Scientific Program of the XXIII Conference of the Italian Association of Aeronautics and Astronautics - AIDAA 2015

Politecnico di Torino and Oval Lingotto, Torino, Italy

16-19 November 2015

Chairman: Erasmo Carrera

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Emanuele Pensavalle, Aviospace
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Franco Tortarolo, Avio Aero

Monday, 16 November 2015

New Space Challenges: Innovations and Projects for the Future	
AESA Pre-Conference Event Politecnico di Torino - Aula Magna	
Chaired by: Erasmo Carrera, Dario Pastrone, Marco Petrolo (Polito) Christopher Andrea Paissoni (President of AESA Torino)	
0830 - 0850	Paolo Musi Thales Alenia Space Italy *Scientific missions recent achievements and perspectives*
0850 - 0910	Franco Fenoglio Thales Alenia Space Italy *Robotic and human exploration, key features and milestones*
0910 - 0935	Lorenzo Casalino Politecnico di Torino *Space propulsion: How to get to your destination*
0935 - 1000	Sabrina Corpino Politecnico di Torino *Next generation CubeSats:* *A new paradigm for space exploration and science missions*
1000 - 1030	Emanuele Pensavalle Aviospace *Aviospace, the Italian subsidiary of Airbus Defence & Space*
1030 - 1100	**Break**
1100 - 1130	Filomena Iorizzo Argotec *Argotec: an alternative approach for developing space technologies*
1130 - 1215	Giuseppe Sarri ESA *Gaia and JUICE:* *Two missions of the European Space Agency science program*
1215 - 1300	Adriano Calvi ESA *Spacecraft flight loads, design loads and test loads.* *The three sides of the same coin!*

Tuesday, 17 November 2015, Politecnico di Torino

Tuesday Morning / 17 November / Polito / Sala Consiglio di Facoltà	
0730 - 0830	**Registration**

Tuesday Morning / 17 November / Polito / Aula Magna	
0830 - 0850	**Opening Ceremony**
Chaired by: Erasmo Carrera (Politecnico di Torino)	
Welcome Addresses by	
The Rector of Politecnico di Torino, the President of AIDAA, the Director of the Department of Mechanical and Aerospace Engineering at Polito, and the Coordinator of the Aerospace Engineering Courses at Polito	

Tuesday Morning / 17 November / Polito / Aula Magna	
0850 - 1020	**Plenary Talks**
Chaired by: Cesare Cardani (Politecnico di Milano), Gaetano Iuso (Politecnico di Torino) and Leonardo Lecce (Università di Napoli)	
0850 - 0920	Aldo Frediani Università di Pisa *IDINTOS: the first prototype of an amphibious Prandtl-Plane-shaped aircraft*
0920 - 0950	Giuseppe Davì Università di Palermo *Sulla trave multistrato in materiale composito*
0950 - 1020	Paolo Luchini Università di Salerno *Ruolo del rumore termico nella generazione di instabilità dello strato limite su di un profilo alare*

Tuesday Morning / 17 November / Polito	
1020 - 1050	**Coffee-Break**

Tuesday Morning / 17 November / Polito

1050 - 1255 **Parallel Sessions**

Tuesday Morning / 17 November / Polito / Aula Magna

Session S4 **Flight Mechanics**

Chaired by: Pierangelo Masarati (Politecnico di Milano) and Silvano Sgubini (La Sapienza)

1050	1115 -	1140	1205	1230
Dynamic model design for an on board multi-purpose precise orbit determination scheme F. Menzione, A. Renga, M. Grassi, G. Campolo	Modeling spacecraft formation dynamics including aerodynamic drag Silvano Sgubini, Giovanni B. Palmerini	Inverse dynamics particle swarm optimization for spacecraft minimum-time maneuvers with constraints Dario Spiller, Fabio Curti, Luigi Ansalone	Magnetic spacecraft attitude stabilization via output feedback with separation between measurement and actuation Fabio Celani	A new, general perturbative guidance for space vehicles Mauro Pontani

Tuesday Morning / 17 November / Polito / Sala Consiglio di Facoltà

Cooperation in Aeronautics and Aerospace R&D between Russian Federation and Europe
Teleconference with Russian Scientists

Chaired by: Leonardo Lecce (Università di Napoli) and Erasmo Carrera (Politecnico di Torino)

From Russia:
Aleksandr Efremov - Dean of the Moscow Aviation Institute Faculty of Aeronautical Engineering
Oleg Alifanov - Head of the Moscow Aviation Institute Department of Space Systems and Missilery

1050 - 1200 Round Table

Tuesday Morning / 17 November / Polito / Room 1P

Session S12 **Space Structures**

Chaired by: Adriano Calvi (ESA) and Mario Marchetti (La Sapienza)

1050	1115	1140	1205	1230
Thermal effect on the modal characteristics of FGM plates with temperature-dependent materials Fiorenzo Fazzolari	A new advanced structural panel sandwich for reentry systems Marta Albano, Samantha Ianelli, Roberto Viotto, Mario Marchetti	Accurate analysis of launcher structures by means of refined one dimensional models Erasmo Carrera, Tommaso Cavallo, Enrico Zappino	Mechanical architecture and loads definition for the design and testing of the Euclid spacecraft Adriano Calvi, Patrizia Bastia	Semi-analytical orbital parameters description for thermal fatigue analysis Paolo Gasbarri, Riccardo Monti

Tuesday Morning / 17 November / Polito / Room 2P

Session S15 **Student Session**

Chaired by: Cesare Cardani (Politecnico di Milano),
Maria Cinefra and Sabrina Corpino (Politecnico di Torino)

1050	1105	1120	1135	1150	1205	1220
On orbit refueling for low-thrust based geosynchronous satellites	Titan mission feasibility study for bi-static SAR mapping of the planet by formation flying	A simulation facility for vision-based planetary landing systems	A hazard detection and avoidance system for autonomous planetary landing	Stereo-vision to estimate uncooperative objects pose, motion and inertia tensor	Earth-Mars fuel depots to support fast and heavy manned mission to Mars	Variational approach to the problem of optimal propeller design
Lorenzo Bucci, Andrea Capannolo, Francesco Cavenago, Michèle Lavagna	Tommaso Guffanti, Matteo Losacco, Roberto Travaglini, Michèle Lavagna	Paolo Lunghi, Marco Ciarambino, Michèle Lavagna	Paolo Lunghi, Marco Ciarambino, Michèle Lavagna	Vincenzo Pesce, Michèle Lavagna	Simone Flavio Rafano Carnà, Alessandro Serboli, Matteo Baiguera, Michèle Lavagna	Francesco Torrigiani, Antonio Dipace, Aldo Frediani

Tuesday Morning / 17 November / Polito / Room 3P

Session S10 **CFD**

Chaired by: Gaetano Iuso (Politecnico di Torino) and Paolo Luchini (Università di Salerno)

1050	1115	1140	1205	1230
Overdriven detonation and bidimensional stability for an explosive mixture with symmetric reaction	Numerical simulation of fluidic thrust-vectoring	Simulation of in-flight ice accretion based on the exact solution of the Stefan problem	RANS prediction of the flap unsteady aerodynamics using dynamic mesh	CFD simulation of flame penetration test - Calibration phase
F. Carvalho, G.M. Kremer, W. Marques Jr, M. Pandolfi Bianchi, A.J. Soares	Michele Ferlauto, Roberto Marsilio	Giulio Gori, Gianluca Parma, Marta Zocca, Alberto Guardone	Serena Russo, Giovanni Paolo Reina, Carlo de Nicola	Mario Panelli, Luigi Cutrone, Gaetano Mirra

Tuesday Morning / 17 November / Polito / Room 4P

Session S8 **Composites**

Chaired by: Marco Gigliotti (University of Poitiers) and Alberto Milazzo (Università di Palermo)

1050	1115	1140	1205	1230
Microwave analysis of nanostructured composite shell structures for advanced RAS applications	Postbuckling Analysis of Cracked Stiffened Composite Plates by pb-2 Rayleigh Ritz Method	Distorted similitudes for the frequency response of composite plates	Some examples of "multi-physical"fatigue of organic matrix composites for aircraft applications	High thickness kevlar/carbon nanostructured composite for impact protection
Roberto Pastore, Antonio Vricella, Davide Micheli, Mario Marchetti	Vincenzo Oliveri, Andrea Alaimo, Alberto Milazzo	Sergio De Rosa, Francesco Franco, Elena Ciappi, Viviana Meruane	Marco Gigliotti, Yannick Pannier, Marie Christine Lafarie-Frenot, Jean-Claude Grandidier	Antonio Vricella, Davide Micheli, Roberto Pastore, Mario Marchetti

Tuesday Morning / 17 November / Polito / Room 5P

Session MS7

Green and Great: A leap of research collaboration network for more environmental friendly engine

Chaired by: Sara Biamino (Politecnico di Torino) and Franco Tortarolo (AvioAero)

1050	1115	1140	1205	1230
A leap of research collaborative network	Building strategic supply chain for R&D purposes	Aviation goes green	Multidisciplinary numerical developments for LPT design	Electron beam melting of gamma-TiAl alloys for aerospace applications
F. Tortarolo	N. Atzei	G. De Poli	M. Marconcini, M. Giovannini, F. Poli, L. Pinelli, F. Bertini	S. Biamino, G. Baudana, M. Terner, F. Pelissero, S. Sabbadini, M. Pavese, P. Fino, C. Badini

Tuesday Afternoon / 17 November / Polito	
1300 - 1400	**Lunch**

Tuesday Afternoon / 17 November / Polito	
1400 - 1605	**Parallel Sessions**

Tuesday Afternoon / 17 November / Polito / Aula Magna

Session S4 — Flight Mechanics

Chaired by: Lorenzo Casalino (Politecnico di Torino) and Caterina Grillo (Università di Palermo)

1400	1425	1450	1515	1540
Mediterranean aeronautics research & training academy: a new facility for human factor research Giovanni Tesoriere, Andrea Alaimo	Optimal design of agricultural and environmental aerial mission profiles Samuele Draghi, Lorenzo Trainelli	Indirect optimization of ascent trajectories Lorenzo Casalino, Dario Pastrone	Automatic take-off or landing path following in turbulent air for UAS, an EKF based procedure Caterina Grillo, Fernando Montano	Accurate positioning of a payload suspended to a quadrotor unmanned aircraft Giulio Avanzini, Alessandra Bottazzi, Fabrizio Giulietti, Guido De Matteis

Tuesday Afternoon / 17 November / Polito / Sala Consiglio di Facoltà

Session S13 — Space Exploration and Missions

Chaired by: Franco Bernelli-Zazzera (Politecnico di Milano) and Emanuele Pensavalle (Aviospace)

1400	1425	1450	1515	1540
Wireless sensor network with vibrational energy harvesting - an efficient solution for space transportation and exploration vehicles telemetry Alessandro Rapisarda, Daniele Renzoni, Emanuele Pensavalle	Synthesis model for real time dynamic analysis of planetary rovers Giancarlo Genta, Marco Dolci	Dynamic model of a sampling tool mechanism for low gravity bodies Giacomo Gori, Pierluigi Di Lizia, Franco Bernelli-Zazzera, Rolando Gelmi, Piergiovanni Magnani, Edoardo Re	Robotic system study for a LEO orbiting vehicle payload capturing Marco Dolci, Simona Ferraris, Giancarlo Genta, Pasquale Pellegrino, Daniele Richiardi, Genny Scalise	Design of thermal exchange, a microgravity experiment on-board the international space station Nicole Viola et al.

Tuesday Afternoon / 17 November / Polito / Room 1P

Session S2 — Materials

Chaired by: Roberto Galatolo (Università di Pisa) and Massimo Rossetto (Politecnico di Torino)

1400	1425	1450	1515	1540
Grain level modeling of fatigue in polycrystalline materials Vincenzo Gulizzi, Alberto Milazzo, Ivano Benedetti	Tests of sapphire optical fiber sensors for strain monitoring in high temperature environment Claudio Paris, Cristian Vendittozzi, Antonio Paolozzi, Ferdinando Felli	Very-high-cycle fatigue response of a high-performance steel Andrea Tridello, Davide S. Paolino, Giorgio Chiandussi, Massimo Rossetto	Space C/C TPS electromagnetic characterization in reverberation chamber Davide Micheli, Roberto Pastore, Andrea Delfini, Marta Albano, Mario Marchetti	Mechanical and microstrutural characterization of electron beam melted Ti-6Al-4V specimens Stefania Franchitti, Carmine Pirozzi, Rosario Borrelli, Nicola Paletta

Tuesday Afternoon / 17 November / Polito / Room 2P

Session S15 — Student Session

Chaired by: Cesare Cardani (Politecnico di Milano),
Maria Cinefra and Sabrina Corpino (Politecnico di Torino)

1400	1415	1430	1445	1500	1515	1530
High efficiency regional aircraft conceptual design and on-board systems preliminary study Cesare Graziano, Matteo Cappo, Gesumino Fiore, Giacomo Montesoro, Luca Boggero, Roberta Fusaro	MASCOT-2 landing opportunities using three-body solutions for asteroid impact mission Fabio Ferrari, Michèle Lavagna	Tumbling space debris capturing via tethered-nets mechanism: multibody dynamics analysis and in flight experiments Riccardo Benvenuto, Michèle Lavagna	Dynamics of the separation of an airlaunched rocket by parachute Lucio Gradoni, Paolo Teofilatto	The Caurus "Nibbio"High Speed Tilt Rotor Concept Luca Sala, Gianluca Alitta, Davide Berbenni, Carlo Capocchiano, Andrea Fugazza, Sebastian Rojas, Stefano Sangalli, Andrea Scaringello, Paterson Waffo, Lorenzo Trainelli	Global optimization of relative configurations between spacecraft near Lagrangian point orbits Fabio Ferrari, Michèle Lavagna	Flight dynamics model for preliminary design of PrandtlPlane wing configuration with sizing of the control surfaces D. Zanetti, F. Oliviero, V. Cipolla

Tuesday Afternoon / 17 November / Polito / Room 3P

Session S10 — CFD

Chaired by: Raffaele Donelli (CIRA) and Gaetano Iuso (Politecnico di Torino)

1400	1425	1450	1515	1540
The use of RANS approach for predicting transition Serena Russo, Donato de Rosa, Carlo de Nicola, Raffaele Salvatore Donelli	Thermal investigation of a nacelle internal and external fields in pusher configuration Antonio Carozza, Giuseppe Mingione, Gennaro Serino, Giuseppe Pezzella	Numerical and experimental transition prediction on a realistic laminar swept wing Diego Giuseppe Romano, Donato de Rosa, Raffaele S. Donelli	Numerical assessment of flap effectiveness for winged re-entry vehicles Donato de Rosa, Giuseppe Pezzella, Raffele S. Donelli	Numerical simulations of the HEXAFLY-INT experimental vehicle Pietro Roncioni, Giuseppe Pezzella, Marco Marini, Johan Steelant

Tuesday Afternoon / 17 November / Polito / Room 4P

Session S8 — Composites

Chaired by: Michele D'Ottavio (Université Paris Ouest) and Ugo Galvanetto (Università di Padova)

1400	1425	1450	1515	1540
Design and manufacturing of new advanced 3D preform for carbon-carbon structures Andrea Delfini, Giulio Rubini, Marta Albano, Roberto Pastore, Fabrizio Volpini, Mario Marchetti	Experimental analysis of a piezoelectric based SHM system for delamination detection Andrea Alaimo, Antonio Esposito, Calogero Orlando	Discontinuous mechanical problems studied with a peridynamics-based approach Mirco Zaccariotto, Giulia Sarego, Daniele Dipasquale, Arman Shojaei, Teo Mudric, Matteo Duzzi, Ugo Galvanetto	Development of quasi three-dimensional beam models for accurate free vibration analysis of FG beams with general boundary conditions Fiorenzo A. Fazzolari	A beam theory for layered composite subjected to uniformly distributed load Andrea Alaimo, Giuseppe Davì, Alberto Milazzo, Calogero Orlando

Tuesday Afternoon / 17 November / Polito / Room 5P

Session MS7

Green and Great: A leap of research collaboration network for more environmental friendly engine

Chaired by: Massimo Damasio (Exemplar) and Franco Tortarolo (AvioAero)

1400	1425	1450		
Mesh adapter tool development used in fluid dynamic flow path seals optimization process	Low oil consumption solution for next gen engines	P_BEAR, analytical tool for planet bearing robust preliminary design conditions		
Massimo Damasio, Luca Fattore, Daniele Coutandin	L. Bucchieri, D. Coutandin	A. Cappadona, M. Giardino, F. Dellavalle, M. Gravina		

Tuesday Afternoon / 17 November / Polito	
1605 - 1630	**Coffee-Break**

Tuesday Afternoon / 17 November / Polito	
1630 - 1810	**Parallel Sessions**

Tuesday Afternoon / 17 November / Polito / Aula Magna

Session S4 — Flight Mechanics

Chaired by: Giulio Avanzini (Università del Salento) and Massimo Sorli (Politecnico di Torino)

1630

Comparative analysis of the docking systems for the space tug project "STRONG"

Tharek Mohtar,
Stefano Pastorelli,
Stefano Mauro,
Alberto Cernusco,
Massimo Sorli

1655

Performance analysis of a hybrid airplane through a flight simulator

Fabrizio Oliviero,
Vittorio Cipolla,
Michele Franchi

1720

Operation oriented path planning strategies for RPAS

Giorgio Guglieri,
Alessandro Lombardi,
Gianluca Ristorto

1745

Onboard electromechanical actuators affected by short circuit of stator coils: a new prognostic method based on spectral analysis techniques

Dario Belmonte,
Matteo Dalla Vedova,
Paolo Maggiore

Tuesday Afternoon / 17 November / Polito / Sala Consiglio di Facoltà

Session S13 — Space Exploration

Chaired by: Michele Lavagna (Politecnico di Milano) and Nicole Viola (Politecnico di Torino)

1630

SEEDS, the international post-graduate master program for space exploration

Nicole Viola,
Eugenio Gargioli,
Piero Messidoro,
Ernesto Vallerani

1655

A feasibility study for a short duration human mission to the martian surface

Samuel Brown,
Oliver Hardy,
Rachel Henson et al.

1720

The SpaceTrips project: space thermoacoustic radioisotopic power system

Maurice-Xavier Francois,
Antoine Alemany,
Emmanuel Roy,
Janis Freibergs,
Gerard Poli,
Eleonora Zeminiani,
Gunter Gerbeth

Tuesday Afternoon / 17 November / Polito / Room 1P

Session S9 — Aeroelasticity

Chaired by: Sergio De Rosa (Università di Napoli) and Giuseppe Quaranta (Politecnico di Milano)

1630

Analysis of non-classical aileron buzz

M. Irfan Zafar,
Francesca Fusi,
Giuseppe Quaranta

1655

Design and manufacturing of an aero-servolastic wind tunnel model for experimental validation of gust load alleviation technologies

Alessandro De Gaspari,
Sergio Ricci,
Stephan Adden,
Matteo Martegani

1720

Design and realization of the control surfaces actuation system within the glamour project

Alessandro De Gaspari,
Andrea Mannarino,
Paolo Mantegazza

1745

Aeroelastic rotorcraft-pilot couplings: problems and methods

Giuseppe Quaranta,
Pierangelo Masarati,
Jacopo Serafini,
Massimo Gennaretti

Tuesday Afternoon / 17 November / Polito / Room 2P

Session S1 — Aircraft Design

Chaired by: Valerii Komarov (Samara State Aerospace University) and Gianluca Ghiringhelli (Politecnico di Milano)

1630	1655	1720	1745
Preliminary assessment of effect of heating on structure mass	Topology optimization of the regions surrounding large fuselage cutouts	Aerodynamic optimization of a large Prandtlplane configuration	Wingbox weight estimation for metallic and composite manufacturing in a conceptual design phase
Zhijin Wang, Binbin Jiang, Anatoly Kretov, Sheng Huang	Valerii A. Komarov, Andrey V. Boldyrev	Lorenzo Cappelli, Vittorio Cipolla, Giulio Costa, Aldo Frediani, Fabrizio Oliviero, Emanuele Rizzo	G.Bindolino, G. L. Ghiringhelli, S. Ricci, M. Terraneo

Tuesday Afternoon / 17 November / Polito / Room 3P

Session MS4 — Drag reduction & Flow Control

Chaired by: Raffaele Donelli (CIRA) and Gaetano Iuso (Politecnico di Torino)

1630	1655	1720	1745
Flow separation control applied to simplified car	Development of a numerical model for a PSJ actuator	Analyses of non local effects of riblets	Investigation of plasma actuators for flow separation control on a low pressure turbine blade at low Reynolds number
Costantino Sardu, Salvatore Sedda, Gaetano Iuso	Matteo Chiatto, Luigi de Luca	Benedetto Mele, Renato Tognaccini, Pietro Catalano	Maria Grazia De Giorgi, Elisa Pescini, Fedele Marra, Antonio Ficarella, Luca Francioso

Tuesday Afternoon / 17 November / Polito / Room 4P

Session S8 — Composites

Chaired by: Ugo Galvanetto (Università di Padova) and Alberto Milazzo (Università di Palermo)

1630	1655	1720	
Analysis of tapered structures by means of refined 1D models	Free vibration analysis of laminated structures with viscoelastic layers	Hygro-thermal analysis of multilayered structures by means of MITC9 shell finite elements based on the CUF	
Enrico Zappino, Andrea Viglietti, Erasmo Carrera	M. Filippi, E. Carrera	M. Cinefra, E. Carrera	

Tuesday Afternoon / 17 November / Polito / Room 5P

Session S5 — Propulsion

Chaired by: Antonio Ficarella (Università del Salento) and Roberto Marsilio (Politecnico di Torino)

1630	1655	1720	
Definition and optimization of the supercharging architecture for an aircraft two stroke diesel engine	Flame image processing and analysis in an ultra-lean liquid fueled combustor	"Greening the propulsion": a comparative analysis of advanced more electric solutions for aircrafts	
A. Paolo Carlucci, Antonio Ficarella, Domenico Laforgia, Gianluca Trullo	Maria Grazia De Giorgi, Aldebara Sciolti, Stefano Campilongo, Antonio Ficarella	Maria Grazia De Giorgi, Teresa Donateo, Stefano Campilongo, Luigi Spedicato, Antonio Ficarella, Giuseppe Giliberti	

Tuesday Afternoon / 17 November / Polito / Aula Magna	
1810 - 1910	**Plenary Talks**
Chaired by: Alessandro Chiesa (Aviospace) and Mario Marchetti (La Sapienza)	
1810 - 1840	Francesco Marulo Università di di Napoli Federico II *Aircraft Community Noise: The Revenge of a Neglected Problem*
1840 - 1910	Carlo Barbieri Università Ambrosiana *Uomini e Macchine in Volo, Italo Balbo Aviatore*

Tuesday Afternoon / 17 November / Polito	
1910 - 2030	**Apericena**

Wednesday, 18 November 2015, Oval Lingotto

Wednesday Morning / 18 November / Oval Lingotto	
0730 - 0815	**Registration**

Wednesday Morning / 18 November / Oval Lingotto	
0825 - 1055	**Parallel Sessions**

Wednesday Morning / 18 November / Oval Lingotto / Plenary Room

Session MS2 **IXV Minisymposium**

Chaired by: Roberto Angelini (Thales Alenia Space) and Salvatore Mancuso (ESA)

0825	0845	0905	0925	0945	1005	1025	1045
The IXV mission from conception to development and successful completion G. Tumino, S. Mancuso, J.M. Gallego, S. Dussy, J.P. Preaud, G. Di Vita, P. Brunner	IXV re-entry demonstrator: mission overview, system challenges and flight reward A. Denaro, S. Mancuso	IXV mission analysis and flight mechanics: from design to postflight D. Bonetti, G. De Zaiacomo, G. Blanco, I. Pontijas, C. Parigini, R. Haya, J. Freixa, E. Bassano, R. Carducci, M. Sudars, A. Denaro, S. Mancuso	Intermediate experimental vehicle, ESA program aerodynamics - aerother-modynamics key technologies for spacecraft design and successful flight S. Dutheil, J. Pibarot, D. Tran, J.J. Vallee, J.P. Tribot, G. Rufolo, S. Mancuso	The development, verification and performances of the IXV guidance, navigation and control subsystem R. Haya, V. Marco, M. Kerr	CMC windward TPS and nose of the IXV vehicle: qualification, integration, and flight T. Pichon, F. Buffenoir	IXV avionics architecture: from design to mission results M. Succa, I. Boscolo, A. Drocco, S. Dussy	The IXV ground segment design, imple-mentation and operations Giovanni Martucci di Scarfizzi, Alessandro Bellomo, Ivano Musso, Diego Bussi, Massimo Rabaioli, Gianfranco Santoro, Gerhard Billig, Jose Maria Gallego Sanz

Wednesday Morning / 18 November / Oval Lingotto / Room AIDAA-1

Session MS5 **SMAT - Sistema di monitoraggio avanzato del Territorio**

Chaired by: Salvatore Farfaglia (Alenia Aermacchi) and Pier Antonio Catella (Selex ES)

0825	0850	0915	0940	1005
The SMAT project: advanced environment monitoring system Salvatore Farfaglia	UAS autonomy for ATOL, automatic taxi and mission planning/replanning Ilaria Sale, Luca Damilano	Sensors and payloads management Pier Antonio Catella, Marco Maffei	SMAT supervision and coordination station Michele Martino, Filomena Solitro, Eugenio Topa, Alfredo Villa, Carlo Vizzi	Airspace integration Nicole Viola, Sara Cresto Aleina, Roberta Fusaro

Wednesday Morning / 18 November / Oval Lingotto / Room AIDAA-2

Session S1 — Aircraft Design

Chaired by: Franco Bernelli-Zazzera (Politecnico di Milano) and Aldo Frediani (Università di Pisa)

0825	0850	0915	0940	1005	1030
Load control and alleviation technology for application to future green regional aircraft E. Baldassin, E. Capello, G.M. Carossa, E. Bocchio, N. Calvi	Preliminary design of an adaptive aileron for next generation regional aircraft Gianluca Amendola, Ignazio Dimino, Francesco Amoroso, Rosario Pecora, Antonio Concilio	Investigation on an anti-icing system based on piezoelectric technology Salvatore Ameduri, Angela Brindisi, Monica Ciminello	Dynamic response analysis of pressurized cabins subjected to decompression loadings Alfonso Pagani, Erasmo Carrera	Guided procedure for the zonal safety analysis in aircraft preliminary design Luca Boggero, Marco Fioriti, Sabrina Corpino	Conceptual design of a VTOL spacecraft aimed at parabolic flights Roberta Fusaro, Nicole Viola, Francesco De Vita, Alberto Del Bianco, Francesco Santoro, Franco Fenoglio, Federico Massobrio

Wednesday Morning / 18 November / Oval Lingotto / Room AIDAA-3

Session MS3 — Technologies for Space Debris Capture and De-orbiting: the CADET project

Chaired by: Walter Allasia (Eurix) and Emanuele Pensavalle (Aviospace)

0825	0850	0915	0940	1005	1030
Aviospace's developments on active debris removal technologies and concepts Alessandro Chiesa, Giovanni Gambacciani, Franco Fossati, Emanuele Pensavalle	In-situ measurement of debris kinematics and inertial properties during active debris removal mission Gabriele Biondi, Alessandro Chiesa, Stefano Mauro, Tharek Mohtar, Stefano Pastorelli, Massimo Sorli	Guidance strategies for the capture of space debris Fabrizio Stesina, Sabrina Corpino, Loris Franchi	Space debris motion reconstruction for removal Walter Allasia	Innovative solutions for space debris capture: role of materials friction coefficient Sara Ferraris, Sergio Perero, Giovanna Gautier di Confiengo, Alessandro Chiesa, Monica Ferraris	Development of a novel nanocomposite pressure sensor based on carbon nanotubes: material synthesis and read-out electronics integration Alessandro Chiolerio, Sergio Bocchini, Ignazio Roppolo, Matteo Stoppa, Paolo Motto Ros, Marco Crepaldi, Danilo Demarchi, Candido Fabrizio Pirri

Wednesday Morning / 18 November / Oval Lingotto / Room AIDAA-4

Session MS8 — Small satellites for big missions: challenges and opportunities

Chaired by: Vittorio Ancona (Thales Alenia Space) and Sabrina Corpino (Politecnico di Torino)

0825	0845	0905	0925	0945	1005	1025
Operational capabilities of next-genera-tion nanosatellites Marco Villa, Fabio Nichele, Sabrina Corpino	Cubesats for space exploration: a new paradigm for planetary science missions Sabrina Corpino	Merging educational with technical challenges in small satellite missions in the experience of ESA's education office Piero Galeone, Joost Vanreusel, Antonio De Luca, Matteo Boerci, Christian Bungeroth	Assembly, integration and test lessons learned from small satellite development Vittorio Ancona	Cubesat tecnology demonstrator :bifocal metrology , innovative space metrology system Fulvio Bresciani, Vittorio Ancona	Microsatellite technologies: recent activities at the University of Pisa Salvo Marcuccio	Preliminary mission analysis of a CubeSat constellation in support of COSMO SkyMed Domenico Cascone, Stefano Federici, Andrea Cici

Wednesday Morning / 18 November / Oval Lingotto / Room AIDAA-6

Session S8 **Composites**

Chaired by: Marco Gigliotti (University of Poitiers) and Calogero Orlando (Università di Enna Kore)

0825	0850	0915	0940	1005	1030
Variable kinematics models for multilayered smart plates	Residual strength analysis of damaged composite stiffened panels	A generalized unified formulation for vibration analysis of prestressed laminated panels	A probabilistic approach for buckling analysis of sandwich composite cylindrical shells	Advanced laminated composite applications for doubly-curved shell structural components with variable curvature	Multi-scale analysis and optimisation of 3D orthogonal woven composite structures combining the response surface method and genetic algorithms
Alberto Milazzo, Calogero Orlando	Fulvio Romano, Francesco Di Caprio, Umberto Mercurio, Leonardo Lecce	Michele D'Ottavio, Olivier Polit	Michela Alfano, Chiara Bisagni	Francesco Tornabene, Nicholas Fantuzzi, Michele Bacciocchi	Xinwei Fu, Sergio Ricci, Chiara Bisagni

Wednesday Morning / 18 November / Oval Lingotto

1055 - 1115 **Coffee-Break**

Wednesday Morning / 18 November / Oval Lingotto / Plenary Room

1115 - 1210 **Clean-Sky Round Table**

Organized by Giuseppe Pagnano, Clean-Sky CS Coordinating Project Officer with the participation of Distretti Aerospaziali

Wednesday Morning / 18 November / Oval Lingotto / Plenary Room

1210 - 1300 **AIDAA General Assembly**

Wednesday Afternoon / 18 November / Oval Lingotto	
1300 - 1350	**Lunch**

Wednesday Afternoon / 18 November / Oval Lingotto / Plenary Room	
1350 - 1520	**Plenary Talks** Chaired by: Roberto Galatolo (Università di Pisa), Mario Marchetti and Silvano Sgubini (La Sapienza)
1350 - 1420	Amalia Finzi and Franco Bernelli Zazzera Politecnico di Milano *Comets are nice to touch*
1420 - 1450	Giorgio Saccoccia ESA *Technologies for Space Exploration: ESA initiatives and plans*
1450 - 1520	Paolo Gaudenzi Università La Sapienza Roma *Sfide di meccanica strutturale nello sviluppo di un lanciatore*

Wednesday Afternoon / 18 November / Oval Lingotto / Plenary Room	
1520 - 1530	**AWARDS CEREMONY**

Wednesday Afternoon / 18 November / Oval Lingotto	
1530 - 1545	**Coffee-Break**

Wednesday Afternoon / 18 November / Oval Lingotto / Plenary Room	
1545 - 1830	**Addresses of Local, National and Finmeccanica Authorities** *Prospettive sulle attività aerospaziali in Italia e Piemonte*

Wednesday Afternoon / 18 November / Oval Lingotto	
1830	**BUS DEPARTURE FROM OVAL LINGOTTO TO VILLA SASSI**
1900	**WELCOME DRINK AT VILLA SASSI AND BOOK PRESENTATION**
2000	**DINNER AT VILLA SASSI**
2330	**BUS DEPARTURE TO THE CITY CENTER**

Thursday Morning, 19 November 2015, Oval Lingotto

Thursday Morning / 19 November / Oval Lingotto	
0800 - 0830	**Registration**

Thursday Morning / 19 November / Oval Lingotto / Plenary Room	
0830 - 1045	**Plenary Talks** Chaired by: Marco Gigliotti (University of Poitiers), Mario Marchetti (La Sapienza), Giuseppe Pagnano (Clean-Sky), and Raimund Rolfes (Leibniz Universitaet Hannover)
0830 - 0900	Wenbin Yu Purdue University *Mechanics of Structure Genome:* *A Unified Theory for Constitutive Modeling of Composite Structures*
0900 - 0930	Paul Weaver University of Bristol *Enhanced Structural Performance using Variable Angle Tow Composites*
0930 - 1000	Adrian Mouritz RMIT University *Multi-Functional Three-Dimensional Fibre Composites*
1000 - 1045	Eric Dautriat Clean-Sky Executive Director *Clean Sky and the aeronautical research eco-system*

Thursday Morning / 19 November / Oval Lingotto	
1045 - 1110	**Coffee-Break**

Thursday Morning / 19 November / Oval Lingotto

1110 - 1250 **Parallel Sessions**

Thursday Morning / 19 November / Oval Lingotto / Plenary Room

Session S7 **Helicopters**

Chaired by: Cesare Cardani (Politecnico di Milano) and Roberto Galatolo (Università di Pisa)

1110	1135	1200	1225
Design and manufacturing of a pitch-oscillating system for helicopter rotor blade dynamic stall testing A. Marino, A. Visingardi, N. Paletta, G. Esposito, V. Quaranta, L. Flamini, D. Sagaria, R. Pasta	Electro-mechanical actuator for helicopter landing gear extension/retraction: experimental study and dynamic model validation Gianpietro Di Rito, Roberto Galatolo, Eugenio Denti, Francesco Schettini, Viviana Bruno, Riccardo Grassetti	Modelling and identification of the nonlinear dynamics of a small-scale unmanned rotorcraft Francesco Schettini, Gianpietro Di Rito, Eugenio Denti, Roberto Galatolo	The use of GIS for locating helicopter emergency medical service (HEMS) operating sites Maurizio Bruglieri, Cesare Cardani, Matteo Putzu

Thursday Morning / 19 November / Oval Lingotto / Room AIDAA-1

Session MS9 **Innovative Training Networks and Manufacturing Technologies for Composite Structures for the Aerospace Sector: ADMACOM, COACH and FULLCOMP European projects Coordinated by Politecnico di Torino**

Chaired by: Monica Ferraris and Milena Salvo (Politecnico di Torino)

1110	1135	1200	1225
Advanced manufacturing routes for metal/composite components M. Ferraris & ADMACOM team	Joining of Al-6016 to Al-foam using Zn-based alloys to obtain aluminium foam sandwich (AFS) for aerospace applications Muhammad Kashif Bangash, Pardeep Kumar Gianchandani, Graziano Ubertalli, Valentina Casalegno, Monica Ferraris	Joining of C/SiC ceramic composite to itself and Ti6Al4V for aerospace applications Pardeep Kumar Gianchandani, Muhammad Kashif Bangash, Valentina Casalegno, Monica Ferraris	Review of different test methods on shear strengths of aerospace glues G. Mata-Osoro, G. Blugan, J. Kuebler

Thursday Morning / 19 November / Oval Lingotto / Room AIDAA-2

Session S3 **Fluid Dynamics**

Chaired by: Raffaele Donelli (CIRA) and Gaetano Iuso (Politecnico di Torino)

1110	1135	1200	1225
Velocity-pressure coupling deriving from the interaction of a low speed jet with a tangential flat plate Alessandro Di Marco, Matteo Mancinelli, Tiziano Pagliaroli, Roberto Camussi	Analysis on aerodynamic characteristics of a paraglider airfoil Maurizio Boffadossi, Federico Savorgnan	Investigation of a novel VTOL aircraft concept for operations in urban areas Salvatore Sedda, Costantino Sardu, Gaetano Iuso	Exact solutions of non-classical nozzle flows of van der Waals fluids Alberto Guardone, Davide Vimercati

Thursday Morning / 19 November / Oval Lingotto / Room AIDAA-3

Session MS1 — European Project CRYSTAL

Chaired by: Eugenio Brusa (Politecnico di Torino) and Lucio Tirone (INCOSE Italia Chapter)

1110	1130	1150	1210	1230
Industrial implementation of the systems engineering and impact upon product innovation according to INCOSE Lucio Tirone	Alenia Aermacchi needs and experience on MBSE: the Crystal user scenario Bruno Di Giandomenico, Claudio Pessa, Elena Valfrè, Ivo Viglietti	Heterogeneous simulation based on standards: deepening interoperability in trade-off analysis approach for aeronautical application Andreas Mitschke, Eugenio Brusa, Ambra Calà, Davide Ferretto, Claudio Pessa, Gray Bachelor	Architecture framework in Space industry: adopting DODAF viewpoints through the ARCADIA methodology Enrico Vezzetti, Marco Alemanni, Ana Cristina Diaz Del Castillo Zambrano, Paolo Maggiore, Lorenzo Pace	Cross-domain fertilization in systems engineering applied to transportation systems Marco Ferrogalini

Thursday Morning / 19 November / Oval Lingotto / Room AIDAA-4

Session S6 — Systems, Air Traffic Management and Navigation

Chaired by: Caterina Grillo (Università di Palermo) and Lorenzo Trainelli (Politecnico di Milano)

1110	1135	1200	1225
Performance based navigation (PBN): from technology to operations Filippo Tomasello, Maria Grazia Cristofaro	Feasibility study for a voice relay supporting ATC operator communications to the RPAS ground pilot Francesco Fusco, Mario Raffa, Michele Inverno	Air multi mission surveillance solutions in the current situational awareness domain Antonietta Guarracino, Mario Fassero Gamba, Michele Genisio	Project FIREFLY - An innovative solution for the Italian aerial firefighting system Alessandro Ramazzotti, Lorenzo Trainelli

Thursday Morning / 19 November / Oval Lingotto / Room AIDAA-6

Session S8 — Composites

Chaired by: Mario Marchetti (La Sapienza) and Alberto Milazzo (Università di Palermo)

1110	1135	1200	
Higher-order solutions for buckling and vibration analysis of variable stiffness plates Riccardo Vescovini, Lorenzo Dozio	Coupled and uncoupled thermoelasticity solution for a rotating disk using an analytical method Mohammad Ali Kouchakzadeh, Ayoob Entezari, Erasmo Carrera	Analysis of laminated structures by combined ESL-LW variable kinematics plate elements Alfonso Pagani, Stefano Valvano, Erasmo Carrera	

Thursday Afternoon / 19 November / Oval Lingotto	
1250 - 1400	**Lunch**

Thursday Afternoon / 19 November / Oval Lingotto	
1400 - 1605	**Parallel Sessions**

Thursday Afternoon / 19 November / Oval Lingotto / Plenary Room

Session S7 **Helicopters**

Chaired by: Giuseppe Quaranta (Politecnico di Milano)

1400	1425	1450		
Unsteady aerodynamic optimization of the camber of a morphing airfoil for rotorcraft blades	Conceptual design of a very light rotorcraft for environmental monitoring using a twin piston engine	Boundary element method for aerodynamic analysis of bluff bodies		
Andrea F. Cortesi, Francesca Fusi, Giuseppe Quaranta	Alessio Barbato, Andrea Carbonara, Giorgio Riva, Luigi Grimaldi, Salvatore Costagliola, Smaranda Chifu, Tommaso Guffanti, Giuseppe Quaranta, Roberto Papetti	Giovanni Bernardini, Giorgio Pierfederici, Jacopo Serafini, Massimo Gennaretti, Corrado Ficuciello		

Thursday Afternoon / 19 November / Oval Lingotto / Plenary Room

Session S14 **Satellites**

Chaired by: Sabrina Corpino (Politecnico di Torino)

			1515	1540
			Satellite system cyber security, specific security needs for an uncommon environment	A simple method for accurate center of gravity determination of small satellite platforms
			Daniele Frasca, Gianluca Scialanga, Giorgio Sciascia	Dario Modenini, Lorenzo Iannascoli, Paolo Tortora

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-1

Session MS9 **Innovative Training Networks and Manufacturing Technologies for Composite Structures for the Aerospace Sector: ADMACOM, COACH and FULLCOMP European projects Coordinated by Politecnico di Torino**

Chaired by: Frederic Dau (ENSAM Bordeaux) and
Gaetano Giunta (Luxembourg Institute of Science and Technology)

1400	1425	1450	1515	1540
Joining of SIC composites by TA alloys: wetting studies and physical-chemical characterization of interfaces Fabrizio Valenza, Sofia Gambaro, Maria L. Muolo, Alberto Passerone, Michael J. Reece, Theo Saunders, P eter Tatarko, Andreas Schmidt, Thomas Schubert, Thomas Weissgaerber	Joining of SiC-based composites with Ti_3SiC_2 using spark plasma sintering Peter Tatarko, Valentina Casalegno, Theo Saunders, Milena Salvo, Monica Ferraris, Michael J. Reece	Quantifying the physical and chemical degradation of composite materials Stefanos Giannis, Milena Salvo	Development and integration of glass fibre sensors into polymer composites for applications in harsh environments Milena Salvo, Daniel Milanese, Monica Ferraris, Massimo Olivero, Guido Perrone, Stefanos Giannis, Roderick H. Martin, Ben Milsom	A thermal stress finite element analysis of beam structures by hierarchical modelling Gaetano Giunta, Salim Belouettar

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-2

Session S3 **Fluid Dynamics**

Chaired by: Raffaele Donelli (CIRA) and Gaetano Iuso (Politecnico di Torino)

1400	1425	1450	1515	
Stability analysis of three-dimensional laminar compressible boundary layers based on ray-tracing theory and multiple scale technique Raffaele S. Donelli, Donato de Rosa	Transition prediction in unsteady flow on a rotor blade in forward flight condition Donato de Rosa, Raffaele S. Donelli	Geometric data reduction in aero-shape optimization Davide Cinquegrana, Emiliano Iuliano	Using a high velocity oxy-fuel torch for aerothermodynamic applications Antonio Esposito, Antonio Grieco, Michele Nugnes	

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-3

Session MS6 **STEPS 2 - Sistemi e Tecnologie per l'esplorazione spaziale**

Chaired by: Marco Nebiolo and Maria Antonietta Perino (Thales Alenia Space)

1400	1425	1450	1515	1540
STEPS2 Project - Precision landing for future space exploration missions Carlo Maria Paccagnini, Marcello Chiaberge, Paolo Prinetto, Carlos Perez, Paolo Navone, Luigi Pantani, Daniele Camatti, Costantino Scozzafava	STEPS2: rover surface navigation "Enabling new robotic exploration capabilities" Andrea Biggio, Carmine Ianni, Sandro Torelli, Alessandro Sperindé, Enrico Simetti, Basilio Bona, Francesco Lamberti, Federico Salvioli	Regenerative fuel cells Giorgio Ferrari, Stewart Pelle, Massimiliano Antonini, Paolo Maggiore, Sabina Fiorot	Virtual reality applications for re-entry vehicle aerothermal and mission analysis Manuela Marello, Agata Marta Soccini, Lorenzo Rocci	New inflatable habitats generation Marco Nebiolo, Antonia Simone, Andrea Messidoro, Monica Ferraris, Erasmo Carrera, Paolo Maggiore, Donata Valletti

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-4

Session S6 — Systems, Air Traffic Management and Navigation

Chaired by: Paolo Maggiore (Politecnico di Torino) and Alberto Rolando (Politecnico di Milano)

1400	1425	1450	1515	1540
New algorithm for horizon detection and attitude estimation Ignazio F.Finazzi, Vito M. Fico, Maria A.Martin Prats	Frequency modulated continuous wave synthetic aperture radar focusing techniques: a review in the framework of indoor autonomous operations by small unmanned aerial systems Antonio F. Scannapieco, Alfredo Renga, Antonio Moccia	DR-ONE: A formation fight dedicated unmanned aerial vehicle Alberto Rolando, Andrea Mottin, Valentina Onorato	A preliminary design study of maintenance and logistic infrastructure for male UAS Marco Fioriti, Luca Boggero, Sabrina Corpino, Nicole Viola	A method intended to prevent users interaction problems in aircraft hydraulic systems Lorenzo Borello, Matteo D.L. Dalla Vedova, Paolo Maggiore

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-6

Session S11 — Space

Chaired by: Paolo Gasbarri (La Sapienza) and Emanuele Pensavalle (Aviospace)

1400	1425	1450	1515	
Technical working group on know-how improvement on space launch vehicles: the "TETHIS"initiative Alessandro Chiesa, Erika Manis, Emanuele Pensavalle	Transferring an Earth-based adaptive optics technology to space telescopes Marco Bevilacqua, Lorenzo Dozio, Paolo Mantegazza	Design, testing and experimental data assessment of a heat sink combustion chamber Francesco Battista, Daniele Cardillo, Pasquale Natale, Daniele Ricci, Mario Panelli, Manrico Fragiacomo, Michele Ferraiuolo	Preliminary analysis of the high-speed experimental flight test vehicle HEXAFLY-international Nunzia Favaloro, Maria Pia Di Donato, Attilio Rispoli, L. Vecchione, Johan Steelant	

Thursday Afternoon / 19 November / Oval Lingotto	
1605 - 1630	**Coffee-Break**

Thursday Afternoon / 19 November / Oval Lingotto	
1630 - 1835	**Parallel Sessions**

Thursday Afternoon / 19 November / Oval Lingotto / Plenary Room

Session S14 **Satellites**

Chaired by: Fabio Curti and Antonio Paolozzi (La Sapienza)

1630	1655	1720	1745	1810
Scheduling satellite observations to monitor illegal immigration in the Mediterranean sea Riccardo Lombardi, Mauro Massari, Francesco Topputo	Use of LARES satellite data for Earth science Erricos C. Pavlis, Antonio Paolozzi, Ignazio Ciufolini, Claudio Paris, Giampiero Sindoni, Alessandro Gabrielli	Design of a reusable space TUG Sara Cresto Aleina, Nicole Viola, Simona Ferraris, Maria A. Viscio	Orbital data analysis on LARES satellite Giampiero Sindoni, Erricos C. Pavlis, Ignazio Ciufolini	Model reference adaptive method for microsatellite active magnetic control Fabio Curti, Maurizio Parisse, Alessandro Salvati

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-1

Session MS9 **Innovative Training Networks and Manufacturing Technologies for Composite Structures for the Aerospace Sector: ADMACOM, COACH and FULLCOMP European projects Coordinated by Politecnico di Torino**

Chaired by: Eelco Jansen (Leibniz Universitaet Hannover) and Marco Petrolo (Politecnico di Torino)

1630	1655	1720	1745	1810
Multi-mode reduced order approach for dynamic post-buckling analysis of composite panels Eelco Jansen, Tanvir Rahman, Raimund Rolfes	Selected aspects of current challenges in composite product development for Automotive and Aerospace industry Steffen Czichon, Jessica Koehnke, Andreas Preisler, Henrik Herranen	Advances in modeling damages in composites using a discrete element method F. Dau, J. Girardot, Ba Danh Le	Evaluation of damage effects on metallic and composite aerospace structures via refined models Marco Petrolo, Erasmo Carrera, Gabriele De Pietro, Alessandro Rosati	Dynamic response analysis of structures through component-wise models Marco Petrolo, Erasmo Carrera, Gabriele De Pietro

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-3

Session MS6 STEPS 2 - Sistemi e Tecnologie per l'esplorazione spaziale

Chaired by: Marco Nebiolo and Maria Antonietta Perino (Thales Alenia Space)

1630	1655	1720		
Development and manufacturing of high performance ribbons structures for the inflatable habitat module technology Andrea Messidoro, Donata Valletti, Antonia Simone, Marco Nebiolo, Carol Monticelli, Valter Carvelli, Zhengyu Fan	STEPS 2 contributions to exploration Maria Antonietta Perino, Piero Messidoro, Dario Boggiatto	Smart skin developments in the STEPS2 pad project Gaetano Poidomani, Eleonora Zeminiani, Luigi Pantani, Giampiero Benettin, Alessandro Chiolerio, Giovanni Benefazio		

Thursday Afternoon / 19 November / Oval Lingotto / Room AIDAA-6

Session S11 Space

Chaired by: Franco Bernelli-Zazzera (Politecnico di Milano) and Lorenzo Casalino (Politecnico di Torino)

1630	1655	1720		
Additive manufacturing towards space applications: Qualification guidelines for a new market approach Ciro Borriello, Emilio Ferrari, Erika Manis, Emanuele Pensavalle	Equatorial Italian observatory for space debris monitoring at the Broglio space center Fabio Santoni, Fabrizio Piergentili, Lorenzo Arena, Tommaso Cardona, Francesco Diprima, Gioacchino Scirè, Andrea Spinetti, Armando Grossi, Federico Curianò, Claudio Canu, Claudio Portelli	Development of a flexible lead-free piezoelectric transducer for health monitoring in the space environment Marco Laurenti, Denis Perrone, Alessio Verna, Candido F. Pirri, Alessandro Chiolerio		