

List of Poster Abstracts

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Innovative sustainable air travel between Aruba, Curacao, and Bonaire with airships.

Author: Michel Frank, University of Aruba

This thesis examines the feasibility of lighter-than-air (LTA) airships as a sustainable alternative for inter-island passenger transport in the Caribbean, focusing on the ABC islands: Aruba, Bonaire, and Curaçao. Small island states (SIS) face pressing challenges from climate change, dependence on imported fossil fuels, and the high costs of conventional aviation infrastructure. Airships, with their low emissions, quiet operations, and minimal takeoff and landing requirements, present a potential solution. Using a mixed-methods case study approach centered on Aruba, the research combines literature analysis, stakeholder interviews, and a public survey to evaluate technological readiness, regulatory compatibility, economic viability, and public acceptance. The Functions of Innovation Systems (FIS) framework, extended with sustainability as an eighth function, guides the analysis of innovation dynamics. Findings suggest that modern airship designs, such as hybrid-electric models, can operate within Aruba's climatic conditions and offer competitive advantages for short-haul travel, though challenges remain regarding regulatory adaptation, wind resilience during mooring, and initial investment requirements. Public perception indicates cautious optimism, with safety, cost, and sustainability as key factors influencing acceptance. This study contributes to sustainable transport discourse in SIS by linking aviation innovation to climate adaptation, energy independence, and regional integration. It concludes with recommendations for pilot projects, policy alignment, and further research on engineering performance and long-term economic modeling.

VLMs onboard of airships for scene understanding in a wildfire context

Author: Simon Gehringer, Fraunhofer / Evolonic

Early wildfire detection is critical for effective suppression efforts. While CV techniques offer reliable fire detection, they often lack contextual understanding. To address this VLMs were utilized to generate structured scene descriptions from UAV imagery. To achieve long flight times, airships are used as the platform. Our results demonstrate, that such compact VLMs, that can be run onboard the airships, can provide rich contextual information.

Initiative Lighter-than-Air, Turning Crisis Aid Into Future Support

Authors: Andreas Werner, Dr. Dirk Spaltmann, Peter Hilgenberg, Wolfgang Pest, Initiative Leichter als Luft e.V., Germany

Founded in 2003, the Initiative Leichter als Luft e.V. (formerly Initiative Zukunft in Brand e.V.) is an association organised in the field of lighter-than-air (LTA) technologies. The association has a proven track record of success in dealing with the CargoLifter insolvency proceedings (1992-2023), in securing and providing source material and in supporting current company initiatives. A particular concern is the maintenance and management of an extensive media archive on lighter-than-air technology. This includes the complete archive of the former CargoLifter AG and its successor companies, for which the organisation grants the copyright. The poster discusses the role of the association as an intermediary between research, industry, the public and its potential for science.

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Design Concept of a Solar-Powered Airship for Long-Distance Travel

Author: Manuel Müller, FH Joanneum Graz, Austria

With a global impact of around 3.5 percent, air travel contributes significantly to human-made climate change. However, on long-distance routes in particular, there is no practical replacement for air travel, making the search for alternative modes of transport extremely important. With this in mind, this thesis examines how climate-friendly and attractive long-distance mobility can be achieved in the future. As part of the thesis, a holistic concept for a solar airship is developed that combines the potential of current technologies with the needs and expectations of users. In addition to technical aspects, the thesis focuses in particular on the question of how longer travel times can be compensated by new experiences and added value for travellers. The result is a vision of climate-friendly long-distance travel that takes into account both ecological requirements and the need for comfort, experience and flexibility. The work thus contributes to the discussion about future-proof alternatives in international passenger transport and shows how sustainable mobility can be rethought and redesigned on a global level.

Flight-Path Optimization for Solar-Powered Airships

Authors: Niklas Heidenreich, Christoph Pflaum, FAU, Germany

Routing between two points is a well-established problem, but the unique challenges of solar-powered airships introduce significant complexity. Ground speed is heavily influenced by wind conditions, while solar energy generation, and consequently battery charge, varies with cloud cover, time of day, geographic position, and season. These dynamic, time-dependent factors dramatically expand the search space, rendering conventional pathfinding methods computationally expensive and often suboptimal. Traditional approaches rely on fixed, discretized grids of nodes and edges, which can constrain the solution and prevent the airship from following the true optimal path. We present an adaptive grid method that dynamically generates nodes and edges in response to evolving weather and energy conditions. This approach models time-varying influences more naturally, reduces computational overhead, and yields more accurate route approximations for long-duration, solar-powered airship missions.

Buoyant Drone for Close-Proximity Crop Inspection

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This Poster explains the design and development of a novel lighter-than-air (LTA) drone concept that integrates helium buoyancy envelope to achieve low noise, longer flight time, and close-proximity crop monitoring. Unlike traditional multirotor drones, the proposed system employs a low-noise propulsion mechanism assisted with Buoyancy. The drone is designed to carry a series of sensors for multispectral imaging, disease detection, and real-time plant health assessment, giving precise individual plant data enabling deeper insight of the entire field. Key design considerations include envelope material selection to minimize helium permeability, rotor quieting strategies, and structural lightweighting for enhanced endurance. Scaled prototyping indicate significant improvements in hovering stability, significant drag reductions, and operational time compared to conventional UAV platforms. This work contributes to advancing LTA drone applications in precision agriculture, aiming to bridge the gap between sustainable farming practices and advanced aerial monitoring technologies.

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