



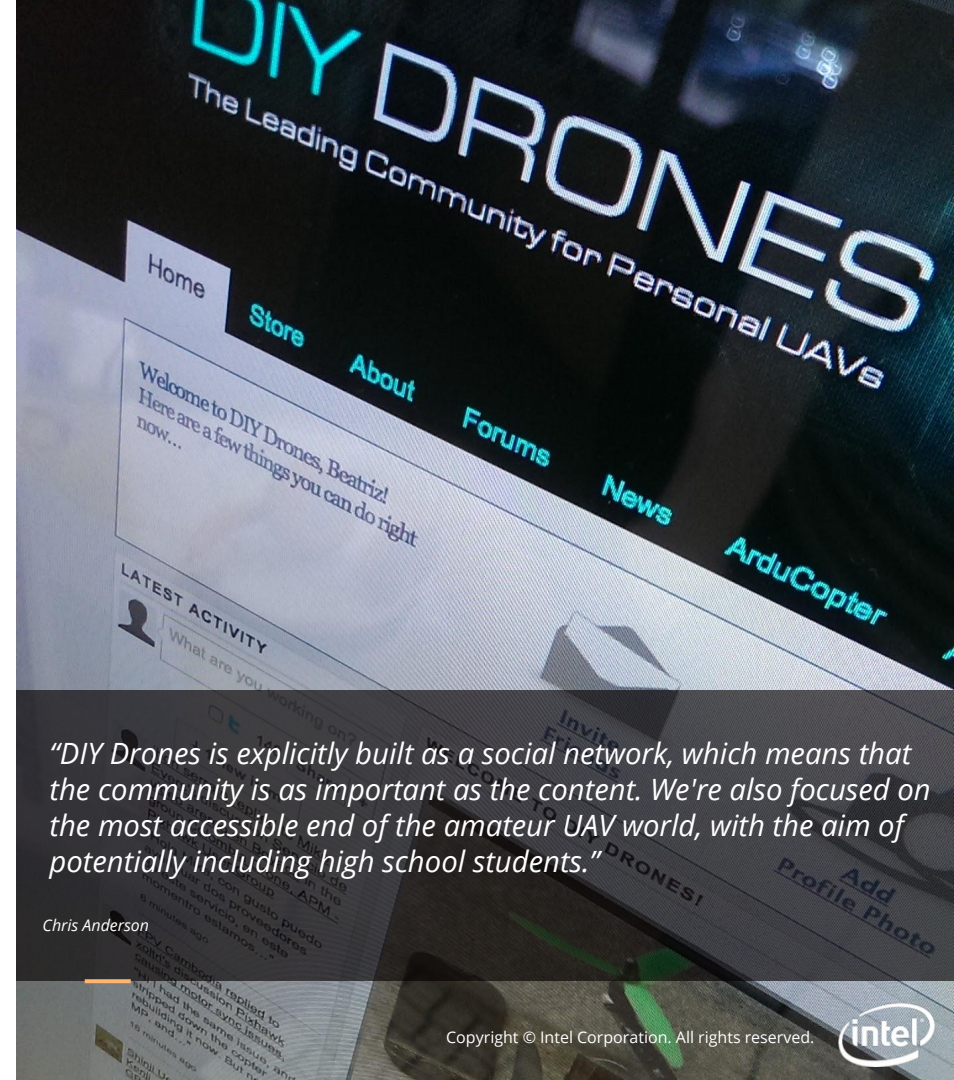
Ground control station | Users feedback

September 2015

Why this study

Gather the opinion from people who really use Ground Control Stations software to propose some user experience improvements based on that.

DIY Drones is **the largest community (71,055 members)** for amateur **Unmanned Aerial Vehicles**. They are focused on **recreational projects by amateurs**. They are primarily interested in just **have fun technical challenge**.



"DIY Drones is explicitly built as a social network, which means that the community is as important as the content. We're also focused on the most accessible end of the amateur UAV world, with the aim of potentially including high school students."

Chris Anderson



Skype conversations with some of the main developers of most used GCS and members of DIY Drones community

Open questions in the DIY Drones forum

What is your drones' usage?

Which GCS do you use and why?

What are the main features you use?

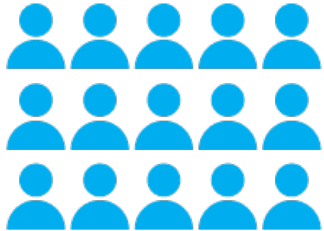
What are the best and the worst experience using the Ground Control you had?



Online survey posted in DIY Drones Blog

Users profiles

15 respondents



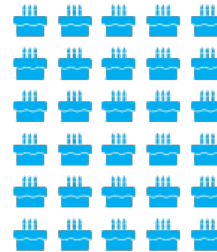
All male



Profession

Sr. UAS Pilot
UAS Designer
Industrial Engineer
Sea Defence
Engineering Student
Pilot
University professor
Engineer

Around 20-30
years-old



Country

U S A B r a z i l
Colombia Australia
Dominican Republic Portugal
England F r a n c e
United Kingdom Belarus
Spain Germany



Summary

Setup, Planning and Flight Monitoring are the most used features

Massive set of controls are difficult to understand and use

Performance is a big concern

Lack of explanation for new users

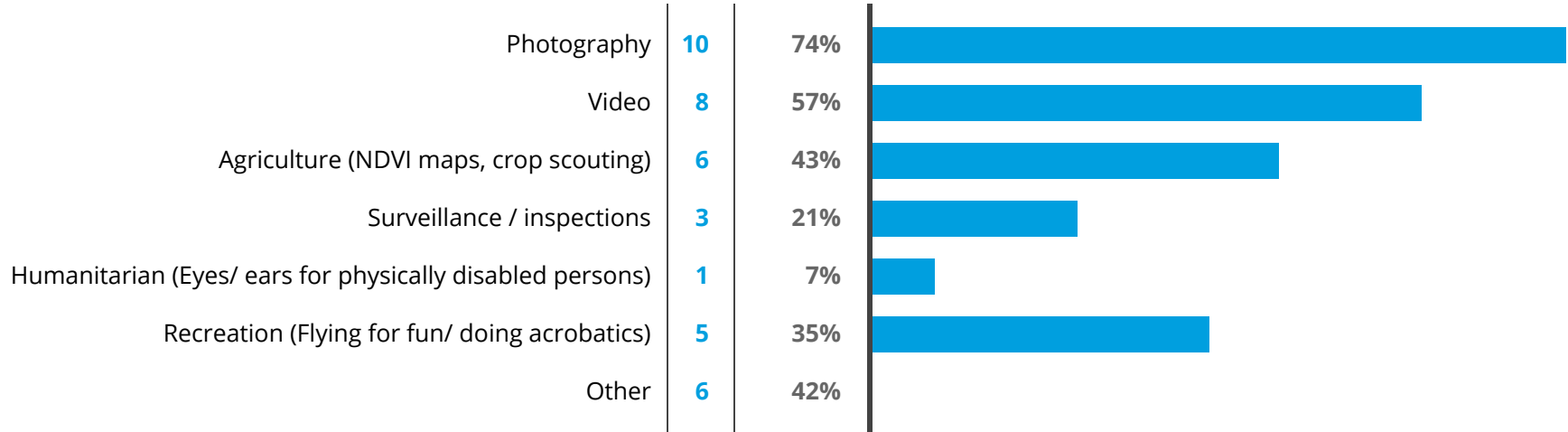
Summary

Get the **vehicle recognized by the GCS and customize the UI** according to that

Mission planning is hard once the UI doesn't work properly to edit waypoints

GCS for **mobile are growing**, but the lack of hardware requisites is a concern

Regular drone usage



Survey results

Regular drone usage

Other usages brought by the community



Survey

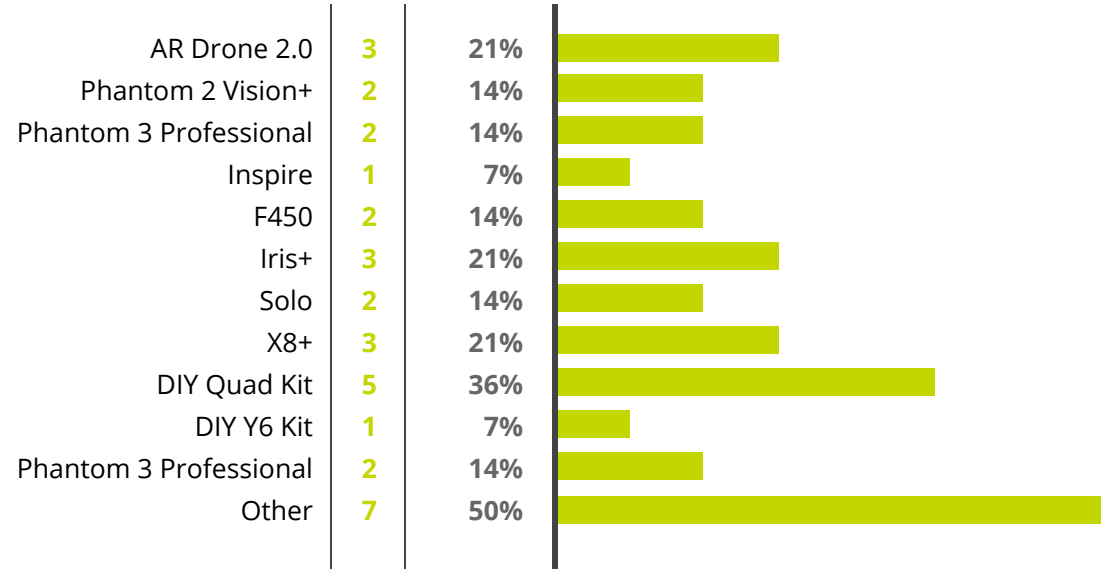
Scientific
research

Ecology and
geoscience
research

Environmental
survey

Lidar
surveying

Owned drones



Owned drones

Other usages brought by the community

Custom
built

Planes and
multirotors

Custom
made
hexcopter

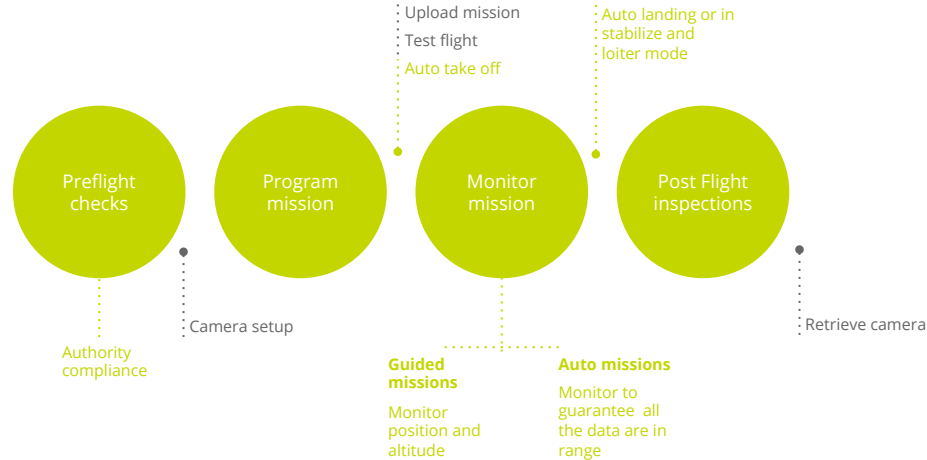
DJI S1000

Gauji 1300

Sky Hero
Spyder X8
w/ Pixhawk

XA4000

Flight journey

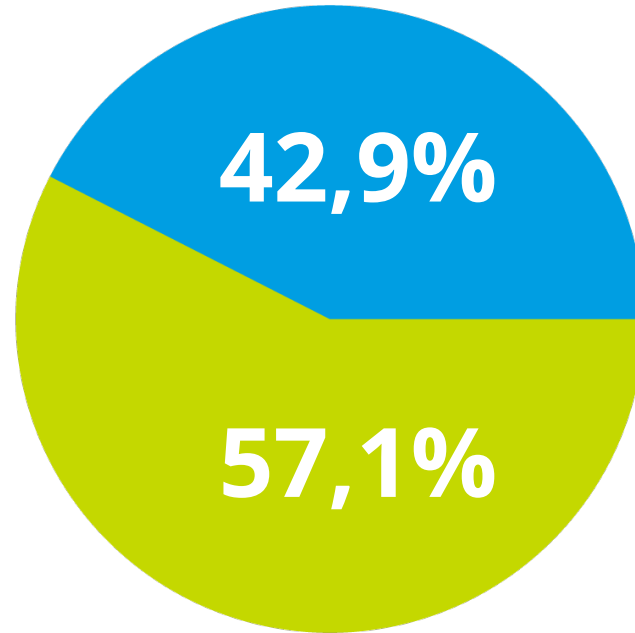


Regular

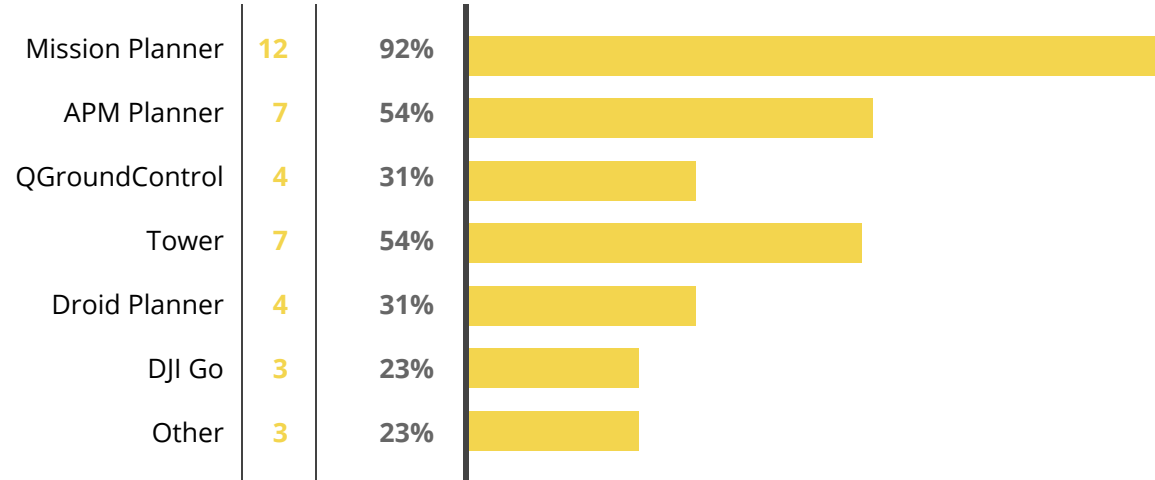
Optional

Majority of flights

Autonomous	8	57,1%
Guided	6	42,9%



Most used ground control stations

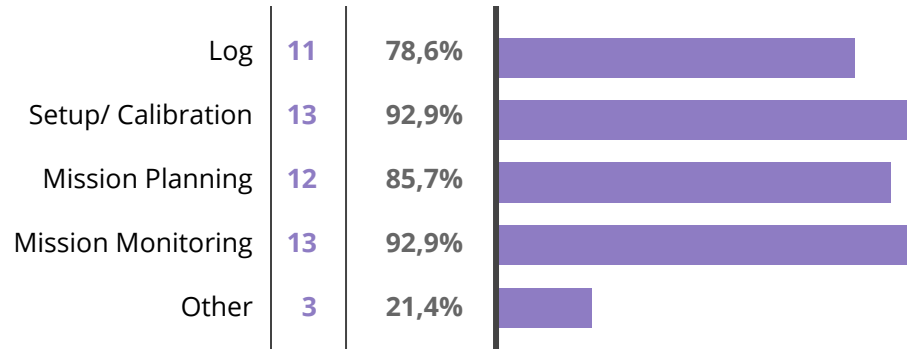


Most used ground control stations

Other usages brought by the community



Most used features (GCS)



Most used features (GCS)

Other usages brought by the community



Contingency actions

What do you do if the drone has some problem during a flight? How is this problem analysed afterwards? (if applicable)

- Take manual control
- Run an auto analyst on GCS then manually check but graphing each parameter
- Check the sensors accuracy

Best experiences using GCS

"Haven't had an experience that I could call it the best, it's just that if the software is doing what it's supposed to do, everything should be Ok."

"Old DJI GS very simple and good, so is Tower."

"Tower, when it comes to flying. Mission Planner when it comes to anything else. Mostly for the sheer volume functionally."

"I would love a tower like ground station which featured full functionally."

"Another thing I find useful is video overlay in mission planner. In mission planner you can have a video input, and then put your his over the video. There is nothing like this for android."

Worst experiences using GCS

"Problems not related to the software itself like losing telemetry signal or running out of power with the PC."

"Often I experience crashes with mission planner. Another time I connected my uav and there was a problem refreshing the parameters, so it reset the uav. I didn't know, so I went to take off with reversed accelerometers. Caused a nasty crash. It would be good if there was some kind of check list for this. "

"Software dont make what you think."

"Proprietary software from now defunct company."

"Poor camera planning, does not estimate the number of pictures needed for required overlap very well, especially side to side."

"Hit auto by accident, causing quad to fly away, used RTL to recover."

How analyse the collected data

“It would be good in the future to be able to download images taken from the drone and have integrated functionality in the ground station.”

“I generally compare each flight with a baseline flight (a flight in which there were no identified anomalies) and check to see the differences between the two log outputs.”

Most analysed parameters:

Geotagged images

post processing

LIDAR

Hyperspectral

Photos with RTK GPS gcp's

sensors accuracy and health.

Survey results

More

What we need is a Ground station that focus on Planes and Heli's where automated flight is a must as missions can be 1-4 hours long covering 50-500 hectares

Recommendations for a new GCS:

1. More customizable, to be able to present additional information about the drone, i.e. remaining fuel, multiple batt monitor, camera trigger info, external sensors like temp and humidity.
2. More visible notifications of important information like flight modes.

Mission planner is ok, I am looking for something more robust to replace, I am only getting started in survey flying. Key issues I see is a weak setting on Home, could result in a fly away because it does not understand that home should be where it took off, not my house.

Very poor presentation of flight data, units are unreliable need to show units in all displays, we work in ft, (I know we need to change) but data can be presented in ft on one display and M on the next, with no units shown to make sure are correct.

Flight planning is weak, gps coordinates from google maps are close but not really close, it would be nice to set a survey/know point and have the program adjust the flight gps coordinates to match.

Quotes

“ I've been flying quadcopters for just under a year, have crashed many and several months ago **built myself a \$2500 dollars quadcopter, for the sake of learning, experimenting and developing my skills.** ”

“ **Too many ways of doing the same thing,** difficult to explain to new people (especially with regards to flight modes and state). ”

“ We **must** always be able to **command** the UAV. ”

“ The biggest mistake with the current GCS software is that they are monolithic in nature. **I think they can be split into three areas, Configuration** (which is drone specific), **Mission Monitoring and Control** (MAVLink makes this more generic for all MAVLink autopilots) **Mission Planning.** ”

“ Set-up can be complicated, but it's more **an indication of the complexity of the flight controller (Pixhawk) than the software.** ”

“ Overall mission planner **works quite well once you get used to it.** ”

“ Information flow is also key, especially for a GSC.

Make sure the vital stuff you need is always visible, and at the same time make sure you don't stress the user by showing too much information.

Placement is also a big factor. **The vital information should be logically grouped and placed**, so that the eyes does not have to move around hunting for the information when you do a quick glance at the screen.”

“ Certain screens/lists will cause the entire GCS to become unresponsive (**Full Parameter List, Survey Grid are the worst offenders**). ”

Thank you

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