A new improved multicopter chassis structure tested on slope stability monitoring

Guglielmo Rossi, Luca Tanteri, Teresa Salvatici, Gabriele Scaduto, Carlo Tacconi Stefanelli, Nicola Casagli, and Sandro Moretti

Department of Earth Sciences, University of Florence, Florence, Italy, (guglielmo.rossi@unifi.it)

The multicopter has an increasing role in remote sensing and aerial photography. The piloting ease and the mechanical simplicity are the main reasons for drone diffusion as a hobby and for professional use. Usually multicopters have a "spider" structure with a central body and many radial arms that support the propulsion device. To improve the structure of the existing multicopter, the Department of Earth Sciences of Florence (DST) has developed and patented a new type of chassis structure that allows us to overcome some critical issues for scientific and heavy payload or long flight applications. The drone has an innovative perimetric chassis that fully supports flight dynamics. The new structure allows us to obtain high flight performance combined with low vibration transmission to the carried instruments. The new patented structure is implemented in two new prototypes of high performance drones completely developed by the Department of Earth Sciences of Florence: Saturn 2 and Saturn mini X-21. Saturn 2 is a high performance multi-role drone capable of carrying up to 14 kg of scientific instruments. Saturn Mini X-21 is a high performance drone, entirely 3D printed and specialized for digital and 3D rapid mapping. The Saturn mini X-21 was especially developed to obtain for the first time, by a drone, a 3D high resolution digital model for slope monitoring purposes of the Stromboli Sciara del Fuoco, a large inaccessible area that presents harsh flight conditions such as high persistent wind, rotors, volcanic ash and saltiness. The Saturn drones are mainly developed and tested, all around software and hardware, on slope stability monitoring. Four test cases are proposed, which were performed during the development and testing phase: a large area 3D survey (Scillato - Sicily), a harsh condition 3D survey (Stromboli –Sicily), a multitemporal 3D survey (Ricasoli - Tuscany) and the testing phase of measurement performed by onboard radar equipment.