

## **Structured control law design and robustness assessment for the automatic launch of small UAVs**

Automatic launch is an important capability towards the truly autonomous flight of Unmanned Aerial Vehicles (UAVs) that does not require the presence of an expert pilot, as it is often the case today. In this work a complete approach to the design and robustness assessment of a set of control laws for the automatic launch of fixed-wing UAVs is presented. The proposed control system consists of an airspeed tracking loop and a nested lateral guidance loop. Important nonlinearities such as actuator saturations and signal delays are taken into account for controller synthesis and robustness evaluation. Due to the high risk inherent to flight testing the launch phase, extensive Monte-Carlo simulations have been performed on the nonlinear model of a flying-wing type UAV, including atmospheric turbulence. Time consuming Monte-Carlo simulations are complemented by robust stability tests using Structured Singular Value analysis methods.