Cryogenic Hypersonic Advanced Tank Technologies

Fact Sheet

Project Information

<table>
<thead>
<tr>
<th>CHATT</th>
<th>Funded under FP7-TRANSPORT</th>
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<tr>
<td>Grant agreement ID: 285117</td>
<td>Overall budget € 4 237 230,80</td>
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<tr>
<td>Status</td>
<td>EU contribution € 3 225 681</td>
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<td>Closed project</td>
<td>Coordinated by</td>
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DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV
Germany

Objective

"Topic: Cryogenic propellant management and advanced tank design for hypersonic and advanced future aviation systems

In future aviation and particularly in hypersonic systems new propellants will be used, such as liquid hydrogen, liquid methane and possibly even liquid oxygen. These systems will require complex technology, ultra light-weight, and reusable propellant tank systems. Challenging technological developments are required for such systems. New materials and design concepts are required such as fibre composites in order to reduce the tank weight and to increase the structural performance. Propellant management is imperative for achieving reliable and efficient vehicle operation. The sloshing of cryogenic fluids close to their boiling conditions in tanks of horizontal take-off vehicles is not yet mastered.

Proposed work tasks are:
• Design, manufacturing, and tests of 4 different scaled cryo-tanks in CFRP material including and w/o liner.
• Screening of future cryogenic insulation systems not only lightweight and long lasting but also resistant to the high thermal gradients experienced in hypersonic flight. New cryogenic insulation concepts and materials will be addressed, such as e.g. Aerogels.
• The following propellant management technologies will be studied by simulation or experiment: tank pressurization, fuel location/retention, horizontal sloshing, analytical and experimental study of stratification, nucleation, and boiling in cryogenic fuel tanks subject to surface heat transfer.
• Design of a small ceramic heat exchanger to assess the safe generation of gaseous propellants used for improved tank pressurization, attitude control and cabin oxygen supply. A prototype Rankine cycle cabin air-conditioning system, utilising a cryogenic working fluid is designed.
• All cryo-tank technologies will be driven by system requirements of advanced passenger vehicles (e.g. LAPCAT A2 and the SpaceLiner) and results will at the study end be assessed on impact.”

Field of science

/engineering and technology/materials engineering/composites
/technology/materials engineering/composites/carbon fiber

Programme(s)

Topic(s)

Call for proposal

FP7-AAT-2011-RTD-1

Funding Scheme

CP-FP - Small or medium-scale focused research project

Coordinator

DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV

Address
Linder Hoehe
51147 Koeln
Germany

Activity type
Research Organisations

EU contribution
€ 859 586
Participants (10)

TOTALFORSVARETS FORSKNINGSINSTITUT
Sweden
€ 249 375
Address
Gullfossgatan 6
164 90 Stockholm
Website
Administrative Contact
Ines Sander (Mrs.)
Activity type
Research Organisations

RISE SICOMP AB
Sweden
€ 413 055
Address
Fibervaegen 2 - Ojejbyn
941 26 Pitea
Website
Administrative Contact
Mats Dalenbring (Dr.)
Activity type
Other

UNIVERSITE LIBRE DE BRUXELLES
Belgium
€ 188 280
Address
Avenue Franklin Roosevelt 50
1050 Bruxelles
Website
Administrative Contact
Patrick Hendrick (Prof.)
Activity type
Higher or Secondary Education Establishments
Orbspace Aron Lentsch
Austria
EU contribution
€ 272 825
Address
Frauenkirchnerstrasse 1
7141 Podersdorf Am See
Activity type
Private for-profit entities (excluding Higher or Secondary Education Establishments)
Website
Contact the organisation
Administrative Contact
Aron Lentsch (Mr.)

EOTVOS LORAND TUDOMANYEGYETEM
Hungary
EU contribution
€ 63 000
Address
Egyetem Ter 1-3
1053 Budapest
Activity type
Higher or Secondary Education Establishments
Website
Contact the organisation
Administrative Contact
Katalin Sinkó (Dr.)

TECHNISCHE UNIVERSITEIT DELFT
Netherlands
EU contribution
€ 151 734
Address
Stevinweg 1
2628 CN Delft
Activity type
Higher or Secondary Education Establishments
Website
Contact the organisation
Administrative Contact
Martin Hoekstra (Mr.)

ECM-ENGINEERED CERAMIC MATERIALS GMBH
Germany
EU contribution
€ 129 450
Address
Am Bleichbach 10
85452 Moosinning
Activity type
Private for-profit entities
(excluding Higher or Secondary Education Establishments)
Website
Contact the organisation
Administrative Contact
Matthias Kroedel (Mr.)

CENTRE DE RECHERCHE EN AERONAUTIQUE ASBL - CENAERO
Belgium
EU contribution
€ 390 500
Address
Batiment Eole, 1Er Étage - Rue Des Frères Wright 29
6041 Gosselies
Activity type
Research Organisations
Website
Contact the organisation
Administrative Contact
Bertrand Herry (Dr.)

GAS DYNAMICS LTD
United Kingdom
EU contribution
€ 291 726
Address
22 Empress Avenue
GU14 8LX Farnborough
Activity type
Private for-profit entities
(excluding Higher or Secondary Education Establishments)
Website
Contact the organisation
Administrative Contact
Craig Walton (Dr.)

ADVANCED LIGHTWEIGHT ENGINEERING BV
Netherlands
EU contribution

€ 216 150

Address
Rotterdamseweg 145
2628 AL Delft

Activity type
Private for-profit entities
(excluding Higher or Secondary Education Establishments)

Website

Contact the organisation

Administrative Contact
Jan Koppert (Mr.)

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