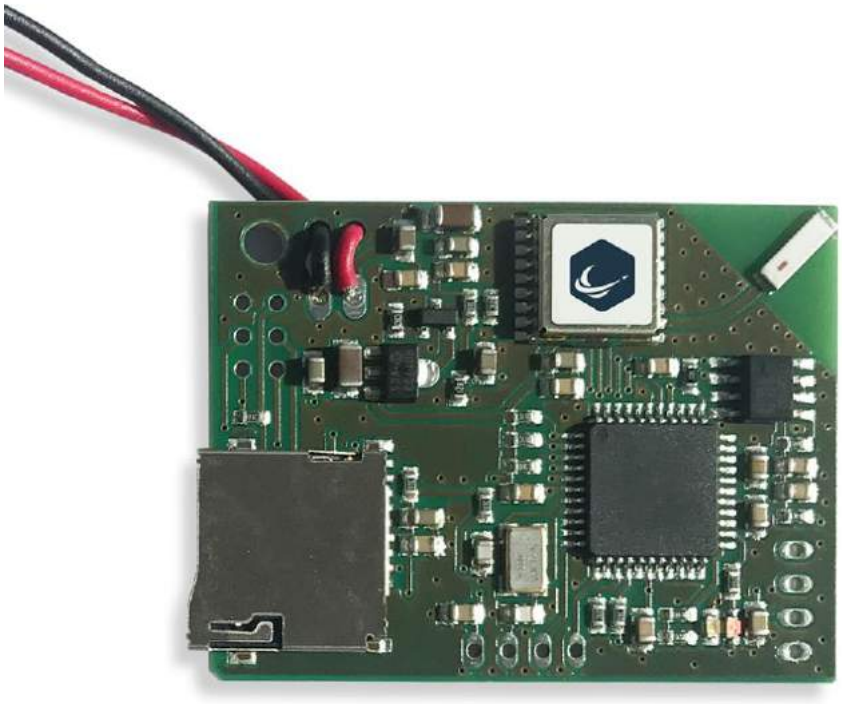
Datalogger STRATOmini

Altitude logger for stratospheric flights



Introduction

This GPS data logger was specially designed and developed for recording measurement data during a stratospheric flight. The data is stored on a microSD card and can be processed after the flight on our computer. The lightweight design is ideal send the data logger attached to a weather balloon to the maximums heights.

Datalogger Evaluation:

https://www.stratoflights.com/en/tutorial/datalogger-evaluation/

Features

- Logging the altitude during the flight, GPS coordinates, speed over ground
- Unlocked GPS module: Saves the data up to a height of 50,000m (31 Miles). The majority of the common GPS modules stop working at a height of 18,000m (11.2 Miles)
- The data is stored on a microSD card
- Data is accessible through the microSD card.
- Online tool for creating graphs
- Online tool for creating a 3D flight curve on google earth
- Easy handling and no programming skills required
- Light-weight design form in the format of a credit card (13g 0.46oz))
- Battery-powered (9V)

Quick Start

Insert a microSD card and connect a 9V block battery to the data logger. The logger will start automatically and starts recording measurement data right away. There is no extra switch required, as soon as the battery is removed, the data logger stops recording data.

Usage of the data logger

Power supply

To reach a stable power supply for the STRATOmini data logger, please connect it to a 9V battery. We recommend the usage of a 9V lithium battery. Lithium batteries are more reliable during the cold condition in comparison to other materials like Alkaline, NiCd or NimH which are used for batteries. We over a suitable 9V block battery in our shop at https://www.stratoflights.com/en/shop/

Attachment of the data logger

The temperature surrounding the data logger should not fall below 0 °C (32 °F). For perfect working conditions please place the data logger in a Styrofoam probe. The 30 to 40 mm (0.09 to 0.13 ft) thick walls of the Styrofoam probe are no problem for the GPS module. The Styrofoam probe provides a corresponding mounting hole for the data logger.

Important:

- **Please ensure that the data logger does not touch any metal surfaces or parts. Otherwise, the risk of a short circuit may occur.**
- **In addition, the data logger must not be in contact with water, oil or any other liquids.**
- **The data logger should be placed as such the GPS antenna faces upwards during the complete flight (the side of the circuit board with the equipped parts)**
- **The sensor board should be mounted so that it is protected from splash water.**

Logging

To record any type of data, a commercially available microSD card is required. Cards with a storage capacity of up to 32 GB where been tested. In any case, please test the combability between your microSD with the data logger and your computer beforehand. You wouldn't want to find out after your space mission, that there was no data recorded. The data logger records every two seconds a new measurement value. Even with a 2 GB microSD card, the data logger would be able to record data for more than 360 days, this should be enough for the most applications.

Usage

To rule out a malfunction the data logger starts recording the measurement values automatically right after attaching it to the battery. This way it cannot happen, that your flight will take place without a running data logger.

The measurement data is stored in the files of the microSD card starting with "F_" followed by a digit and the file extension ".log". At every start, the data logger checks for the last existing files and continues the numbering with the next available number.

Please note: The GPS module has different modes which can be used, depending on the field of application in which you plan to use it. Since we use the logger for a stratospheric flight, we use the "Airborne Mode", which unlocks the module for heights up to 50,000 m (31.06 miles). However, this mode is sometimes inaccurate for stationary applications. If small jumps in the recording data appear during the recording of data on ground level this is due to the Airborne Mode. As soon as the data logger lifts off, the GPS signal will become accurate.

Data Analysis

The measured values of the data logger are stored as ".log", on the microSD card, and can be evaluated with different programmes. Just copy the ".log"-files on to your computer.

Important: Before opening the files, we recommend that you first create a backup at another location. In case of an accidental overwriting of the data, with for example excel, you will still have a fresh, pure data set for the online tool. Therefore, please only work with copies of the original data set. After copying the dataset, you can start evaluating your data in every way you desire.

The data which are recorded through the data logger is in detail:

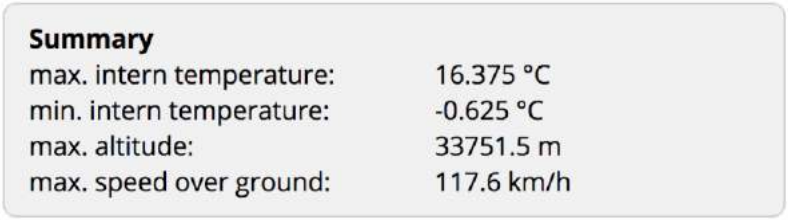
Measured value	**Meaning**
Up-Time	Runtime
UTC	Coordinated world time
Date	Date
RMC Valid	Validity of the GPS data
Sats in use	Number of used satellites
Latitude	Latitude
Longitude	Longitude
Speed over Ground [knots]	Speed over Ground [knots]
Speed over Ground [km/h]	Speed over Ground [km/h]
Course over Ground	Course over Ground
Altitude NN [m]	Altitude above sea level
Board: Temp [C]	Temperature of the board sensor
Extern: Temp [C]	*(only possible with the model STARTO3)*
Extern: Hum [perc]	*(only possible with the model STARTO3)*
Extern: Press [hPa]	*(only possible with the model STARTO3)*
Batt Voltage [V]	Battery voltage
Logger Status	Logger status of any error messages

Online tool for creating graphs

To analyze the flight data, in a clear and structured way, we have developed an easy to use online tool. https://www.stratoflights.com/en/tutorial/datalogger-evaluation/

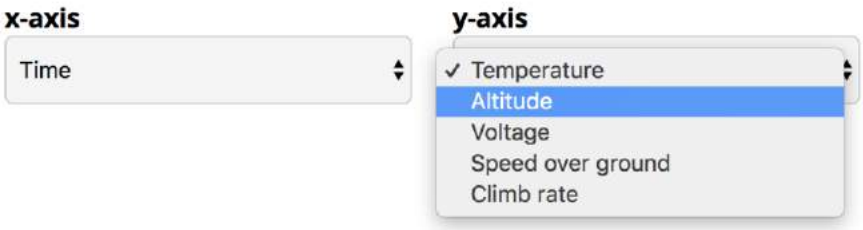
Procedure:

The “browse” button allows you to add your recorded log data. Now select the file you want to evaluate. The upload starts automatically and after a few seconds, you will receive the results. The tool will immediately create a listing for the different extreme values:

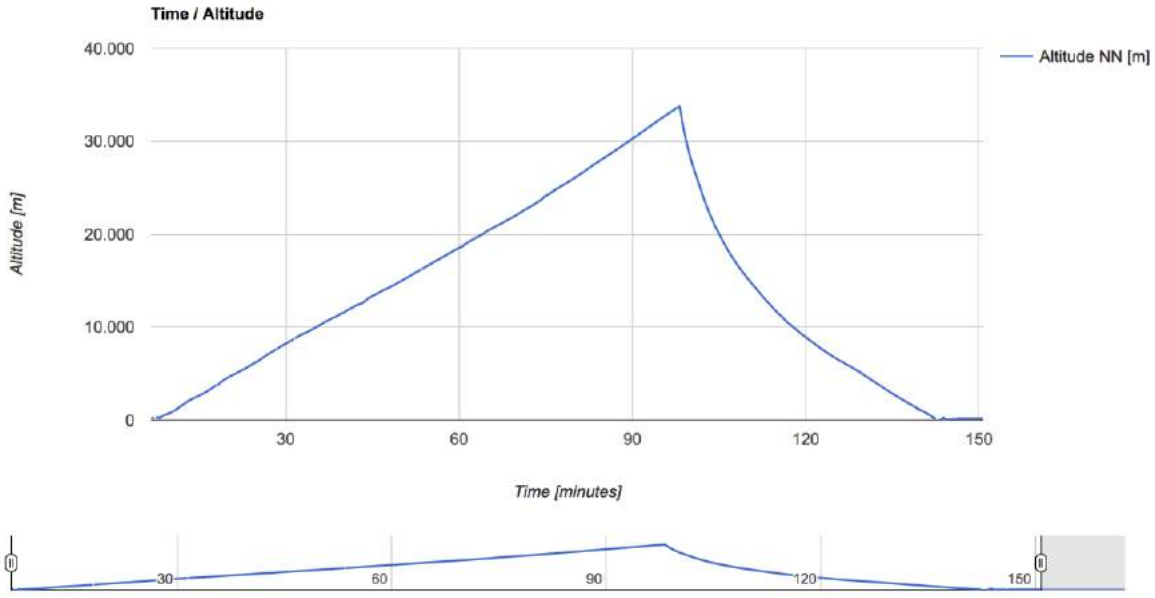


Create graphs:

Under the extreme values, you will find the corresponding graphs. It is possible to select the appropriate readings values for the x-axis and the y-axis separately. Here you can choose the following measurements and combine them as you like:

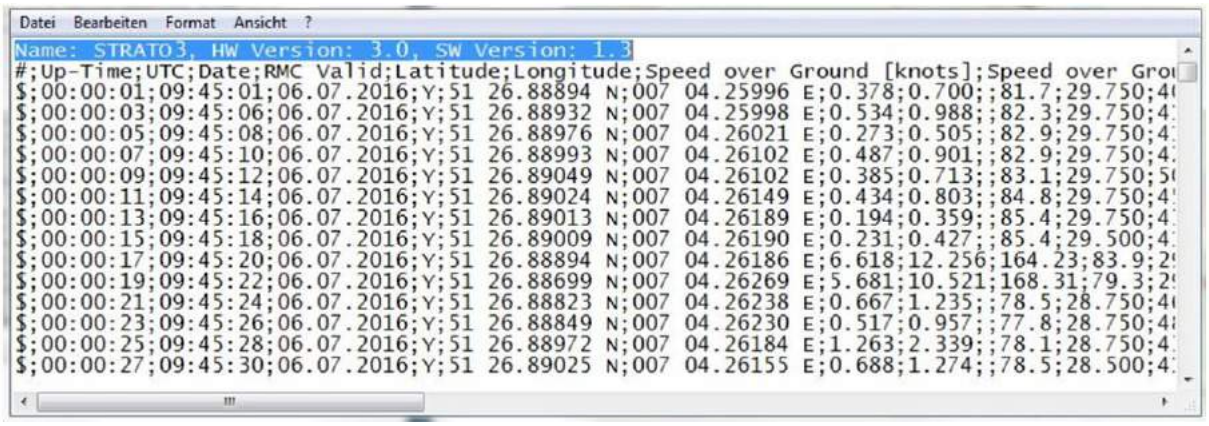


The graphs are then automatically created, including all labels. The underlying measurement value can be trimmed at the beginning and end so that it is possible to display the curtail parts of the flight. After creating the graphs, it is possible to download them as PNG.



Creating flight curves in Google Earth

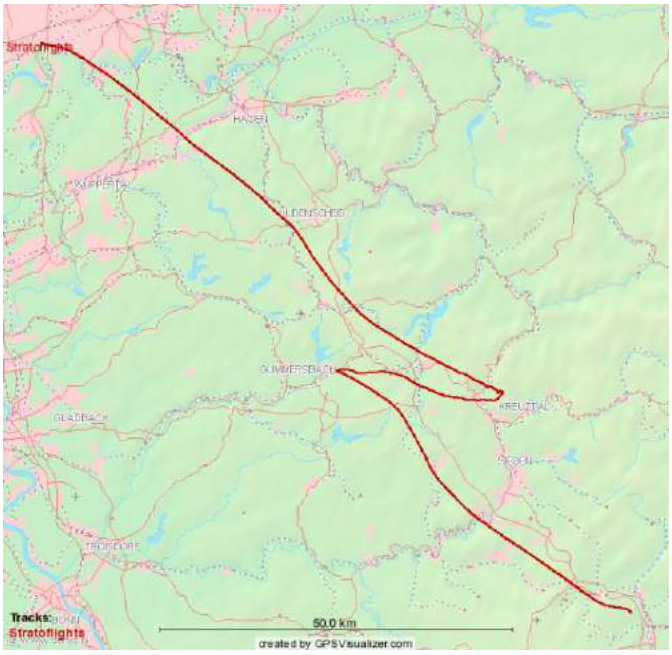
To visualize the flight data in Google Earth, there are some changes to make in the log file before. Open the copies of the original in a text program e.g. the editor. After you have opened the dataset, please delete manually the first line and save the file with a new name.



The newly created file is ready to be evaluated with the following tool:
http://www.gpsvisualizer.com/

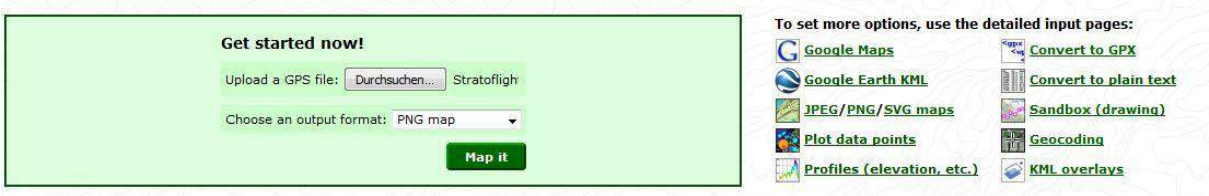
Procedure:

Click on the “Browse” field and upload your log file. Then please choose an output format. An easy way is, for example, to create a "PNG map", where a 2D flight route is created form latitude and longitude.



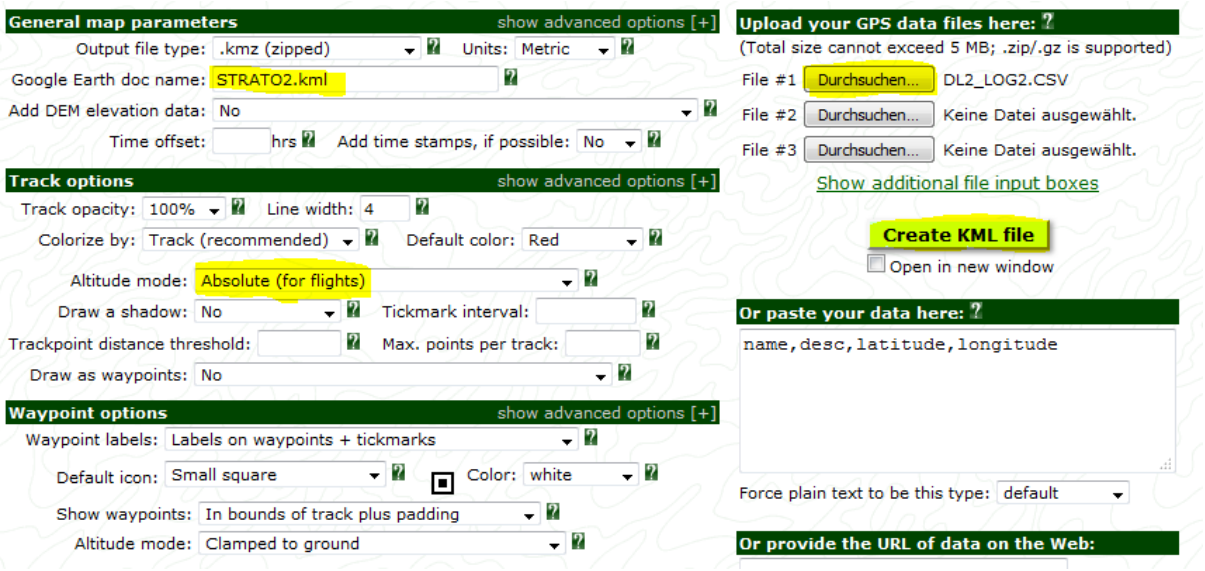
Create a 3D flight curve in Google Earth

To create a 3D Google Earth curve, you need to modify the file as shown on the previous page. The tool for creating the Google Earth flight curve can be reached via the link on the right side. “Google Earth KML”:



Procedure:

Click on the "Browse" field on the right and upload your log file. Afterward please choose a name for the file which will be created. For the stratosphere flight, please choose the Altitude mode Absolut (for flights). In this mode, the tool also interprets the heights in the data set. For applications on the ground, an alternative mode can be selected. After you set the basic settings please click on the "Create KML file". Afterward, the Google Earth file can be downloaded.



Presentation in Google Earth:

Double-click on the generated file will open the curve in Google Earth (if installed). Under the following link you will find the latest version of Google Earth:

https://www.google.de/intl/de/earth/

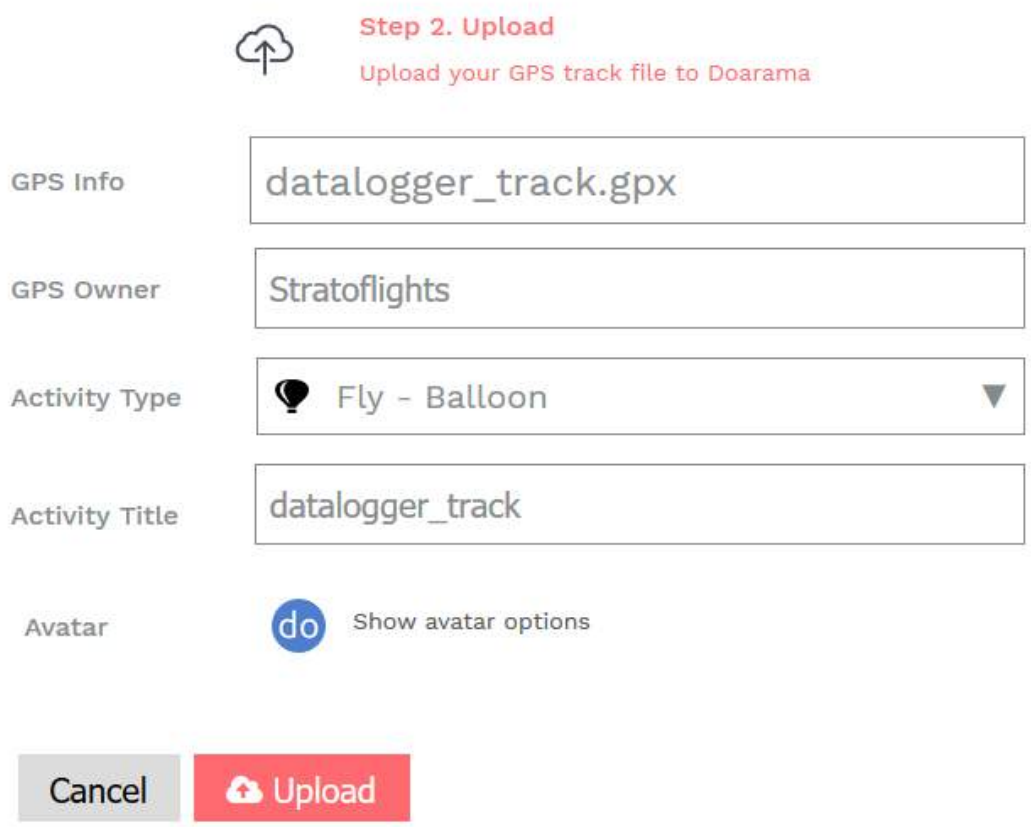
After opening Google Earth the map can be rotated arbitrarily and the flight route can be viewed from every perspective.

Create flight curves in Doarama

For an interactive 3D flight curve, you can upload the data into Doarama. As a first step, you have to convert the log file of the datalogger. Please use the following link to convert the data: https://www.stratoflights.com/en/tutorial/datalogger-evaluation/

Afterward, you can upload the new file into Doarama, at www.doarama.com

Click on "Create your own track". Then you can log in with your Google, or Facebook account. The registration is free. In the second step, you can upload the newly created GPX file.
For the evaluation of the data set, please select the “Activity Type”, “Fly Balloon”.



You will receive an interactive 3D flight curve. In this, you can move forward and backward or set a specific playing speed. In addition, the most important data can be displayed directly, such as:

- Current altitude
- Speed
- Distance to the starting point
- Climb rate
- Time
- Flight duration

Through this tool, the flight can be displayed in a very vivid manner. It is interesting to see how the direction and speed of the balloon in the different air layers changes.

37352 m
Altitude
Distance 74.76 of 102.43 km
Altitude 37352 m
Rate Of Climb 5.0 m/s
Time 12:54:25 (UTC +1)
CESIUM - BING • © Analytical Graphics Inc., © CGIAR-CSI, Produced using Copernicus data and information funded by the European Union - EU-DEM layers • Image courtesy of NASA • Earthstar Geographics SIO • © 2016 Microsoft Corporation • © 2016 Intermap
16x
01:54:54

Specifications

Parameter	Value	Unit
Input voltage	4,5 - 9	Volts
Temperature range	0 bis + 85	°C
Maximum height	50.000	Meter
Recording rate	0,5	Hz
Temperature measuring range int.	-40 to +85	°C
Dimensions	48 x 37 x 8	mm
Weight (without battery)	13	Gramm
Weight (without battery)	58	Gramm
Running time	24	Hours

Please Note: The specifications of the components and their system limits were not fully tested, but they refer to the manufacturer's specifications.

We wish you a good flight!

Everyone needs an adventure

https://www.stratoflights.com/en/tutorial/weather-balloon-tutorial/