# HAMAV – abstract

Stratospheric missions’ value is underestimated in the world of science. Experiments conducted in this demanding environment develop our knowledge about the atmosphere, climate and astrobiology. However, scientific payloads sent up by stratospheric balloons are blown far off course by the wind. Upon the uncontrolled landing, the payload can touch down on inaccessible terrain, such as a lake, forest or on private property. Moreover, it can be stolen by third parties or destroyed as a result of a hard landing. There exist advanced solutions to this problem, such as Airbus’ Zephyr, but their price and availability severely limits their commercial utility. As a result, these solutions are only available for the military, large corporations and some space agencies. The rest of the scientific community is forever doomed to using problematic stratospheric probes.

We identified this problem, and as the 3-SAT engineering team we decided to solve it. We formulated a list of requirements for a platform that would be able to eliminate it. According to said list, we designed a drone, High Altitude Micro Air Vehicle, that – after being lofted into the stratosphere suspended from a balloon – will be able to return to the location of launch, carrying a scientific payload. We produced a prototype that we put through a series of rigorous tests. On the 20th of October 2018 it became the worlds’ first micro class drone to return automatically from the lower layers of the stratosphere (11.5 km AGL) carrying a scientific payload, and landed at the launch site. It was carrying 16 test tubes of astrobiological material, however we have equipped it with adaptable loading bays that are able to accept a variety of experiments. Sensors that detect air pollution varying with altitude or a radiosonde could be easily mounted in them.

The project along with its premises is now complete. The drone proved itself to be a successful prototype which is able to work as a functional multi use product. The gathered data and experience have allowed us to put forth a path of further development for the drone. Our current goal is reaching 30 km AGL. Additionally, we are presently discussing using HAMAV as a platform for conducting sounding with the Institute of Meteorology and Water Administration. This would allow Polish institutes that conduct meteorological studies to save almost 2 million zloty (polish currency, equivalent to about 460 thousand Euro) by recovering the radiosondes. They are currently used only once, and each unit costs approximately 150 Euro.