Abstract

MESH: Modular Environmentally Sustainable Hybrid Landing Systems for Scalable, Reusable, Relocatable Advanced Air Mobility Infrastructure

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Advanced Air Mobility (AAM) is now more often described as constrained less by aircraft readiness than by ground infrastructure. This constraint is particularly acute: rapid urban growth combined with ambitious eVTOL roadmaps are converging on a shared bottleneck, namely the absence of certifiable, deployable landing infrastructure that can keep pace with aircraft development. It is most acute in the dense urban cores where AAM demand is highest, and where it is hardest to satisfy: central business districts, entertainment districts, and transport hubs are precisely the locations with the poorest Obstacle Limitation Surfaces, since tall buildings restrict approach and departure paths, and available ground-level real estate is scarce and expensive exactly where it is needed most. More than 80% of the world's largest cities sit on waterways, and these waterways typically run directly through the highest-demand urban zones while offering some of the clearest approach and departure surfaces available in a dense city. Siting strategy, not aircraft capability, is what will determine whether AAM can operate in the environments it is intended for.
Conventional heliport and vertiport construction, reliant on bespoke concrete groundworks and lengthy civil engineering programmes, cannot scale at the rate AAM operators require, and does not translate to marine, rooftop, or constrained urban sites without a bespoke design exercise each time. Once built, a concrete pad is effectively immovable, and removal can cost nearly as much as the original construction.

This abstract introduces MESH, Modular Environmentally Sustainable Hybrid landing systems, a proprietary platform developed by Unified Aviation to address this infrastructure gap directly.

The name describes the design philosophy in full.
Modular: MESH is built from a common set of prefabricated structural sections that are manufactured off-site, assembled in our factory, transported, and installed in place, compressing what is typically a multi-month construction programme into a matter of weeks. Sections combine, separate, rearrange, or extend as project requirements evolve, and individual modules can be replaced or reconfigured without disturbing the surrounding structure.
Environmentally Sustainable: the platform is engineered to minimise permanent ground and seabed disturbance, reduces concrete and steel consumption relative to conventional pad construction, and is designed to be relocated or decommissioned without leaving a permanent structural footprint, an important consideration for sensitive coastal and desert sites across the region. The reusable element of MESH is also an important feature. If a particular site for some reason does not work out, the MESH product can be relocated and reused at a different

location. The modular components can be reused at any location rather than only reused on their original site, or recombined with additional modules as a deployment scales. This Asset feature is something that currently does not exist in the traditional helipad construction methodology. MESH is designed from the outset to be taken apart and rebuilt elsewhere, without permanent construction at either end.
Hybrid: rather than a single fixed configuration, MESH is designed and built around a shared structural core adaptable to ground, elevated, and floating installations, and supports both conventional helicopter operations and emerging eVTOL types from a common certification basis. This is what makes the waterway siting strategy practical rather than theoretical: the same validated platform that sits at grade on an airport apron can be specified as a floating structure moored in a city-centre waterway, or as a rooftop platform on a constrained urban environment. This hybrid structural strategy allows MESH to serve markedly different operating environments, from coastal locations to urban rooftop pads, without requiring a bespoke design exercise for each site.

Regulatory alignment has been treated as a design input from the outset rather than an afterthought. The design draws directly on established heliport and vertiport standards, including ICAO Annex 14 Volume II, ensuring that the modular and hybrid nature of the platform does not come at the expense of conformance with the standards regulators and operators already trust. This regulatory grounding is reflected in the platform's first GACA-certified reference installation at King Abdullah Financial District (KAFD) in Riyadh, which stands as an operational proof point for the modular construction methodology and its associated certification basis.

Operationally, MESH is designed to be paired with Whirly, Unified Aviation's cloud-based heliport management software, which provides digital oversight of asset condition, safety compliance status, and operational readiness across a network of MESH sites. This pairing extends the platform's value beyond physical structures, providing operators and regulators with a consistent, auditable compliance record across diverse, widely dispersed landing sites. The implications of this approach extend beyond any single site. AAM adoption globally, depends on infrastructure that can be certified, deployed at a pace commensurate with aircraft delivery schedules, sited where operational and urban planning constraints allow, without compromising on established safety standards or imposing an unsustainable environmental and construction burden at each new location. By treating modularity, environmental sustainability, and structural adaptability as a single integrated design problem rather than three separate considerations, MESH offers a template for how heliport and vertiport infrastructure can be scaled across ground, elevated, and waterway environments alike, while remaining anchored to internationally recognised regulatory frameworks.

Our proposed presentation will present the MESH design methodology in further detail, the certification pathway followed to date, and early operational lessons from the KAFD reference installation, with a view to informing infrastructure planning for AAM operators and regulators across the world.

[1] International Civil Aviation Organization, Annex 14 to the Convention on International Civil Aviation, Volume II — Heliports.
[2] General Authority of Civil Aviation (GACA), Kingdom of Saudi Arabia, GACAR Part 138 — Heliports.

Biographies

Mark Trotter

Mark Trotter is Managing Director and founder of Unified Aviation, a UAE-based vertical aviation company specialising in Advanced Air Mobility infrastructure. He holds an ATPL(H) with over 6,500 flight hours across military and civilian roles and is a former Royal New Zealand Navy officer and pilot. He is the visionary and co-creator of the MESH landing system.

Paul Trotter

Paul Trotter is the Products Director at Unified Aviation. He is an accomplished entrepreneur and technology innovator with more than 30 years of experience in software and aerospace industry. He has led the development of pioneering solutions including a SaaS platform for heliport and vertiport management and is the co-creator and architect of the MESH landing system.