	Off
DISP Button	

Automatic preview off

1 2 3 4 5 6	
 Pre-AF	Off
Zoom Setting	Only optical zoom
 Eye-Start AF	
FINDER/MONITOR	Auto
Release w/o Lens	On
 AF w/shutter	On

Turn on the shutter without a lens

1 2 3 4 5 6	
Function Menu Set.	
Custom Key Settings	
Dial/Wheel Setup	 SS  F/no.
Dial/Wheel Ev Comp	Off
MOVIE Button	Video Mode only
Dial/Wheel Lock	Unlock

Video mode only for Movie button

- In  Setup menu set **Start time energy saving - 30 min** (tab 2) and set **File Number - Reset** (tab 5).


1 2 3 4 5 6	
Tile Menu	Off
Mode Dial Guide	Off
Delete confirm.	"Cancel" first
Pwr Save Start Time	30 Min

Set the time to start energy saving

1 2 3 4 5 6	
Format	-
File Number	Reset
Select REC Folder	-
New Folder	-
Folder Name	Standart Form
Recover Image DB	-

Reset file number

SD card Formatting

Select **MENU** →  (tab 5) [Setup] → **Format**



All data will be deleted!

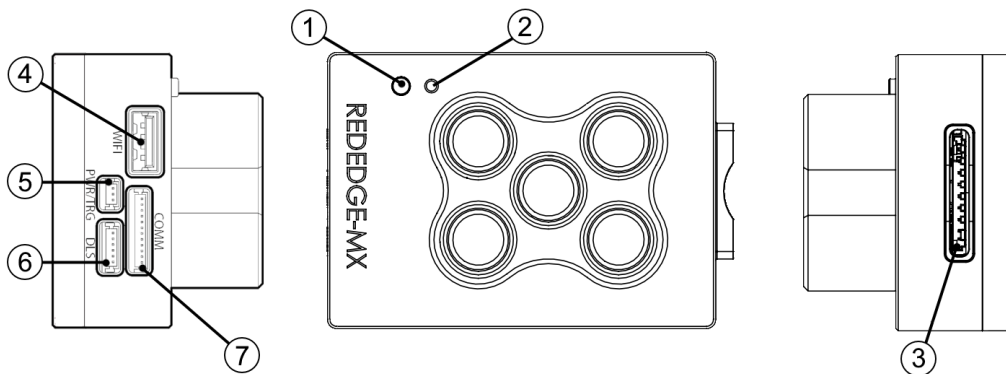
MicaSense RedEdge-MX Camera

RedEdge-MX Camera is developed for multispectral imaging.

Parts

System included two main parts: 5-band camera and downwelling light sensor (DLS2).

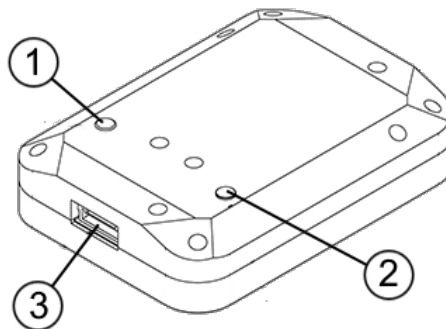
Camera



- 1. Control button
- 2. LED
- 3. SD-card slot
- 4. Wi-Fi Module Slot

- 5. External Power/Trigger Port
- 6. DLS/GPS-module Connection Port
- 7. Communication Port

DLS2 sensor



- 1. Camera Trigger Button
- 2. Camera Status LED

- 3. 6-pin Camera Connection Port








Pay attention, that you need portable compass for camera's magnetic compass system calibration.

LED Indication

Camera's LED indicates system state.

DLS2 sensor's LED is same.

The table describes LED states:

Color	State	Description
	1 flash	The camera is ready for shooting: GPS connect is successful, SD card storage is more than 2 GB
	1 flash	Image is captured
	3 flashes	GPS connection time out
	4 flashes	SD card is not installed, or file system is not supported.
	5 flashes	SD card is full

Camera Settings

Before Power On

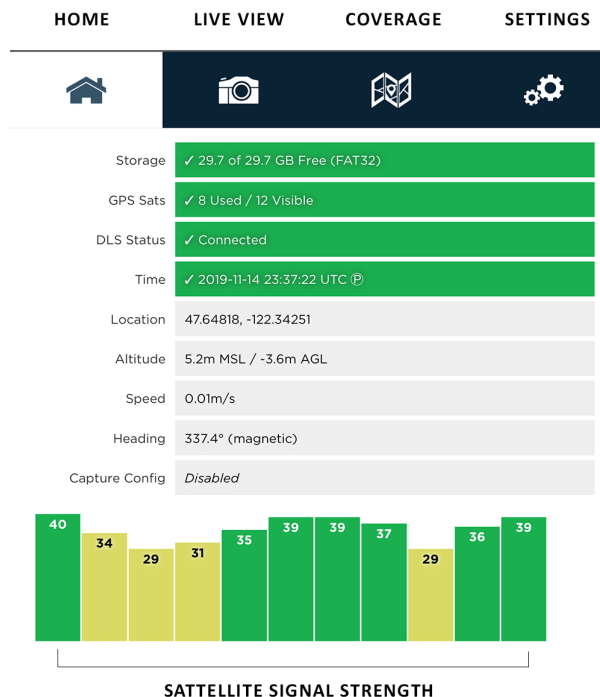
1. Check lenses for a clearance.
2. Check DLS sensor for a clearance.
3. Insert 32 GB UHS-I FAT32 SD card in SD card slot.



FAT32 file system is supported only.

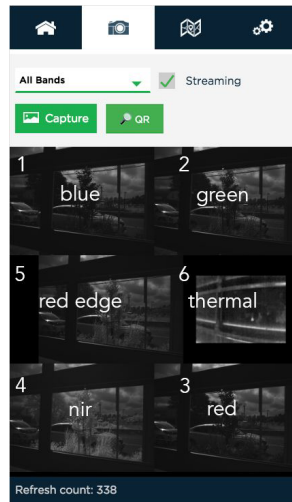
Pre-launch Check

1. Turn UAV on.
2. Wait 15 sec for camera system initialization.
3. Check that DLS and camera LEDs are flashes green.
Otherwise, check SD card file system.
4. Use Wi-Fi PC or phone to connect camera.
Wi-Fi spot: **rededgeRMXXX-XX**. password: **micasense**.
5. Open **192.168.10.254** page in browser.
6. Open 🏠 **Home** tab.



Home tab

7. Check that **Storage** field highlights green, and SD card is empty.
Otherwise, turn camera off, format and reinstall SD card.
8. Make sure that **DLS Status** field highlights green.
This field shows DLS sensor connect.
If it highlights red, turn camera off and check DLS sensor connect.
9. Switch to 📷 **Live View** tab.
10. Turn camera live view on by enable **Streaming** option.
Make sure that the streams from all bands are available.
Frame per second is 2.
11. Disable **Streaming** option.
12. Open ⚙️ **Settings** tab.




Stream in Live View tab

13. Check that **Ext. Trigger** is selected in **Auto-Capture Mode** field.
14. Make sure that **Ext Trigger Mode** is selected **Rising Edge** field.
15. In **Advanced Configuration** section in subsection **PPS pin usage** for **Pin purpose** field must be selected **Output** option.

Calibration

Shooting Calibration

1. Connect the camera via Wi-Fi.
Network: **reledgeRMXXXX-XX**. Password: **micasense**.
2. Open **192.168.10.254** page in browser.
3. Switch to  **Live View** tab.
4. Turn camera live view on by enable **Streaming** option.
5. Place calibration board on a flat surface.
6. Lift UAV up over the calibration board.
7. The board must be on approximately 50 % of total shooting area.
You can check it on streaming tab.
8. Make sure that calibration board and DLS sensor doesn't have any shadows.
9. Disable **Streaming** option.
10. Press **Capture** button on the camera.
11. Make sure that photos are showed in browser.
12. Repeat steps 10 and 11.

Magnetic Compass Calibration

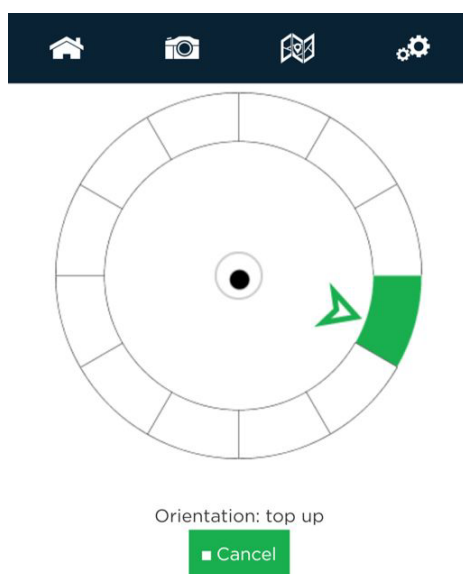
You need portable compass to calibrate camera's inside magnetic compass system. The calibration should be performed away from metal objects and buildings.

1. Select **DLS Configuration** in  **Settings** tab.
2. Press **Calibrate DLS Mag** button to start magnetic compass calibration.
3. Follow steps on the screen.

Keep UAV horizontal for each calibration step.

Pay attention to black point in calibration window.

It is «ground level».



Calibration window

Check magnetic compass value after calibration finish.

To do this, go to home page  and check **Heading** value.

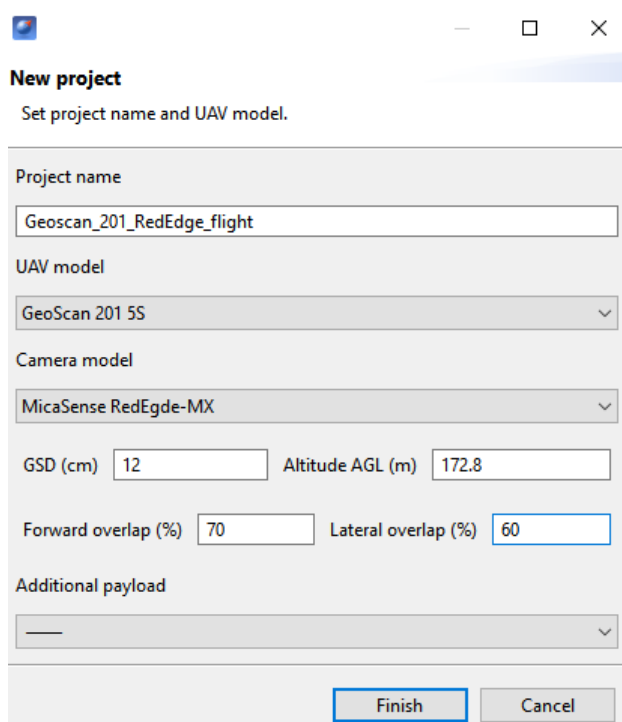
The difference between portable compass heading and camera compass heading should be no more than $\pm 5^\circ$.

Flight Project Settings

Set these recommended parameters in Geoscan Planner new project window (see more information in [Geoscan Planner Software](#) section):

UAV Model – Geoscan 201 5S;
Camera Model – MicaSense RedEdge-MX;
GSD (cm) – 12;
Forward Overlap (%) – 70;
Lateral Overlap (%) – 60.

Additional payload does not need to be specified. The autopilot automatically detects the second camera for UAVs with two cameras and performs in-flight shooting sync.



New project
Set project name and UAV model.

Project name
Geoscan_201_RedEdge_flight

UAV model
GeoScan 201 5S

Camera model
MicaSense RedEdge-MX

GSD (cm) 12 Altitude AGL (m) 172.8

Forward overlap (%) 70 Lateral overlap (%) 60

Additional payload
—

Finish Cancel

Geoscan Planner settings

Make shooting in normal daylight conditions for the best pictures quality.
Repeat camera calibration after UAV take off.
The camera can be switched off by control button on the front side.

Metadata Sync

Copy photos to PC and attach GNSS metadata to each photo. For this:

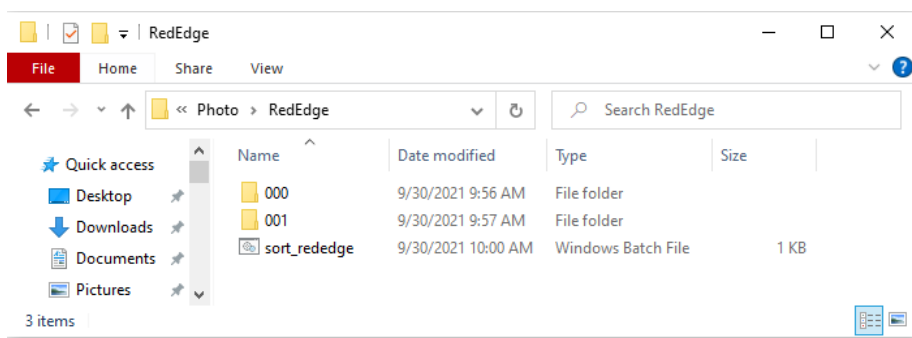
1. Eject SD card and open SD card memory in file browser.
The pictures are placed in **XXXXSET** folder, where XXXX – number of shooting session. Inside this folder, the photos are separated on folders (no more than 1000 pictures for each) 000, 001, 002 etc.

2. Create **RX1RM2** and **RedEdge** folders and copy in photos from cameras.

3. Copy **sort_rededge.bat** script in RedEdge folder. This script will sort pictures in 5 folders. Each folder contains photos from one of spectral bands.

The script is available for download here:

https://download.geoscan.aero/site-files/sort_rededge.bat

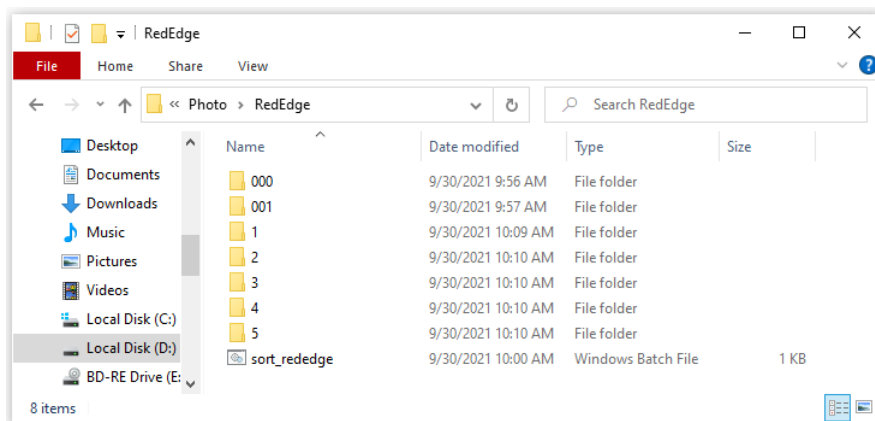


File structure before script sorting

4. Launch **sort_rededge.bat** script as administrator.

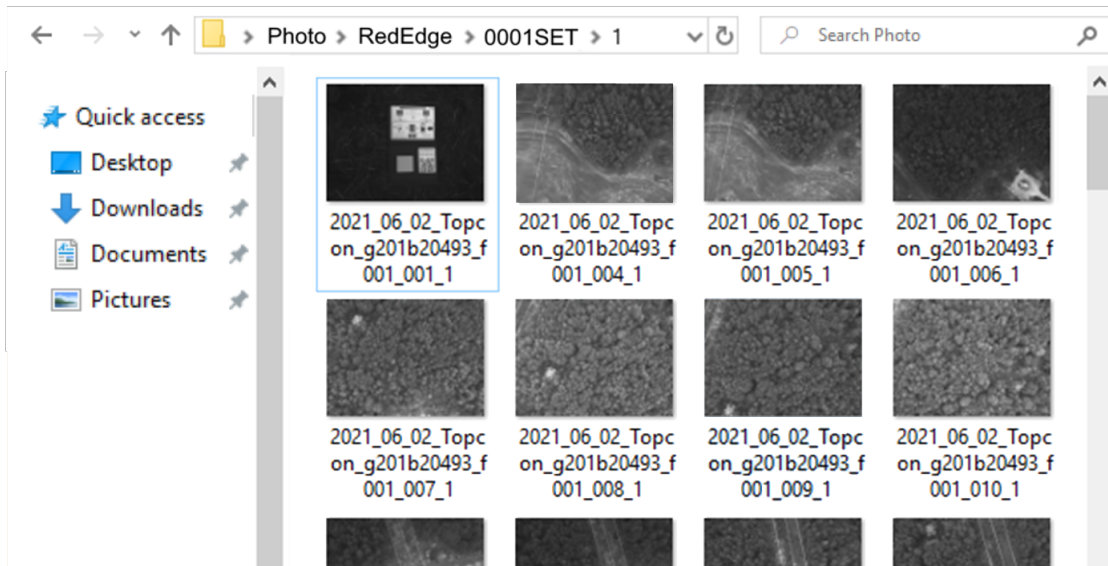
Mouse right button click on the script – Run as administrator.

The script window will be closed after sorting is finished.



File structure after script sorting

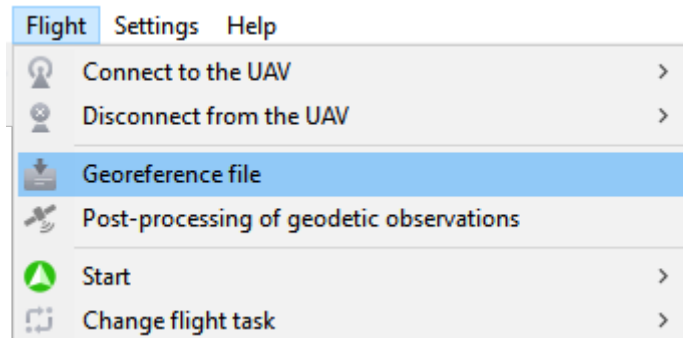
Delete first calibration board photos in each folder (1,2,3,4,5). Leave only one of them.



One calibration photo in one of the folders

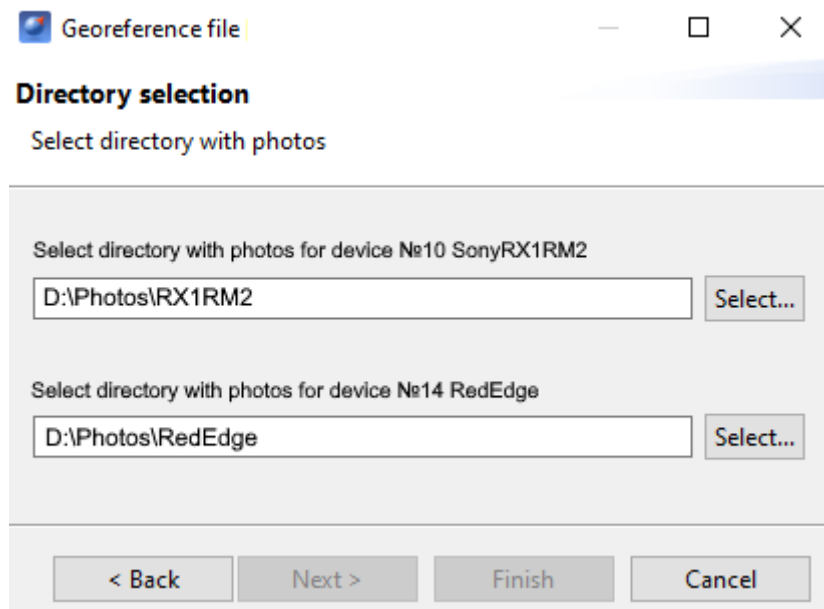
If RX1RM2 camera included in delivery kit, copy camera photos in RX1RM2 folder to sync metadata.

5. Connect UAV to Geoscan Planner software and select **Georeference file** in **Flight** tab.



Georeference file

GNSS metadata will be downloaded from UAV memory automatically. Set paths to RedEdge and RX1RM2 photos and press «Next» button.



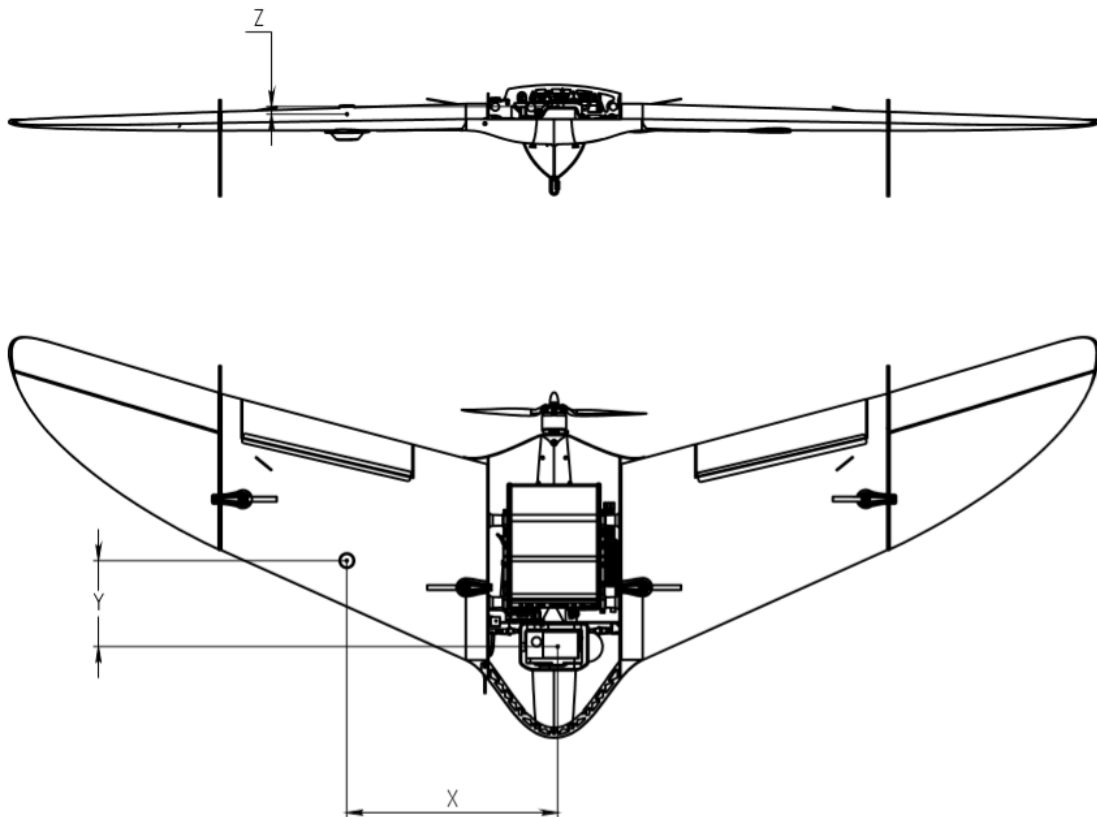
Paths to photos

6. Metadata will be attached to photos automatically.

Cameras' Offsets

Onboard GNSS receiver is located inside UAV wind, and its center is away from camera sensor center.

GNSS receiver offsets should be taken into account, when you create orthophoto mosaic and 3D models.



Coordinate axes

Offsets of left camera slot

Camera, direction	x	y	z
A6000/ZV-E10, down	0.505	-0.180	-0.033
DSC-RX1RM2, 15°	0.503	-0.181	-0.033
DSC-RX1RM2, 20°	0.505	-0.175	-0.25

Offsets of right camera slot

Camera, direction	x	y	z
A6000/ZV-E10, down	0.374	-0.179	-0.04
DSC-RX1RM2, 15°	0.357	-0.181	-0.033
DSC-RX1RM2, down	0.368	-0.181	-0.032

Offsets of Sony DSC-RX1RM2 camera in center position

Camera, direction	x	y	z
DSC-RX1RM2, down	0.489	-0.175	-0.032

RedEdge-MX camera offsets of right slot

Band	x	y	z
Blue	0.480	-0.188	-0.006
Green	0.509	-0.188	-0.006
Red	0.509	-0.167	-0.006
NIR	0.480	-0.167	-0.006
Red Edge	0.494	-0.177	-0.006

Select **Camera Calibration** in **Tools** tab of Agisoft Metashape to set camera offsets. Select **GNSS/INS Offset** tab in Camera Calibration window and set coordinates in meters. Pay attention, that X-axis offset is inputted with + sign, but Y and Z offsets must be specified with - sign.

Battery and Charger

Safety Rules

Battery

- DO NOT disassemble the battery.
- DO NOT use chargers and cables, that not tested for capability with UAV battery by manufacturer.
- DO NOT connect the battery to switched off charger.
- DO NOT transport the battery in UAV body (in transport case only).
- DO NOT leave the battery in direct sunlight.
- DO NOT store or transport the battery at temperatures below +3 °C.
- DO NOT shortcut battery pins.

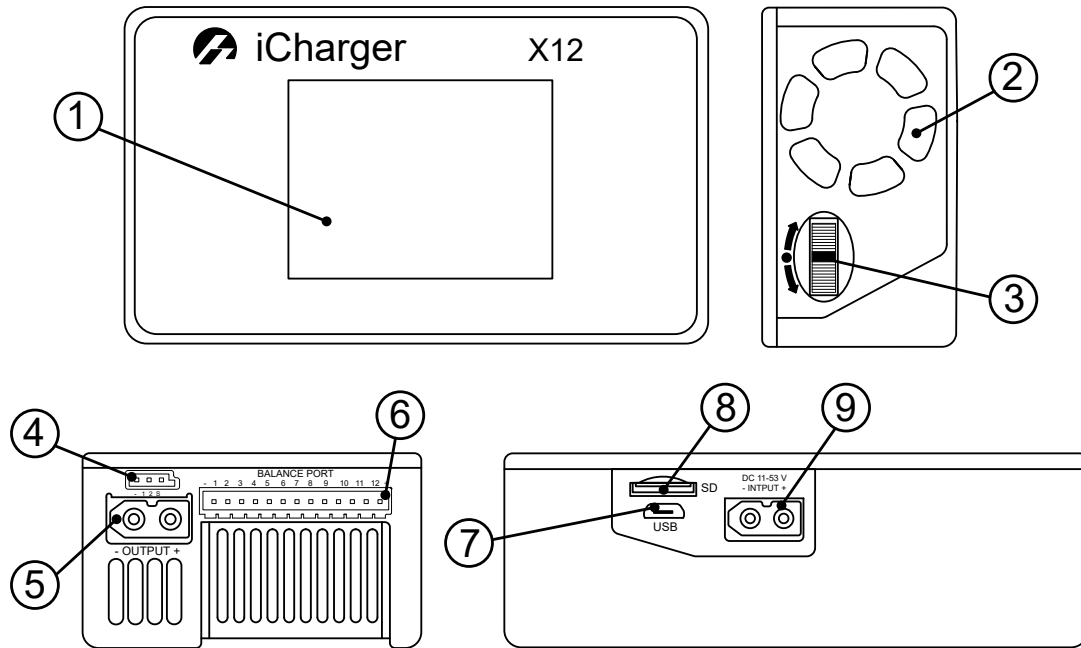
Charger

- Set **LiPo** cells type before battery connection.
- Carefully check cables and connectors for a damage before each use.
- DO NOT use the charger in direct sunlight.
- DO NOT leave turned on battery charger unattended.

iCharger X12 Charger

The iCharger X12 charger has a small control unit, but high power, which allows you to charge the batteries of Geoscan UAVs.

Control Unit Parts



- 1. LCD Screen
- 2. Cooling Fan
- 3. Navigation Wheel
- 4. Multifunctional Port

- 5. Output Charge Port
- 6. Balance Port
- 7. USB Port
- 8. microSD Slot
- 9. Input Power Port

Preset

1. Connect the power cable of charger to 220 V power source.
2. Press on navigation wheel to open settings (3).

Memory Selection menu will be opened.

3. Select **LiPo** by rotating of wheel (3).
4. Press on navigation wheel (3) to approve LiPo select.

Setup screen will be displayed.

5. Check parameters for **Charge** mode.

If required, change them to the ones shown below using the wheel (3). Parameter change will be available after a long press on the wheel. Select a parameter to be changed and set the value by scrolling the wheel and pressing it once.

MEMORY SELECTION	
00	LiPo
01	Lilo
02	LiFe
03	LiHV
04	LiHv_1
05	LTO
06	NiMH
07	NiCd
08	NiZn
09	Pb
10	Power

Memory Selection menu of presets

Connection OK	
20.031v	0.00 A
---- °C	0.000Ah
0.00 w	
LiPo	
Run Program	
Charge	LiPo Cap. Ignore
Storage	Cells Auto
Discharge	Current 10A
Cycle	Chg Mode Slow Balance
Balance Only	

Charge mode parameters



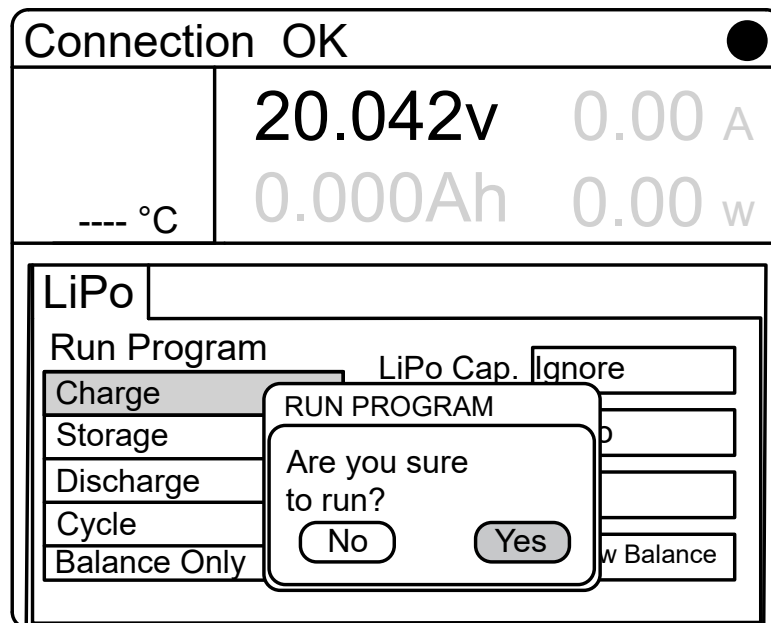
To fully charge the battery properly, you must use **Chg Mode – Slow Balance** charging mode.

This ensures maximum capacity of the battery cells, does not disturb the charge cycles and increases battery life.

Otherwise, cell charging errors may occur, resulting in reduced efficiency and overall battery life!

Battery Connect to X12 and Charging

1. Connect the power cable of charger to 220 V power source.
2. Connect balance board to balance port (6).
3. Connect balance cable to 5S slot of balance board.
4. Connect balance cable to UAV battery.
5. Connect charge cable to UAV battery.
6. Select **LiPo** battery type, **Charge** mode and check preset in accordance with point 5 of [Preset](#) section.
7. Long press on navigation wheel (3) and approve charge start by selecting **Yes** in approve window.



Approve window

At the end of charging the charger will beep and go into capacity holding mode. A message will be displayed on the screen indicating that charging has finished successfully.

Disconnect the battery in reverse order.

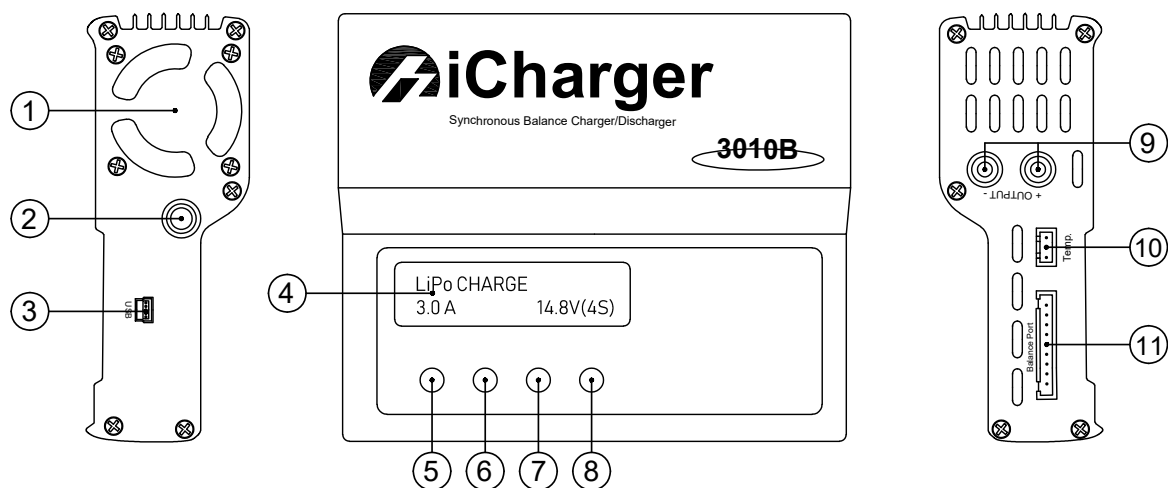
In case you want to stop the process during charging, press and hold the wheel (3) 3-4 sec.

The status will change to STOPS. A short press on the wheel again will open settings menu.

iCharger 3010b Battery Charger

Control Unit Parts

Control unit and power unit are placed in charger transport case.
iCharger 3010B is installed as control unit.
The picture below shows main parts of this device.



1. Cooling Fan
2. DC Cable
3. Port miniUSB
4. LCD Screen
5. **Batt type/Stop** – Battery Type and Stop button
6. **Dec** – «Left» Button
7. **Inc** – «Right» Button
8. **Start/Enter** – Approve Settings and Start Charging Button
9. Output Ports
10. Temperature Sensor Port
11. Balance Socket

Setup

The charger is factory preset.

Use this section if you need to restore the settings:

To open settings:

- On PROGRAM SELECT main screen press **Batt type/Stop** button several times, to the moment, when screen will **Settings** section;
- Press **Start/Enter** to open settings menu.

Use **Dec** and **Inc** buttons to choose parameters and **Start/Enter** to select.

- Select **Safety timer** and press **Start/Enter** button.
Use **Dec/Inc** buttons to change it to **OFF**. Press **Start/Enter** button until stop switcher blinking.
- Select **Capacity cut-off** and press **Start/Enter** button.
Use **Dec/Inc** buttons to change it to **OFF**. Press **Start/Enter** button until stop switcher blinking.

Press **Batt type/Stop** button to exit from settings section.

- On PROGRAM SELECT main screen select **Lithium battery** section and press **Start/Enter** button. Set these parameters:

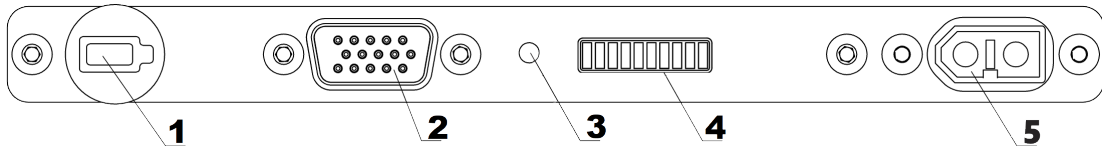
AUTO value, that defines battery cells number (S) automatically.

Charge current: **10,0 A**.

Other settings not should be specified.

LiPo Battery

Control and Indication



- 1. Control button
- 2. Balance port
- 3. Status LED

- 4. LED status bar
- 5. Charge port

Press **Control button** (1) to check battery status. **Status LED** (3) will light green and will change color to red. (and orange for «Arctic» batteries).

Status LED color shows type of data, that indicated **LED status bar** (4):

● Green – charge level. ● Red – temperature inside the battery.

● Orange – remaining time of temperature holding for «Arctic» batteries.

Each bar's LED indicates 10% of charge level in ● charge indication mode.

The table below shows LED sections number connection with temperature values ●:

Temperature Level Indication

LEDs	Flash Mode	Temperature, °C
I (1)	flashes	< 5
II (2)	flashes	5-10
III (3)	flashes	10-15
IIII (4)	lights	15-20
IIIII (5)	lights	20-25
IIIIII (6)	lights	25-30
IIIIIII (7)	flashes	30-35
IIIIIIII (8)	flashes	35-40
IIIIIIIII (9)	flashes	40-45
IIIIIIIII (10)	flashes	>=45





Attention! Do not connect external power source to the battery, when indication mode is activated.

Battery discharge speed depends on UAV motor speed. The autopilot system is change speed level depends on telemetry sensors and UAV flight task. For example, for minimizing of battery discharge you can create field of aerial survey with minimum points of UAV rotate in flight.

Battery Heating (for «Arctic» Battery)


«Arctic» batteries are marked by snowflake on the body. That batteries have more using temperature range from -40 to +20 °C.

Press **Control button** (1) more than 2 seconds to activate temperature holding mode (range: from +20 to +30°C) for 30 minutes. **Status LED** (3) will change color to  orange. LED status bar (3) will show remaining temperature holding time (3 min for each LED). Press **Control button** (1) again to turn temperature holding off.

The table below shows LED number connection with remaining time of temperature holding .

Remining Time of Battery Temperature Holding

LEDs	Remaining Time, min
I (1)	3
II (2)	6
III (3)	9
IIII (4)	12
IIIII (5)	15
IIIIII (6)	18
IIIIIII (7)	21
IIIIIIII (8)	24
IIIIIIIII (9)	27
IIIIIIIIII (10)	30

Battery temperature holding mode is activated automatically, when you connect external heating source (battery of auto) to balance port (2) by balancing cable. Status LED will lights  orange, and battery will change mode to temperature holding for 30 minutes. Repeat balance cable connection if you need more time of temperature holding.

We recommend to turn auto engine on to avoid full discharge of auto's battery.

Battery Connecting

1. Check charge settings.
2. Connect balance cable to the battery.
3. Connect charge cable to the battery.
4. Long press **Start/Enter** button, until the charger will change status to *Battery Check*.

After successful cells check battery charger will start charging process automatically.



You can use car's 12 V battery as charger power source. Make sure that you turn car engine on to avoid full discharge of car's battery.

Recommendations for Battery and Charger Using

- Store the battery in warm place without any condensation before flights in below 0 °C temperature conditions. Remember that LiPo batteries can lose up to 30% of capacity in cold temperature.
- Store the batteries in dry cool place without direct sun light before flights in temperatures more than +25 °C. Do not charge batteries directly before flight. Wait for a moment, when battery temperature is cool down. Charge the battery in dry cool place without direct sun light.
- Charge the batteries directly after using to avoid full discharge.
- Do not overcharge or overdischarge the battery The voltage for each cell must be in range of 3,3 to 4,2 V. Full voltage on power socket must in range of 16,5 - 21 V.
- Do not charge the battery in cold place, if you planning to move it to warm place. The temperature risen can be reason to battery overcharge and damage or fire.
- Do not store batteries fully discharged or fully charged.
For a long storage (more than 14 days) charge the batteries to 50% of full capacity and correct charge level to 50% once in 5-6 months.
Store batteries in dry cool place with relative humidity no mor than 80% without direct sun lights and any condensation.
- Make full charge-discharge cicle after long time storage.
- Optimum temperature for charge, storage and using is +15 °C.
- Service life: 1 year.

Battery Recycling



Do not utilize batteries with household trash. It may be dangerous for ecology. Send them to recycling points.

Geoscan Planner Software



Geoscan Planner software allows to configure UAV and create flight projects for aerial survey of areas and single objects.

System Requirements

Minimum System Requirements

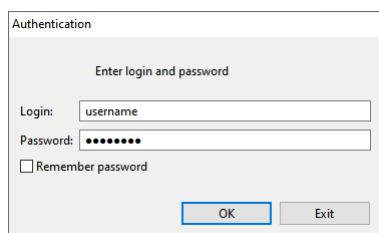
Operating system	MS Windows 7,8,10
CPU	Intel Core i3
RAM	4 Gb
GPU Type	Dedicated
GPU Model	Nvidia GeForce GT620M, GT630M, 710M, GT720M; AMD Radeon HD 7670M

Recommended System Requirements

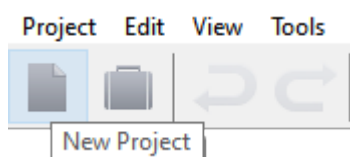
Operating system	MS Windows 7,8,10
CPU	Intel Core i5, i7
RAM	8 Gb
GPU Type	Dedicated
GPU Model	Nvidia GeForce GT645M, GT745M, 845M, GT720M, 940M and higher

New Project

1. Install and launch **Geoscan Planner** software.
2. Enter your login/password in authentication window and create new project by press **New Project** button.

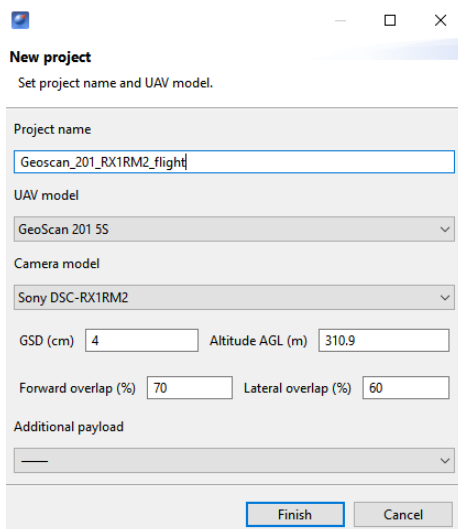


Authentication window



New Project button

3. Enter a project name and shooting parameters in the new project window.



Parameters in new project window

Aerial Surveying

Aerial surveying is a polygon surveying. User sets vertices of the polygon (more than 3) and the software will automatically calculate a flight route.

1. Press **Create aerial surveying** on the toolbar.



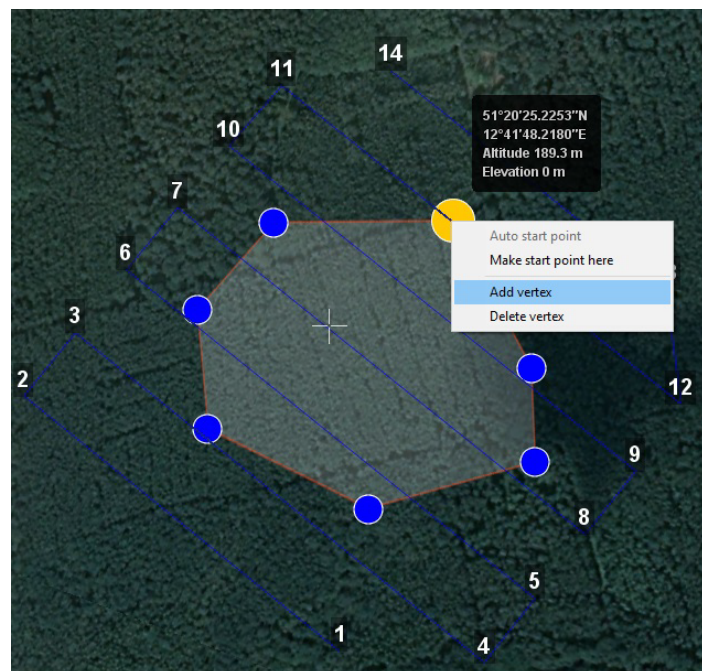
Create aerial surveying

2. Click on the map to set vertices of aerial surveying area. The program will automatically calculate the flight route.

Polygon Vertices Adding and Removing

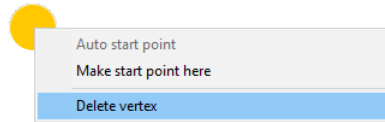
You can add vertices to polygon.

1. Hold left mouse button and move middle point of a polygon side. The vertex will be created automatically. A floating window will display location of the vertex.



Vertex adding

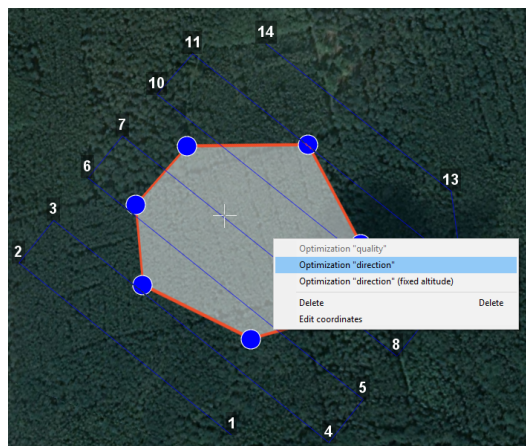
- To remove the vertex:
1. Right click on the vertex.
 2. Select *Delete vertex*.



Delete vertex

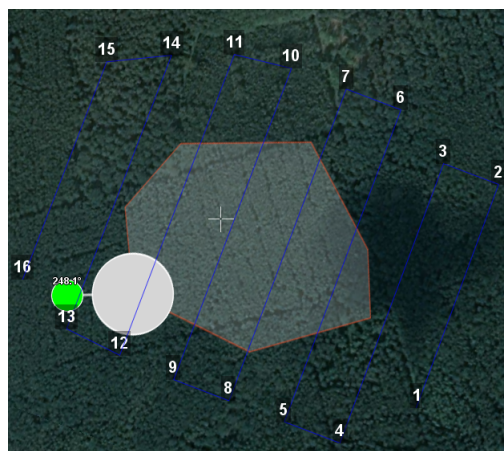
Change Flight Route Direction

The need to change a flight route may be caused, if the force and direction of the wind are unfavorable (strong wind along the flight route of the polygon). Right-click on the polygon and select the option *Optimization «Direction»* in context menu to change the direction of flight route.



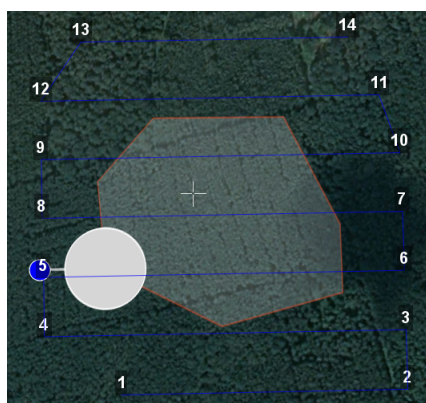
Optimization by direction

One of the vertices of the polygon will be colored gray. Use the point's slider to set the flight route direction.



Correction of the flight direction

A new flight route through the polygon in a selected direction will be generated automatically.

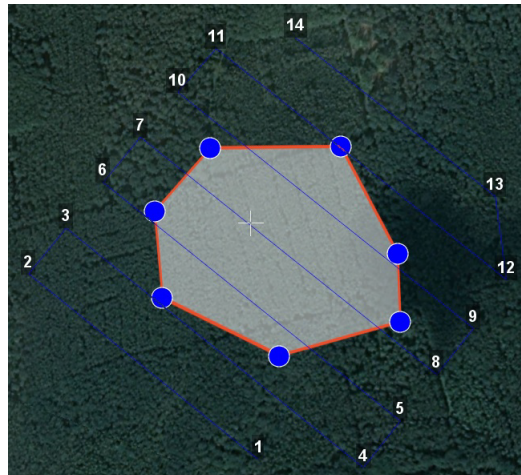


Changed flight route

Start Point Changing

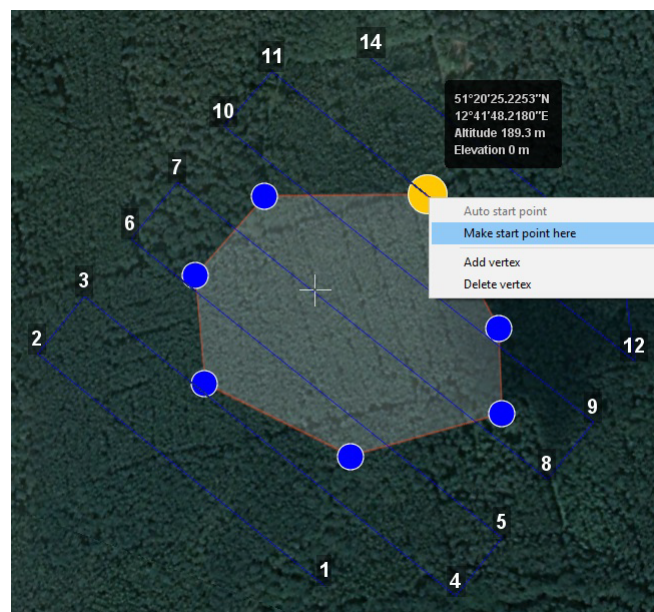
Follow these steps to change the polygon entry point:

1. Select a polygon.




Selected polygon

2. Select vertex, right click and choose *Make start point here*.



Context menu of a point

The selected point will be marked with a flag 

Linear Surveying

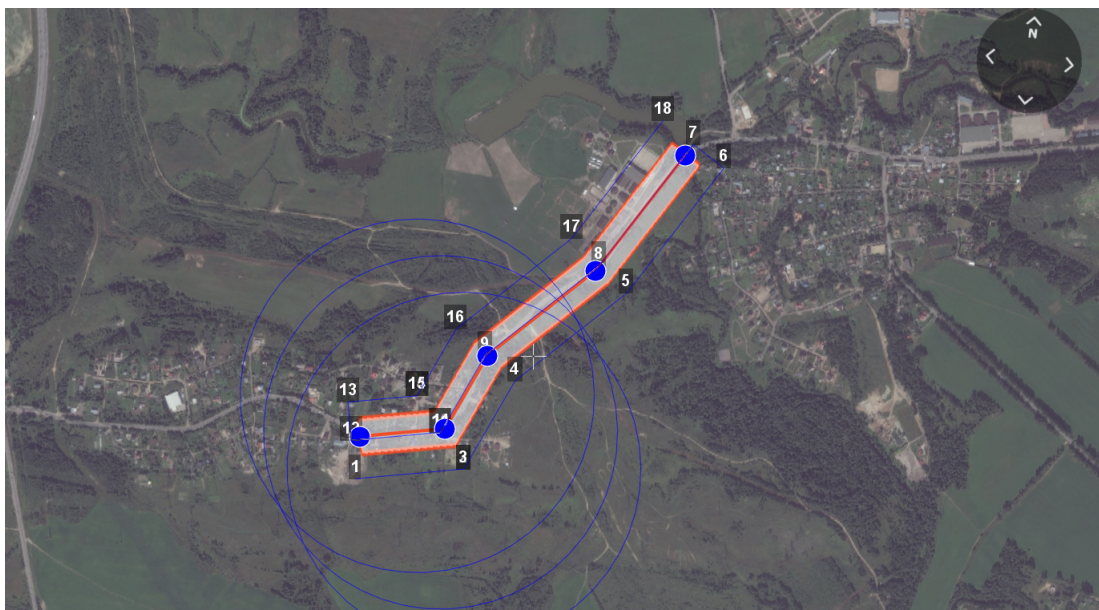
Create linear surveying tool allows to create a flight route along linear objects, such as: rivers, roads, oil pipelines, etc. .

1. Press **Create linear surveying** button on the toolbar.



Create linear surveying button

2. Single clicks to set a path around an object. The program will automatically generate flight route.



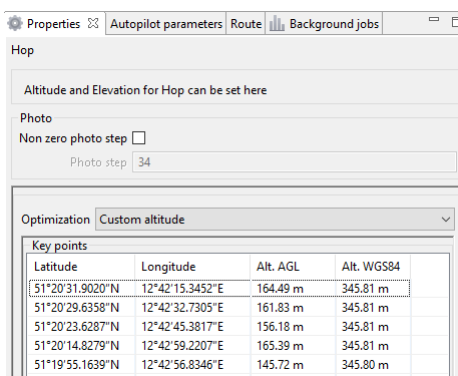
Linear survey example

Hop

Fight by pre-seted route with a seted altitude. It is mainly used for passing around point objects (i.e. high objects) and topographic inequality. Click on the icon **Create hop** on the toolbar.



Create hop button



Hop options

2. Specify the flight route by single-clicking. To build a hop at different altitudes, select **Optimization - Custom altitude** in properties window.

3. **Non zero photo step** function activates the camera.

You can change the step of photo in meters is specified in the corresponding field. Values of the Alt. AGL column are the differences between the absolute height of the flight task point and the relief below it. Thus, the height of the relief must be taken into account. The absolute heights of the points are also available for editing through the column Alt. WGS84. Besides, height can be changed by visual editing (drag mouse with Shift key pressed).

Hop route between two flight elements is built according to the following rules:

If the flight task elements have the same height, then the flight will be performed at the same height.

If the flight task elements have different heights, then the flight will be performed at the highest of them.

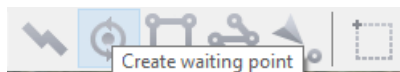


If conditions do not allow to reach the height of the second point by a straight trajectory (for example, due to small distance between points, but a large difference in altitude), the aircraft will fly with the maximum allowable pitch by a straight trajectory in order to reach a point by the coordinates, after which it will rise/descend in a spiral.

Waiting Point

Create waiting point tool allows to hold UAV on selected map point.

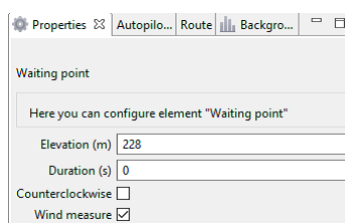
1. Press **Create waiting point** on the toolbar.



Waiting point button

2. Click mouse button on the map to set waiting point.

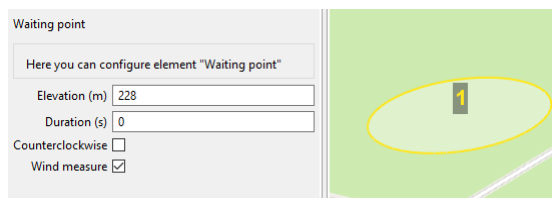
You can activate more options an expert mode: set delay point height, waiting time, direction, wind measurement and endless devay functions.



Waiting point options

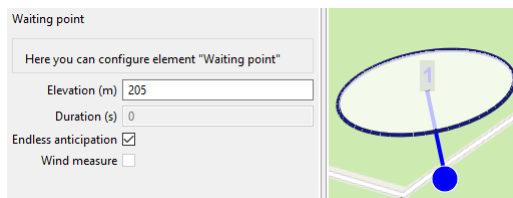
UAV will hold the point on the set height during seted time, and then go back to the flight route.

In **Wind measure** mode the waiting point will be colored yellow, and the duration will change to 15 seconds. UAV will take into account a wind mesurements when performing a flight task.



Waiting point in wind measure mode

Infinite waiting option sets holding point in the air (point will be hold until the low battery charge will trigger automatic return to start point). The waiting point color will change to deep blue.



Infinite waiting point



We recommend to set the waiting point with wind measurement before each flight element at the height of the flight element, especially if they are located a large distance from each other.

Landing Point

Create landing point tool is used to set the UAV landing point.

It is necessary to land UAV at the flight mission end.

Choose open dry place without trees and other barriers for landing.

Check the wing direction at landing route and correct land trajectory if it needs.

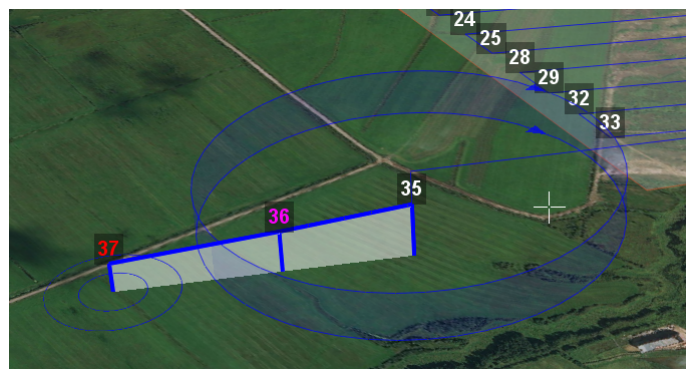
1. Press **Create landing point** button on the toolbar.



Create landing point button

2. Click on the map to select landing point for UAV.

The software will generated 3 points landing route automatically.



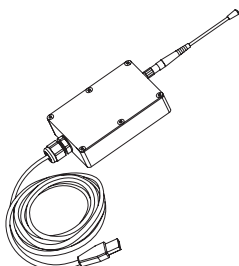
Landing route example



Landing should be carried out against the wind in the landing area. Otherwise, a hard landing is possible. It may provide UAV damages.

Connection Settings

Radio Modem Connection



The radio modem is used to load a flight task into the autopilot memory, set up and semi-automatic control UAV flight up to 40 km, if a flight zone doesn't have any signal barriers. This section describes how to set up wireless connection between the UAV and laptop.

1. Connect radio modem to laptop's USB port.
Radio modem drivers will be installed automatically.
Use these drivers, if operating system is not detect radio modem device:
[CP210x VCP\(for Windows 7-8\)](#) и [CP210x\(for Windows 10\)](#).

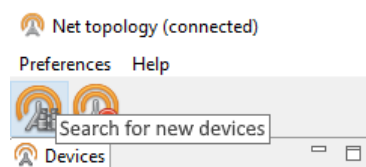
2. Install  **MdmDisp** and  **NetTopology** software.
3. Turn UAV power on.
4. Launch **MdmDisp** utility.

The antenna icon and the number of connected UAVs will be displayed in a right corner of the laptop screen.



- 4.1 At the first time you need to configure connection with UAV.
 - 1) Run the **NetTopology** utility.

- 2) Press **Search** button.

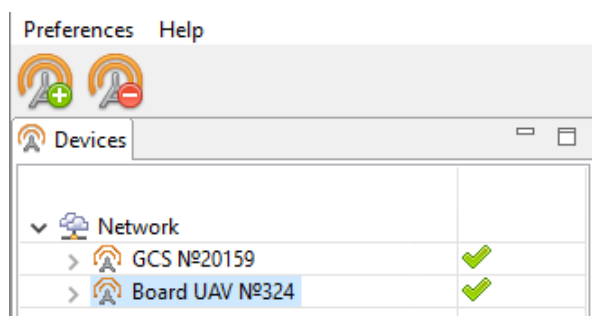


The program will show the list of detected devices. The search will continue until the **Search new devices** button will be pressed again.

- 3) Select UAV №xxxx and press **Add device** button.

The utility saves the list of added devices automatically.

Before the next flights just run MdmDisp utility and check successful connection.



Adding a new device

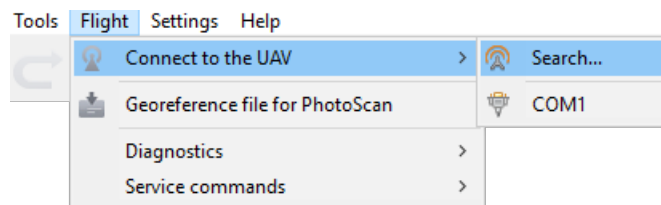
If UAV is not detected reconnect radio modem by right-click on the MdmDisp icon and select **Reconnect**. in the context menu.

If connection is failed:

- Check connection of the radio modem to laptop's USB socket.
- Check network settings in NetTopology.
- Set COM-port of the radio modem manually. Right click on the MdmDisp antenna icon and select textbfSettings in the context menu. Set **Connection type – Serial** and select COM-port of the radio modem.
- Right click to MdmDisp icon and select **Reconnect**.

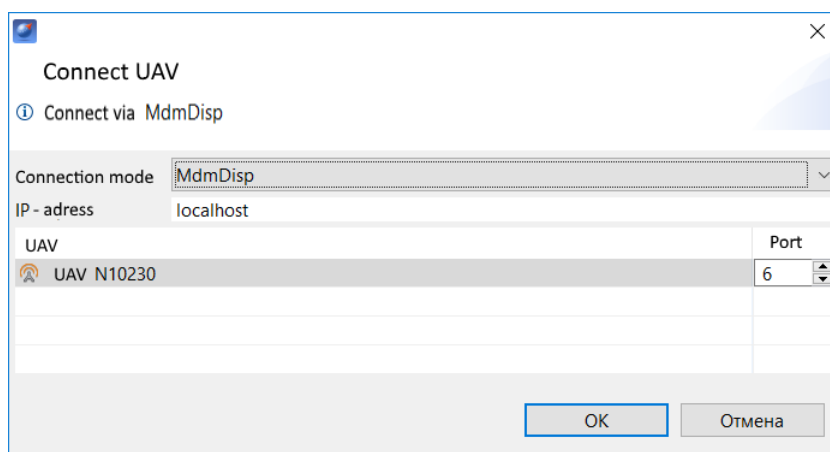
UAV Connecting to Geoscan Planner

- 1) Select **Connect to the UAV – Search...** in **Flight** tab.



UAV connection

- 2) Select connection type in **MdmDisp**.
Set *IP-adress – localhost*.
In **UAV** list set **UAV – Port 1**.



Connection settings

The settings will be automatically saved. At the next connections turn on the UAV power and use **Connect UAV** button on the toolbar.

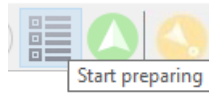


Connect UAV button

The receiver will automatically detect UAV coordinates and display position on the map.

Pre-launch Check

Launch **Start Preparing Wizard**.



Start Preparing Wizard launch button

Follow the instructions of the Start preparing Wizard (most tests are passed automatically).

On **Parameters** stage set:

Parashute autodeattach radius (m) – radius around landing point, that trigged parashute autodeattach after landing.

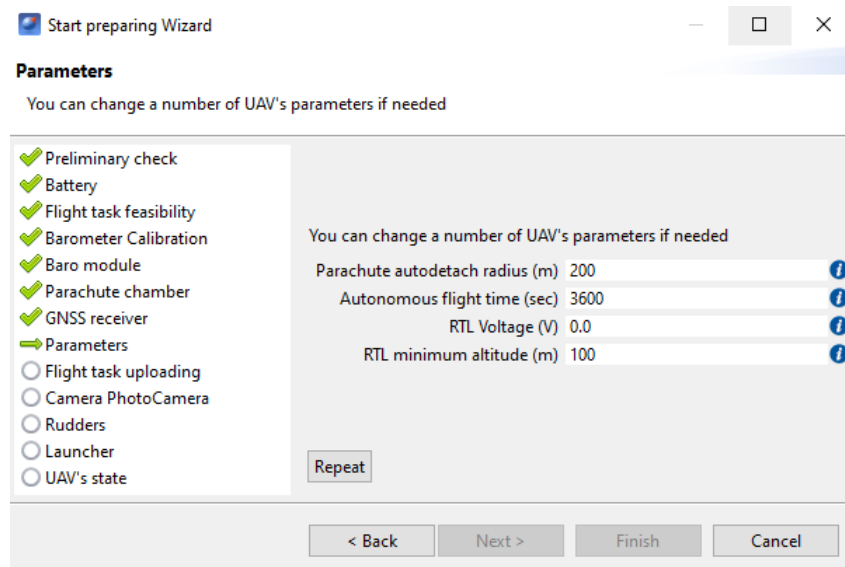
Example: If trees, transmission towers or any other barriers stays on landing route set value less than 150 m. It helps to off autodeattach, if UAV will landed on a tree.

The value should be in range from 0 to 300 m, where 0 – disabled autodeattach system.

Autonomous flight time (sec) – time after radio signal loss that UAV will fly in automatic mode. If the connection is not restored in this time, UAV will start return to start point.

RTL Voltage (v) – battery voltage cut-off, that launch immediate landing. Cut-off safety range: from 13.6 to 16.6 v.

RTL minimum altitude (m) – altitude cut-off that launch immediate landing. It sets if terrain or other barriers can block return route. Safety value range: from 100 to 4000 m.

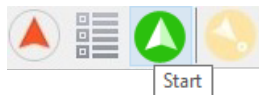


Flight mission settings

Place UAV on the launcher's carriage after successful pre-launch check.

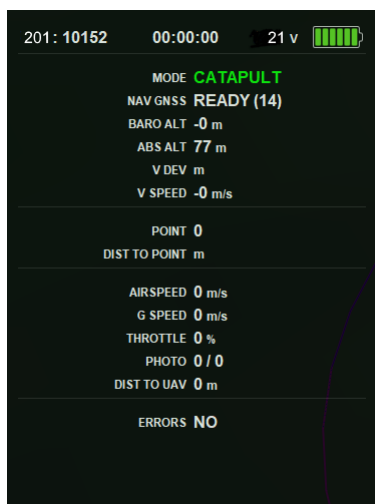
Flight

Press **Start** button.



Start button

UAV autopilot will change mode to start.
The telemetry panel will display **CATAPULT** mode.



Catapult mode



It is necessary to switch the UAV to start mode only after placing it on the launcher. It is forbidden to take and move the UAV after switching to **CATAPULT** mode.



Press the cancel button **Cancel** to cancel Catapult mode. UAV will be switched to the **Preparation** mode. It will require to go through the flight preparation again.

Eject safety pin and activate launch by pulling launcher's cord.
UAV will take off.

Landing

Press **Go to landing** button to start UAV landing.



«Go to landing» button

The automatic landing slowdown is triggered by the barometric altitude. It is not recommended to indicate the landing point at a location that differs much in elevation from takeoff point.

Launch

Use this section for preflight check.

1. Charge UAV battery and make sure, that battery's LED status bar showed full charge level (see [Battery and Charger](#) section for details).
2. Create and save new project in Geoscan Planner software to upload it directly before flight (see [Geoscan Planner Software](#) section for details).
3. Assemble UAV launcher (see [Launcher](#) section for details).
4. Assemble UAV (see [UAV Assembly](#) section for details). Place the parachute (see [Parashute](#) section for details).





Check that the parashute compartment cover can opens. To do that just rotate servo horn. The parashute rigging lines must be free.

5. Close and lock parashute compartment cover by servo horn.
6. Open UAV top cover. Check camera connection to UAV.
7. Press battery control button once. When the LED status bar turns red, install the battery in UAV. If necessary, activate temperature hold mode beforehand.
8. Turn and set up cameras (see [Camera Settings](#) section for details). Place cameras in cradles and lock them by velcros.
9. Check autopilot indication on the board near the battery connector.
10. Close UAV top cover.
11. Turn the laptop on and connect radio modem.
12. Open flight project in Geoscan Planner software and connect UAV. (see [Connection Settings](#) section for details)

Autopilot Indication

LED	Default	Error	USB Mode
POW	blinks slowly	blinks fast	turned off
ERR	turned off	lights	turned off
STM	blinks slowly	blinks fast	turned off
USB	turned off	turned off	lights
LPC	blinks slowly	blinks fast	lights

13. Launch  **Start Preparing Wizard** and complete all steps.
On launch preparing remove lens caps from cameras, install UAV on launcher and pull rubber cords (springs for «Arctic» launcher).
14. Make sure that you completed all steps successfully and press **Done** button.
15. Press  **Start** button to switch the UAV to “Catapult” mode. Remove safety pin and pull launching cord to launch UAV.

The UAV will take off.

16. After launching the UAV, loose rubber cords tension. To do this, hold reel handle by one hand and use the other to remove reel stopper and smoothly unwind the tension cable. After that, the cords can be removed from the launcher by disconnecting the carbine from the cable and the loop from the carriage.

UAV Disassembly

- 1, Open UAV top cover.
- 2, Turn UAV power off and eject the battery.
- 3, Eject SD card from cameras to process shooting results.
- 4, Place UAV on folding rack.
- 5, Unclasp rubber locks on the wingtips and pull them off the rods. Remove the rods and fins.
- 6, Unclasp wings' rubber locks and pull them 5-10 cm away from UAV body to get access to the connectors. Disconnect them from autopilot board and take wings off. Take the rods out and place them in transport case.
- 7, Close the UAV cover.
- 8, Fold the parachute and place it in parachute compartment.
- 9, Close the parachute compartment cover and secure it by servo horn.
- 10, Place UAV parts in transport case.

Appendix

Specifications

UAV

UAV Type	Fixed-wing
Motor Type	Electric Brushless
Max. Flight Speed	130 km/h
Max. Survey Area per Flight	7-22 km
Max. Wind Resistance	12 m/s
Wingspan	2,22 m
Max. Flight Altitude	4000 m
Max. Flight Time	180 min
Max. Flight Distance	210 km
Max. Payload Weight	1,5 kg
Max. Weight	8,5 kg
Operating Temperature Range	Standart Battery: from -20 to +40°C «Arctic» Battery: from -40 to +20 °C

LiPo Battery

Cells	5S
Capacity	34 000 mA-h
Recommended Charge Current	10 A
Max. Charge Current	17 A
Max. Voltage	21 V
Normal Voltage	18,5 V
Min. Voltage	15 V
Weight	3,1 kg

Topcon B111 GNSS Receiver *

Number of channels	226 universal tracking channels
Acquisition time (hot/cold start)	<15 / <44 sec
Signals tracked	GPS: L1/L2; GLONASS: L1/L2
Positioning accuracy (PPK)	horizontal: 5 mm + 0.5 ppm × baseline length; vertical: 10 mm + 0.8 ppm × baseline length

Radio modem

Operating frequency	867.75 – 872.25 MHz
Transmitting power	<1 W
Max. bandwidth	500 kb/s
Max. delay	20 ms
Duplexing mode	TDD
Max range	40 km

Sony DSC-RX1RM2 Digital Camera *

Sensor	Full-frame CMOS Exmor R (35.9x24 mm)
Number of Pixels	43,6 MP
Shutter	Central
Aperture	f/2-22
ISO Range	100-102400
Shutter Speed	from 1/4000 to 30 sec

Sony A6000 Digital Camera *

Sensor	CMOS
Number of Pixels	24,3 MP
Shutter	Focal
Focal Length	16-50 mm
Aperture	f/3.5-22
ISO Range	100-25600

MicaSense RedEdge-MX Camera *

Max. Resolution	1280 x 960 (1.2 MP x 5 bands)
Sensor Size	4,8 x 3,6 mm
Aspect Ratio	4:3
Focal Length	5,4 mm
Field of View	Horizontal: 47,2°; Vertical: 35,4°
Accuracy of results	120 m flight altitude: up to 8 cm/pix per band; 60 m flight altitude: up to 4 cm/pix per band

* – camera and installed GNSS receiver depends on delivery kit

Battery Charger's Case

Body Material	Polypropylene
Protection Class	IP67
Transport Handle	Yes
Wheeled	No
Dimensions	49.9 x 39.3 x 19.1 cm

UAV Transport Case

Body Material	Injection Molded HPX™ high performance resin
Protection Class	IP67
Extendable Handle	Yes
Wheeled	Yes
Dimensions	79.5 x 51.8 x 31 cm

