

NEWSLETTER #1 – October 2025



Credit: Airbus. Artist rendering - ZEROe hydrogen-powered aircraft

Progress update

Ground-based mobile LH2 refueller development and test

Aircraft-based LH2 refuelling system

LH2 aircraft ground operations demonstrations

Standards & certification for H2 aircraft refuelling

Assessment of H2 infrastructure at airports

Operational and techno-economic assessment

Dissemination and cooperation activities

A few words from the Coordination

Aircraft powered by hydrogen will play a central role in the development of climate-neutral aviation. They can only exist with proper airport readiness and mastering of hydrogen operations in a safe and regulated manner. GOLIAT is all about paving the way in that direction.

GOLIAT is working on four key pillars on hydrogen operations:

- Large-scale liquid hydrogen (LH2) refuelling technologies development and tests
- Small-scale demonstration of LH2 operations at three European airports
- Recommendation for standardization and certification of LH2 refuelling
- Techno-economics studies of LH2 supply chain until the aircraft.

The GOLIAT consortium includes a large number of airports in order to gather as much information as possible on their operational constraints and practices to feed our works on future LH2 ground operations definition. We believe this is a real strength and are relying on both their expertise and valuable contribution.

Technological hurdles have to be solved on the LH2 refuelling side, which needs to be efficient in order to be competitive for airlines in terms of turnaround time and cost. The LH2 refueller prototype being developed by GOLIAT is progressing in the right direction and has already generated significant learning opportunities.

Finally, regulations and economics are key. GOLIAT is tackling these topics, addressing the lack of unified rules on hydrogen operations and understanding of the future market. This is completed by empirical works currently on-going with the preparation of small-scale demonstrations at three airports.

While the first 18 months of the GOLIAT project have been dense, activities are well underway. While there are many steps to go through, GOLIAT's focused collaboration will bring us closer to the era of H2-powered aviation.

Jean-Christophe Hoguet, GOLIAT Coordinator, Airbus

Ground-based mobile LH2 refueller development and test (WP2)

Leader: Chart Ferox

The overall objective of the work package (WP) assigned to Chart Ferox and GOFA, its affiliate, is to design, manufacture and test a prototype of a ground-based mobile liquid hydrogen (LH2) refueller that achieves the target values regarding performance and safe operation of the aircraft tank prototype.

Therefore, the main tasks are:

- To evaluate the functional analysis and specifications in close cooperation with the organisations involved in the WP dedicated to the development of the aircraft-based LH2 refuelling, led by Airbus
- Perform detailed engineering of the system
- Procurement of parts and materials plus the fabrication and assembly of the system
- Testing of the refuelling system prototype.

The flow rate target for the prototype is between 5 to 7.2 ton/h - this value will be finalised after full definition and validation of interfaces of the cryogenic pump with WP3. Since the start of the project in May 2024, the progress is according to the schedule to reach testing phase in Q3 2027.

The general technical concept is preliminarily agreed: a first trailer including the tank, pump, and control system, plus a second platform with the balance of equipment required for operating the refuelling.

The following general engineering project documents were prepared and shared with WP3 Partners: general

arrangement description, filling procedure time estimation, heat and mass balance, general design, boil off gas utilization options, technical specification.

The internal first preliminary HAZID (identification of risks) was performed. Chart and Airbus are continuously discussing and clarifying interfaces.

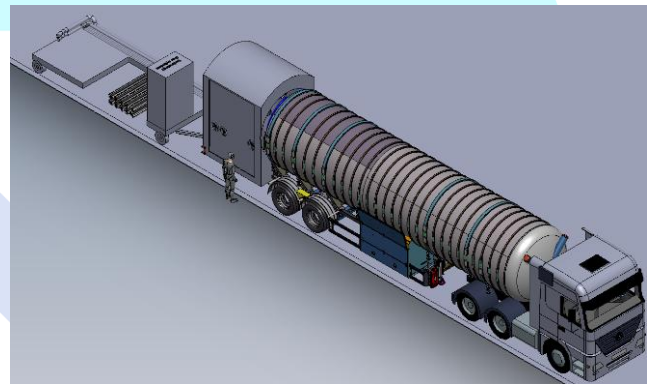


Fig. 1: First preliminary refueller model (© Chart Ferox)

Activities planned for 2026 include:

- Evaluating the safety process with relevant authorities to confirm the full feasibility of the solution
- Finalizing the detailed design, including workshop documentation
- Placing orders for raw material and long lead time items
- Start the manufacturing.

Aircraft-based LH2 refuelling system (WP3)

Leader: Airbus

The main objective of the WP3 is to design, develop and prototype a representative aircraft-based LH2 fuelling system. This includes a refuel coupling, a LH2 tank and the components needed to fill the tank.

It also includes the development of test benches, test equipment and control systems that will be needed to operate the system. The developed equipment will be used together with the ground-based refuelling system developed by WP2 to perform a complete LH2 refuelling demonstration.

The refuelling demonstration will take place in Filton (UK) at AIRBUS ZEDC facility (ZEDC: Zero Emissions Development Centre)

The works until now have mainly concerned the specifications of:

- the LH2 tank and distribution system for the demonstration prototype
- the LH2 coupling (on-board and on-ground parts)
- the interfaces with the LH2 refueller developed by CHART Ferox
- the global test set-up and test zone.

The prototype should comprise (still under investigation though) a 400kg LH2 capacity tank, a skid to "condition" the LH2 upstream of the tank, a boil-off gas management system and a venting system, and all ancillary equipment either for nominal operation, safety, controls and measurements as well as data acquisition.

The allowable flow rate to be tested should be in the range of 5 bars.

Next works will include:

- Detailed design and PFD, PID of the LH2 tank and distribution system, as well as the coupling
- Safety studies
- Test program objectives and definition of necessary test equipment
- Start of procurement of the various equipment.



*Fig. 2: Similar LH2 tank test installation
(Credit: Airbus - for illustration only)*

In the meantime, the Airbus ZEDC in Filton will start to adapt the site to the future demonstration.

LH2 aircraft ground operations demonstrations (WP5)

Leader: H2Fly

The main objective of WP5 is to conduct LH2 aircraft ground operations demonstrations at three different airports. As a foundation for these demonstrations, the GOLIAT consortium completed and published a comprehensive feasibility study (D5.1) in April 2025 which analysed the technical requirements, operational challenges, and regulatory framework for LH2 aircraft operations planned to be demonstrated at the international airports in Stuttgart, Rotterdam, and Lyon. Based on the results of these demonstrations, guidelines for the future introduction and use of LH2 will be published.

Feasibility study results

Led by Rotterdam The Hague Airport in collaboration with Stuttgart Airport, Lyon Airport, and H2FLY, the GOLIAT feasibility study establishes the technical and operational basis for LH2-powered aircraft operations at European airports. The study's key finding confirms that LH2 refuelling infrastructure at EU airports is not only technically feasible but represents a crucial step toward sustainable aviation.

The study provides comprehensive recommendations for LH2 handling across five critical areas:

Infrastructure and logistics: The research defines essential infrastructural specifications for LH2 operations, including cryogenic storage and transport systems, specialized refuelling equipment, and safety-critical venting systems. The logistical framework emphasizes the necessity for site-specific adaptations, addressing everything from refuelling site layout optimization to compliance with local ATEX (explosive atmospheres) zoning requirements.

Regulatory framework: The study comprehensively maps European Aviation Safety Agency (EASA) regulations alongside relevant national and local legislation governing LH2 operations. A key insight

reveals significant variations in local regulations across EU-member states, requiring airport-specific regulatory compliance strategies.

Safety and risk management: Given LH2's unique properties, including high flammability, cryogenic temperature requirements, and extremely low ignition energy, the study emphasizes that comprehensive risk assessments are fundamental to safe demonstration operations. This includes developing robust emergency response protocols and implementing proven mitigation strategies for potential hydrogen leaks, fires, or other safety incidents.

Environmental impact: Hydrogen propulsion technology directly supports the European Green Deal's ambitious target of reducing transport emissions by 90% by 2050. The study positions hydrogen as a transformative technology for aviation sustainability, particularly for short and medium-haul flights.

Demonstration strategy: The GOLIAT demonstration program follows an iterative approach, where insights from each airport demonstration inform and improve subsequent implementations. This methodology ensures that lessons learned contribute directly to developing industry standards for infrastructure development, operational procedures, and certification processes essential for broader LH2 adoption across European aviation.

Next step: Stuttgart demonstration

The program now advances to its first practical phase with the LH2 ground demonstration at Stuttgart Airport. Stuttgart Airport and H2FLY are currently collaborating to finalize the demonstration zone specifications, complete comprehensive risk and safety assessments, and establish the required LH2 infrastructure and logistics framework.

Standards & certification for H2 aircraft refuelling (WP6)

Leader: Airbus

GOLIAT encompasses a work package dedicated to preparing the standardisation and certification of future LH2 refuelling equipment and operations. It combines the expertise of equipment manufacturers, standardisation and certification specialists and airports to produce gap analyses and sets of requirements that will serve as a basis for future standardisation.

The initial focus so far has been on the specifications of LH2 refueller compatibility with airports. This task includes: describing current refuelling practices; defining preliminary refueller technical and safety specifications as well as positioning of LH2 refueller and phases of refuelling operations; work on preliminary specifications for pre-standardisation; and detailing technical and operational inputs expected from airports.

The main findings are:

- Refueller positioning must ensure clear exit paths and avoid conflicts with ground support equipment
- Compatibility must consider technical dimensions, turning radii, and interface clearances
- Operational safety requires detailed grounding, purging, personal protective equipment, and visual demarcation procedures
- There is an absence of unified standards for mobile LH₂ operations in an airport environment
- There is a need for consistent training and certified personnel for LH₂ fuelling.

This will be captured in a public deliverable which is currently under preparation under the leadership of Vinci Airports with inputs of all Goliat Partners, in order to propose a preliminary set of requirements for the future liquid hydrogen refueller.

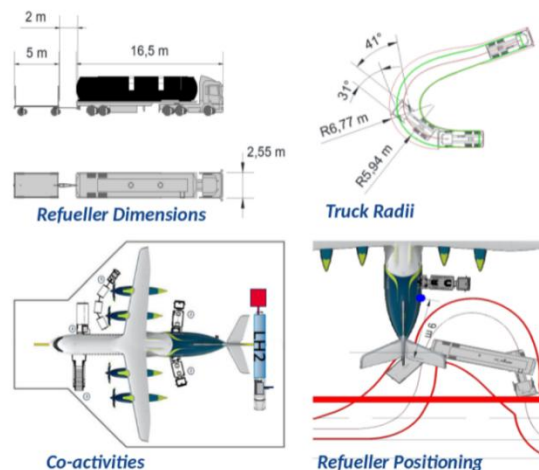


Fig. 3: Examples of LH2 refueller movement studies
(© Airbus – For illustration only)

Progress has also been achieved on other tasks of WP6 (T6.2: standardisation of refuelling system components and interfaces, T6.3: Certification aspects of LH2 equipment T6.4: Certification aspects on airport environment) with the identification of relevant standards, rules and norms applicable to hydrogen equipment and operations and the selection of Bureau Veritas to provide support on certification and standardisation activities.

Additional reports (preliminary versions) are expected to be released in the following months, in close coordination with the work performed in WP2 & 3:

- Identification of EU laws and conformity requirements applicable to future LH2 refuelling
- Environmental and safety requirements proposed to be applied to the LH2 refuelling equipment.

In addition, synergies on standardisation activities have been discussed with ALRIGH2T project and a common way forward has been defined (shared topics of investigation such as way of working with Authorities, certification/regulation, co-activities during refuelling, demos, standardisation items...).

Assessment of H2 infrastructure at airports (WP7)

Leader: Vinci Airports

As aviation moves towards decarbonisation, the GOLIAT project is working to ensure that liquid hydrogen (LH₂) can be safely and efficiently integrated into airport operations. VINCI Airports leads a work package that has just kicked-off its activities to look ahead at the broader infrastructure adaptations that hydrogen aircraft will require at airside facilities. The first steps will be to evaluate how current airport layouts and procedures may need to adapt and assess the potential operational impacts that the introduction of hydrogen aircraft will have on airport organisation in terms of ground operations, traffic flows and infrastructure.

Over the coming year, a comprehensive impact analysis using data from ongoing demonstrations and further LH₂ refueller development will be carried out.

Airports will compare current infrastructure with the operational needs of hydrogen aircraft, while technical partners will support the development of a concept of hydrogen ground operations. This work will feed directly into future planning efforts and lay the groundwork for standardising hydrogen infrastructure at the involved European airports.

Operational and techno-economic assessment (WP8)

Leader: TU Delft

Within GOLIAT, we aim to perform operational and techno-economic assessments of the hydrogen value chain and the ground operations of liquid hydrogen aircraft. These assessments will yield insights into the future demand for hydrogen at and around airports and the supply chain needed to support it, leading to hydrogen cost estimates. Additionally, we will examine the ground operations of hydrogen aircraft to identify what support equipment and infrastructure is needed, and to evaluate the required costs.

Since these analyses are extensive and rely on many uncertain parameters, we started developing the scope and scenarios after the GOLIAT kick-off in May. This scope and scenario definition phases included a broad literature study and consultations with experts from GOLIAT partners and external stakeholders such as airports, airlines, energy providers, etc. We gathered and classified factors impacting the future demand, supply chain, and/or ground operations of hydrogen. These factors were then evaluated in terms of their impact and uncertainty to identify the most critical ones to include in the scenario definitions.

The outcomes of this initial phase are the scope for our future analyses, summarized in the figure below, and a set of five main scenarios. These scenarios consider variations in aircraft technology, airport readiness, and hydrogen supply over mid- and long-term horizons, as well as critical disruptions due to economic and safety issues. These five scenarios and supporting materials

are published in [Deliverable 8.1](#), which can be found on the project website.

This initial phase led to next tasks, where we will develop computational models for operational and techno-economic assessments. We have set up the model requirements and identified relevant methods, again in consultation with the GOLIAT partners.

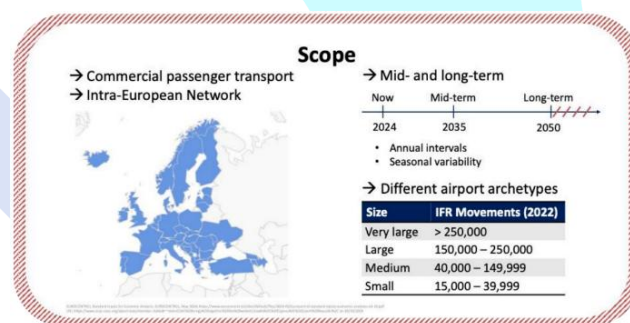


Fig. 4: Scope of the operational and techno-economic analyses
(© TU Delft)

In the coming year, we will further develop the computational models to estimate the future demand for H₂ at airports, assess the cost pathways for H₂ refuelling, and simulate the ground operations for H₂ aircraft refuelling and taxiing. To achieve accurate predictions, we will regularly involve GOLIAT experts to ensure sound assumptions and to verify the initial outcomes of the operational and techno-economic analyses.

Communication & Dissemination activities

Events & Conferences

Since project start-up in May 2024, GOLIAT has been exchanging with aviation and hydrogen ecosystem stakeholders at various events throughout Europe:

14th European Aerospace Science Network (EASN) Conference (Thessaloniki, October 2024)

"Technical challenges and economics of direct high-flow LH2 refuelling" by Airbus & Leibniz University Hannover



14th EASN International Conference – October 2024

2nd Hydrogen Airport Conference (Turin, October 2024)

"Prepare the hydrogen and airport ecosystems for the arrival of zero emission aircraft" by VINCI Airports

European Fuel Cell and Hydrogen Conference (Capri, September 2025)

"Scenarios for operational and techno-economic analysis of the hydrogen value chain for aviation" by TU Delft and Leibniz University Hannover

"Impact of GH2 infrastructure and market development on optimal LH2 supply strategies for aviation" by Leibniz University Hannover

3rd Hydrogen Airport Conference (Milan, October 2025)

"Challenges and development of high-flow LH2 refuelling technologies and the H2 masterplan for Lyon-Saint Exupéry Airport" by Airbus & VINCI Airports.

Public deliverables

Two public deliverables are currently available:

Scenarios for techno-economic analysis

This deliverable presents the scenarios which will be used to assess the LH2 demand, supply chain size and cost, and ground operations in WP8.

Feasibility study for LH2 aircraft ground operations at airports across Europe

This deliverable describes the feasibility of integrating LH2 aircraft operations into existing airport ecosystems and plans the demonstrations at three major European airports: Stuttgart, Rotterdam and Lyon, in the frame of WP5.

Collaboration with ALRIGH2T project

The EU-funded GOLIAT and ALRIGH2T projects, which are both developing liquid hydrogen refuelling technologies and conducting demonstrations, have agreed on a collaboration roadmap. A key milestone was reached during the joint workshop held on 22-23 January 2025 at the Austrian Institute of Technology. This event provided an opportunity to discuss critical topics: feasibility analysis and authorisation procedures for proposed demonstrations; techno-economic assessments; identification of standardisation gaps; and the development of common roadmaps to address shared technological challenges related to airport infrastructure, refuel time, boil-off gas management, and LH2 thermodynamics.



GOLIAT - ALRIGH2T Joint workshop at AIT – Vienna – January 2025

Steering Committee meetings

The GOLIAT partners gathered in Brussels for the kick-off meeting in May 2024.

In November 2024, they organised the first Steering Committee (SC) meeting at the Vinci headquarters (Paris).

The second SC was convened at Budapest Airport in May 2025. At this occasion, the first Advisory Board meeting was conducted. The Advisory Board includes representatives from:

- *Clean Aviation Joint Undertaking*
- *Clean Hydrogen Joint Undertaking*
- *ACI EUROPE (Airports Council Initiative)*
- *European Regions Airline Association*
- *AZEA (Alliance for Zero Emission Aviation).*



GOLIAT consortium at Budapest Airport – May 2025

The next SC is scheduled at Airbus premises in Toulouse during November 2025

For more information and updates

GOLIAT Project Website: [Link](#)

EU Cordis Website: [Link](#)

Register and follow us on LinkedIn: [#GOLIAT](#)



**Co-funded by
the European Union**



**UK Research
and Innovation**

Views and opinions expressed are, however, those of the author(s) only and do not necessarily reflect those of the European Union or CINEA. Neither the European Union nor the granting authority can be held responsible for them