µHoubolt Recovery Flight Test Protocol

18.03.2022

LEAD	MISSION CONTROL		RANGE SAFETY	
DANIEL FRANK	Markus Pinter		Reinhard Rath	

TESTTYPE	Recovery Flight Test
TESTGOAL	Verify correct function of recovery system
CHANGES	None, Initial test
FAILS AND LEARNINGS	Altimax light sensitivity, Railbutton fit, Premature logging end

Test summary

On 18.03.2022, a flight test of the designated µHoubolt recovery system was conducted in Straubing, Germany.
The goal of the test was to verify the correct function of the recovery system, namely the separation of the nosecone and drogue deployment at apogee and the main chute deployment at a set altitude. Both the function of the COTS Altimax recovery altimeter and the SRAD mechanical design was tested.
The exact performance of the system with regards to shock loading resistance and descent speed was not evaluated however, as the maximum altutude was limeted, the mass of the test vehicle was lower than the planned mass of µHoubolt and the parachute size was differrent.

Previously, the mechanical design of the system was verified by separation and deployment tests on the ground (where the function of the linecutters was imitated by using sidecutters) and the altimeter and its configuration was tested using by simulating the air pressure profile of a flight in a vacuum chamber. All tests were sucessfull.

The vehicle (aptly named „Ofenrohr" as its body tube was made from oven exhaust pipes) used for the test was a simple one stage rocket propelled by a COTS solid rocket motor. It was built specifically for this test using cheap and fast manufacturing methods (Except for the nose cone and the recovery system itself, which were designated to fly on µHoubolt). The dimensions of the vehicle were a close match for µHoubolt but the mass was lower at around 7kg.

After stressfull preparation days, where the airframe was built in record time, the launch day was fairly uneventful, except for two mishaps during preparation:

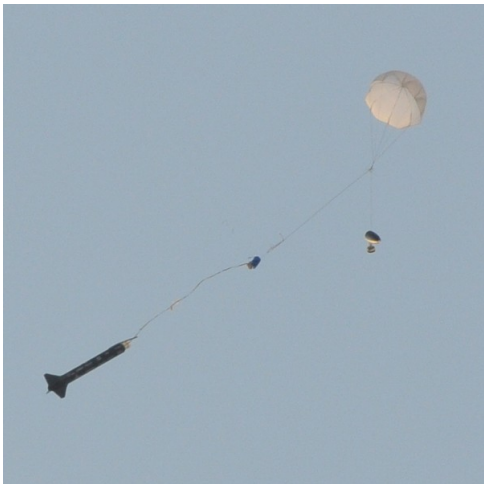
- During preparation of the recovery system the altimeter was powered on and armed for testing and software configuration. While this was not expected to cause problems, the nosecone separation line cutter, normally to be fired at apogee, was triggered. While this released the clamp band and required the single use line cutter to be replaced, this did not cause any further problems nor danger, as the powerul nose cone ejection mechanism was not primed.
  The suspected cause is, that sunlight directly hitting the barometric pressure sensor caused false readings due to the photoelectric effect, which is a known problem with th type of sensor used.
  To mitigate this issue, dark open cell foam will be placed over the altimeter pressure sensors to block any light from hitting them.
- The vehicle was for the first time assembled fully and installed on the launch rail at the launch site. This revealed a problem with the dimensions of the railbuttons, which had to be replaced.
  Such problems shall be avoided for future flights by completing the hardware and doing fit checks on the rail well in advance of launch day.

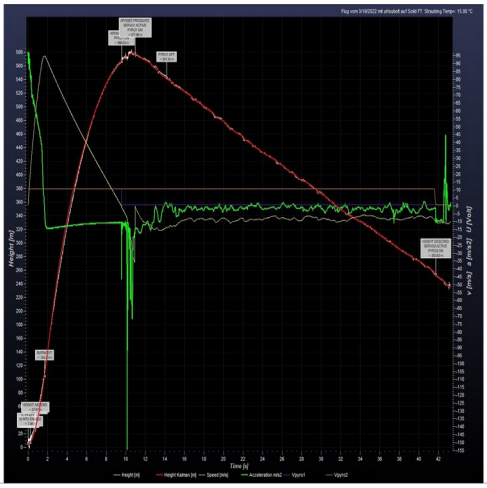
The flight itself went well, with the recovery system performing exactly as planned, bringing the

vehicle safely back to the ground and allowing the nose cone and recovery system to be used for µHoubolt. An apogee of around 580m AGL was reached, close to the predicted value. One problem was still discovered though:

- The altemeter stopped recording data after triggering the main chute deployment. It is unclear why this happened, as the logging should have continued until landing gets detected. One possible explaination is an intermittent loss of electrical power due to the deployment shock.

Diagrams and Pictures





Signature 1

Daniel Frank

Signature 2

Markus Pinter

Signature 3

Andreas Ungersböck