

INTEGRATED APPROACH TO ASSESS THE FEASIBILITY AND APPLICABILITY OF MODULAR HALE PLATFORMS

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ABSTRACT:

A renewed interest in the application of HALE platforms also for commercial applications has arisen in the last year. Among others, disaster monitoring, telecommunication, as well as continued Global Monitoring and Earth Sciences drive design and development efforts. Last but not least, there is a growing interest, also within the German Aerospace Center (DLR), to perform research both on platform technologies and the potential applications of HALE.

For this reason, a novel approach has been initiated within DLR to simultaneously assess the feasibility and applicability of modular HALE platforms. Payload requirements like space, weight, power supply, location on the platform to satisfy slant angle requirements are incorporated into basic design tools like SALT (Solar Aircraft Layout Tool) and SAMS (Solar Aircraft Mission Simulator). For the first time, the configuration is not only optimized with respect to flight performance (like endurance) but already in the conceptual design phase, the constraints of payload as well as power supply are addressed simultaneously. Combinations of solar cell, fuel cells and potentially novel launch concepts like towing, catapult, or air drop launches are addressed to reduce the amount of required launch power and subsequently fuel. Hybrid propulsion concept are described, modelled, simulated, and assessed to provide the required mission power (both to support the payload as well as to keep the HALE platform on station and to control it). In order to derive high fidelity and robust results about mission feasibility, dedicated models of solar radiation, performance of fuel cells in harsh environment, and detailed information about payload power consumption are integrated into the analysis and preliminary design steps. Model parameters are derived either from theoretical studies or – more important – from laboratory and flight test demonstrations of individual components for commercial HALE.

Results of this novel, integrated approach to assess the feasibility and applicability of modular HALE platforms are both conceptual designs of HALE platforms, its related suitability for payload applications, and statements about mission parameters like range, endurance, maximum ceiling etc.