List of Poster Abstracts

International Conference on Electric Airships
Nürnberg
September 25 to September 27, 2025

ENERGIE CAMPUS NÜRNBERG

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

Author: Michel Frank, University of Aruba

The Airship transport alternative, in its diverse engineering variants, has the potential to be a game-changing technology with significant development in recent years. It offers the technical capabilities to make a broad contribution to the optimization of mobility and logistics networks in isolated communities and territories, especially but not only in Small Island Developing States (SIDS). This innovative mode should be incorporated into the transport matrix (both nationally and regionally), for the latter to move towards more efficient, sustainable, and resilient networks. Airships do not necessarily compete with other means of transport, instead, they complement traditional modes which improve co- modality/synchro-modality and perform social functions, achieving a clear improvement in connectivity, interior (hinterland) and external (foreland) accessibility. There is a diversity in Airship technology, operational mode, and in the functions, both in commercial and in non-commercial operations (such as humanitarian aid), as will be showcased in the following sections, along with the logistics and connectivity standards that it has the potential to raise. Besides transporting cargo and passengers for scheduled or rescue flights, Airships can provide communication and monitoring services to remote and vulnerable locations, as well as to provide health care through mobile sanitary units.

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.

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.

Powering the Skies: Roll-to-Roll Perovskite Solar for the Next Generation of Airships

Author: Naveen Bastian Waduge, Helmholtz-Institute Erlangen-Nuremberg for Renewable Energies, Germany

At the Solar Factory of the Future, we are establishing entirely roll-to-roll (R2R) processes to provide high-efficiency, flexible perovskite modules for lightweight utilization. With a focus on production scalability, this talk will feature recent achievements in ambient R2R processing and outline future potential for deploying perovskite photovoltaics in electric airships and other mobility platforms.

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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Supported by: SAOT erlangen graduate school in advanced optical technologies