

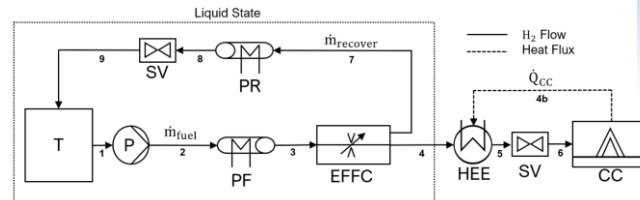
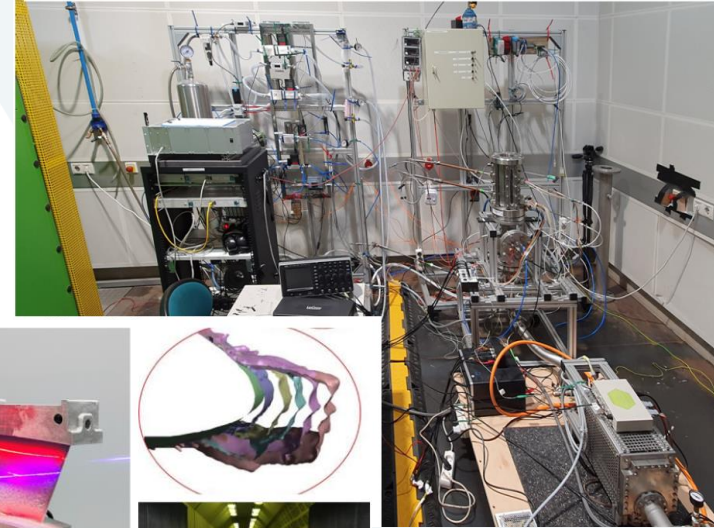
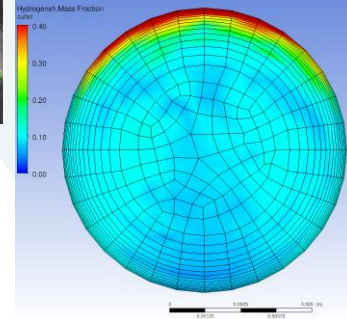
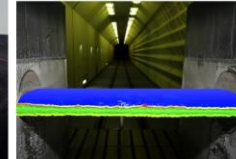
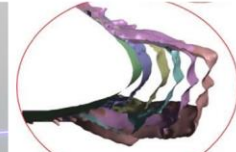
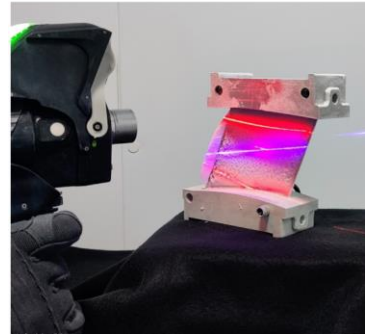
IRON LIQORNE

Iron bird to test a safe and efficient LIQuid
hydrogen fuel system for airbORNE applications

Andreas Tramposch
University of Applied Sciences FH JOANNEUM Graz
Institut Luftfahrt



Kurzdarstellung der Konsortialpartner



Ziel des Projekts

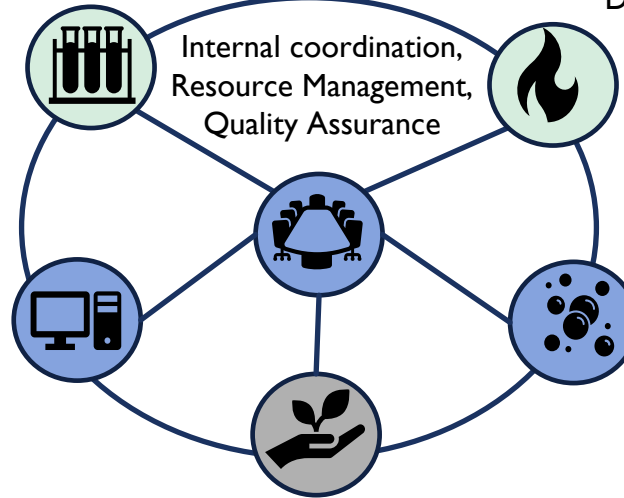
WP2: Cryogenic LN2 fuel system testing (Lead FHJ)

Design and commission of a small-scaled flexible cryogenic research test rig. Testing of individual components and entire systems.

WP4: Thermodynamic 2Phase-Simulation (Lead FHJ)

Adaption, Improvement and Validation of thermodynamic models with experimental data. Parametrized CAE model for flexible change of fluids and conditions. Comparability of fluids.

WP1: Project Management (Lead FHJ)



WP6: Environmental Impact & Utilization

Analysis of the system feasibility for industrial applications. Certification Preparation. Communication and Dissemination. Education of future aircraft engineers.

WP3: Combustor with cryogenic feed (Lead CBOne)

Design of a 40-kW burner with a cryogenic feed. Heat Exchanger concept for gaseous injection phase. Procedures & safety concept.

WP5: Condensation and Icing (Lead AIIS)

Condensation of humid air and icing. Development of multiphase CFD simulation workflow. Analysis of system behaviour caused by boil-off and rapid temperature changes. Validation with experimental data. Avoidance measures. Knowledge transfer from aircraft icing.

Arbeitsplan/Zeitplan/Umsetzung

			2024			2025												2026												2027											
			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4		
			10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
T2-1	Design/Commission LN2 IRON-Bird	FHJ																																							
T2-2	LN2 Procurement and Safety Aspects	FHJ																																							
T2-3	Cryogenic Component and System Testing	FHJ																																							
T2-4	LN2 Flight Mission Testing	FHJ																																							
T3-1	Design of a 40 kW Burner	CBOne																																							
T3-2	Heat Exchanger Concept	CBOne																																							
T3-3	Mission Testing LN2/LNG	CBOne																																							
T3-4	Component Malfunction Testing	CBOne																																							

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			Q4			Q1			Q2			Q3			Q4			Q1			Q2			Q3			Q4														
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T4-1	Thermodynamic RGP Modelling	FHJ																																							
T4-2	Comparability of fluids/fuel systems	FHJ																																							
T4-3	Simscape Model Improvement	FHJ																																							
T4-4	CFD Multiphase Simulation	FHJ																																							
T4-5	Validation	FHJ																																							
T5-1	CFD of Condensation Process	AIIS																																							
T5-2	Experimental Icing Tests	AIIS																																							
T5-3	Anti-Ice/De-Ice System Components	AIIS																																							
T6-1	Environmental Impact & Utilization	CBOne																																							
T6-2	Dissemination of Project Results	ALL																																							
T6-3	Certification Preperation	CBOne																																							



Angestrebte Verwertung

- 1. Academic Publications & Conference Participation:** Publish research in academic journals and present findings at conferences for networking, feedback, and collaboration.
- 2. Education:** Apply project knowledge in Bachelor's and Master's Aviation programs, covering cryogenics, sustainability, thermodynamics, heat transfer, and more. Offer experimental opportunities for theses.
- 3. Collaborative Projects:** Partner with industry, government, and academia for follow-up initiatives, promoting technology transfer and practical applications.
- 4. Social Media & Website:** Share project updates and highlights via social media, reaching students, researchers, industry professionals, and the public.

- 5. Icing Knowledge:** Further development of the AIIS 4D scanning process and the evaluation routine for cryogenic applications. CFD multiphase simulation of condensation will be analyzed and applied to develop more efficient de-icing and anti-icing systems.
- 6. Industrial protection:** Retain control over own developments while remaining open to industrial partnerships.

Kontakte

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Thermodynamics & CAE Modelling

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