DESIGN AND OPTIMISATION OF UAV EMPENNAGE FOR VARIOUS MISSION SCENARIOS.

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Abstract. Aircraft design process is typically aimed to provide the optimal solution for some mission scenario(s). Especially during initial design phases, engineers assume level, straight flight as dominant, and the aircraft performance calculations are based on this assumption. Mission scenarios for UAVs are different, and sometimes consist of significant time spent in climb (e.g. atmosphere research) or turn (observation of fixed point) phases. In this paper, the optimisation incorporating different flight conditions is carried out for the empennage of PW-141.1 “Samonit” aircraft. Two different boom-mounted empennage design arrangements are investigated: V-tail (2 surfaces at some angle) and conventional (horizontal and two vertical surfaces). The objective is to assess the effect of mission scenario on the optimal empennage arrangement, showing which is superior in particular conditions. The objective function in optimisation process is maximisation of the aircraft's performance, defined as maximum lift to drag ratio, which for the empennage design is minimisation of drag. Optimal shape is chosen not only basing on the performance, but also robustness of the design.