

FAR 2022

2nd International Conference on Flight Vehicles,
Aerothermodynamics and Re-entry Missions and Engineering

Official Conference Programme

19 – 23 June 2022 | Heilbronn | Germany



Overview

(Venue: AULA Bildungscampus, Bildungscampus 6, 74076 Heilbronn, Germany)

| | Day Zero Sunday 19.06.2022 | Day One Monday 20.06.2022 | Day Two Tuesday 21.06.2022 | Day Three Wednesday 22.06.2022 | Day Four Thursday 23.06.2022 |
|-----------|---------------------------------|---|--|-------------------------------------|---|
| Morning | Lecture Day | Conference Opening | Conference | Conference | Conference |
| Afternoon | | Conference | | | Conference Closure |
| Evening | | Science Evening <i>Will be held at Experimenta (Heilbronn)</i> | Gala Dinner <i>Will be held at Harmonie (Heilbronn)</i> | | Technical Visit of DLR & ArianeGroup Test Center Lampoldshausen |



Day ZERO

19th June 2022

Sunday

8:30 – 18:00

AULA Foyer

Registration

9:00 – 10:40

AULA Saal

Lecture 1

Current Challenges in Computational Fluid Dynamics for Space Missions

by Richard Schwane (ESA)

10:40 – 11:00

AULA Foyer

Coffee & Networking Break

11:00 – 12:40

AULA Saal

Lecture 2

Globalisation and the Future of Aerothermodynamics

by Louis Walpot (ESA)

12:40 – 14:00

Lunch Break

14:00 – 15:40

AULA Saal

Lecture 3

Green Propellants for New Space

by Helmut Ciezki (DLR)

15:40 – 16:00

AULA Foyer

Coffee & Networking Break

16:00 – 17:40

AULA Saal

Lecture 4

Ground Testing for Future Space Transportation Systems

by Anja Frank (DLR)



Day ONE

20th June 2022

Monday

8:30 – 18:00
AULA Foyer

Registration

8:30 – 9:30
AULA Foyer

Welcome Coffee

9:30 – 10:45
AULA Saal

Conference Opening

Opening Speeches

by Peter Gräf (DLR), Torben Henriksen (ESA), Michael Kleiner (State of Baden-Wuerttemberg), Wilfried Hajek (City of Heilbronn), Stefan Schlechtriem (DLR), Helmut Ciezki (DLR) and Jamila Mansouri (ESA)

10:45 – 11:15
AULA Saal

Keynote Speech 1

by Roberto Vittori (ESA)

11:15 – 12:15
AULA Saal

Plenary Round Table 1

One Space

moderated by Orr Cohen (ESA) with Kazuhisa Fujita (JAXA), Peter Gräf (DLR), Torben Henriksen (ESA), Marius-Ioan Piso (ROSA), Helmut Spitzl (EUSPA), Ethiraj Venkatapathy (NASA) and Roberto Vittori (ESA)

12:15 – 13:30
AULA Foyer

Lunch Break

13:30 – 14:00
AULA Saal

Keynote Speech 2

NASA's Entry, Descent and Landing (EDL) Technology Portfolio

by Michelle Munk (NASA Langley Research Center)

14:10 – 14:30

Session 1.1 | KONFERENZ EINS
Supersonic and Hypersonic Flight Vehicles and Missions
Chairs: N. Viola, D. Bonetti

Experimental investigation of aerodynamic forces and shockwaves for waveriders in supersonic and slip regime carried out in the MARHy facility

H. Noubel (CNRS)

14:30 – 14:50

Influence of the rarefaction degree on the aerodynamic performances of hypersonic waveriders: experimental and numerical analysis

D. Toussaint (CEA)

14:50 – 15:10

SeRANIS Multispectral Object Sensing by AI-processed Cameras Experiment – An Overview

M. Mueller (UniBw)

15:10 – 15:30

Numerical methods for laminar-turbulent transition prediction in Hypersonic regime

G. M. Infante (CIRA)

15:30 – 15:50

Baseline Systems Design and Performance Analysis of Thermal Energy Management System for Hypersonic Commercial Aircraft

S. Nambiar (Politecnico di Torino)

Session 1.2 | KONFERENZ ZWEI
Testing Facilities, Model Verification and Validation
Chairs: R. Schwane

Empirical Extraction of Quantitative Material Demiseability Parameters from Plasma Wind Tunnel Experiments

A. Pagan (University of Stuttgart)

Development of Plasmatron Wind Tunnels at the Center for Hypersonics and Entry Systems Studies

F. Panerai (University Of Illinois At Urbana-Champaign)

Evaluation of High Enthalpy Air Plasma Conditions for Investigation of Magnetohydrodynamics Flow Interactions

J. Oswald (University of Stuttgart)

Commissioning and characterization of semi-elliptical and conical supersonic nozzles for space debris demise testing in the VKI Plasmatron

L. Sombaert (VKI)

Characterization of the aerothermomechanical response of quartz, Zerodur and titanium space debris materials to atmospheric entry plasmas

A. Fagnani (VKI)

Session 1.3 | KONFERENZ DREI
Aerothermodynamics
Chairs: J. Bertrand, S. Hickel

Microscale Rough Surface Turbulent Heating Augmentation Study for High-Speed Earth Entry

A. Mazaheri (NASA)

A Multivibrational Mode Relaxation Scheme for Two-Temperature Thermochemical State Models

A. Mazaheri (NASA)

Assessment of the radiative heat flux on the backshell during an atmospheric entry maneuver at Saturn's Titan

J. Beyer (University of Stuttgart)

Numerical rebuilding of the aerothermal environment of the Schiaparelli Entry Module

M. Spel (RTech)

Fidelity Management of Aerothermodynamic Modelling for Destructive Re-entry

F. Morgado (University Of Strathclyde)

Session 1.4 | KONFERENZ VIER
Thermal Protection Systems
Chairs: J.M. Bouilly, M. Marini

Spark plasma sintering of ceramic-based materials for application in hypersonic and re-entry vehicles

M. Wiśniewska (Łukasiewicz)

NASA Efforts to Explore Additively Manufactured Thermal Protection Systems

E. Venkatapathy (NASA)

Thermal Protection Materials and Systems at NASA Ames Research Center

M. Stackpoole (NASA)

THE EFESTO PROJECT: ADVANCED EUROPEAN RE-ENTRY SYSTEM BASED ON INFLATABLE HEAT SHIELD

G. Guidotti (Deimos)

Session 1.5 | KONFERENZ FÜNF
Engineering Software Tools
Chairs: J. Merrifield, S. Weikert

Unsteady simulation of an externally excited LOX/H₂ experimental combustor

F. Tonti (DLR)

Using GPUs for Efficient Launch Vehicle Aerodynamics

O. Gloth (enGits)

Improving liquid propulsion modeling capabilities in the European Space Propulsion System Simulation (ESPSS) library

F. Rodriguez (Empresarios Agrupados)

Aerodynamic studies of sounding rockets developed by the Students' Space Association

N. Sahbon (Warsaw University of Technology)

Acoustic Analysis of a Liquid-Propellant Rocket Engine - Optimisation of the Meshing Strategy

P. Kekus (Łukasiewicz)

Session 1.6 | KONFERENZ SECHS
Workshop: In-Orbit Demonstrators
Chair: C. Jeger

HEARTED, the Hyper-velocity Earth Re-entry Demonstrator

L. Ferracina (ESA)

Human In The Loop for Moon Landing

L. Ferracina (ESA)

MiniPINS – A Suite of Instruments for the Exploration of Moon and Mars

V. Fernandez Villace (ESA)

LUMEN – the DLR liquid rocket engine demonstrator

J. Deeken (DLR)

Flight Test Designs for High-Speed Transportation

J. Steelant (ESA)

15:50 – 16:10
AULA Foyer

Coffee & Networking Break

16:10 – 16:30

Session 1.7 | KONFERENZ EINS
Supersonic and Hypersonic Flight Vehicles and Missions
Chairs: J. Steelant, G. Governale

Destinus' technology roadmap to hypersonic global delivery

D. Bonetti (Destinus)

16:30 – 16:50

MAIN ACHIEVEMENTS OF THE H2020 STRATOFly PROJECT

N. Viola (Politecnico di Torino)

16:50 – 17:10

Aero-Thermal Design of STRATOFly MR3 Hypersonic Vehicle

R. Scigliano (CIRA)

17:10 – 17:30

SPACECASE: DEVELOPMENT OF A COMMERCIAL TEST PLATFORM FOR REENTRY EXPERIMENTS

J. Bertrand (ArianeGroup)

Session 1.8 | KONFERENZ ZWEI
Testing Facilities, Model Verification and Validation
Chairs: H. Ciezki, A. Turchi

Validating numerical tools for predicting injector-coupled combustion instability

J. Hardi (DLR)

Experimental Concept to Improve Surface Tension and Dynamic Contact Angle Modelling in Computational Fluid Dynamics for Micro-gravity Cases

E. M. Dupuy (ESA)

Mobile Laboratory for Rocket Propulsion Tests (MOLAR). Design Consideration and status report of Mobile Test Bench for green propulsion and solid motors testing

T. Mayer (Łukasiewicz)

Design and Preliminary Numerical Analysis of a Flexible Structure for a Cold Gas Nozzle Experiment

S. Jack (DLR)

Session 1.9 | KONFERENZ DREI
Aerothermodynamics
Chairs: V. Fernandez Villace, D. Schneider

DSMC study of hypersonic ablation using SPARTA

C. Stemmer (TU Munich)

In-situ spectral emissivity assessment of sintered silicon carbide (SSiC) in high-enthalpy flows for catalysis investigations

C. Kaiser (University of Stuttgart)

Direct numerical simulation of the chemically reacting boundary layer of hypersonic flows subject to ablation

M. Karimi (TU Munich)

Session 1.10 | KONFERENZ VIER
Thermal Protection Systems
Chairs: H. Ritter, M. Stackpole

DEVELOPMENT OF DOMESTIC LYOCCELL BASED PHENOLIC IMPREGNATED CARBON ABLATOR (PICA-D) FOR FUTURE NASA MISSIONS

M. Gasch (NASA)

ReChar: Assessment of reliable material characterisation methods for charring ablators

B. Helber (VKI)

Wood fibre materials on hot sounding rocket structures

R. Guenther (TU Dresden)

DEVELOPMENT OF 3D MATERIALS FOR HEATSHIELDS OF ATMOSPHERIC REENTRY CAPSULES

G. Pinaud (ArianeGroup)

Session 1.11 | KONFERENZ FÜNF
Engineering Software Tools
Chairs: J. Merrifield

Aerodynamic coefficients estimation tool for re-entry vehicle missionisation

J. Guadagnini (Deimos)

On the role of turbulence in scallops formation on the ablative heat shield of a reentry vehicle.

M. Stuck (CEA)

Application of a thermo-mechanical FEM method to re-entry problems

B. Fritsche (HTG)

PAMPERO V3, A SPACECRAFT-ORIENTED REENTRY ANALYSIS CODE

P. Van Hauwaert (RTech)

Session 1.12 | KONFERENZ SECHS
Workshop: In-Orbit Demonstrators
Chair: C. Jeger

Space Rider Observer Cube (SROC) Demonstrator

TBD (ESA)

Feasibility and Preliminary Design of a Moon Drone Vehicle

TBD (ESA)

The Ram-EP technology VLEO satellite mission design and integrated ram-EP ground testing towards a demonstrator mission
L. Walpot (ESA)

Workshop Wrap-Up

C. Jeger (ESA)

Science Evening

18:00 – 22:30

Experimenta Heilbronn

18:00 – 18:30 Arriving of guests

18:30 – 19:30 Buffet

19:30 – 21:30 Exhibition tour, panorama rooftop access and 3D movie screening (Capcom Go!)

21:30 – 22:30 Reception with drinks & finger food



Day TWO

21st June 2022

Tuesday

8:30 – 9:00
AULA Saal

Keynote Speech 3

Space for Europe
by Helmut Spitzl (EUSPA)

Session 2.1 | KONFERENZ EINS
Reusable Space Transportation Systems
Chairs: S. Schuster, G. De Zaiacomò

MIURA, the first reusable European microlauncher
M. Climent (PLD Space)

Reentry decelerator device for aerodynamic control of reusable launch vehicle stages
A. Zamprota (Pangea Aerospace)

Supersonic Braking Devices for Reusable Upper Stages – Overview of RocketHandbrake
C. Hantz (DLR)

Space Rider: Design of a System Drop Test for the validation of the Descent and Landing mission phase.
P. Vernillo (CIRA)

LUMEN Evolution for Lunar Lander Propulsion
J. Deeken (DLR)

Session 2.2 | KONFERENZ ZWEI
Testing Facilities, Model Verification and Validation
Chairs: G. Herdrich

The Effect of Rarefaction Level on Shock/Shock Interferences applied to Atmospheric Re-entry: Experimental Study in a Supersonic Rarefied Flow
V. Cardona (CNRS)

Experiments on the static stability of a changing capsule shape in hypersonic flow
P. Seltner (DLR)

Determination of trajectory-based ground testing conditions for space-debris material by means of a data-driven approach
A. Turchi (VKI)

Numerical rebuilding of magnetic heat flux control experiments for re-entry vehicles by enhanced MHD simulation tools
J. Giacomelli (University of Stuttgart)

A Transpiration Cooled Heat Flux Sensor utilizing Plenum Pressure: Measurement in High Enthalpy Flow
F. Hufgard (University of Stuttgart)

Session 2.3 | KONFERENZ DREI
Aerothermodynamics
Chairs: C. Mundt

High Enthalpy Flow Diagnostics for Atmospheric Entry Research
S. Loehle (University of Stuttgart)

Light field imaging for re-entry flows
M. Eberhart (University of Stuttgart)

A multi-GPU based algorithm for atmospheric entry flows
D. Ninni (Politecnico di Bari)

Quasiclassical Trajectory State-Specific Dissociation Rates of the H₂+H Collision
J. Vargas (King Abdullah University Of Science And Technology)

Hypersonic shockwave / boundary layer interactions with different wall-to-freestream temperature ratios
D. Surujhlal (DLR)

Session 2.4 | KONFERENZ VIER
Thermal Protection Systems
Chairs: J. Lachaud

HARLEM: a platform for studying carbon-phenolic ablators with embedded diagnostics
S. Loehle (University of Stuttgart)

On the effect of the internal gas flow velocity on the thermal conductivity of porous Thermal Protection Systems
J. Chevalier (I2M)

Transient Material Response Analysis of Carbon-based Thermal Protection Systems for Rocket Nozzle Applications
M. Rotondi (Sapienza University Of Rome)

Session 2.5 | KONFERENZ FÜNF
Engineering Software Tools
Chairs: D. Ferretto, C. Jeger

Updates on the Predictive Materials Modeling Software Tools
A. Borner (NASA)

Predictive Tools for Supersonic Retropropulsion Flows
J. Shafner (University Of Maryland)

Ray-tracing Analysis of the Effect of an Applied Magnetic Field onto Re-entry Radio Communication Blackout
J. Laur (University of Luxembourg)

Session 2.6 | KONFERENZ SECHS
Workshop: Lampoldshausen Testing Facilities
Chair: H. Ciezki

P5 – Test Bench for Ariane Main Engine – Prepared for the Future
P. Altenhoefer (DLR)

P5.2: European Versatile Stage Test Facility
G. Kruehsel (DLR)

Operation of Test Facilities for Upper Stage Engines: High Altitude Test Facility P4
C. Gusinde (DLR)

The Test Facility P2 as a High Flexible Test Plant for Current and Future Engines
V. Kraft (DLR)

Research and Technology Test Bench P8 and P8.3
L. Mueller (DLR)

9:10 – 9:30

9:30 – 9:50

9:50 – 10:10

10:10 – 10:30

10:30 – 10:50

10:50 – 11:10

AULA Foyer

Coffee & Networking Break

Session 2.7 | KONFERENZ EINS
Reusable Space Transportation Systems
Chairs: A. Marwege, J. Vos

Leakage Investigation of Epoxy-Based Composite Laminates for Reusable Cryogenic Propellant Tanks

C. Rauh (DLR)

Session 2.8 | KONFERENZ ZWEI
Testing Facilities, Model Verification and Validation
Chairs: E. M. Dupuy, A. Okninski

Ablation modeling of liquefying materials

P. Schrooyen (Cenaero)

Session 2.9 | KONFERENZ DREI
Aerothermodynamics
Chairs: C. Stemmer, S. Hickel

A Conservative Cut-Cell Immersed Boundary Solver for Accurate Simulation of Hypersonic Flows with Gas-Surface Interactions

A. O. Baskaya (TU Delft)

Session 2.10 | KONFERENZ VIER
Thermal Protection Systems
Chairs: J. Lachaud

Ablative material numerical test case series (AblANTIS)—From experimental tests to numerical results

A. Turchi (VKI)

Session 2.11 | KONFERENZ FÜNF
Engineering Software Tools
Chairs: C. Jeger, D. Ferretto

Machine-Learn-Driven Prediction of Streamwise Vorticity Induced by a Random Distributed Roughness Patch in Hypersonic Flow

F. Ulrich (TU Munich)

Session 2.12 | KONFERENZ SECHS
Workshop: Lampoldshausen Testing Facilities
Chair: H. Ciezki

Overview on the DLR M3 Test Infrastructure

M. Boerner (DLR)

11:10 – 11:30

AURORA – Aircraft-like Access to Space

W. Fischer (Polaris Raumflugzeuge)

Low-cost hypersonic flight testing using the T-Minus rocket motors

L. Pepermans (T-Minus)

Shock Tube Simulations with the PIC-DSMC Code PICLas

R. Tietz (University of Stuttgart)

Carbon ablation in 4D

F. Panerai (University Of Illinois At Urbana-Champaign)

Numerical Turbine Blade Fatigue Life Analysis Taking into Account Partial Admission Effects

J. Riccius (DLR)

Green and Advanced Storable Rocket and High-speed Airbreathing Propulsion – Highlights and Capabilities of Text Complex M11

C. Kirchberger (DLR)

11:30 – 11:50

Concept for a reusable lunar shuttle with hybrid propulsion using in-situ resource utilization

M. Haupt (TU Braunschweig)

Cost-effective options for parachute testing on the Barracuda high-altitude sounding rocket

L. Pepermans (T-Minus)

Numerical Modeling of Hypersonic Air and Carbon Dioxide Flows in Thermochemical Non-equilibrium with SU2-NEMO Solver

M. Çelik (Roketsan)

Two Temperature Ablative Material Response Model With Application to Low-Density Carbon Phenolic Ablators

H. Scandelli (Arts et Métiers ParisTech)

An entropy stable and positivity preserving multi-dimensional Finite Volume method for simulating supersonic flows over unstructured grids

P.H. Maire (CEA)

Green Hydrogen at DLR Lampoldshausen – Extension of the Existing H2 Infrastructure

A. Haberzettl (DLR)

11:50 – 12:10

Espace Space center - Reusability missions, testing and orbital launch

C. Krokstedt (Espace Space Center)

Computation of Compressible Flow by Means of the Potential Theory

W. Kitsche (DLR)

Development and validation of a numerical procedure for ablation analysis in hypersonic re-entry applications

L. Cutrone (CIRA)

Workshop Wrap-Up

H. Ciezki (DLR)

12:10 – 12:30

12:30 – 13:00

AULA Courtyard

Conference Group Picture

13:00 – 14:00

AULA Foyer

Lunch Break

Plenary Round Table 2

14:00 – 15:00
AULA Saal

Sustainable Space, A Keystone to the Future?

moderated by Helmut Ciezki (DLR) with Stefanos Fasoulas (University of Stuttgart), Angelo Fontana (AVIO), Stefan Hässler (ArianeGroup), Kristian Lium (NAMMO), Davide Nicolini (ESA) and Markus Peukert (OHB)

Session 2.13 | KONFERENZ EINS
Reusable Space Transportation Systems
Special Track: RETALT
Chairs: S. Schuster

Key Technologies for Retro Propulsive Vertical Descent and Landing – RETALT – an Overview

A. Marwege (DLR)

Aerodynamic Phenomena of Retro Propulsion Descent and Landing Configurations

A. Marwege (DLR)

CFD Simulations and Wind Tunnel Experiments for Re-usable Launch Vehicles

J. Vos (CFS Engineering)

Aerothermal Databases and CFD Based Load Predictions

M. Laureti (DLR)

Session 2.14 | KONFERENZ ZWEI
Decelerators

Chairs: L. Ferracina, P. Tran

Hypersonic Wind Tunnel Test of Passive Deployable Aeroshell using Shape Memory Alloy

K. Yamada (JAXA)

Development and Flight Demonstration of Reentry & Recovery Module with Deployable Aeroshell Technology for Sounding Rocket Experiment

T. Nakao (JAXA)

Development and Flight Plan of Nanosatellite BEAK for Breakthrough Technology Demonstration using Deployable Aeroshell

Y. Nagata (JAXA)

IRENE – The Design and the Qualification of an Innovative Deployable Thermal Protection Shield for the Atmospheric Re-entry

P. Vernillo (CIRA)

Session 2.16 | KONFERENZ VIER
Thermal Protection Systems

Chairs: G. Pinaud, F. Panerai

Investigating the graphitization of carbon and its effects by means of multi-scale numerical simulations.

F. Torres-Herrador (VKI)

Experimental investigation of heat transfer in Calcarb : one or two temperature model ?

S. Liu (Arts et Métiers ParisTech)

Stochastic mechanical modeling of fibrous ablaters: the influence of defects on directional behavior

M. Seif (University Of Kentucky)

Session 2.17 | KONFERENZ FÜNF
Multidisciplinary and Multiphysics Vehicle Design

Chairs: S. Weikert, S. Fasoulas

MICROLAUNCHER DESIGN AND COST ESTIMATION (IDREAM PROJECT)

G. Narducci (Politecnico di Torino)

HUMAN LUNAR LANDER MULTIDISCIPLINARY DESIGN TOOL

G. Narducci (Politecnico di Torino)

Results of a VLEO Satellite Design Optimisation for Drag Minimisation

F. Hild (University of Stuttgart)

Propulsion System Design for Hybrid Sounding Rockets

A. Dabanovic (DLR)

15:10 – 15:30

15:30 – 15:50

15:50 – 16:10

16:10 – 16:30

16:30 – 16:50
AULA Foyer

Coffee & Networking Break

Session 2.18 | KONFERENZ EINS
Reusable Space Transportation Systems
 Special Track: RETALT
 Chairs: S. Schlechtriem, R. Bergström

Mission Engineering for the Recovery and Vertical Landing of an Orbital Launch Vehicle

G. De Zaiacomo (Deimos)

Optimum GNC Solutions for the Recovery and Vertical Landing of an Orbital Launch Vehicle

G. De Zaiacomo (Deimos)

Development of a Trowelable TPS Cork Material for Reusable Launch Vehicles

S. Paixao (Amorim Cork Composites)

Thermal characterization of cork- and ceramics-based TPS in DLRs arc-heated wind tunnel

C. Hantz (DLR)

Drop test description and evaluation of a landing leg for a reusable future launch vehicle

C. Thies (MT Aerospace)

Landing leg and aerodynamic control surface mechanisms and functional demonstrators for the RETALT1 launch vehicle

A. Krammer (Almatech)

Session 2.19 | KONFERENZ ZWEI
Space Exploration Flight Vehicles

Chairs: S. Pavesi, V. Fernandez Villace

From the ISS to the Moon – The Success Story of ArianeGroup Propulsion for exploration and Commercial Missions

U. Gotzig (ArianeGroup)

A Novel Human-in-the-loop testing facility for space applications

M. Neves (DLR)

Human In-the-Loop Flight Controls Assessment for Moon Descent & Landing Vehicles

M. Hagenfeldt (GMV)

Mission design of a Planetary Exploratory Mission to Mercury

V. Mani (TU Berlin)

Session 2.20 | KONFERENZ DREI
Aerothermodynamics

Chairs: V. Lago, R. Schwane

Impact of Shape Change on Capsule Aerodynamics and Shock-Wave Boundary Layer Interaction

T. Gawehn (DLR)

Sensitivity Study of Dust-Laden Flows in the DLR GBK Facility using the DUST-US3D Framework

A. Sahai (Analytical Mechanics Associates)

Comparing Particle Flow Regimes in the L2K Arcjet with Martian Entry Conditions

G. Palmer (Analytical Mechanics Associates)

Assessment of Particle Drag Models Using GBK Experimental Data

G. Palmer (Analytical Mechanics Associates)

Session 2.21 | KONFERENZ VIER
Thermal Protection Systems

Chairs: G. Pinaud, F. Panerai

Characterization and Modeling of Arc-Jet Sample Spallation Particles

K. Price (University Of Kentucky)

Spallation of Different Carbon Preforms in Arcjet Facilities

F. Grigat (University Of Stuttgart)

16:50 – 17:10

17:10 – 17:30

17:30 – 17:50

17:50 – 18:10

Gala Dinner

18:30 – 23:00
 Harmonie

18:30 – 19:30 Arriving of guests and welcome drink
 19:30 – 23:00 Dinner and *Best Paper Awards* ceremony

Day Three

22nd June 2022

Wednesday

8:30 – 9:00
AULA Saal

Keynote Speech 4

What it takes to conceive, mature and mission infuse entry and TPS technologies at NASA?
by Ethiraj Venkatapathy (NASA Ames Research Center)

Session 3.1 | KONFERENZ EINS
(Re)-Entry and Aero-Assisted Vehicles

Chairs: M. Sanjurjo Rivo, L. Walpot

LARGE EDDY SIMULATION OF THE UNSTEADY SUPERSONIC FLOW AROUND A MARS ENTRY CAPSULE AT DIFFERENT ANGLES OF ATTACK

L. Placco (University of Padua)

Aerocapture and Aerobraking upon Planetary Arrival using Inflatable Vehicles: Multidisciplinary Design and Assessment

T. Hormigo (Spin.Works)

Modelling and Validation of an Autorotation Landing Controller for Reentry and Descent Applications

C. Riegler (JMU Wuerzburg)

Adaptive heat shield mechanism for a Venus re-entry vehicle

V. Mani (TU Berlin)

Numerical Investigation of MHD based Heat Shield System for Mars Missions

V. Sharma (KU Leuven)

Session 3.2 | KONFERENZ ZWEI
Design for Demise and Clean Space

Chairs: S. Lemmens, P.H. Maire

Design for Containment techniques to reduce spacecraft re-entry footprint

M.A. Vidal Urriza (Thales Alenia Space)

Thermite-for-Demise (T4D): Material Selection for Exothermic Reaction-Aided Spacecraft Demise during Re-entry

A. Finazzi (Politecnico Di Milano)

Additive Manufacturing for D4D: Thermoplastic Demisable Joints for High Altitude Break-up

I. Sakraker (DLR)

Experimental demise study of CF/PEEK composite fasteners for spacecraft structural panel assembly

A. Looten (EPFL)

Design for Demise Breadboarding and Containment Techniques

B. Lockett (OHB)

Session 3.3 | KONFERENZ DREI
Aerothermodynamics

Chairs: J. Bertrand, V. Lago

DNS of a Hypersonic Flow on a Ramp Geometry with Isolated Roughness

G. Chiapparino (TU Munich)

Investigations of the Laminar-Turbulent Boundary-Layer Transition of a Blunted Cone in the Mars Atmosphere

F. Teschner (UniBw)

Environmental Forcing Effects on Entropy Layer Instabilities over Hypersonic Blunt Cones

L. Whyborn (University of Queensland)

Session 3.4 | KONFERENZ VIER
Inflatable Decelerators & Flexible TPS
Special Track: EFESTO
Chairs: EFESTO Project Team

9:10 - Opening

H. Ritter (ESA)

9:20 - Introduction

EFESTO Project Coordinator

9:25 - Mission & Systems

DLR & Deimos

10:05 - Aerodynamics & Aerothermodynamics

ONERA

10:25 – Keynote: Innovative re-entry technologies by NASA

A. Cassell (NASA)

Session 3.5 | KONFERENZ FÜNF
Testing Facilities, Model Verification and Validation
Chairs: D. Schneider, G. Herdrich

The Oxford T6 Stalker Tunnel: Performance, Upgrades & New Modes of Operation

M. Mcgilvray (University of Oxford)

Extension of Test Times in Ludwig Tunnels

J. Hillyer (University of Oxford)

High-pressure combustion and qualification of ESTHER shock-tube driver

R. Grosso Ferreira (Istituto Superior Tecnico)

Qualification of the European Shock-Tube for High Enthalpy Research

M. Lino Da Silva (Istituto Superior Tecnico)

Flow Characterization of the GBK Facility

D. Allofs (DLR)

9:10 – 9:30

9:30 – 9:50

9:50 – 10:10

10:10 – 10:30

10:30 – 10:50

10:50 – 11:10

AULA Foyer

Coffee & Networking Break

Session 3.6 | KONFERENZ EINS
(Re)-Entry and Aero-Assisted Vehicles

Chairs: M. Munk, L. Walpot

CaStAShape: re-entry capsule aerodynamics and stability in the presence of ablation and shape change

A. Turchi (VKI)

Towards flying a Destructive Re-entry Assessment Container Object

S. Lemmens (ESA)

Modelling structural response to aerothermodynamic loads during destructive atmospheric re-entry

C. Maddock (University of Strathclyde)

BFS « Back From Space », an atmospheric reentry kit for Newspace application

C. Pieronne (e.NOVA Aerospace)

Session 3.7 | KONFERENZ DREI
Design for Demise and Clean Space

Chairs: T. Lips, J. Annaloro

PRODUCERS: A tool for predicting the spectrographic response of break-up fragments to the re-entry environment

J. Merrifield (Fluid Gravity Engineering)

De-Risk of the Development of a High-Speed, High-Accuracy, Multi-Physics Propagator to be used in Design for Demise

J. Cornish (Frazer-Nash Consultancy)

ELECTRA: THE CNES LAUNCH AND RE-ENTRY RISK ANALYSIS TOOL

J.F. Goester (CNES)

A Probabilistic Assessment of the Impact of Improved Component Modelling in Destructive Re-entry Calculations

J. Beck (Belstead Research)

Session 3.8 | KONFERENZ DREI
Aerothermodynamics

Chairs: K. Fujita, V. Fernandez Villace

Thermodynamic, Kinetic, and Radiative Database Updates for High-Enthalpy Air and CO₂-N₂ Flows

M. Lino Da Silva (Instituto Superior Tecnico)

CFD Optimization of Film Cooling in Thrusters using 98% Hydrogen Peroxide as Oxidizer

C. Chmielewski (Łukasiewicz)

Sate-of-the-art enthalpy determination procedures employed in high enthalpy facilities

E. Anfuso (VKI)

Aerospike nozzle design, aerothermodynamic analysis and flowfield characterization

F. Neto (Instituto Tecnológico De Aeronáutica)

Session 3.9 | KONFERENZ VIER
Inflatable Decelerators & Flexible TPS
Special Track: EFESTO

Chairs: EFESTO Project Team

F-TPS Design and Testing

Aviospace & DLR

Inflatables Structures Design and Testing

CIRA & ONERA

Future applications and roadmap

Politecnico di Torino & Deimos

Q & A Workshop Closure

EFESTO Project Team & ESA

Session 3.10 | KONFERENZ FÜNF
Space Exploration Flight Vehicles

Chairs: S. Pavesi, M. Di Clemente

A Magnetohydrodynamic Enhanced Entry System for Space Transportation (MEESST)

M. La Rosa Betancourt (Neutron Star Systems)

Direct Simulation Monte Carlo Studies of the Gas Sampling for the VATMOS-SR Mission Concept

A. Borner (Analytical Mechanics Associates)

Design and Qualification of the RIDER fluid transfer system for spacecrafts

A. Echebarria (SENER)

Xenon Refueling Compressor: Engineering Model Development and Testing

I. Ušakovs (Allatherm)

11:10 – 11:30

11:30 – 11:50

11:50 – 12:10

12:10 – 12:30

12:30 – 14:00

AULA Foyer

Lunch Break

Plenary Round Table 3

14:00 – 15:00
AULA Saal

Opportunities and Challenges for International Collaboration in Flight Vehicles, Aerothermodynamics & Reentry Technologies

moderated by Michelle Munk (NASA) with Alan Cassell (NASA), Marco Di Clemente (ASI), Kazuhisa Fujita (JAXA), Ashley Korzun (NASA), Jamila Mansouri (ESA), Florin Mingireanu (ROSA), Mairead Stackpoole (NASA) and Ethiraj Venkatapathy (NASA)

15:00 – 18:00
AULA Foyer

Poster Session

Session 3.11 | KONFERENZ EINS
(Re)-Entry and Aero-Assisted Vehicles

Chairs: A. Cassell, C. Stemmer

Hyper-velocity EArth Re-entry TEchnology Demonstrator (HEARTED) – an essential step for sample return mission preparation

G. De Zaiacomo (Deimos)

Hyper velocity demonstration mission to prepare Europe for Sample Return and future explorations (HEARTED)

J. Bertrand (ArianeGroup)

Overview and analysis of the orbital re-entry of the KRUPS capsule

K. Price (University of Kentucky)

Sequential Convex Programming for Onboard Re-entry Trajectory Optimization

J. Sintes Garcia (Universidad Carlos III de Madrid)

Session 3.12 | KONFERENZ ZWEI
Design for Demise and Clean Space

Chairs: C. De Persis

Re-entry survival analysis with DEBRISK V3

S. Galera (CNES)

Lessons learned from the development of DEBRISK v3

J. Annaloro (CNES)

Fragmentation release criteria of demising spacecraft components and their spectral fingerprint

A. Pagan (University of Stuttgart)

Development of high-fidelity spacecraft-oriented tool

V. Ledermann (RTech)

Session 3.13 | KONFERENZ DREI
Space Exploration Flight Vehicles

Chairs: M. Di Clemente

System-level mission design for Venus exploration through a rover and an orbiter

V. Mani (TU Berlin)

Design of an Adaptive Re-entry decelerator for Martian Atmosphere

V. Mani (TU Berlin)

Session 3.14 | KONFERENZ VIER
Inflatable Decelerators & Flexible TPS

Chairs: T. Hancock

THE EFESTO PROJECT: FLEXIBLE TPS DESIGN AND TESTING FOR ADVANCED EUROPEAN RE-ENTRY SYSTEM BASED ON INFLATABLE HEAT SHIELDS

T. Schleutker (DLR)

Developing a flexible thermal protection system for Mars entry: systems engineering, mechanical design and manufacturing processes

T. Hancock (Vorticity)

Developing a flexible thermal protection system for Mars entry: thermal design and testing

J. Merrifield (Fluid Gravity Engineering)

Testing and Qualification of a flexible thermal protection system on Ariane 6

M. Moser (Ruag)

Session 3.15 | KONFERENZ FÜNF
Testing Facilities, Model Verification and Validation

Chairs: D. Schneider

Overview on integration of R&T and Education Activities at the DLR Institute of Space Propulsion

H. Ciezki (DLR)

Mobile Rocket Motor Altitude Simulation Platform and its Operation on Test Bench P8

G. Kruehsel (DLR)

Investigation Of Spatially Resolved Heat Flux Determination From In-Depth Temperature Data

C. Duernhofer (University of Stuttgart)

15:10 – 15:30

15:30 – 15:50

15:50 – 16:10

16:10 – 16:30

16:30 – 16:50

Coffee & Networking Break

AULA Foyer

Session 3.16 | KONFERENZ EINS
Suborbital and Small Launch Systems

Chairs: F. Lourenco

NEXT GENERATION FLIGHT TERMINATION SYSTEM FOR LAUNCHERS - FTSnext

S. Weikert (Astos)

Derivation of Requirements for Autonomous Flight Termination System

M. Schwarzbach (HyImpulse)

Mission analysis and flight safety to launch a hybrid sounding rocket

D. Corbo (HyImpulse)

Environmental disturbances and vehicle uncertainties impact on the design of a sub-orbital vehicle roll control system

T. Moreira (Omnidea)

Session 3.17 | KONFERENZ ZWEI
Design for Demise and Clean Space

Chairs: F. Cacciatore

Hypersonic Aerodynamics of a Free-Flying Ring Interfering with a Two-Dimensional Curved Shock Wave - An Experimental Test Case

D.G. Kovacs (VKI)

In-Situ Measurements in Early Phase Re-Entry of the SOURCE CubeSat for Numerical Simulation Validation

D. Galla (University of Stuttgart)

Asteroid Impacts on the Ocean and its Short-Term Consequences: a Portuguese Case Study

R. Morais (Universidade da Beira Interior)

Session 3.18 | KONFERENZ DREI
Decelerators

Chairs: E. Venkatapathy, L. Ferracina

The ExoMars 2022 Parachute System

J. Underwood (Vorticity)

Development Status of Powered Descent for High-Mass Mars Entry, Descent, and Landing Systems

A. Korzun (NASA)

CFD retro-propulsion simulation with FLUSEPA code

M. Bouarfa (ArianeGroup)

Session 3.19 | KONFERENZ VIER
Inflatable Decelerators & Flexible TPS

Chairs: H. Ritter

THE EFESTO PROJECT: DESIGN, DEVELOPMENT AND TESTING OF THE INFLATABLE STRUCTURE AND ITS GROUND DEMONSTRATOR

R. Gardi (CIRA)

Cool-gas Generators for Space Inflatables

R. Matthijssen (Aerospace Propulsion Products)

Experimental Qualification of Key Elements of a Novel Inflatable Atmospheric Decelerator System for Rocket Stages

A. Pagan (University of Stuttgart)

Session 3.20 | KONFERENZ FÜNF
Flight Data Analysis and Exploitation

Chairs: M. Campana, S. Caruel

Supporting the safety and efficiency of airspace transition for launch and re-entry operations in Europe

A. Stahnke (DLR)

PFAT - Post-Flight Analysis Toolkit

G. De Zaiacomo (Deimos)

Design and validation tool for modular Flight Software in the domain of NewSpace launch services development

E. Diez (GTD)

Variance Decomposition of MEDL12 Reconstructed Heating Using Neural Networks

H. Alpert (Analytical Mechanics Associates)

16:50 – 17:10

17:10 – 17:30

17:30 – 17:50

17:50 – 18:10

Free Evening for Individual Activities in Heilbronn

Day FOUR

23rd June 2022

Thursday

8:30 – 9:00
AULA Saal

Keynote Speech 5
JAXA's EDL&R Mission Achievements and Future Plans
by Kazuhisa Fujita (JAXA)

9:10 – 10:10
AULA Saal

Plenary Round Table 4
The Rise of Commercial Space
moderated by Thilo Kranz (ESA) with Rasmus Bergström (Pangea Aerospace), Philipp Dahm (Rocket Lab), Antonio Figueroa (The Exploration Company), Pablo Gallego (PLD Space) and Christian Schmierer (HyImpulse)

10:10 – 10:30
AULA Foyer

Coffee & Networking Break

Session 4.1 | KONFERENZ EINS
Suborbital and Small Launch Systems

Chairs: C. Schmierer, C. Jeger

HyImpulse Small Launcher – The European Hybrid Launch Vehicle

F. Hertel (HyImpulse)

Design and Launch of the Hybrid Rocket Demonstrator Compass

M. Oechsle (University of Stuttgart)

Mission design of FOK guided rocket

K. Kaczmarek (Warsaw University of Technology)

The ILR-33 AMBER 2K suborbital rocket: a low-cost in-flight test platform and a step to green orbital and exploration space transportation systems

A. Okninski (Łukasiewicz)

Session 4.2 | KONFERENZ ZWEI
Design for Demise and Clean Space

Chairs: O. Cohen, A. Gabrielli

Deorbit and Clean Space - what we need from a Space Propulsion point of view

U. Gotzig (ArianeGroup)

Breakup Analysis of Structural Spacecraft Materials using Plasma Wind Tunnel Testing including Mechanical Load Cases

D. Leiser (University of Stuttgart)

Ecological Impact of Re-entering Launcher Structures in Comparison to Natural Sources

J.S. Fischer (University of Stuttgart)

Session 4.3 | KONFERENZ DREI
Decelerators

Chairs: P. Vernillo, E. Venkatapathy

Development of a Rigid Deployable Decelerator Concept for Small Mars Landers

S. Foerste (DLR)

European Advanced Parachute Reefing: developing a space-qualified programmable reefing cutter

T. Hancock (Vorticity)

Session 4.4 | KONFERENZ VIER
Thermal Protection Systems

Chairs: S. Hudrisier, M. Marini

Critical design of a re-entry TRANspiration Cooling Experiment - TRACE

N. Heyn (Space Team Aachen)

Development Status of the CMC Thermal Protection System and Body Flap Assembly of Space Rider, the First Re-usable European Space Transportation System

R. Gardi (CIRA)

Arc-jet testing and catalytic model development for the ceramic reinforced composite material of the Space Rider flaps

L. Cutrone (CIRA)

Session 4.5 | KONFERENZ FÜNF
Flight Data Analysis and Exploitation

Chairs: S. Caruel

Lessons Learned from Aerothermal Flight Data on NASA Mars Entry Vehicles

K. Edquist (NASA)

REBUILD AND DATA EXPLOITATION OF THE AVUM RE-ENTRY EVENT FOR BREAK-UP MODEL DEVELOPMENT

J. Dumon (RTech)

10:30 – 10:50

10:50 – 11:10

11:10 – 11:30

11:30 – 11:50

12:00 – 12:30

AULA Saal

Conference Closure

by Jamila Mansouri (ESA), Stephan Schuster (ESA), Representatives of FAR 2024

12:30 – 13:30

AULA Foyer

Lunch Break

13:30 – 18:30

Lampoldshausen

Technical Visit of DLR & ArianeGroup Test Center Lampoldshausen

13:30 Bus departure from Bildungscampus (please be at the registration desk in the AULA at 13:15)

14:30 – 17:30 Guided tour of exhibition hall on European rocket development and visit of DLR & ArianeGroup propulsion test facilities

18:30 Bus arrival at Bildungscampus

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