



Airship for Earth atmosphere and surface investigations

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Autonomous Lighter-Than-Air (LTA) systems can be used as support platforms for Earth atmosphere and surface observations. Airships, in particular, can explore unknown environments without obstacle avoidance problems, mapping large areas to different resolutions and perform a wide variety of measurements and experiments while traveling in the terrestrial atmosphere. An autonomous airship with sensor fusion between Inertial Measurement Unit (IMU) and vision systems can be used to support vehicle navigation and variable resolution surface mapping. Autonomy also reduces human intervention and guarantee the desired distribution (time/space) of measurements. Airships are good platforms for a wide variety of measurements thanks to their dynamic properties, which include good controllability for position and speed; station keeping capabilities; very stable attitude and consequently low vibrations; long flight potentials; safety and low operational costs.

Main aspect of the Airship is its high degree of stability which means low attitude noise during measurement sessions; in fact, no high frequency oscillations have been observed during the simulations performed with our model and will be presented. To demonstrate the airships capabilities and investigate possible application scenarios field tests are ongoing with a 15m length airship with a 25 kg payload capability and more than 2.0 hours of autonomy; the airship is able to fly over 1000 m with max wind of 8 m/s and a maximum velocity of 70 km/h. Autonomy concepts operations has already been tested on a 4.0 m scaled airship using way-point navigation and results have been encouraging.

With this huge payload bay there are several portable instruments that can be carried on board the gondola: high resolution cameras, infrared thermo cameras; infrared spectrometer; raman and moessbauer spectrometer; dust collectors; ph meters; gas chromatograph; lidar, ecc.