

SPACECRAFT	SPACE TRANSPORTATION	GENERAL INTEREST
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## Tuesday 15th May 2018

	Session 1 - ST - Programmes	Session 2 - ST - Components: Combustion Chambers	Session 3 - ST - System Modelling	Session 4 - SC - Lessons Learned	Session 5 - SC-CP - Components: Green Monopropellant Thrusters	Session 6 - SC-EP - Mission Analysis	Session 7 - SC-EP - Thermal (1)	Session 8 - SC - Microsatellite Propulsion (1)
ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5
Chairpersons	E. D'Aversa, ASI, IT J. Breteau, ESA	M. De Rosa, ESA	F. Di Matteo, ESA J. Hijikema, ONERA, FR	M. Peukert, OHB System, DE V. Hruby, Busek, US	H. Mulkey, NASA Goddard, US T. Langener, ESA	N. Viola, Politecnico di Torino, IT G. Ortega, ESA	M. Smith, ESA	A. Aanesland, ThrustMe, FR K. V. Mani, Politecnico di Milano, IT
09:00	331 Propulsion systems developments for next generation of the European Vega Launcher E. D'Aversa, Italian Space Agency (ASI), IT	123 Experimental Investigation and Numerical Simulation of Cooling Film in the Nozzle Extension of a LOX/H2 Subscale Thrust Chamber V. Zhukov, German Aerospace Center (DLR), DE	193 Statistical approach in structural mechanics for robust design of liquid rocket engines C. Marattukalam, ArianeGroup, DE	165 In-Orbit Performance of the LISA Pathfinder Cold Gas Micro-Propulsion System G. Morris, Airbus Defence & Space, GB	388 HAN-based Monopropellant Thruster Development with New Heat-Resistant Catalyst K. Hatai, Japan Aerospace Exploration Agency (JAXA), JP	465 Mission Scenarios for High-Power Electric Propulsion C. Paissoni, Politecnico di Torino, IT	109 Optimum Design of Low Pressure Micro-Resistojets Applied to Nano- and Pico-satellites D. Cordeiro Guerrieri, TU Delft, NL	104 Dual Chemical-Electric Propulsion Systems Design for Interplanetary CubeSats K. V. Mani, Politecnico di Milano, IT
09:20	328 Development of Rocket Engines in Russia S. Mosolov, Keldysh Research Center, RU	176 3D-printed coaxial injector for a LOX/kerosene rocket engine M. Kuhn, German Aerospace Center (DLR), DE	453 Cycle Analysis and Feasibility Evaluation of Pump fed Hybrid Propulsion System R. Hahn, German Aerospace Center (DLR), DE	147 15 years orbital operation summary of DRTS (Data Relay Test Satellite) unified propulsion subsystem and the lessons learned D. Goto, Japan Aerospace Exploration Agency (JAXA), JP	134 Development status of a 200mN class low-cost thruster for small satellites. S. Igarashi, IHI Aerospace, JP	32 Orbital Maneuvers of Earth Observing Satellites Using Electric Propulsion Systems M. Kazeev, NRC Kurchatov Insitute, RU	257 High Performance Resistojet Thruster: STAR Status Update M. Robinson, University of Southampton, GB	387 Development and Ground Testing of the PM200 Bi-Propellant CubeSat Propulsion Module J. Wink, Hyperion Technologies, NL
09:40	72 Getting to Mars and back beyond the initial missions S. Scimemi, NASA Headquarters, US	523 Numerical fatigue life analysis of a prospective LCH4-cooled core stage main combustion chamber wall and comparison to LH2 cooling J. Riccius, German Aerospace Center (DLR), DE	79 A presentation of a complete design cycle for optimized hybrid rocket motors J. Hijikema, ONERA, FR	146 Initial orbital operation results of SLATS IES (Ion Engine Subsystem) and RCS (Reaction Control Subsystem) D. Goto, Japan Aerospace Exploration Agency (JAXA), JP	549 Development of 1N green propellant thruster in MHI (Mitsubishi Heavy Industries, Ltd.) D. Shiraiwa, Mitsubishi Heavy Industries (MHI), JP	334 Enhancement of the maneuverability capabilities of a small spacecraft for remote sensing of the earth for stereoscopic surveys based on the unified platform AIST-2 I. Tkachenko, Samara University, RU	300 Performance Evaluation of 10 W Class Water Resistojet: AQUARIUS for CubeSats K. Nishii, The University of Tokyo, JP	74 Final Development of the Osaka Institute of Technology 2nd PROITERES Nano-Satellite with High-Power Electrothermal Pulsed Plasma Thrusters for Powered Flight H. Tahara, Osaka Institute of Technology (OIT), JP
10:00		89 On the use of Methane in Rocket Nozzle Cooling Channels – Bench scale trials J. Fridh, KTH Royal Institute of Technology, SE	572 An Overview of the ESPSS Libraries: Latest Developments and Future J. Vila, Empresarios Agrupados, ES	155 Chemical Propulsion In-flight Experience and Analysis Correlation I. Fischer, OHB System, DE	90 Green Propulsion Advancement and Infusion H. Mulkey, NASA Goddard Space Flight Center, US	73 Deorbit of Space Debris by Exposure of Plasma Flows Exhausted from Electric Thrusters with PROITERES-4 Nano-Satellite K. Kajihara, Osaka Institute of Technology (OIT), JP		71 Final Development of Coaxial Pulsed Plasma Thruster systems for Powered Flight onboard the Osaka Institute of Technology 2nd PROITERES Nano-Satellite K. Enomoto, Osaka Institute of Technology (OIT), JP
10:20			170 Implementation of a two-phase pipe component inside the ESPSS library M. Leonardi, Sapienza University of Rome, IT	434 Primary In-Space Experimental results of the HEP-100MF Thruster On Satellite XY-2 Y. Shen, Beijing Institute of Control Engineering, CN	443 The Experimental Investigation and On-orbit Flying Validation of the ADN-based Liquid Thruster Z. Yao, Beijing Institute of Control Engineering, CN			261 Performance Improvement and Flight Model Design of the Water Resistojet Propulsion System, AQUARIUS for 6U CubeSat: EQUULEUS A. Hattori, The University of Tokyo, JP
10:40			143 RPA 3: new features for modelling rocket propulsion systems A. Ponomarenko, RP Software+Engineering, DE		563 Investigation of the thermal catalytic thruster on han-based monopropellant D. Goza, EDB Fakel, RU			511 ThrustMe – a provider of electric space propulsion systems for the next generation satellites A. Aanesland, ThrustMe, FR
11:00	COFFEE BREAK							

## Tuesday 15th May 2018

Session 9 - ST - Reusability

Session 10 - ST - Solid Rocket Motors

Session 11 - ST - Modelling: Multi-Phase Flows

Session 12 - SC-CP - Green propulsion

Session 13 - SC-CP - Components: Hydrogen Peroxide Thrusters

Session 14 - SC-EP - System Analysis (1)

Session 15 - SC-EP - Thermal (2)

Session 16 - SC - Microsatellite Propulsion (2)

ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5
Chairpersons	U. Palmnäs, Palmnäs & Co., SE	A. Ciucci, ESA	M. Pizzarelli, ASI, IT S. Soller, ArianeGroup, DE	J. W. Robinson, NASA Marshall, US N. Pelletier, CNES, FR	L. Prevost, CNES, FR D. Valentini, SITAEL, IT	A. Demaire, OHB Sweden A. Semenkin, Keldysh, RU	A. Oren, Rafael, IL M. Coletti, Thales Alenia Space, UK	D. Packan, Onera, FR M. Micci, Penn State, US
11:30	348 Prometheus: Precursor of new low-cost rocket Engine Family T. Fuhrmann, ArianeGroup, FR	504 Optimal Design of a First Stage SRM for a Class of VEGA Light Vehicles A. Neri, European Space Agency (ESA), IT	222 A five equation model for the simulation of the two-phase flow in cryogenic coaxial injector A. Murrone, ONERA, FR	28 Overview of the CNES "High Performance Green Monopropellant Project": Requirements, Organization & Breakthroughs N. Pelletier, CNES, FR	454 Development of a Flight Type 1N Hydrogen Peroxide Thruster U. Gotzig, ArianeGroup, DE	375 Refinement of Performance and Flexibility Needs for Electric Propulsion B. Wollenhaupt, OHB System, DE	326 Endurance Testing of the STAR Additively Manufactured Resistojet M. Robinson, University of Southampton, GB	258 Performance dependence on the microwave frequency of the miniature water ion thruster and its neutralizer Y. Nakagawa, The University of Tokyo, JP
11:50	406 Callisto - Reusable VTOL launcher first stage demonstrator E. Dumont, German Aerospace Center (DLR), DE	560 An electro-mechanical thrust vector control system for the VEGA-C launcher T. Vanthuynne, SABCA, BE	67 Experimental and Numerical Investigation of Cryogenic Two-Phase Flows and Application to Liquid Rocket Propulsion Systems S. Soller, ArianeGroup, DE	66 Green monopropellant thruster complete design and optimization by numerical simulation Q. Levard, ONERA, FR	101 Test Bench Preparation and Hot Firing Tests of a 1 N Hydrogen Peroxide Monopropellant Thruster F. Lauck, German Aerospace Center (DLR), DE	419 Performance Mapping of Electrostatic Propulsion Devices M. Andrenucci, SITAEL, IT	405 XMET: a Xenon Electrothermal Thruster using additive manufacturing D. Staab, AVS UK, GB	391 On the development and Demonstration of the NanoSpace CubeSat Propulsion Module Product Family with Close-loop Thrust Control K. Palmer, GomSpace Group, SE
12:10	478 Assessment of a European reusable VTOL booster stage J. Wilken, German Aerospace Center (DLR), DE	221 Modular Solid Propulsion Design J. Poucel, ArianeGroup, FR	12 Influence of non-linear mixing effects onto flow and heat transfer in rocket combustion chambers S. Fechter, German Aerospace Center (DLR), DE	75 Research and development of green propellant engines for space propulsion systems Q. Lin, Shanghai Institute of Space Propulsion, CN	481 Green Propellant Thruster Design for LEO Platforms Active Debris Removal D. Valentini, SITAEL, IT	344 Automated System Analysis and Design for Electric Propulsion Systems E. Manfred, University of Stuttgart Institute of Space Systems (IRS), DE	451 Spatially resolved plasma power deposition in a radio-frequency electrothermal microthruster S. Doyle, University of York, GB	433 Latest Progress of Micro-Propulsion Development Activities in BICE Y. Shen, Beijing Institute of Control Engineering, CN
12:30	309 Preliminary Component Definition of Reusable Staged-Combustion Rocket Engine M. Sippel, German Aerospace Center (DLR), DE	250 ARTA 6 firing test : combining Ariane 5 MPS nozzle production support and contribution to Ariane 6 nozzle design. F. Dufour, ArianeGroup, FR	78 Numerical evaluation of the characteristics of Liquid Hydrogen Mixer using LES T. Shimizu, Japan Aerospace Exploration Agency (JAXA), JP	185 Test Facility for Research on Advanced Green Propellants under High-Altitude Conditions M. Wilhelm, German Aerospace Center (DLR), DE	489 Experimental Campaign on a 98% H2O2 Pulsed Thruster D. Valentini, SITAEL, IT	420 EP Boom Operations Concept on the Electra Satellite Platform for GEO Applications H. Lübberstedt, OHB System, DE	55 Performance Characteristics and Electrode Erosion of Low-Power Water-Cooled and Anode-Radiation-Cooled DC Arcjet Thrusters Using Water and HAN Propellants K. Okuda, Osaka Institute of Technology (OIT), JP	Design of a Flexible Propulsion Test bed for CubeSats S. Corpino, Politecnico di Torino, IT
12:50	40 Aerothermal Analysis of Reusable Launcher Systems during Retro-propulsion Reentry and Landing T. Ecker, German Aerospace Center (DLR), DE		228 Modeling of multi-phase effects in cold-gas nozzle flows K. Makowka, ArianeGroup, DE	3 Predicted performance of 10 N High Test Peroxide engine using reduced-order flow model D. Darfilal, Algerian Space Agency, DZ	254 Development of near-anhydrous hydrogen peroxide ( $\geq 97\%$ ) for satellite propulsion and assessment of material compatibility for fluidic components and light weight propellant tanks M. Wolf, ArianeGroup, DE	194 Architecture Features and Application Aspects of High-Power Spacecrafts with Electric Propulsion A. Solodukhin, Keldysh Research Center, RU		305 A 17.8 GHz Ammonia Microwave Electrothermal Thruster for CubeSats and Small Satellites M. Micci, Pennsylvania State University, US
13:10	LUNCH							

## Tuesday 15th May 2018

### ROOM PLENARY SESSION – SEVILLA

14:30

#### PLENARY ROUND TABLE 1: MICROSATELLITE PROPULSION – INNOVATION AND PERSPECTIVES

**Moderator: Sabrina CORPINO**, Politecnico di Torino  
**Ane ANESLAND**, Co-founder and CEO, ThustMe  
**Robert DE TRY**, Engineering Director, GomSpace  
**Christophe KOPPEL**, Chief Consulting Engineer, KopooS Consulting  
**Michael M. MICCI**, Professor of Aerospace Engineering, Penn State University  
**Alexander REISSNER**, Founder and CEO, Empulsion  
**Giorgio SACCOCCIA**, Head of Propulsion and Aerothermodynamics Division, ESA

16:00

#### COFFEE BREAK

Session 17 - ST - Engine developments (1)

Session 18 - ST - P120C Motor (1)

Session 19 - ST - Air-breathing Propulsion - SABRE (1)

Session 20 - SC-EP - GIT (1)

Session 21 - SC-CP - Components: Monopropellant Thrusters

Session 22 - SC-EP - System Analysis (2)

Session 23 - SC-EP - Modelling (1)

Session 24 - SC - Microsatellite Propulsion (3)

### ROOM GIRALDA TRIANA 1 TRIANA 2 ESPAÑA 1 ESPAÑA 2 ESPAÑA 3 ESPAÑA 4 ESPAÑA 5

Chairpersons	H. Gray, Airbus D&S, UK S. Henry, ArianeGroup, FR	E. Pradie, ArianeGroup, FR	M. Ford, ESA	K. Hall, QinetiQ, UK N. Wallace, ESA	U. Gotzig, ArianeGroup, DE A. Mayer, TNO, NL	H. Leiter, ArianeGroup, DE B. Wollenhaupt, OHB System, DE	J. Laube, OHB System, DE	A. Reissner, ENPULSION, AT M. Tajmar, University of Dresden, DE
16:20	349 VULCAIN 2.1, the European reference for Ariane 6 lower stage cryogenic propulsive system L. Dariol, ArianeGroup, FR	558 Progress Synthesis of the Development of the Common Propulsive Srm for Ariane 6 and Vega C T. Germani, EUROPROPULSION, FR	512 ESA/UK Space Agency Progress and Overview on the SABRE Engine M. Ford, European Space Agency (ESA), NL	197 Development of a 30-cm Ring Cusp Discharge Chamber - design and performance characterisation with simulated ion beam extraction S. Ciaralli, Mars Space Ltd, GB	540 Design, Development and Flight of the new European MHT-1N Monopropellant Thruster A. Watts, Nammo Westcott, GB	467 Design and Cost Analysis of High-Power Solar Electric Propulsion Platforms M. Mammarella, Politecnico di Torino, IT	128 openPlume, new concept for next generation plume modelling B. Zitouni, OHB System, DE	398 Development of a resistorjet for cubesats A. Mayer, TNO, NL
16:40	95 Development of advanced oxygen-kerosene rocket engines on basis of RD170/RD171 engines for LV of medium and heavy classes. V. Sudakov, NPO Energomash, RU	206 Ariane 6 & VEGA-C Programs - The P120C Nozzle Development Progress Status E. Gautronneau, ArianeGroup, FR	506 The SABRE Engine – Concept and Development Status S. Driscoll, Reaction Engines, GB	352 T5 gridded ion engine development P. Randall, QinetiQ, GB	204 Development of Reaction Control System and low-cost 50N thruster for the H3 Launch Vehicle S. Koga, IHI Aerospace, JP		156 EP plasma plume: Modelling, validation status and way forward J. Laube, OHB System, DE	458 Vacuum Arc Thrusters for space propulsion with magnet field enhancements and exotic materials M. Kühn, Universität der Bundeswehr München, DE
17:00	282 Innovative Solid Propulsion Technologies for Space Applications M. Berdoyes, ArianeGroup, FR	279 Two Minutes Inside P120C SRM - Current Status on the future SRM thrust oscillations behavior S. Larrieu, ArianeGroup, FR	423 HTX – High Temperature Heat Exchanger Development I. Duran, Reaction Engines, GB		562 Investigation of the ultra-low thrust hydrazine thermal catalytic thruster D. Goza, EDB Fakel, RU			163 Integration and Miniaturization Challenges in the Design of Micro-Propulsion Systems for Picosatellite Platforms V. Pallichadath, Delft University of Technology, NL
17:20	33 Development Progress of LE-9 Engine for H3 Launch Vehicle H. Kawashima, Japan Aerospace Exploration Agency (JAXA), JP	394 Advanced Plants designed for Non-Destructive-Testing of P120 Solid Propellant Motor in development for Ariane 6 and Vega C Programs E. Tosti, Avio, IT	503 SABRE DEMO-A – Key Challenges for a Ground Demonstrator R. Varvill, Reaction Engines, GB	366 Development and qualification status of the RIT 2X electric propulsion system J.-P. Porst, ArianeGroup, DE	301 European Fuel Blend Development for space craft propulsion A. Mayer, TNO, NL	129 Helium passivation: calibration with in-orbit data B. Zitouni, OHB System, DE	212 A Xenon Detailed Global Model in Support of Electric Propulsion Technology K. Katsonis, DEDALOS Ltd, GR	8 Design and numeric simulation of a solid propellant microthruster for the attitude control of cubesat L. Shipeng, Beijing Institute of Technology, CN
17:40	65 Progress of Engineering Model Hot-Firing Tests in LE-9 Engine Development T. Fujiwara, Mitsubishi Heavy Industries (MHI), JP	1 Integrated Production Plant for the Nozzle of the P120C booster of Ariane 6 O. Drevet, ArianeGroup, FR	502 SABRE TF1 – Development of the SABRE Demonstrator Test Facility S. Driscoll, Reaction Engines, GB	410 QinetiQ High Power Electric Propulsion Systems J. Perez Luna, QinetiQ, GB	218 Testing of a novel nitrous-oxide and ethanol fuel blend I. Waugh, Airborne Engineering, GB	551 Presentation of a French passivation device for spacecraft propulsion system (uperforator) : qualification status and test results of firing on reactive mixtures T. Liénart, CNES, FR N. Bocquillon, LACROIX, FR	295 A 3D electron fluid model to study magnetic field effects on an expanding plasma thruster plume F. Cichocki, Carlos III University of Madrid (UC3M), ES	311 Active attitude control with thrusters versus magnetic torquers for CubeSats C. Koppel, KopooS Consulting, FR
18:00	133 Qualification Test Results of the 2nd Stage Engine for H3 Launch Vehicle S. Ukai, Japan Aerospace Exploration Agency (JAXA), JP	2 Deployment of a new Industrialization process in Ariane Group : Example of the nozzle of the P120C booster of Ariane 6 E. Pradie, ArianeGroup, FR	505 SABRE Technology Development – Pathways to Flight J. Barth, Reaction Engines, GB	422 Thrust measurements of a RIT using a thrust balance based on an inverted pendulum S. Scharmann, Justus Liebig University, DE	53 Influence of combustion chamber size (L*) on characteristic exhaust velocity (c*) for a N2O/C2H4 premixed green propellant L. Werling, German Aerospace Center (DLR), DE	479 Impulsive helium venting impact S. Hyde, European Space Agency (ESA), NL	306 On electromagnetic and plasma thruster thermodynamics M. Ivanov, Central Institute of Aviation Motors, RU	
18:20	END OF DAY 2							

Wednesday 16th May 2018

ROOM

PLENARY SESSION – SEVILLA

08:30

**KEYNOTE SPEECH 3: INITIATIVE IN VERY HIGH POWER ELECTRIC PROPULSION WITH SOLAR AND NUCLEAR SOURCES**  
Alexander SEMENKIN, Deputy General Director, Keldysh Research Center

Session 33 - SC - Programmes

Session 34 - ST - Components: Tanks and lines

Session 35 - ST - Solid Rocket Motors Modelling &amp; Test

Session 36 - SC - Components: Propellant Management (1)

Session 37 - SC-CP - Components: Bipropellant Thrusters

Session 38 - SC-EP - Plasma Thrusters (1)

Session 39 - SC-EP - Modelling (3)

Session 40 - SC - Microthruster Propulsion Systems

ROOM

GIRALDA

TRIANA 1

TRIANA 2

ESPAÑA 1

ESPAÑA 2

ESPAÑA 3

ESPAÑA 4

ESPAÑA 5

Chairpersons	J. Gonzalez Del Amo, ESA N. Viola, Politecnico di Torino, IT	D. Goto, JAXA, JP W. L. Johnson, NASA Glenn, US	E. Cavallini, ASI, IT R. Devillers, ONERA, FR	J. Bejhed, GodSpace, SE J. Kuiper, Bradford, NL	G. Fujii, JAXA, JP	M. Andrenucci, SITAEL G. Popov, RIAME MAI, RU	D. Packan, ONERA, FR M. Coletti, Thales Alenia Space, UK	C. Collingwood, ESA S. Corpino, Politecnico di Torino, IT
09:10	294 Flexible Operations of the BepiColombo Electric Propulsion System H. Gray, Airbus Defence & Space, GB	179 Structural Heat Intercept, Insulation, and Vibration Evaluation Rig (SHIIVER) W. Johnson, NASA Glenn Research Center, US	304 Pressure Oscillations Analysis and Reconstruction of P80 Flight Data M. Laureti, Sapienza University of Rome, IT	269 Development of Next-Generation Electric Propulsion Fluid Management Systems J. Kuiper, Bradford Engineering, NL	242 MMH/MON-3 bi-propellant ceramic thruster and joining of ceramic and metal G. Fujii, Japan Aerospace Exploration Agency (JAXA), JP	54 Performance Characteristics of Low-Power Direct-Current Arcjet Thrusters with Low-Toxicity Propellants T. Mimura, Osaka Institute of Technology (OIT), JP	339 Study on the Influence of Anode on Discharge Characteristics and Performance of Multistage Cusped Field Thruster W. Jiang, Harbin Institute of Technology, CN	483 Micro Propulsion for Scientific Missions L. Fallerin, Leonardo, IT
09:30	255 Propulsion System Development and Verification Activities for the Jupiter Icy Moons Explorer (JUICE) M. Wolf, ArianeGroup, DE	361 Evaluation of diaphragm behavior of partially loaded RCS propellant tank under vibration and acceleration condition D. Goto, Japan Aerospace Exploration Agency (JAXA), JP	303 Investigation of Pressure Oscillation Phenomena in Aft-Finocyl Solid Rocket Motor M. Laureti, Sapienza University of Rome, IT	493 MEMS Based Flow Control Module for Electric Propulsion, Recent Developments and Qualification Approach J. Bejhed, NanoSpace, SE	548 Development of 10N bipropellant ceramic thruster in MHI (Mitsubishi Heavy Industries, Ltd.) D. Shiraiwa, Mitsubishi Heavy Industries (MHI), JP	62 Performance Characteristics of High-Power Steady-State MPD Thrusters Using Permanent Magnets for Deep Space Exploration S. Saito, Osaka Institute of Technology (OIT), JP	424 Numerical model of the Plasma Source of an Helicon Plasma Thruster M. Magarotto, University of Padova, IT	567 Colloid Micronewton Thruster (CMNT) – Comparison Between LISA Pathfinder Flight and Ground Measurements V. Hruby, Busek Co. Inc., US
09:50	31 Ongoing activities of the Strategic Research Clusters on Space Electric Propulsion (2017-2018) J. Lopez Reig, Centre for the Development of Industrial Technology (CDTI), ES	244 Development of LOx recirculation line for 75 ton-class liquid propellant rocket engine J. Kim, Korea Aerospace Research Institute (KARI), KR	272 Numerical Simulation of Combustion Instabilities and Pressure Oscillations in a Solid Rocket Motor A. D. French, Italian Aerospace Research Centre (CIRA), IT	232 Miniaturized low-cost pressure regulator for HET electric propulsion systems H. Moreira, Omnidea, PT	248 Development of Thruster Chamber of Bipropellant Liquid Rocket Engine in China X. Fangtao, Aerospace Research Institute of Material & Processing Technology, CN	100 Plasma morphology and properties of a non-volatile liquid propellant for ablative pulsed plasma thrusters W. Yeong Liang Ling, Beijing Institute of Technology, CN	482 Ways to ensure the spacecraft resistance to EPS plasma effects A. Sizov, TsNIImash, RU	350 RIT-uX Miniaturized Radio Frequency Ion Thruster Systems - Applications and recent Program Status H. Leiter, ArianeGroup, DE
10:10	449 The Ariane Group Electric Propulsion Program 2018 H. Leiter, ArianeGroup, DE	199 Development of a Capacitive Void Fraction Sensor to Mount on a Space Propulsion System for a Ground Firing Test Y. Sakamoto, Waseda University, JP	320 Aluminum particle tracking on experimental shadowgraphy and AI PLIF images to provide velocity data for two-phase flow solid rocket motor simulations R. Devillers, ONERA, FR	7 Development of Robust and Affordable Xenon Feed Unit for Hall Effect Propulsion Systems E. Lee, Satrec Initiative (SI), KR	116 Coaxial Air-Fed Pulsed Plasma Thruster Research and Development for RAM-EP Application T. Schönherr, European Space Agency (ESA), NL	360 Design, Construction and Testing of a Variable Isp Radio Frequency Mini Ion Engine to better serve the Propulsion Requirements of the Next Generation Gravity Missions "NGGM" M. Smirnova, TransMIT, DE		
10:30	64 Liquid Nitrogen Chilldown: Void Fraction Measurement and Feasibility of Extension to Liquid Methane Testing L. Peveroni, Von Karman Institute for Fluid Dynamics (VKI), BE	302 Immersed Boundary Method and Centered Scheme for the Study of the Aero-Acoustic Field in SRMs M. Laureti, Sapienza University of Rome, IT	494 Development Status Of Xenon Flow Control Unit For Electric Propulsion Subsystem On Turksat6a Communication Satellite B. Aydin, TUBITAK UZAY Space Technologies Research Institute, TR	117 Development of Ignition Unit for a Liquid Pulsed Plasma Thruster C. Dobranszki, University of Southampton, GB	400 High Precision Attitude and Orbit Control System Based on the Emission of Electromagnetic Radiation (PACER) J. Martin, University of Stuttgart Institute of Space Systems (IRS), DE			
10:50			106 New possibilities on creating apogee propulsion systems with pneumopump propellant supply systems O. Dibivnyi, Yuzhnoye State Design Office, UA	125 Overview of Halo Thruster Research and Development Activities A. Lucca Fabris, University of Surrey, GB	16 The SpaceDrive Project – First Results on EMDrive and Mach-Effect Thrusters M. Tajmar, TU Dresden, DE			
11:10	COFFEE BREAK							

## Wednesday 16th May 2018

Session 41 - SC - Overview (1)

Session 42 - ST - Components: Nozzles

Session 43 - ST - Modelling:  
Combustion (1)Session 44 - SC - Components:  
Propellant Management (2)Session 45 - SC-CP - Components:  
CatalystsSession 46 - SC-EP - Plasma Thrusters  
(2)

Session 47 - SC-EP - HET (1)

Session 48 - GEN - Manufacturing and  
Processes (1)

ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5
Chairpersons	Z. Yao, China Academy of Space Technology, CN D. Perigo, ESA	M. Onofri, Sapienza University, IT R. Schwane, ESA	L. Prevost, CNES, FR N. Ierardo, ESA	J. Bejhed, GomSpace, SE D. Feili, ESA	F. Valencia Bel, ESA	J. Schein, Universität der Bundeswehr, DE M. Andreucci, SITAEL, IT	J. Polk, NASA JPL, US N. Kutufa, ESA	M. Smith, ESA
11:30	401 Propulsion System Options for a Sample Return Lander(SRL) for Mars V. David, NASA Jet Propulsion Laboratory (JPL), US	161 Reinforcement of Sandwich Rocket Nozzle Extensions by Laser Metal Deposition L. Brox, GKN Aerospace Engine Systems, SE	184 Numerical simulation of a single-injector GOX/GCH4 combustion chamber using TAU Code with a finite rate chemistry model J. Van Schyndel, German Aerospace Center (DLR), DE	519 Innovative xenon regulation for Electric Propulsion E. Guilbaud, Air Liquide, FR	20 Research on Catalytic Ignition of HAN-based Green Monopropellant in 5 N and 60N Thrusters W. Zhang, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, CN	139 Experimental Investigation on Pulsed Plasma Thruster with C/Cu dopant PTFE L. Xiangyang, Beijing Institute of Technology, CN	547 Life Qualification of Hall Thrusters by Analysis and Test J. Polk, NASA Jet Propulsion Laboratory (JPL), US	521 Additive Manufacturing Opportunities in Combustion Devices for Liquid Rocket Engines D. Guichard, ArianeGroup, FR
11:50	289 Chemical Propulsion Options for a European Lunar Precursor Mission N. Gaiser, European Space Agency (ESA), NL	180 VINCI Engine Thermo-Structural Composite Nozzle Extension for Ariane 6 H. Coperet, ArianeGroup, FR	152 Characterization of an adiabatic flamelet combustion model for gaseous CH4/O2 combustion in rocket thrust chambers D. Rahn, TU Munich, DE	476 Development and qualification of a normally closed valve with Shape Memory Alloy actuator S. Kraus, ArianeGroup, DE	564 Ignition of Green Monopropellants on Monolithic Catalysts A. Shchetkovskiy, Plasma Processes, US	166 Numerical investigation of magnetic neutral points in the Halo thruster J. Liu, Imperial College London, GB	429 Development of High Power Hall Thruster Systems to Enable the NASA Exploration Vision J. Jackson, Aerojet Rocketdyne, US	235 3D Printed Green Propellant Thruster H. Moreira, Omnidea, PT
12:10	234 Overview of S/C Propulsion Subsystem Testing P. Fernando, Airbus Defence & Space, GB	48 Status report SWAN sandwich nozzle program for Ariane 6 L. Brox, GKN Aerospace Engine Systems, SE	171 Development of a non-adiabatic Flamelet model for reacting flows with heat loss N. Perakis, TU Munich, DE	442 Research on a New Type of Fast Response Solenoid Valve for Spacecraft Propulsion System C. Guan, Beijing Institute of Control Engineering, CN	369 Synthesis, preparation and test of catalytic materials for low temperature ignition of ADN-based monopropellants decomposition Y. Batonneau, IC2MP-Univ. Poitiers-CNRS, FR	308 An Axisymmetric Hybrid Model for the Plasma Transport in a Helicon Plasma Thruster J. Zhou, Carlos III University of Madrid (UC3M), ES	428 Development Status of SITAEL's 20 kW-Class Hall Thruster T. Andreussi, SITAEL, IT	327 Novel Non-Destructive Inspection of the STAR Additively Manufactured Resistojet C. Ogunlesi, University of Southampton, GB
12:30	271 Past and Present of Bradford & ECAPS Small Satellite Propulsion Systems P. Van Put, Bradford Engineering, NL	526 Fluidic injection active control of transition in a dual-bell launcher nozzle V. Zmijanovic, CNRS, FR	174 Simulation of a single-element rocket combustor using a non-adiabatic Flamelet model N. Perakis, TU Munich, DE		34 The catalytic decomposition kinetics of aqueous ammonium dinitramide (ADN) over an Ir/Al2O3 catalyst B. Hou, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, CN	312 Highly Promising Water Electrical Propulsion System with Evolutional DC Arcjet K. Okuda, Osaka Institute of Technology (OIT), JP	381 SPT-230 stationary plasma thruster I. Pyatikh, EDB Fakel, RU	
12:50			319 Validation of the CSLSolver: A Pressure Based, Unstructured grid CFD Solver for Compressible Reacting Flows at all MACH Numbers B. Özkan, TOBB ETÜ, TR		213 Catalytic study on direct decomposition of nitrous oxide for small spacecraft propulsion Y. Cong, Dalian Institute of Chemical Physics, Chinese Academy of Sciences, CN			
13:10	LUNCH							
ROOM	PLENARY SESSION – SEVILLA							
14:30	<b>PLENARY ROUND TABLE 2: EUROPEAN MICRO-LAUNCHER AND SPACE PORT PROJECTS</b> Moderators: Jérôme BRETEAU, ESA - Ulf PALMNÄS, PALMNÄS & Co. Hélène HUBY, Partner, Global Space Ventures (video) Eleazar GONZALES CASAS, CTO, PLD Space Mario KOBALD, Hyimpuls Luis SANTOS AZORES, Space Port Marina PETROZZI, Director of Engineering, Andøya Space Center Philip PÄHLSSON, Project Manager New Esrange, SSC							
16:00	COFFEE BREAK							

SPACECRAFT		SPACE TRANSPORTATION		GENERAL INTEREST		Wednesday 16th May 2018									
Session 49 - SC - Overview (2)		Session 50 - ST - Future Launcher Preparatory Programme		Session 51 - ST - Modelling		Session 52 - SC-CP - Testing		Session 53 - SC-CP - Components: Hydrocarbon Bipropellant Thrusters		Session 54 - SC-EP - Plasma Thrusters (3)		Session 55 - SC-EP - HET (2)		Session 56 - GEN - Manufacturing and Processes (2)	
ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5							
Chairpersons	T. Liénart, CNES, FR G. Schmidt, NASA Glenn, US	M. Valès, Dassault, FR T. Kachler, ESA	M. Pizzarelli, ASI, IT B. Cingal, ArianeGroup, FR	J. Deeken, DLR, DE	S. Hyde, ESA	I. Kronhaus, Technion, IL	L. Grimaud, CNRS, FR J. Jackson, Aerojet, US	T. Pardal, Omnidea, PT							
16:20	573 ESA Electric Propulsion Activities J. Gonzalez Del Amo, European Space Agency (ESA), NL	68 ESA-STS Future Launchers Preparatory Programme Propulsion Activities K. Underhill, European Space Agency (ESA), FR	208 CFD design method for capacitive POGO suppressor devices B. Cingal, ArianeGroup, FR	219 Overview of Rocket Testing at the Westcott Test Facility E. Moore, Airborne Engineering, GB	60 Experimental Investigation of 3000N Liquid Oxygen-Liquid Methane Engine for Orbit Maneuver C. Cheng, Shanghai Institute of Space Propulsion, CN	332 Collisional Effects in Non-stationary Plasma Expansions along Convergent-divergent Magnetic Nozzles J. Zhou, Carlos III University of Madrid (UC3M), ES	56 Performance Characteristics of High Power and High Specific-Impulse Japan Hall Thrusters for In-Space Propulsion K. Fujiwara, Osaka Institute of Technology (OIT), JP	266 Designing Human Robot Collaboration for the Space Factories of the Future – Application to Propellant Tank Cleaning Operation through a Participative Approach T. Moulieres-Seban, ArianeGroup, FR							
16:40	389 Electric Propulsion Research and Development at NASA G. Schmidt, NASA Glenn Research Center, US	205 FLPP ETID: Approaching Hot-Fire Tests of Future European Expander Technologies T. Fuhrmann, ArianeGroup, DE	292 Numerical Study of Flow Field Characteristics of a Liquid Hydrogen Unshrouded Impeller H. Negishi, Japan Aerospace Exploration Agency (JAXA), JP	154 Study on increase of ignition probability by using laser induced ignition method with 1kHz order burst pulse in LOX/Methane thruster Y. Matsuura, IHI Aerospace, JP	49 Development and ground testing of a 200 N vacuum thrust class thruster using a novel nitrous oxide/propene propellant combination J. Wink, Dawn Aerospace, NL	340 Ion acceleration in the magnetic nozzle of an ECR thruster: Comparison of experimental measurements with a quasi 1D kinetic model S. Correyero, Carlos III University of Madrid (UC3M), ES	427 Experimental Characterization of a 5 kW Magnetically-Shielded Hall Thruster A. Piragino, SITAEL, IT	150 Weld Qualification of EB circular welds for the new VEGA LPS venting valve N. Fernandes, Omnidea-RTG, DE							
17:00	475 Propulsion subsystems engineering for Electric and Chemical propulsion – synergy opportunities A. Demairé, OHB Sweden, SE	22 ETID NE status report - Demonstrator for future upper stage expander engines K. Lindblad, GKN Aerospace Engine Systems, SE	399 Numerical investigation of the influence of leakage flow on the performance of the impeller for a LOx turbopump L. Veggi, TU Munich, DE	299 Optical Spectroscopy on Laser-Induced Ignition Sparks and other Space-Relevant Plasmas R. Stützer, German Aerospace Center (DLR), DE	217 Closed-loop throttle control of a N2O/IPA thruster I. Waugh, Airborne Engineering, GB	346 Advances in Wave-Plasma Modelling in ECR Thrusters A. Sanchez-Villar, Carlos III University of Madrid (UC3M), ES	426 Experimental Investigation of a Direct-Drive Hall Thruster T. Andreussi, SITAEL, IT	82 Material and component characterisation under cryogenic conditions with hydrogen and methane A. Schachtsiek, ET Energietechnologie, DE							
17:20	211 The results of electric propulsion development in the Keldysh Research Centre A. Lovtsov, Keldysh Research Center, RU	144 Test results of full electrically actuated engine valves F. Dengra Moya, ArianeGroup, DE	371 Acoustic Emission Prediction of Supersonic Cold Flow Jets Using a CFD-CAA Hybrid Method E. Costa Ruiz, German Aerospace Center (DLR), DE		492 Experimental Campaign on a Green Bipropellant Reaction Control Thruster D. Valentini, SITAEL, IT	373 Development and Characterization of a Pulsed Plasma Thruster F. Paganucci, SITAEL, IT	450 Experimental Investigation of Low-Erosion Hall Thruster Configurations M. Saravia, University of Pisa, IT	11 Investigation of Welding Distortion and Residual Stresses in Space Propellant Tanks D. Catherall, Airbus Defence & Space, GB							
17:40	550 Overview of the activities in the fields of propulsion and pyrotechnics at the CNES Toulouse Space Center T. Liénart, CNES, FR	569 Electric Valves for Upper Stage Propulsion A. Mercadante, Safran Aero Boosters, BE	268 FLUIDICS: FLUID Dynamics in Space, CFD correlation with microgravity experiments R. Roumiquié, Airbus Defence & Space, FR		229 Operational Behaviour investigation of Hartmann-Sprenger Tube based Resonance Ignition systems for Oxygen/Methane In-Orbit Propulsion applications P. Lungu, TU Munich, DE		353 Anode geometry influence on a hot LaB6 cathode in diode configuration L. Grimaud, CNRS - ICARE, FR	404 Hydrates and MOFs as candidate materials for hydrogen storage in telecommunication satellites C. M. Coppola, University of Bari Aldo Moro, IT							
18:00	448 Developed and perspective stationary plasma thrusters by EDB Fakel O. Mitrofanova, EDB Fakel, RU														
18:20	END OF DAY 3														
19:30 23:30	GALA DINNER - HOSTED BY ARIANEGROUP														

SPACECRAFT		SPACE TRANSPORTATION		GENERAL INTEREST							
Thursday 17th May 2018											
Session 57 - SC - Overview (3)		Session 58 - ST - Testing		Session 59 - ST - Modelling: Heat Fluxes		Session 60 - SC-CP - Green Propellants		Session 61 - SC-CP - Components: PMD Tanks	Session 62 - SC-EP - Plasma Thrusters (4)	Session 63 - SC-EP - Hall Effect Physics and Processes (1)	Session 64 - SC-EP - Testing (1)
ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5			
Chairpersons	V. Hruby, Busek, US D. Felli, ESA	J. Hardi, DLR, DE M. De Rosa, ESA	G. Ordonneau, ONERA, FR M. Leonardi, Sapienza University, IT	F. Valencia Bel, ESA M. Negri, DLR, DE	B. Busset, Airbus D&S, FR C. Hunter, ESA	I. Kronhaus, Technion, IL	L. Garrigues, CNRS, FR	H. Leiter, ArianeGroup, DE E. Bosch Borrás, ESA			
09:00	38 An overview of Electric Propulsion Research Activities at Kurchatov Institute: history and state of the art V. Kulygin, Kurchatov Institute, RU	121 Rolle of subscale tests for rocket engine technology development and verification J. Sender, German Aerospace Center (DLR), DE	367 Numerical Thermal Flow Visualization for Rethinking Cryogenic Propellant Management Technology Y. Umemura, Japan Aerospace Exploration Agency (JAXA), JP	317 Alternative green propellant developments at TNO A. Mayer, TNO, NL	23 Review and History of ATK Space Systems Surface Tension PMD Tanks W. Tam, Orbital ATK, US	412 Effects of applied magnetic field on IPG6-S, test-bed for an ABEP-based inductive plasma thruster (IPT) F. Romano, University of Stuttgart Institute of Space Systems (IRS), DE	195 Modern trends and development prospects of thrusters with closed electron drift A. Semenkin, Keldysh Research Center, RU	533 EP: Towards Standardization of Testing and Qualification D. Felli, European Space Agency (ESA), NL			
09:20	253 Electric Propulsion Activities at SITAEL, an Overview T. Misuri, SITAEL, IT	86 The arc heaters for tests of rocket propulsion systems parts A. Kozaev, Keldysh Research Center, RU	559 High-fidelity Thermodynamic Model of Orbital Cryogenic Stages for Uncertain Environment K. Fujimoto, Japan Aerospace Exploration Agency (JAXA), JP	216 Thermal ignition of ADN-based propellants – Selected results of the project Rheform M. Negri, German Aerospace Center (DLR), DE	25 Propellant Management Devices - Functional Design Methodologies and Verifications W. Tam, Orbital ATK, US	432 Development of a miniature plasma propulsion module for small satellites M. Magarotto, University of Padova, IT	566 Characteristics of stationary plasma thruster of spt-100 standart size operating at increased power D. Merkurev, RIAME MAI, RU	363 Advanced Analysis Methods for EP Systems J. Schein, Universität der Bundeswehr München, DE			
09:40	530 Venus – Mission Enhancement using Electric Propulsion: First In-Flight Results of the EPS and Technological Mission J. Herscovitz, Rafael, IL	162 Conceptual Study and Hot-firing Test of GOX/GCH4 Reaction Control System K. Higashi, Japan Aerospace Exploration Agency (JAXA), JP	27 Experimental Analysis of Heat Transfer Processes in Cooling Channels of a Subscale Combustion Chamber at Real Thermal Conditions for cryogenic Hydrogen and Methane J. Haemisch, German Aerospace Center (DLR), DE	99 Environment-Friendly Composite Propellant – Results from the HISP and GRAII Project V. Gettwert, Fraunhofer ICT, DE	137 Development of Propellant Management Reservoir made by Additive Layer Manufacturing B. Busset, Airbus Defence & Space, FR	484 Disruptive Approach in the Development of Applied-Field MPD Thrusters at IRS A. Boxberger, University of Stuttgart Institute of Space Systems (IRS), DE	541 Method for stationary plasma thruster outer and inner ceramic edges erosion rate diagnostics K. Alona, National Aerospace University "Kharkiv Aviation Institute" (KhAI), UA	354 Vacuum Challenges for Ion Thruster Testing S. Lausberg, Leybold, DE			
10:00	534 Research and Development on Electric and Advanced Propulsion at IRS G. Hendrich, University of Stuttgart Institute of Space Systems (IRS), DE	466 Flow Visualization and Surface Measurements of Shallow Water Experiments exemplary for Aerospoke Nozzles with Secondary Injection M. Propst, TU Dresden, DE	158 A numerical procedure for the design of cooling channels for liquid rocket engines M. Leonardi, Sapienza University of Rome, IT	35 Strategy for the design of new room temperature ionic liquids to replace hydrazines in rocket propulsion A. Dhenain, CNRS-University of Lyon, FR	276 On Numerical Modelling And Validation Of Propellant Behavior Within Spacecraft - Application To ESA JUICE Mission H. Bavecstrello, Airbus Defence & Space, FR	490 MINOTOR: Magnetic Nozzle Electron Cyclotron Resonance Thruster D. Packan, ONERA, FR	557 Optimization of magnetic system of Hall Effect Thruster M. Titov, National Aerospace University "Kharkiv Aviation Institute" (KhAI), UA	509 Update of a High-Precision Thrust Pendulum and Performance Characterization of PETRUS 2.0 C. Montag, University of Stuttgart Institute of Space Systems (IRS), DE			
10:20	480 Activities on Electric Space Propulsion at Italian Aerospace Research Centre: Main Achievements and Outlook M. Invigorito, Italian Aerospace Research Centre (CIRA), IT		275 CFD-Analysis of the effect of a cooling film on Flow and heat transfer characteristics in a GCH4/GOX rocket combustion chamber A. Sternin, TU Munich, DE	553 Optical Investigation of the Hypergolic Ignition of Nitric Acid and Lithium Aluminum Hydride-Doped Paraffin Wax K. J. Stober, Stanford University, US	18 Design and Qualification of Fuel and Oxidizer Tank Assemblies for the JWST Space Telescope W. Tam, Orbital ATK, US	496 Waveguide microwave coupling to a magnetic nozzle ECR thruster S. Peterschmitt, ONERA, FR	556 Relationships between ionization and acceleration zone properties with magnetic field parameters in Hall Effect Thruster M. Titov, National Aerospace University "Kharkiv Aviation Institute" (KhAI), UA	568 Analyzing Pumping Speed Models for the Electric Propulsion Vacuum Facilities R. Spektor, The Aerospace Corporation, US			
10:40			103 Numerical Investigation on the Role of Radiative Heat Flux on Liquid Rocket Engines Thermal Loads G. Leccese, Sapienza University of Rome, IT	192 Quantitative determination of segregation effects for ADN-based liquid monopropellants due to internal flow phenomena C. Hendrich, German Aerospace Center (DLR), DE	495 An Experimental Derivation of the Damping Factors of a Submerged Propellant Tank Surface Tension Vane D. Gillis, Airbus Defence & Space, GB	164 Measurements of electron temperature in Helicon Plasma Thruster M. Wijnen, Carlos III University of Madrid (UC3M), ES		114 Installation and Commissioning of a Test Bench for PPT Characterization T. Schönherr, European Space Agency (ESA), NL			
11:00	COFFEE BREAK										

## Thursday 17th May 2018

Session 65 - GEN - Hybrid Propulsion (1)

Session 66 - ST - Air-breathing Propulsion

Session 67 - ST - Acoustics and HF combustion instabilities (1)

Session 68 - SC-CP - Propellants: Hydrogen Peroxide

Session 69 - SC - Components: Tanks

Session 70 - SC-EP - Plasma Thrusters (5)

Session 71 - SC-EP - Hall Effect Physics and Processes (2)

Session 72 - SC-EP - Testing (2)

## ROOM

## GIRALDA

## TRIANA 1

## TRIANA 2

## ESPAÑA 1

## ESPAÑA 2

## ESPAÑA 3

## ESPAÑA 4

## ESPAÑA 5

Chairpersons	J. Anthoine, ONERA, FR	J. Steelant, ESA	G. Ordonneau, ONERA, FR	T.-C. Kuo, National Space Organization, TW A. Gernoth, ESA	T. Wiertz, Air Liquide, FR R. Bellarosa, Airbus D&S, UK	T. Lienart, CNES, FR M. Ruiz, SENER, ES	E. Bosch Borràs, ESA	J. Gonzalez Del Amo, ESA
11:30	29 Hybrid Propulsion for a Moon Sample Return Mission C. Schmierer, German Aerospace Center (DLR), DE	113 Experiments on Nitrogen and Hydrogen Transpiration Cooling in Supersonic Combustion Ramjets (SCRamjets) F. Strauss, German Aerospace Center (DLR), DE	93 Study of the influence of operating conditions on LOX/H2 thrust chamber acoustic eigenmodes J. Hardi, German Aerospace Center (DLR), DE	145 Verifications for the Thrusters and Propellant Tanks of a Satellite Propulsion System by Using Hydrogen Peroxide Propellant T.-C. Kuo, National Space Organization, TW	24 Review of ATK Diaphragm Tanks - An Update W. Tam, Orbital ATK, US	499 Separate measurement of magnetic and pressure thrust contributions in a magnetic nozzle ECR plasma thruster T. Vialis, ONERA, FR	402 Impact of Cathode Flow Fraction on the Location of the Acceleration Region S. Cusson, University of Michigan, US	537 Progress in Characterization of the Two-staged Hybrid Thruster System TIHTUS G. Herdrich, University of Stuttgart Institute of Space Systems (IRS), DE
11:50	364 Development of a Compact Hybrid Rocket Engine for Low-Cost In-Space Propulsion C. Paravan, Politecnico di Milano, IT	570 Numerical study of hydrogen mixing and combustion in HEXAFLY-INT model combustion chamber N. Kukshinov, CIAM, RU	13 Modeling Combustion Chamber Acoustics using the DLR-TAU-Code K. Hannemann, German Aerospace Center (DLR), DE	528 Influence of Vibration and Mixing on 90% and 98% Hydrogen Peroxide B. Jakusz, Jakusz SpaceTech, PL	395 Additive Manufactured Pressure Vessel Shell W. Tam, Orbital ATK, US	538 Investigation of the Electro-Magnetic Contribution in the Low Discharge Current High Mass Flow Rate Regime of the AF-MPDT T. Andreussi, SITAEL S.p.A., IT	414 Two-dimensional simulations of Hall Effect Thrusters P. Fajardo, Carlos III University of Madrid (UC3M), ES	285 HK40 Hall Thruster Plume Measurements with Retarding Potential Analyzer, Faraday Probe and Langmuir Probe K. Ugur, Bogazici University, TR
12:10	61 HYPROGEO Hybrid propulsion: Latest project achievements A. Lecossais, Airbus Defence & Space, FR	440 Effects of Inlet Exit Geometry configuration on Combustion Performance of Dual-Lateral Inlet Ramjet Engine W. Chen, Beijing Power Machinery Institute, CN	132 Low-order modeling of coupling effects between propellant injection and pressure fluctuations in high frequency combustion instability M. L. Frezzotti, Sapienza University of Rome, IT	263 Influence of catalyst geometry on performance of catalysts for green propellant thrusters R.-J. Koopmans, FOTEC, AT	231 Development of a Xenon storage COPV with a seamless aluminium liner H. Moreira, Omnia, PT	290 Test campaign results of a Helicon Plasma Thruster (HPT-05M) prototype and its future development plan M. Ruiz Haro, SENER, ES	288 Influence of relevant parameters on the radial PIC simulation of a Hall effect thruster discharge A. Dominguez Vázquez, Carlos III University of Madrid (UC3M), ES	26 Fluxgate Magnetometer-based Determination of Ion Beam Current C. Volkmar, German Aerospace Center (DLR), DE
12:30	76 Experimental Demonstration of an Innovative Hybrid Rocket Engine Compatible with Long Duration Operation J.-Y. Lestrade, ONERA, FR		178 Low-Order Modeling of High-Frequency Combustion Instabilities in Liquid Rocket Engines Driven by Propellant Flow Rate Oscillations R. Nez, Laboratoire EM2C, CentraleSupélec, FR	325 Towards flight qualification of a 1 N Hydrogen Peroxide Thruster C. Ryan, University of Southampton, GB	518 Cryogenic propellant storage for high power plasma space propulsion T. Wiertz, Air Liquide, FR	359 AQUAJET: an electrodeless ECR water thruster D. Staab, AVS UK, GB	277 Data Driven Model for Electron Transport in a Hall Effect Thruster B. Jorns, University of Michigan, US	265 Electric Propulsion Facility Development and Electric Propulsion Testing at Airbus Friedrichshafen M. Vaupel, Airbus, DE
12:50	98 Catalytic Injectors for an Isochoric Hybrid Rocket Motor A. Musker, DELTACAT Ltd, GB		513 Large-Eddy Simulation of the transition from a stable to thermo-acoustically unstable regime in a lab-scale liquid rocket engine T. Schmitt, CNRS, FR		397 Impact of Using Aluminium Tanks on Spacecraft Propulsion Systems R. Bellarosa, Airbus Defence & Space, GB	546 Type 2G High Temperature Superconductors as game changers for Electromagnetic Propulsion Systems M. La Rosa Betancourt, Pi Integral Solutions, DE		
13:10	LUNCH							



Thursday 17th May 2018

ROOM

PLENARY SESSION – SEVILLA

14:30

**PLENARY ROUND TABLE 3: DEMISABILITY AND SPACE DEBRIS MITIGATION: A PROPULSION PERSPECTIVE**

**Moderator: Mark FORD**, Head of Propulsion Engineering, ESA  
**Luisa INNOCENTI**, Head of Clean Space Office, ESA  
**Rosario NASCA**, ESA

16:00

COFFEE BREAK

Session 73 - ST - Engine developments (3)

Session 74 - ST - Components: Turbopumps

Session 75 - ST - Acoustics and HF combustion instabilities (2)

Session 76 - SC-EP - GIT (3)

Session 77 - SC-CP - Modelling

Session 78 - SC-EP - Components: Neutraliser (1)

Session 79 - SC-EP - Hall Effect Physics and Processes (3)

Session 80 - SC-EP - FEEP

ROOM

GIRALDA

TRIANA 1

TRIANA 2

ESPAÑA 1

ESPAÑA 2

ESPAÑA 3

ESPAÑA 4

ESPAÑA 5

Chairpersons

L. Pfützenreuter, DLR, DE  
 F. Di Matteo, ESA

K. Hannemann, DLR, DE

J. Polk, NASA JPL, US  
 M. Smirnova, Transmit, DE

I. Fischer, OHB System, DE  
 C. Inoue, University of Tokyo, JP

M. Coletti, Thales Alenia Space, UK  
 D. Pedrini, SITAEL, IT

T. Misuri, SITAEL, IT

F. Scortecci, AEROSPAZIO, IT  
 A. Genovese, Thales Deutschland, DE

16:20

341  
 Preparatory activities and development of a LOX-CH4 engine for the Vega-E upper stage  
 D. Kajon, Avio, IT

45  
 Effect of the pre-inducer on the performance and cavitation in a two-stage inducer  
 K. Byung Yun, Korea Aerospace Research Institute (KARI), KR

392  
 Numerical simulation of an air-assisted liquid jet submitted to a high-frequency transverse acoustic modulation  
 N. Rutard, ONERA, FR

500  
 Performance tests of a complete electric propulsion system based on cathode-less gridded ion thruster  
 A. Aanesland, ThrustMe, FR

51  
 Research on the Effects of Space Liquid Rocket Engines' Mixing Ratio on Gas Return Characteristics of Injectors' Surface  
 L. Changguo, Shanghai Institute of Space Propulsion, CN

473  
 Design of a 100-A-class LaB6 cathode for high-power electric propulsion  
 L. Garrigues, CNRS Laplace, FR

183  
 Suppression of Convective (Rayleigh-Taylor) Instability in Wall-less Hall Effect Thruster by Magnetic Field with Shear  
 A. Kapulkin, Technion - Israel Institute of Technology, IL

281  
 In-Orbit Demonstration of the IFM Nano FEPP Thruster Module  
 B. Seifert, FOTEC, AT

16:40

463  
 Hyprob project: status of the technological and experimental activities of the LRE development line  
 D. Cardillo, Italian Aerospace Research Centre (CIRA), IT

510  
 Latest Activities on Turbopumps at Sitael with an On Board Acquisition System  
 D. Valentini, SITAEL, IT

207  
 Numerical Modelling of Acoustic Excitation of High Frequency Combustion Instabilities in an Experimental Combustor  
 F. Tonti, German Aerospace Center (DLR), DE

368  
 Experimental research on a micro-newton multi-cusped field thruster  
 M. Zeng, Harbin Institute of Technology, CN

91  
 Characteristic Velocity Modeling of Bipropellant Thrusters  
 C. Inoue, The University of Tokyo, JP

280  
 Overview of Hollow Cathode Development at Sitael  
 D. Pedrini, SITAEL, IT

140  
 A Study of Discharge Characteristics of No-Wall Hall Thruster  
 Y. Ding, Harbin Institute of Technology, CN

97  
 An Indium Detailed Global Model for FEPP Thrusters Characterization and Optical Diagnostics  
 K. Katsonis, DEDALOS Ltd, GR

17:00

455  
 Current status of the DLR LUMEN Project  
 J. Deeken, German Aerospace Center (DLR), DE

416  
 Modal Decomposition of Combustion Dynamics based on Time-resolved CH\* Chemiluminescence in an Ethanol/LOx Rocket Engine Model Combustor with a Pintle Injector  
 S. Nakaya, The University of Tokyo, JP

196  
 Development of a 30-cm Ring Cusp Discharge Chamber - 2D-axisymmetric numerical model design and validation  
 S. Ciaralli, Mars Space Ltd, GB

457  
 Priming verification for complex pipe manifolds using EcosimPro. Simulations results vs. test data  
 F. Valencia-Bel, European Space Agency (ESA), NL

514  
 Spot to plume transition with Krypton in an LaB6 hollow cathode  
 S. Gabriel, University of Southampton, GB

37  
 Study on formation mechanism and variation characteristics of dark current before Hall Start-up  
 W. Li, Harbin Institute of Technology, CN

15  
 MEMS FEPP Thrusters – Miniaturised Liquid Metal Ion Source using Glass Capillaries  
 M. Tajmar, TU Dresden, DE

17:20

287  
 Current Status on Joint L75 Engine Development with Focus on Turbo Pump Activities  
 L. Pfützenreuter, German Aerospace Center (DLR), DE

30  
 Controlling Low Frequency Instability in Hybrid Rocket Combustion  
 C. Lee, Konkuk University, KR

565  
 Experimental and analytical study for the erosion of accelerating electrode of an ion thruster double-electrode ion-extraction system  
 R. Akhmetzhanov, RIAME MAI, RU

421  
 Propellant Gauging Accuracy Analysis for the ESA EUCLID Spacecraft  
 M. D'Ambrogio, Thales Alenia Space Italy (TAS-I), IT

542  
 Vacuum current emission and initiation in an LaB6 hollow cathode  
 S. Gabriel, University of Southampton, GB

63  
 Performance Parameter Analysis of a Hall Thruster  
 C. Min Gyoung, Korea Aerospace University (KAU), KR

17:40

461  
 Stability characteristics of the L75 Lox-Ethanol Rocket Engine  
 L. Pfützenreuter, German Aerospace Center (DLR), DE

283  
 BURFIT RF Ion Thruster Operational Parameters and Further Advanced RF Ion Thruster Design  
 K. Ugur, Bogazici University, TR

157  
 Optimised Thermal Hardware Concept for Increased Thermal Propellant Gauging Accuracy  
 I. Fischer, OHB System, DE

436  
 Experimental study of effect of propellant asymmetrical distribution on anode current in a Hall thruster  
 M. Ding, Harbin Institute of Technology, CN

18:00

527  
 PLD Space Liquid Rocket Engine development  
 G. C. Eleazar, PLD Space, ES

571  
 Chemical Propulsion Induced Plume openPlume Modelling Approach  
 B. Zitouni, OHB System, DE

18:20

END OF DAY 4

## Friday 18th May 2018

Session 81 - GEN - Hybrid Propulsion  
(2)

Session 82 - ST - Propellants

Session 83 - ST - Sloshing

Session 84 - SC-EP - Alternative  
Propellants (1)

Session 85 - SC - Advanced Propulsion

Session 86 - SC-EP - Components:  
Neutraliser (2)

Session 87 - SC-EP - HEMPT

Session 88 - SC-EP - MiniHET (1)

ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5
Chairpersons	C. Lee, Konkuk University, KR G. Poppe, DLR, DE	A. Gernoth, ESA	D. Benson, NASA Goddard, US J. van den Eynde, ESA	F. Paganucci, University of Pisa, IT C. Collingwood, ESA	G. Schmidt, NASA Glenn, US N. Gaiser, ESA	M. Gollor, ESA	E. Bosch, Thales Deutschland, DE	N. Kutufa, ESA
09:10	87 Experimental demonstration of the propulsive performances of a hybrid engine operating with highly concentrated hydrogen peroxide J. Anthoine, ONERA, FR	115 Densified propellants for future launch vehicles: Experimental characterization of an isothermal slurry in circular pipelines in flow similarity with slush hydrogen M. T. Scelzo, Von Karman Institute for Fluid Dynamics (VKI), BE	41 Validation of Slosh Modeling Approach Using STAR-CCM+ D. Benson, NASA Goddard Space Flight Center, US	102 Alternative Propellants for Gridded Ion Engines N. Fazio, University of Southampton, GB	17 Solar Sail Propulsion for Interplanetary Small Spacecraft L. Johnson, NASA Marshall Space Flight Center, US	92 Detailed Work Function Measurements and Development of a Hollow Cathode using the Emitter Material C12A7 Electride C. Drobny, TU Dresden, DE	445 HEMPT Based Electric Propulsion Systems - Supporting upcoming applications from LEO to GEO Systems E. Bosch, Thales Deutschland, DE	374 Simulation and optimization of a 200 W magnetically shielded Hall thruster with various discharge channel materials L. Grimaud, CNRS - ICARE, FR
09:30	191 Development and ground-testing of the Nucleus hybrid sounding rocket within ESA FLPP A. J. Boiron, Nammo Raufoss, NO	224 An Overview on Current Gelled Propellants Activities at DLR Lampoldshausen C. Kirchberger, German Aerospace Center (DLR), DE	225 Propellant Phenomena in Cryogenic Tank Systems: Experiments with Liquid Hydrogen J. Gerstmann, German Aerospace Center (DLR), DE	333 Investigation of alternative propellants for use with a low-power cylindrical Hall thruster P. Tisdall, University of Southampton, GB	336 Development of a Water Propulsion System for Satellite Applications U. Gotzig, ArianeGroup, DE	471 Neutralizer development for the RIT2x family of engines S. Kraus, ArianeGroup, DE	120 Lifetime Test of HEMPT Propulsion System A. Lazurenko, Thales Deutschland, DE	181 Development of low power Hall-effect Propulsion System with Improved System Efficiency for Small Satellite Applications L. Hodong, Satrec Initiative (SI), KR
09:50	357 Flight test of the hybrid rocket propulsion system - lessons learned from ILR-33 project D. Kaniewski, Institute of Aviation, PL	39 System study of slush propellants for future European launch vehicles J. Wilken, German Aerospace Center (DLR), DE	151 Effect of Thermal Stratification Thickness on Pressure Drop Enhanced by Sloshing in a Closed Vessel T. Himeno, The University of Tokyo, JP	310 Overview of the UniPI & Sitael Activity on Iodine-fed Hall Effect Thrusters F. Paganucci, University of Pisa, IT	347 Development of a Water Electrolysis Propulsion System for Small Satellites N. Harmansa, University of Stuttgart Institute of Space Systems (IRS), DE	408 Low-Current Hollow Cathodes for Hall Effect Thrusters D. Pedrini, SITAEL, IT	241 Performance of the mN- $\mu$ HEMPT with iodine and xenon M. Vaupel, Airbus Defence & Space, DE	284 Development of a Low Power Hall Thruster for Small LEO Satellite Systems K. Ugur, Bogazici University, TR
10:10	508 Design and Testing of a Paraffin-Based Hybrid Rocket Demonstrator D. Cardillo, Italian Aerospace Research Centre (CIRA), IT	226 Gel Propulsion - An overview and a vision for a throttleable, greener and safer rocket propulsion system H. K. Ciezki, German Aerospace Center (DLR), DE	501 Iodine - a game-changing propellant for plasma based electric propulsion A. Aanesland, ThrustMe, FR	108 Topology optimization of heating chamber for Vaporizing Liquid Microthrusters M. De Athayde Costa E Silva, TU Delft, NL	286 Development of a High Current Heaterless Hollow Cathode A. Daykin-Iliopoulos, University of Southampton, GB	522 Development of a low power HEMP Thruster - Status and Overview R. Heidemann, Thales Deutschland, DE	111 Experimental Characterization of the Narrow Channel Hall Thruster I. Kronhaus, Technion - Israel Institute of Technology, IL	
10:30	59 Investigation of the Kelvin-Helmholtz Instability Process in Liquefying Hybrid Rocket Fuels A. Petrarolo, German Aerospace Center (DLR), DE	417 Green, Highly Throttleable and Safe Gelled Propellant Rocket Motors -Application Potentials for Launcher Propulsion K. W. Naumann, Bayern-Chemie, DE	118 A performance Comparison of Xenon and Krypton Propellants on a HEMPT-3050 Ion Thruster A. Genovese, Thales Deutschland, DE	345 Air Breathing Electric Thrusters Characterization and Diagnostics by a Four Components Detailed Global Model C. Berenguer, DEDALOS Ltd, GR	539 Long duration experimental and theoretical investigations of emitters for hollow cathodes A. Tsaglov, National Aerospace University "Kharkiv Aviation Institute" (Khai), UA			
10:50	112 Regression Rate Measurements in a Hybrid Rocket Engine with Advanced HTPB-based Fuel Mixtures and Hydrogen Peroxide G. Poppe, German Aerospace Center (DLR), DE					351 An investigation on the effects of the axial magnetic field on hollow cathode thruster performance L. Chen-Guang, Harbin Institute of Technology, CN		
11:10	COFFEE BREAK							

## Friday 18th May 2018

Session 89 - SC-EP - Diagnostics and Electronics

Session 90 - ST - Engine cycles

Session 91 - ST - Modelling: Combustion (2)

Session 92 - SC-EP - Alternative Propellants (2)

Session 93 - SC - Alternative Propulsion Concepts

Session 94 - SC-EP - Components: Neutraliser (3)

Session 95 - SC-EP - Colloid

Session 96 - SC-EP - MiniHET (2)

ROOM	GIRALDA	TRIANA 1	TRIANA 2	ESPAÑA 1	ESPAÑA 2	ESPAÑA 3	ESPAÑA 4	ESPAÑA 5
Chairpersons	F. Pinto Marin, Airbus D&S, ES M. Gollor, ESA	T. Kimura, JAXA, JP A. Herbertz, ESA	G. Ordonneau, ONERA, FR Y. Daimon, JAXA, JP	S. Gabriel, Mars Space, UK K. Holste, Giessen University, DE	D. Felli, ESA	J. Schein, Universität der Bundeswehr, DE	V. Giannetti, Airbus D&S, UK T. Henning, Giessen University, DE	T. Misuri, SITAEL, IT T. Kawakami, OIT, JP
11:30	487 Characterization of Spherical Double Layer in Inertial Electrostatic Confinement Device by Using Mach-Zehnder Interferometers Y.-A. Chan, University of Stuttgart Institute of Space Systems (IRS), DE	452 Studies on Electric Pump-Fed Liquid Rocket Engines for Micro-Launchers G. Waxenegger-Wilfing, German Aerospace Center (DLR), DE	544 An algorithm for the automatic construction of the CH4 global reaction model N. Slavinskaya, German Aerospace Center (DLR), DE	215 Using of an Iodine Detailed Global Model for Characterization and for Optical Diagnostics of Helicon Thrusters C. Berenguer, DEDALOS Ltd, GR	535 Towards low-cost rocket propulsion using Vortex Flow Cooling and high-speed Electrical Capacitance Tomography A. Baker, Kingston University London, GB	435 A New External Loop for Cathode Independent Life Test to Simulate effect of Discharge Current Oscillation between Cathode and Thruster W. Li, Harbin Institute of Technology, CN	88 Development of a High-Performance Low-Cost Electro Spray Colloid Electric Propulsion System for Small Satellite applications V. Giannetti, Airbus Defence & Space, GB	94 Development and testing of an in-situ thrust balance and characterization of a miniature Hall-effect thruster C. Drobny, TU Dresden, DE
11:50	507 Standardization Approach on Langmuir Probe Measurements with Thermal Arcjet VELARC J. Skalden, University of Stuttgart Institute of Space Systems (IRS), DE	57 Feasibility Study on Electric Pump-fed Cycle Rocket Engines T. Kimura, Japan Aerospace Exploration Agency (JAXA), JP	259 Comparison Study of Combustion Flow Fields and Heat Transfer Characteristics between GCH4/GO2 Single- and Multi-element Combustion Chamber Y. Daimon, Japan Aerospace Exploration Agency (JAXA), JP	148 Sublimating propellants for ion thrusters K. Holste, Justus Liebig University Giessen, DE	182 Asteroid flyby fleet mission by E-sail propulsion P. Janhunen, Finnish Meteorological Institute, FI	403 Experimental Evidence for Ion Acoustic Solitons in the Plume of a Hollow Cathode M. Georjin, University of Michigan, US	260 Characterization of a Micro-electrospray Thruster Using a Porous Glass Emitter Array C. Chengyu Ma, University of Southampton, GB	444 Preliminary Design of a Low Power Hall Thruster H. Yanlin, Beijing Institute of Control Engineering, CN
12:10	122 Power Processing Unit Activities at Thales Alenia Space in Belgium E. Bourguignon, Thales Alenia Space Belgium (TAS-B), BE	52 System-Level Case Study with Rotating Detonation Rocket Engine Targeting Several Space Applications K. Kawatsu, Japan Aerospace Exploration Agency (JAXA), JP	227 The impact of methane oxidation kinetics on a rocket nozzle flow V. Zhukov, German Aerospace Center (DLR), DE	431 Development and Experimental Validation of a Hall Effect Thruster RAM-EP Concept T. Andreussi, SITAEL, IT	187 A scheme for controlling the E-sail's spin rate by the E-sail effect itself P. Janhunen, Finnish Meteorological Institute, FI	516 Analytical approach for investigation of the Hollow Cathode Orifice F. Coccaro, Alma sistemi, IT	70 Additive manufacturing of electrospray emitters at the microscale T. Henning, Justus Liebig University Giessen, DE	58 Performance Characteristics of Low-Power Cylindrical Hall Thrusters Systems for the Osaka Institute of Technology Moon-Exploration 3rd PROITERES Satellite T. Kawakami, Osaka Institute of Technology (OIT), JP
12:30	485 Airbus DS Power Processing Unit new developments for Hall Effect and Gridded Ion thrusters for LEO and GEO F. Pinto, Airbus Defence & Space, ES	203 Green, Highly Throttleable and Safe Gelled Propellant Rocket Motors -Application Potentials for In-Space Propulsion K. W. Naumann, Bayern-Chemie, DE	159 3D RANS Simulations of Full-Scale Liquid Rocket Thrust Chambers D. Eiringhaus, ArianeGroup, DE	237 Characterization and Optical Diagnostics of CO2 Fed Electric Thrusters by Using a Detailed Global Model K. Katsonis, DEDALOS Ltd, GR	239 Experimental study of radio-frequency cathode-neutralizer. P. Smirnov, Moscow Aviation Institute (MAI), RU			
12:50		318 Project Sirius - Affordable Access to Space: Part 1 A. Musker, DELTACAT Ltd, GB		245 Detailed Global Modeling in Support of Electric Propulsion and Throttling of Common Propellants C. Berenguer, DEDALOS Ltd, GR		81 Development and Characterization of an rf-Neutralizer based on a RIM-4 Ion Source P. Köhler, Institute of Experimental Physics 1, DE		
13:10	LUNCH							
14:30	TECHNICAL VISIT							
16:30	TECHNICAL VISIT							
17:00	END OF SPACE PROPULSION CONFERENCE							