



GCS | Compass calibration redesign

August 2016



The Challenge

Ardupilot flight stack has recently implemented to their embedded compass calibrator a [mask representing sections of a geodesic grid](#).

Their goal is “[...] to provide a **picture on how the calibration is progressing** with respect to the distribution of the samples collected and a **way for the GCSs** to somehow **guide the user** when she is performing the calibration [...]”

The challenge here was to **redesign the user interface incorporating the geodesic grid**, as it solves the problem of lack of feedback during calibration.

Our **previous research** showed that **calibration is one of the most used features on GCSs**[\[1\]](#). The benchmark found that, out of the 14 tools analyzed, in relation to how they support users achieving goals, 12 of them received a “must improve” and 2 of them an “achieved with much effort” on the compass calibration[\[2\]](#).

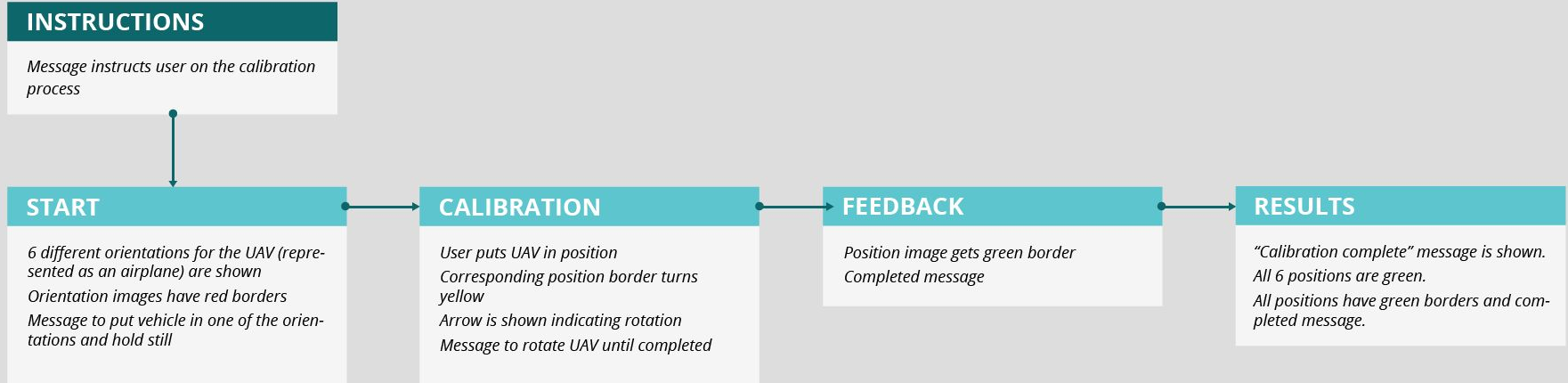
The QGroundControl usability test revealed that users didn’t know how to start the process, didn’t know how to move to the next steps [\[3\]](#), were not sure if the process sequence was a must and found the feedback unclear [\[4\]](#).



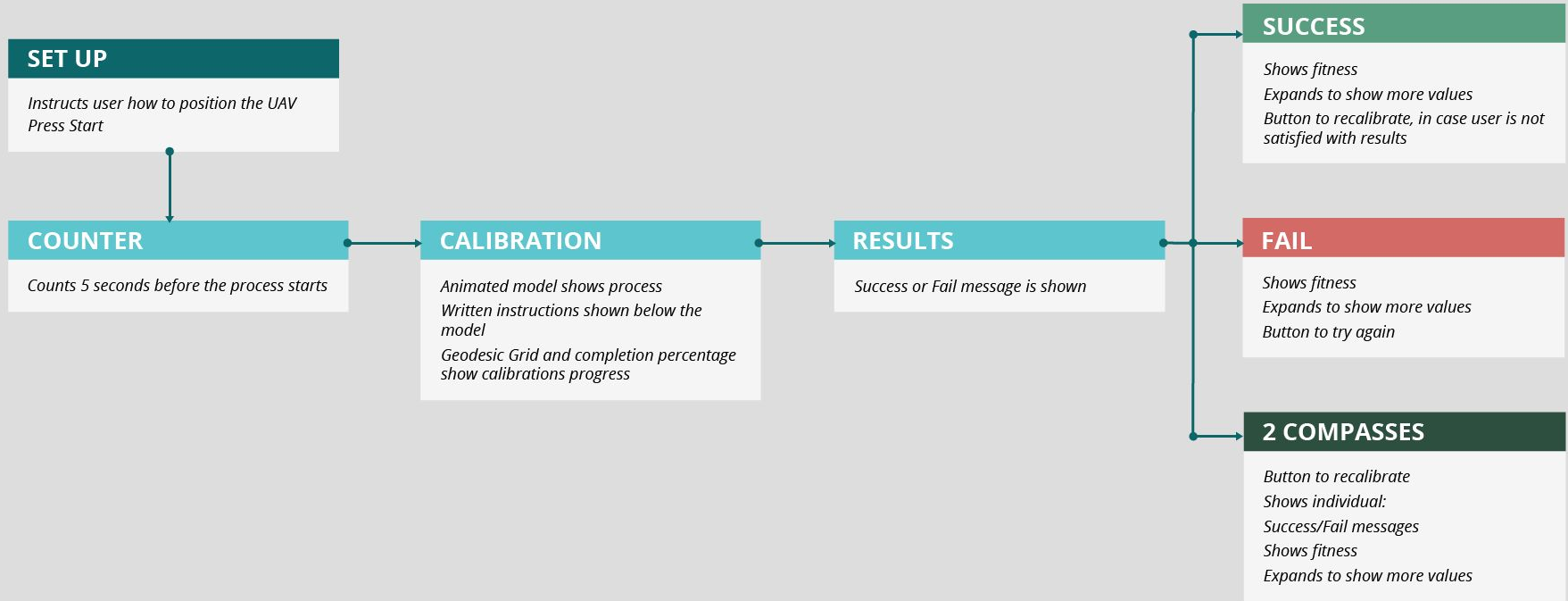
The action

QGroundControl's flow was used as a **reference**, as it is the GCS we have been studying. The problems identified during the research basically originated from the **confusing task flow and feedback**, that led the user to feel insecure during the whole process, from start to conclusion. To solve this issues, we aimed at **clearer instructions**, a more **responsive process** and **clear feedback**.

QGroundControl's Flow

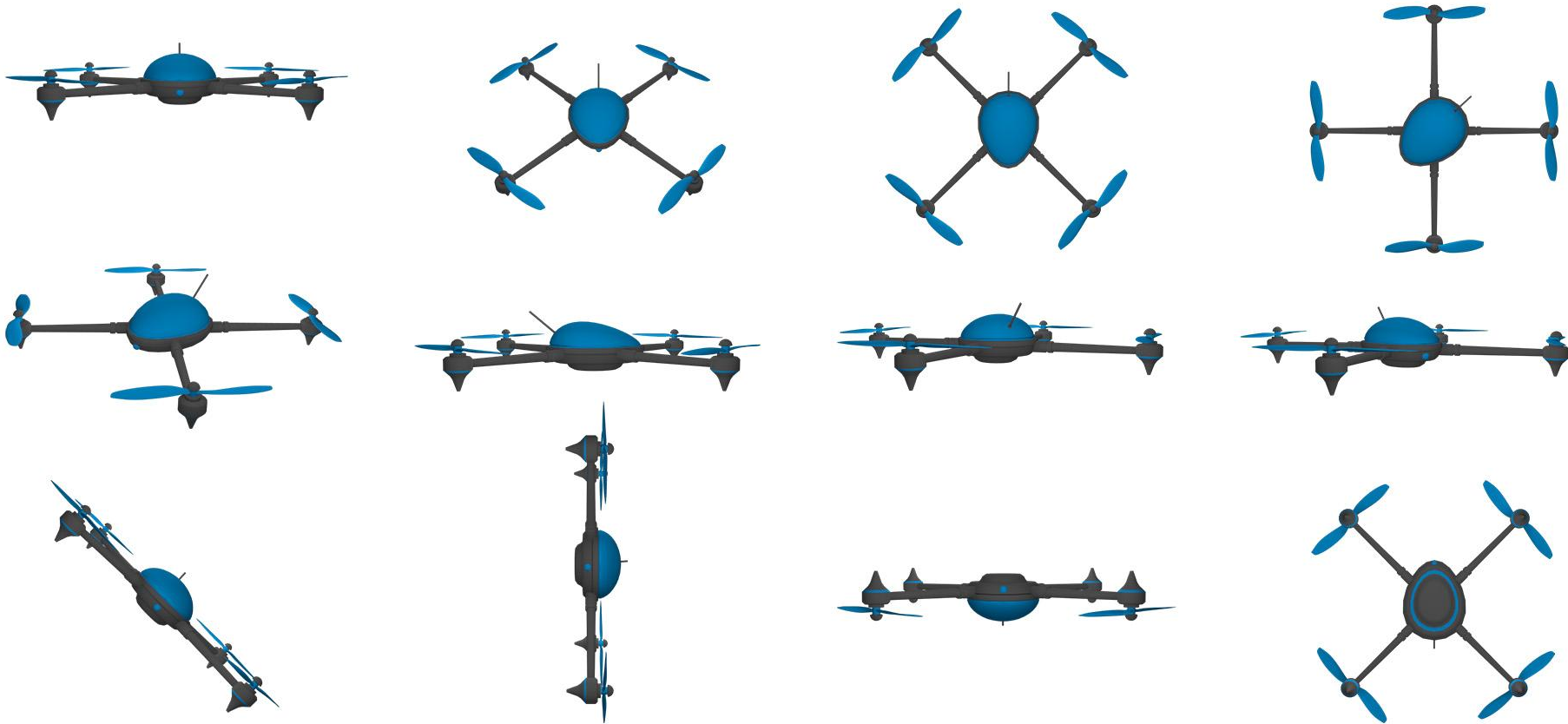


Proposed Compass Calibration Flow



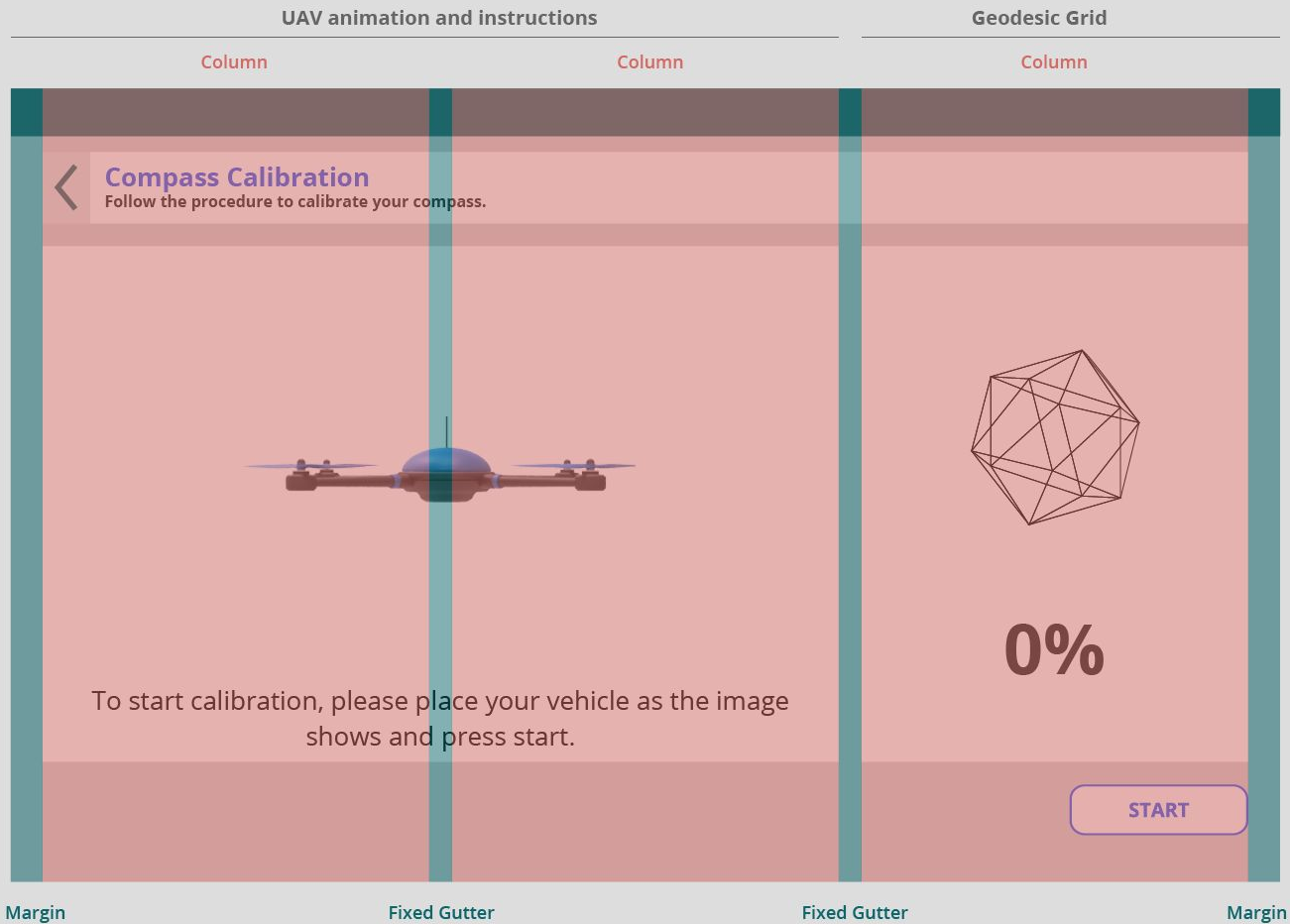
The instructions for calibration will be given by an **animated UAV 3d model**, while the **geodesic grid** will be completed accordingly to the user's action with the drone. We divided the screen in 2, so the **user can discover** and manipulate the geodesic grid.

We opted for an animation as it presents the user with **clearer instructions**. The animation presents one movement at a time, so the user **does not need to wonder about the sequence**. The animation also makes the movement clearer. We opted to use a quadcopter in the animation, as it is an easily recognizable UAV.



You can see the video [here](#).

Grid



Note: the values and the geodesic grid in this image are just representations.

Specifications



Compass Calibration

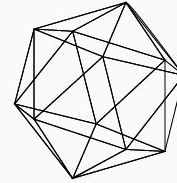
Follow the procedure to calibrate your compass.



The UAV animation is the most important thing in the interface.

Instructions orientate and reassure users.

To start calibration, please place your vehicle as the image shows and press start.



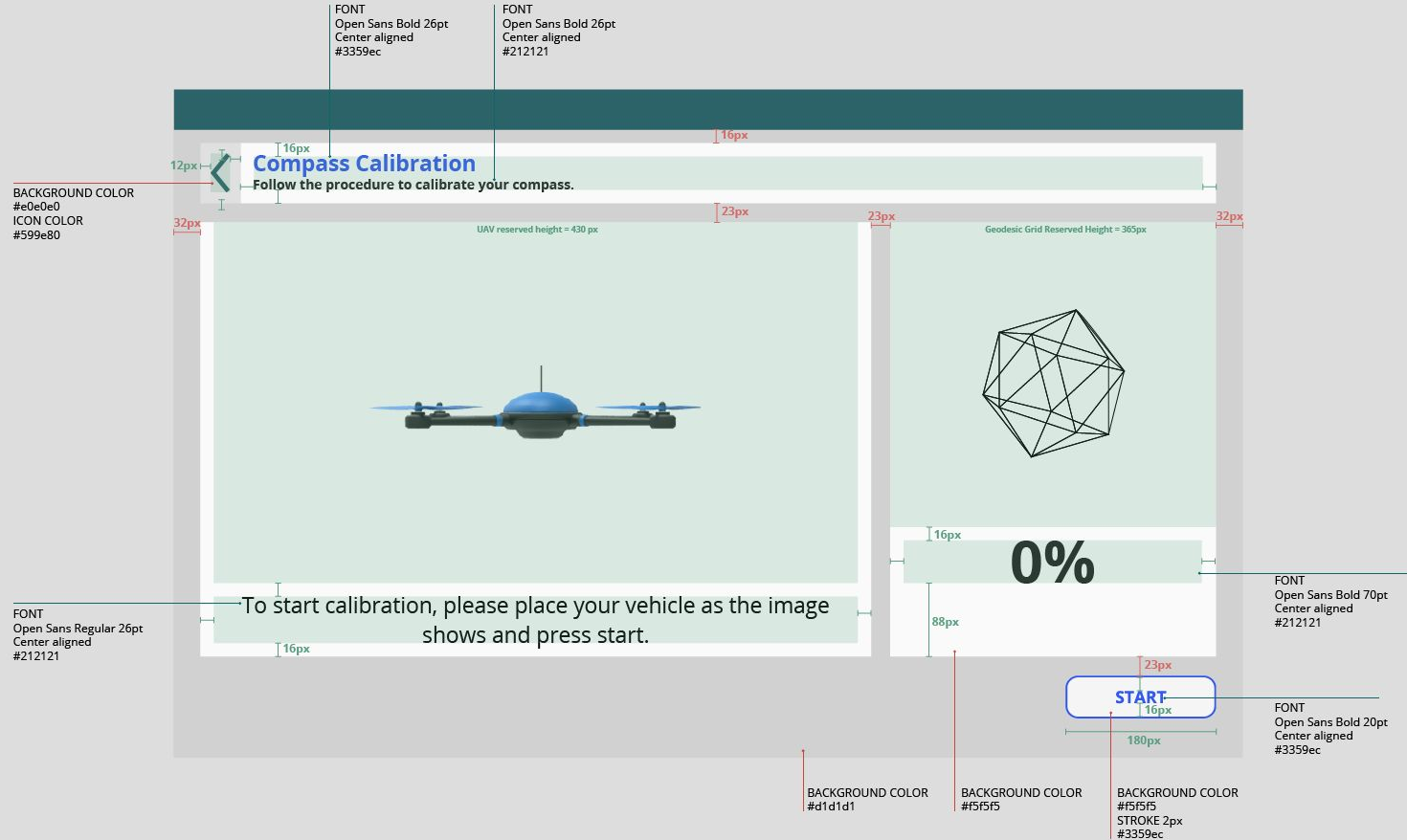
0%

Percentage shows below the geodesic grid.

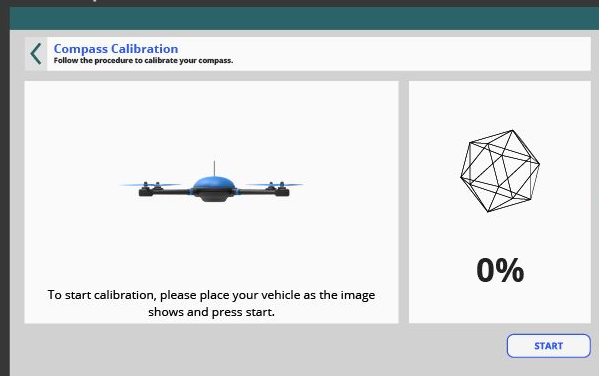
START

Buttons stay in the bottom. Start button must be highlighted.

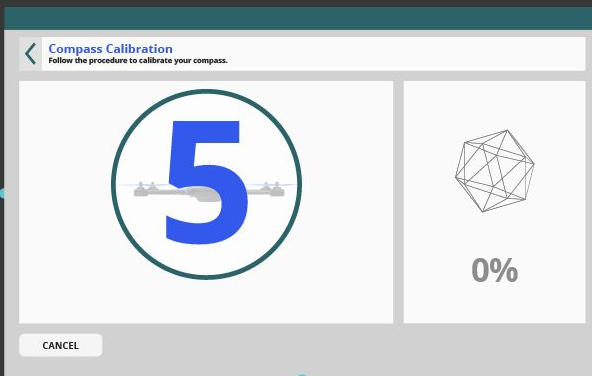
Specifications



Set Up

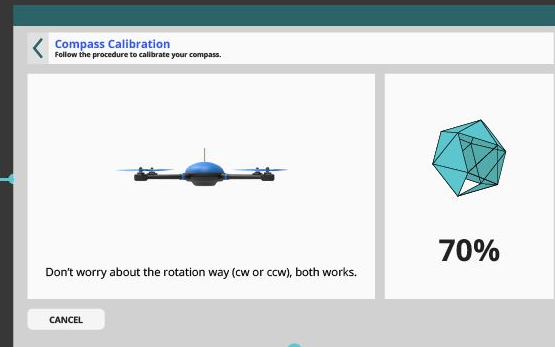
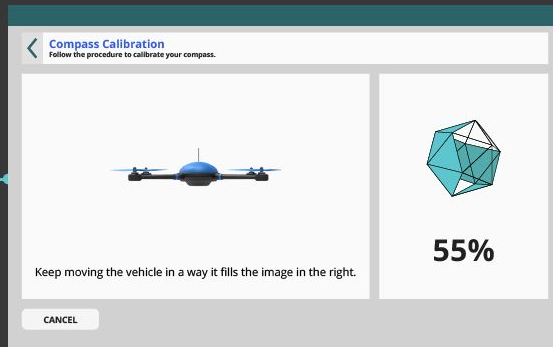
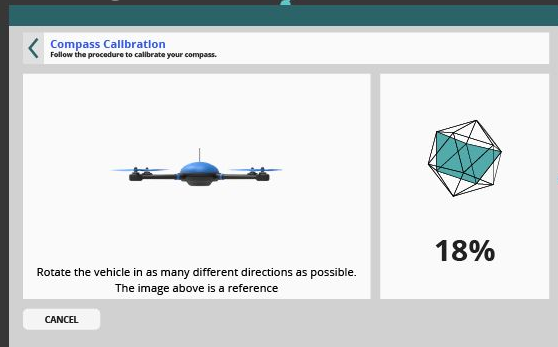


Counter




This is the full proposed flow and UI. For bigger image, go [here](#).


Messages



Success

Compass Calibration
Follow the procedure to calibrate your compass.


CALIBRATION	
Compass 1	
 SUCCESS	
Fitness	12
Show More Values	RECALIBRATE




100%

Fail

Compass Calibration
Follow the procedure to calibrate your compass.



CALIBRATION	
Compass 1	
 FAIL	
Fitness	6.5
Show More Values	TRY AGAIN




70%

Two compasses


Compass Calibration
Follow the procedure to calibrate your compass.


CALIBRATION	
Compass 1	Compass 2
 SUCCESS	 FAIL
Fitness	Fitness
12	6.5
Show More Values	TRY AGAIN



70%

Compass Calibration
Follow the procedure to calibrate your compass.


CALIBRATION	
Compass 1	
 SUCCESS	
Fitness	12
Show More Values	RECALIBRATE




100%

COMPASS_OPS_X: 01
COMPASS_OPS_Y: 0
COMPASS_OPS_Z: 49
COMPASS_OPS2_X: 37
COMPASS_OPS2_Y: 610
COMPASS_OPS2_Z: 419

Compass Calibration
Follow the procedure to calibrate your compass.



CALIBRATION	
Compass 1	
 SUCCESS	
Fitness	6.5
Show More Values	TRY AGAIN




70%

COMPASS_OPS_X: 01
COMPASS_OPS_Y: 0
COMPASS_OPS_Z: 49
COMPASS_OPS2_X: 37
COMPASS_OPS2_Y: 610
COMPASS_OPS2_Z: 419

Compass Calibration
Follow the procedure to calibrate your compass.

CALIBRATION	
Compass 1	Compass 2
 SUCCESS	 FAIL
Fitness	Fitness
12	6.5
Show More Values	TRY AGAIN



0%

COMPASS_OPS_X: 01
COMPASS_OPS_Y: 0
COMPASS_OPS_Z: 49
COMPASS_OPS2_X: 37
COMPASS_OPS2_Y: 610
COMPASS_OPS2_Z: 419

Conclusion

The changes in flow and UI make the process **clearer from start to finish**. The user can be more secure on starting the process and moving to the next steps. The instructions (written or animated) **guide users through the process**, while also giving more experienced user freedom to do the calibration in the way it is most beneficial to them.

Conclusion

We **improved the feedback**. The geodesic grid in itself is an improvement, as it shows, in a graphic way, the progress of the calibration. The “success” and “fail” **messages give a clearer feedback** to the user than a “completed” message, and also **let the user look at values and decide if they are satisfied** or if they want a recalibration.

These changes improve the user experience of the compass calibration, as they **reassure the user on what they are doing**, even when they have no experience with GCSs.



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Thank you

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