TrueFuse, TruePath & apogee calculation

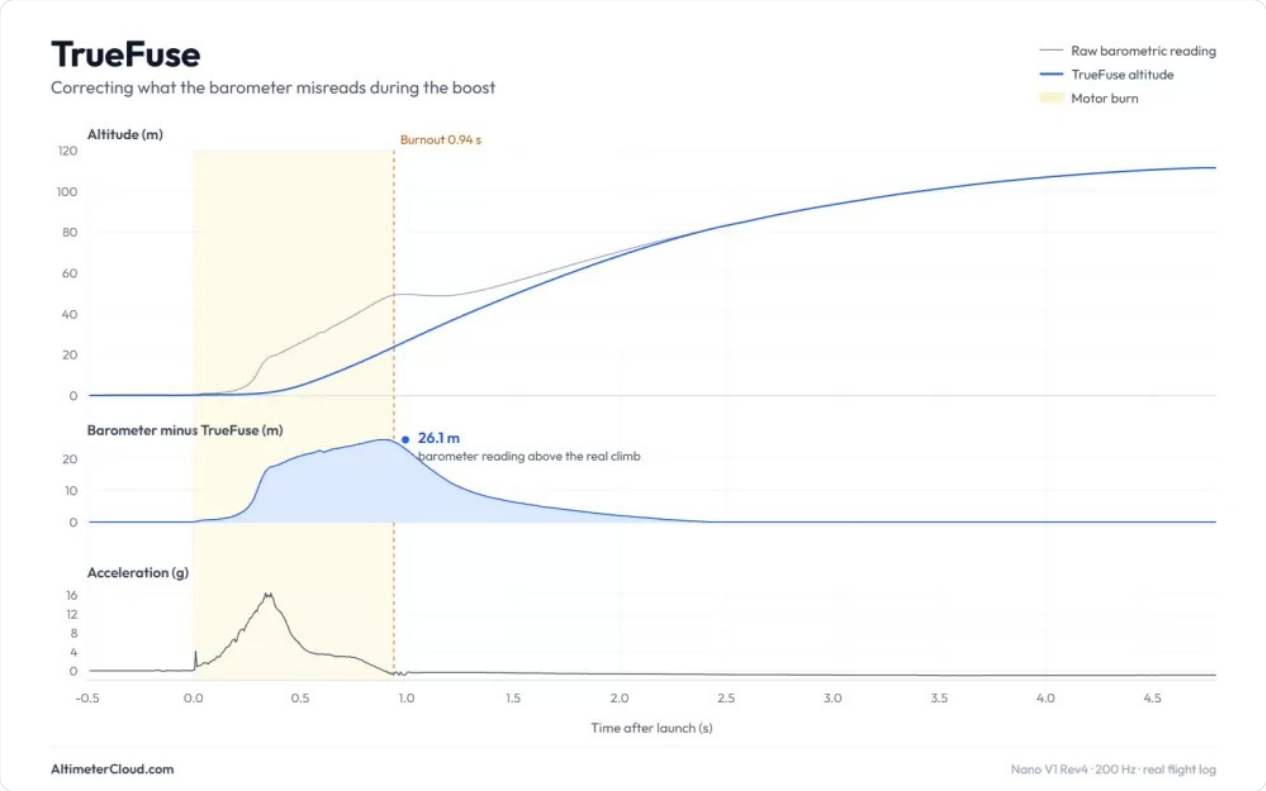
Every height reading on the Nano starts as an air pressure measurement, and during a flight that pressure gets knocked about by things that have nothing to do with the rocket's true height. Two processes turn the raw readings into the clean flight you see in your data, and both run on the Nano itself when the flight is saved.

- **TrueFuse** uses the motion sensor to correct the altitude where the pressure can't be trusted.
- **TruePath** removes errors from the altitude trace and improves the data in a real way, without using estimates or inventing data.

This page explains what each does for you, why they run after the flight rather than during it, and how your velocity and apogee come out of them.

What TrueFuse does

TrueFuse is our altitude fusion filter. It combines the barometer with the accelerometer and gyroscope to hold the altitude true on the pad and through the launch, where the motor and the airflow past the vent holes make the pressure misread while the rocket accelerates hard. It also bridges other short pressure disturbances using the flight's own trend. Away from those moments, the output is the barometer. It never invents altitude.



A Revision 4 boost where the barometer reads up to 26 m high. TrueFuse uses the motion sensor to follow the real climb.

TrueFuse needs the motion sensor, so it runs on Revision 4 and later boards; earlier boards use TruePath alone. If it can't be used on a flight, for example a very short recording, the barometer altitude is passed to TruePath as it was recorded, and the flight info page shows whether TrueFuse was applied.

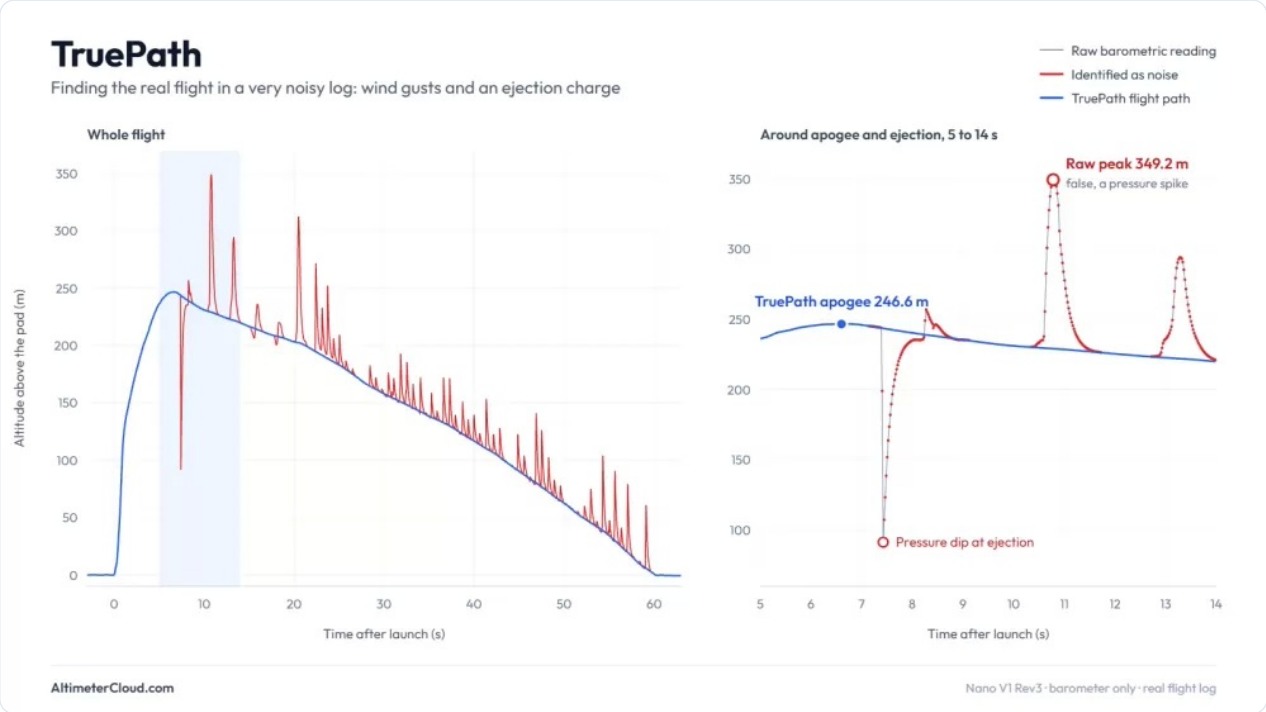
TrueFuse in depth ↗

What TruePath does

TruePath is our own in-house filtering system. During a flight the pressure around the sensor is disturbed by all sorts of things: the sharp pulse from an ejection charge, the shock waves as the rocket passes through the sound barrier, buffeting and swinging under the parachute in the wind, and even sunlight on the sensor. All of these show up in the raw trace as spikes and wobble that aren't real changes in height.

TruePath finds those spikes and removes them, then smooths the trace. The smoothing is set by time rather than by the number of samples, so it behaves the same at any logging rate, and it is tighter through apogee than under the parachute. Quick, genuine moments such as the turn at apogee stay sharp, without the lag you would get from simply averaging the readings.

TruePath doesn't invent data or estimate where your rocket went. It works only from the readings the Nano recorded, identifies the ones that are clearly wrong, and removes them. What is left is the real flight the rocket flew: the true path through your data.



An old Revision 3 flight with far more wind noise than current sensors give, plus an ejection charge. It's a harder test for the filter, which is why it makes a good example.

TruePath in depth ↗

Why the Nano processes after the flight

Some altimeters double as flight computers, firing charges or driving airbrakes, so they have to filter their readings live as each one arrives. The Nano is a pure altimeter with no outputs, so it has no reason to clean the data in real time. During the flight it logs the raw readings, up to 833 times a second on Revision 4 and later boards, and saves all the processing for afterwards.

Working on the complete flight at once is a real advantage: the filters can look at what came both before and after

each point, which a live filter never can because the rest of the flight hasn't happened yet. That fuller picture is part of why the result is so clean.

The same processing runs whether the flight is saved normally after landing, or rebuilt by log recovery at the next power-on.

Nothing is thrown away

An ACLZ flight log keeps the raw barometric altitude in its own column, exactly as measured before any processing, so you can always see what the processing did and judge it for yourself. The flight info page shows the raw and the processed apogee side by side for the same reason.

Saving takes a moment

The processing is the heaviest work the Nano does. It can take up to about 2.5 minutes on a long log at 833 Hz, and longer on a low battery, because the Nano slows its processor to protect the cell. Leave it switched on until it finishes. The LED shows each stage:

LED	Stage
Pink	The save has started
Red, green, then white	TrueFuse
Red, green, then orange	TruePath
Red, green, then blue	Writing and signing the log
Solid blue, then 20 fast white flashes	Saved and checked

Velocity and apogee

Both come from the finished, processed trace, not the raw readings.

Velocity is the rate the height is changing, worked out across a short window centred on each sample and narrowed around motor burnout so the peak isn't smeared. Because TrueFuse has already corrected the climb, the velocity rides through ignition and the pressure disturbances of a fast boost instead of jumping around with them.

Apogee is the highest point of the processed trace above the pad. A single stray spike in the raw data could look like a brief jump in height and be mistaken for the peak; reading apogee from the processed trace means the figure reflects where the rocket really reached.

The Nano also spots apogee live during the flight, but only to time the hybrid mode change and the end of recording. The apogee in your log, on the LED and on the flight info page is always the one worked out at save.

If you later adjust the ground pressure or temperature on the Altimeter Cloud, it recalculates the height from this same processed data, so your corrected flight stays just as clean.

Flight events

While it saves, the Nano also works out the key moments of the flight from the whole recording: lift-off, motor burnout (including each stage on a multi-stage flight), ejection, apogee, landing and the landing speed. On Revision 4 and later boards it also takes the launch rail angle from the pad readings just before lift-off. These appear in the log

header and on the flight info page.