

HORIZON
2020

Smart Valve, low cost, low weight and high reliability for tank and cargo compartment inerting systems.

Berichterstattung

Projektinformationen

VISTAC

ID Finanzhilfvereinbarung: 101007686

[Projektwebsite](#)

DOI

[10.3030/101007686](https://doi.org/10.3030/101007686)

Projekt abgeschlossen

EK-Unterschriftsdatum

2 Dezember 2020

Startdatum

1 Februar 2021

Enddatum

28 Februar 2023

Finanziert unter

SOCIETAL CHALLENGES - Smart, Green And Integrated Transport

Gesamtkosten

€ 499 425,00

EU-Beitrag

€ 349 597,00

Koordiniert durch

E A TECHNIQUE



France

Periodic Reporting for period 2 - VISTAC (Smart Valve, low cost, low weight and high reliability for tank and cargo compartment inerting systems.)

Berichtszeitraum: 2022-02-01 bis 2023-02-28

[Zusammenfassung vom Kontext und den Gesamtzielen des Projekts](#)



The present project, VISTAC, offers cooperation between GDTech, highly skilled company in the field of simulation of thermal, fluid and multiphysics behaviour of aeronautical equipment and Equip'Aero TECHNIQUE, recognized design and production organization for aircraft fluid management equipment including innovative solutions. This strong partnership combines expertise in all required fields and experienced practice in working-in and managing research projects. These elements are a guarantee of VISTAC success.

A low weight, low cost, high reliability, and maintainability optimized multiposition valve will be developed for the needs of future generation of halon free fire extinguishing systems using a common On-Board Inert Gas Generation (OBIGGS) with the fuel tank inerting system.

The present project deals with the design of an electrically driven pneumatic valve optimized in mass, reliability, and maintainability: In the frame of the development of the halon free fire extinguishing system using Nitrogen, Using the On-Board Inert Gas Generation System (OBIGGS) already used on the aircraft (fuel tank inerting) and diverting the flow of nitrogen toward cargo.

This valve will, in response to an electrical signal, provide a variable piloted flow section. This variable flow area will permit to the system to implement a closed loop regulation. Thus, the OBIGGS will only be employed at the required level minimizing power consumption.

The overall objectives by the end of the project are:

- Develop a technically optimized valve: Designing and validate a multi-position, electrically piloted, pneumatic valve, that should be mass effective and reliable enough to achieve safety goals of the fire extinguishing system. Achievement of the above characteristics will be done by developing a new generation of actuator based on innovative principles.
- Develop a valve aiming be industrialized and be a competitive product on the market: To maximize impact the valve should be industrialized in a close future and contain the necessary potential for quick time to market. Then design choices will have to be made for industrialization, in service reliability for low number of maintenance actions, they shall consider maintainability aspect.
- Scalability: Scalability of the design must be considered, then the retained actuator technology shall permit to be adapted to other applications. The associated design toolbox shall be available at the end of the project.

This project belongs to the Cleansky 2 program.

Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse



Work done between February 1st to the end of May 2021:

- A technical specification has been written for each part of the pneumatic valve. This specification will allow to trade off all technology.
- all the candidates for fluidic and actuator architecture have been identified in order to confirm the choice of the concept retained in the proposal. Preliminary 0D-1D simulation-based analysis performed by GDTech to assess the performance.
- Design concept trade off has been performed:
- Choice of the technology that is the best candidate.

- The simulation results led to select and design the standard and non-standard parts to be integrated in the prototype. GDTech also updated the preliminary Reliability Analysis.

Main output: At the end of WP3, concept is mature enough to start detailed design of the valve.

Work done from May 2021 to 31/01/22

- design of the part of the prototype (fluidic and actuator) and realisation drawings or specifications of each part to allow manufacturing/purchasing.
 - The number of prototypes has been defined according to the need to validate design.
 - Tests have been performed following the development test plan.
 - the ajustement of the prototype performance has been done following the development test results.
- A numerical correlation has been performed, based on the test results.

Main achievement: All the work done in simulation and by test on the prototypes allowed to pass TRL3 level of maturity.

Work done from February 2021 to the end of the project

- The following dissemination and communication activities have been done along the project :
Presentation in conferences (TSAS event), Participation to industrial event (Istanbul air show)
- The redesign of the development prototype following the preliminary tests that didn't comply with the requirements has been done, followed by the manufacturing and assembly of the new development prototype
- CFD simulations done allowed to characterise the convective exchange on the silicones sleeves that are protecting the SMA wires. Update of the system calculation thanks to the CFD results.
- The following tests have been done on the qualification prototype: Performance, Vibration, Shocks and crash safety, High and low temperature, Endurance
- TRL/MRL has been evaluated to TRL/MRL 4.
- The test benches have been designed, as well as tooling for the assembling of the prototypes

Conclusion of the project:

For the Topic Leader Safran, considering the relative youth of the technology used (Shape Memory Alloy replacing an actuator), the level of knowledge obtained is acceptable. But questions are left unanswered for now such as reliability and safety assessment of this new equipment. It implies that more tests and studies are required to asses the performance and the potential of this technology . This project allowed EAT to increase its knowledge in SMA actuator, from its making and design to its integration in an equipment. This project has then been used as a model and a proof of pedigree to answer requests for proposal.

This project allowed GDTech to gain knowledge about SMA, as well as the design of mechanical effort to operate the SMA wires. A finer model has been developed for the mechanical calculations. This model has been compared and adjusted to the results of qualifications tests.

Outcomes of the project - A communication model has been made with a 3D print body. This represents the future model that could be made with a lighter body. More studies and tests are still required in order to understand the behaviour if the SMA wires and its possible integration in the OBIGGS system.

This project has received funding from the Clean Sky 2 Joint Undertaking (JU) under grant agreement No 101007686. The JU receives support from the European Union's Horizon 2020 research and innovation program and the Clean Sky 2 JU members other than the Union

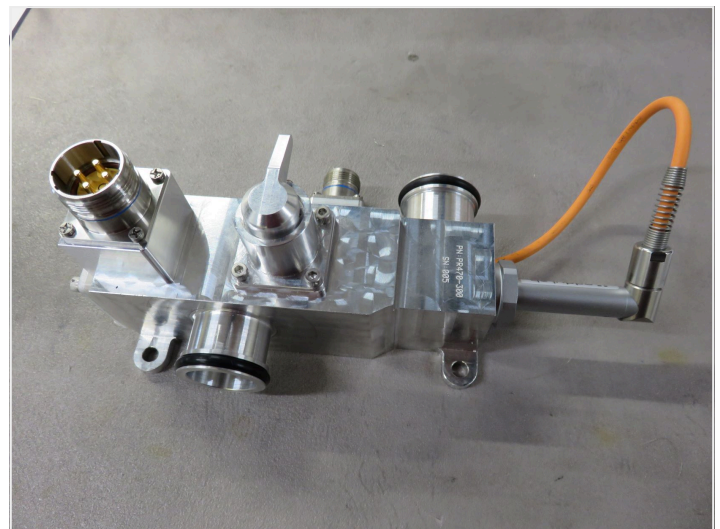
Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

State of the art knowledge of the partners in valves technologies will be associated with the development of a new generation of electromechanical actuator using thermal effects. Heat generated by electrical signal is converted into mechanical force and stroke by the mean of Shape Memory Alloys elements or thermostatic wax elements developed in the ATHT project already ongoing in Equip'Aero Technique R&T department.

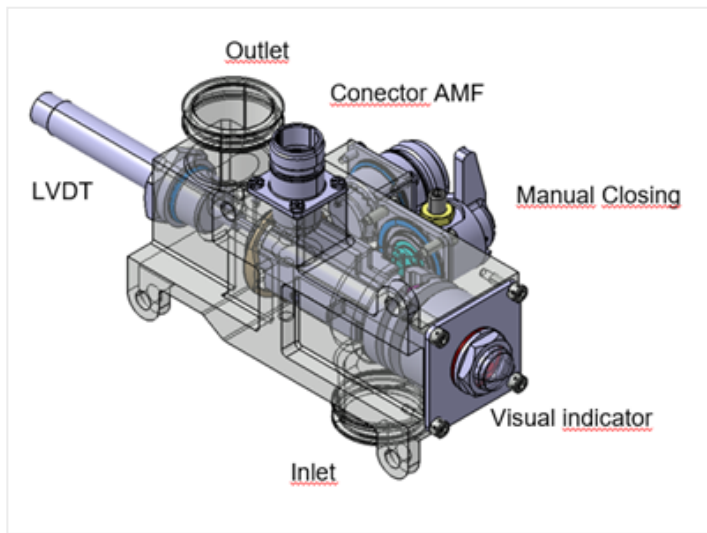
The work carried out has made it possible to better understand the functioning as well as the physical constraints of shape memory materials aka (SMA). TRL 3 maturation means that the potential of the technology is validated in the targeted application fields. The Proof of concept, analytical or experimental is validated. Also, the parameters, functions, important characteristics of the technology, and the intended performances for the areas of application are validated for the entire life cycle.



Vistac valve weight optimization



Final design of the Vistac valve



3D view of the VISTAC valve

Letzte Aktualisierung: 8 Juli 2024

Permalink: <https://cordis.europa.eu/project/id/101007686/reporting/de>

European Union, 2025