Construction plans for a stratosphere probe and a challenge to flat-earthers

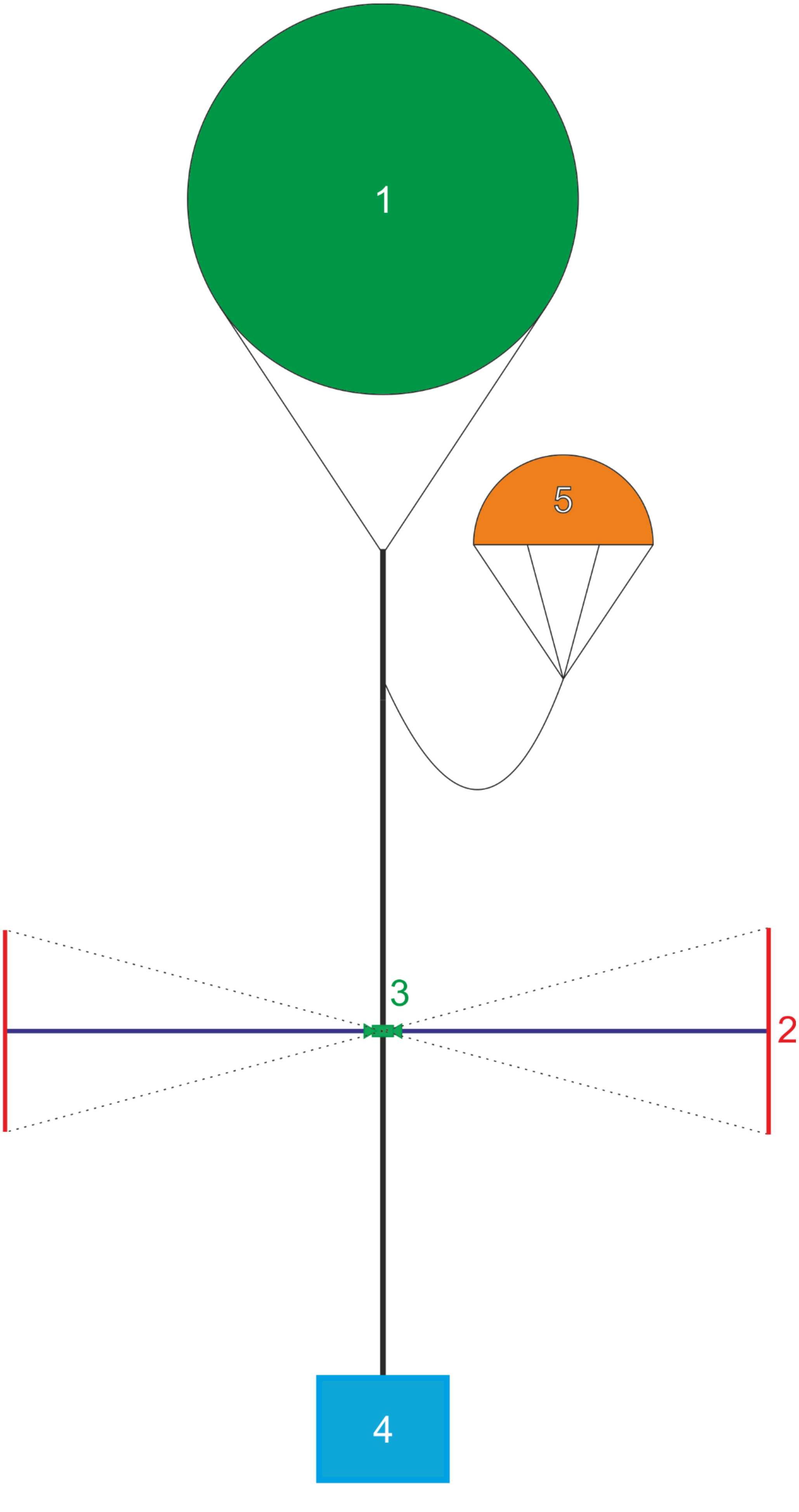
By Alexander T. Nikol

Introduction

Despite of centuries of detailed measurements, the discovery of physics and space flight, there are still people out there who think the earth is a flat disc with the north pole in the middle and an ice wall in Antarctica. Mathematics and physics clearly show the shape of our planet, yet these individuals only use the argument that the horizon always appears to be at eye level, which is often supported by stratosphere balloon footage, that, in every case, has something in common: The lack of any precise instrument capable of measuring angles. Those people's "analysis" always contains the claim the footage wouldn't show any difference in the position of the horizon. That's why we're proposing a stratosphere probe with a design that will allow to measure the angle of the horizon precisely. Planning it is already finished and the launch is scheduled for this autumn. Every flat-earther is invited to take a look at our construction plans, to witness the launch and the analysis of the data.

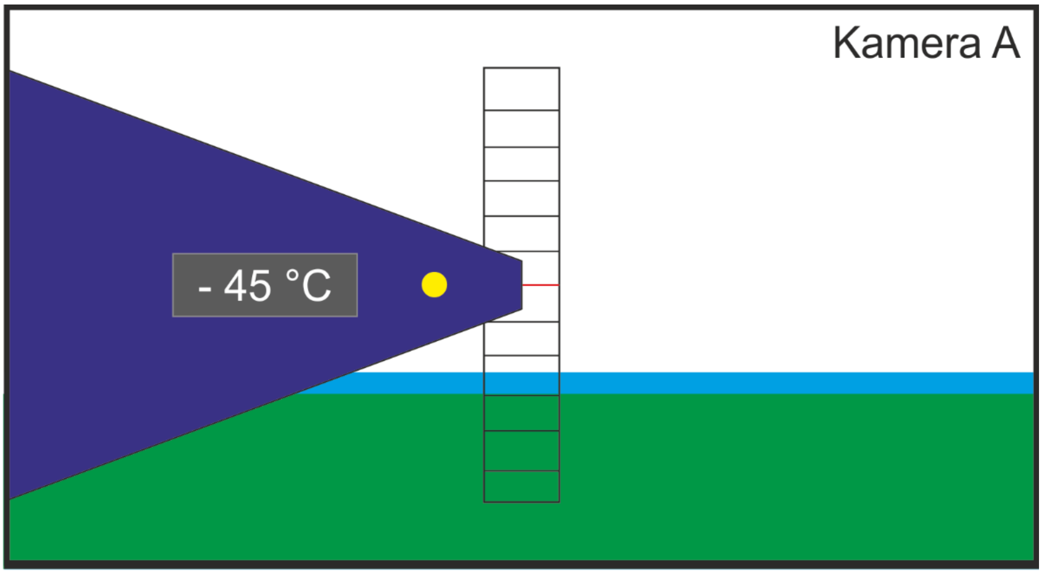
The probe

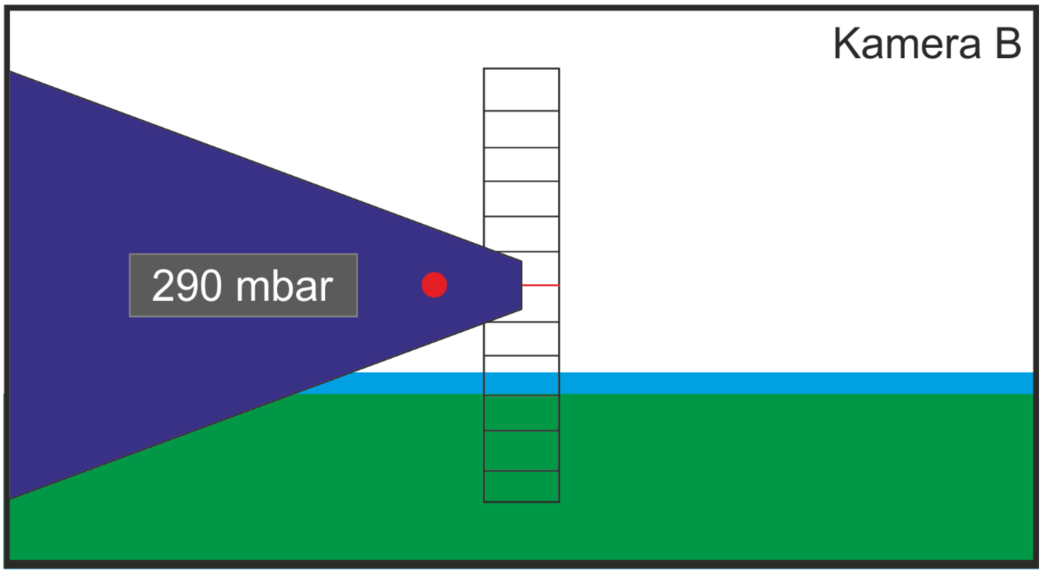
Our stratosphere probe will be simple, yet easily reproducible and relatively affordable. In the middle of the probe, we will mount to identical cameras **3** facing opposite directions. They will be thermally isolated by Styrofoam and heated passively. The cameras will look down a 1 m long arm each, which will have a transparent ruler **2** attached to it. The field-of-view of the cameras will also show flashing LEDs for camera synchronization, as well as a thermometer and possibly a barometer. About 1 meter below the cameras, there will be another Styrofoam box 4 containing two battery packs and GPS-trackers. The battery packs are used to increase the run-time of the cameras. The entire construction is connected to a helium balloon 1, necessary for the uplift, and a parachute. The height the probe will reach is between 30 and 38 km.


1
5
3
2
4

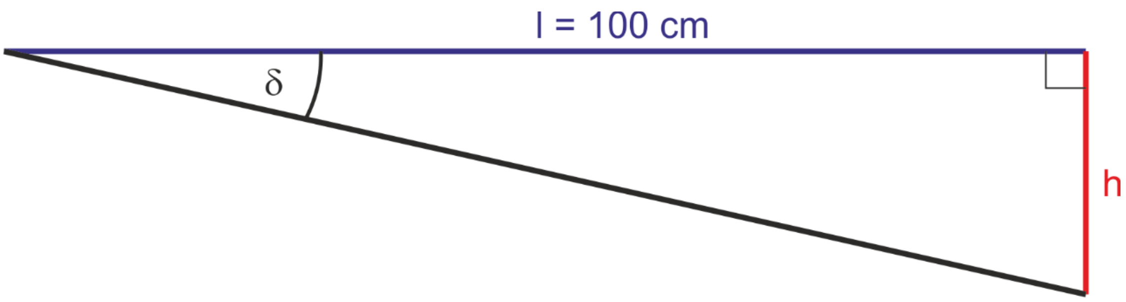
The measurements

The field-of-view of the two cameras will look as follows:





It's important that the center of the transparent ruler, the baseline, is in the center of the picture. Using the tangent formula, we can calculate the angle of the horizon relative to the arms:



$$\delta = \tan^{-1}\frac{h}{l} = \tan^{-1}\frac{h}{100\ cm}$$

In this formula, h is the measured position of the horizon in centimeters while l is the length of the arm, which is exactly 1 m. For more easy calculation, the angle will be defined as negative if the horizon is above the baseline.

For example: If the horizon is found to be 3 cm below the baseline:

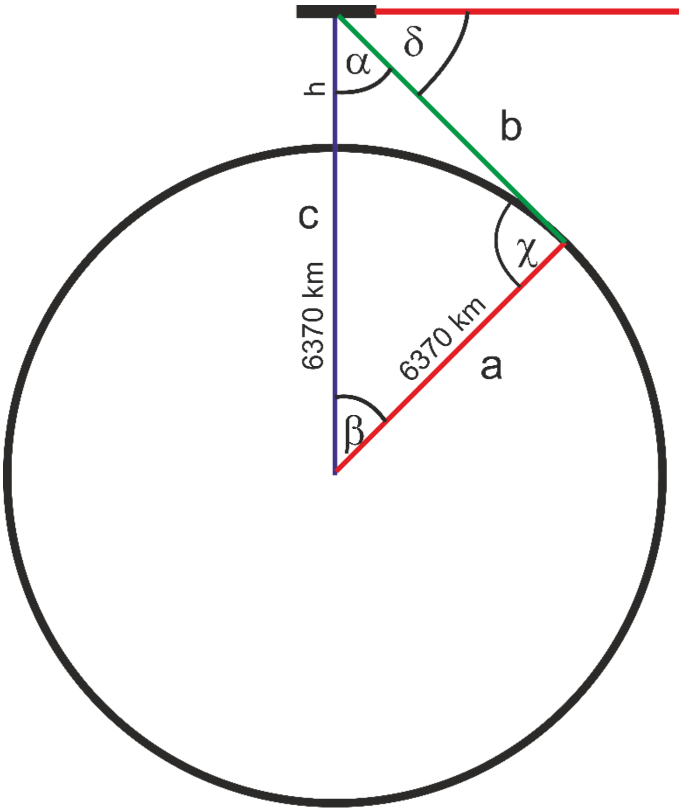
$$\delta = \tan^{-1}\frac{3\ cm}{100\ cm} = 1.71°$$

To calculate the summed-up angle of the horizon, which should always be 180° over a flat earth, the two measured angles will be subtracted from 180°. Because an angle above the baseline will be defined as negative, a tilt of the entire construction does not play a role. If the earth was flat, a tilt over the baseline in camera A would always lead to an exactly identical tilt under the baseline on camera B.

It follows that:

$$\alpha_{added\ up} = 180° - \delta_A - \delta_B$$

As shown in the previous article, the angle of the drop of the horizon below the eye level over a spherical earth is dependent of the height of the viewer over the surface:



$$\sin(\alpha) = \frac{a}{c}$$

$$\alpha = sin^{-1}\left(\frac{a}{c}\right) = \sin^{-1}\left(\frac{6370\ km}{6370\ km + h}\right)$$

$$\delta = 90° - \alpha$$

In this case, h ist he height of the probe over the surface in km. Since the probe has two cameras, the horizon will drop on both sides. This leads to:

$$\alpha_{added\ up} = \alpha_A + \alpha_B = 2 \times \sin^{-1}(\frac{6370\ km}{6370\ km + h})$$

For a height of 10 km, this will lead to an angle of

$$\delta = 3.21°$$

Followed by

$$\alpha_{added\ up} = 180° - 2 \times 3.21° = 173.58°$$

One measurement will be done every 10 minutes. A screenshot of both cameras from the same time (hence the LEDs used as synchronizers) will be analyzed, followed by the calculations of the angles. The measurements will be put in a table. Comparing two following data points, we will be able to calculate the height of the probe, as well as the vertical speed.

The procedure

First of all, the probe will be assembled and the instruments will be tested in the presence of everyone who wants to witness the start. People who doubt the correct procedure are welcome to check for themselves. After assembly, the trackers will be controlled for the last time, the device will be scaled and the necessary amount of helium will be calculated. After switching on everything, the probe will be started.

It will possibly take some hours between the launch and the recovery. It would be a good possibility to do other flat-earth related experiments such as the assembly of a Foucault pendulum or the direct measurement of the angular diameter of the sun during the day.

The position of the trackers will be controlled every 30 minutes and when the trackers seem to stand still, everyone will drive to the location. It might happen that the trackers switch themselves off due to low temperature, yet the trackers are designed to restart after warming up again. After recovering the probe, the data will be copied to various computers, including every flat-earther's computer who wants the raw footage. Then, the footage will be viewed and the measurements taken.

Feedback, planning, judicial details and an invitation to flat-earthers

For us, it's especially important to give as many people the possibility to give their opinions regarding the probe, the procedure and the mathematics behind our project. That's why we urge you to tell us possible problems with it. You can do so on our Facebook page.

Since the probe isn't built yet, it might happen that it will be slightly heavier than originally thought. That's why we might use a bigger balloon than planned. This would lead to extra payload capacities and therefore the opportunity to carry more instruments. If you have suggestions, write them in the comment section of this article. The cameras will take the footage either in 720p120fps or 1080p60fps.

The launch will probably be between the end of October and mid November. The actual launch date will be made public four to six weeks prior. The launch will happen in southern Germany, most likely in the area around Rothernburg ob der Tauber. As already mentioned, everyone is invited. A special welcome goes to our flat-earther friends.

The permission for a launch like that must be requested at the local Landesluftfahrtbehörde (State authority for aerospace) and the German flight security agency. An insurance is also recommended.

www.dergoldenealuhut.de
www.fb.com/dergoldenealuhut
https://twitter.com/GoldenerAluhut