

# Liquid Hydrogen Composite Tank for civil aviation – The best of Dutch industries and institutes in one unique consortium

Third RHIA & NAG interactive workshop on the topic of hydrogen & aviation

Marlie Koekenberg – on behalf of the LH2 composite tank consortium  
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# Context

- To make passenger aircraft more sustainable, aircraft OEMs are looking at other forms of energy supply and energy storage.



Airbus - ZeroE



Embraer - Energia



ZeroAvia

# Introduction

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- One of the possible solutions lies in **hydrogen** as an energy carrier and the combustion of hydrogen in combustion engines. However, this requires a radically **different way of storage**.
- **Long life lightweight composite tanks** can provide a better solution for both gaseous and liquid (cryogenic) storage of hydrogen, because of weight and cost saving opportunities - but *“as the world’s first”* needs development.
- For commercial aviation (longer distances and more passengers > 50), the solution will have to be found in the **storage of liquid hydrogen “LH2” under extremely low temperatures at -253 ° C**. (Energy density of pressurized gas not high enough)

# RVO - R&D Mobiliteit (RDM) Fonds – “Resilience fund”

- NAG defined 3 themes to accommodate RVO RDM Funds
- Team relied on solid **NAG support** (WS, red team reviews, briefings, customer online scouting tours etc.)

Lichtere materialen en constructies

Technologie elektrificering systemen en hybride elektrische voortstuwing

Innovatie in ontwerp, productie (technologie) en onderhoud

JEAN-BAPTISTE MANCHETTE is presenting

ZEROe - Aircraft & Technologies

Hydrogen Powered Gas Turbines (Gas turbines with modified combustion chamber, fuel injectors and fuel system)

Liquid Hydrogen Storage (in non-pressurised zone behind rear pressure bulkhead)

Fuel Cell (megawatt scale, supplementing the gas turbines with electrical power at very high levels of efficiency)

Power Electronics & Electric Motors (powered by the fuel cells and injecting energy onto the turbofan shaft)

JEAN-BAPTISTE MANCHETTE

Tim Leeuwerink

PATRICE PATTEVIEL

- LH2 composite tank was **awarded** the RVO RDM Fund in Q4-2021
- <https://www.toraytac.com/media/news-item/2021/12/14/Toray-Advanced-Composites-to-lead-research-consortium-for-development-of-liquid-hydrogen-composite-tanks-for-civil-aviation>

# LH2 composite tank - team

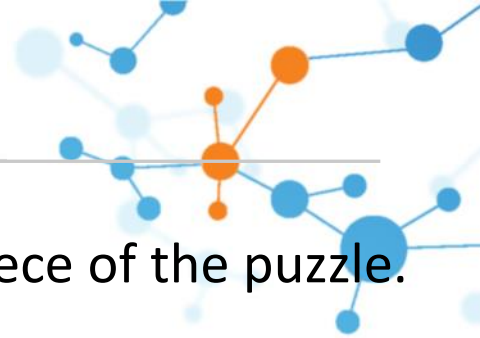


- **Partner linking** through NAG and workshops per theme, partners knowing partners (snowball effect)
- All partners have a **pivotal and unique role**
- **Collaboration** with partners who have limited or no aerospace pedigree
- **Smart workpackages** – clear, easy to execute, no double works.
- **Inspiring and fun!**



# What's next?

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- LH2 composite tank for commercial aerospace is one piece of the puzzle.
- **To complete the picture and claim the headstart for the Netherlands ecosystem on innovation in hydrogen and aerospace**
- We need to **further engage in the liquid hydrogen product and operational technology** for OEMs and the entire hybrid technology.
- By identifying adjacent and complementary activities and projects
  - Aircraft systems
  - Airports
  - Certification
  - Etc...



Thank You!



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