

COST Action Final Assessment Review (02/10/2019 to 01/04/2024)

CA18203: Optimising Design for Inspection

This report is submitted by the Action Rapporteur in fulfilment of the requirements of the rules for COST Action Management, Monitoring and Final Assessment and is confidential to the COST Association and the Management Committee of the Action.

Summaries

Main aim/ objective

advance Europe's position of strength in the Aerospace Industry through the development of optimised intelligent structures integrated at the design inception phase through the creation of an interdisciplinary network of experienced and early career researchers working towards a common goal

The Action addressed this as described below

Ultrasound-based Structural Health Monitoring (SHM) techniques, coupled with advancements in energy harvesting and wireless sensor networks, have demonstrated increasing effectiveness in monitoring damage within aerospace components within laboratory settings. These components encompass critical elements such as airframes, engines, landing gears, and control surfaces. Our COST Action has united top European experts across these domains to facilitate the development of an integrated framework for optimized self-sensing structures capable of diagnosis and prognosis. This effort includes the development of demonstrators and educational activities, including comprehensive training programs. The Action has yielded significant outputs aligned with its objectives, including numerous journal publications, the organization of four training schools, and the submission of large collaborative grant applications. Notably, the Action has produced three core publications focusing on computational design, structural health monitoring in aerospace structures, and wireless communication. The outcomes of this work provide crucial data and insights to establish inspection frameworks, potentially leading to reduced operating costs and, ultimately, the delivery of safer and more environmentally sustainable air transport solutions.

The Rapporteur summarised the Action's major outcomes, impacts and successes as follows

Ultrasound-based Structural Health Monitoring (SHM) techniques, coupled with advancements in energy harvesting and wireless sensor networks, have demonstrated increasing effectiveness in monitoring damage within aerospace components within laboratory settings. These components encompass critical elements such as airframes, engines, landing gears, and control surfaces. This COST Action has united top European experts across these domains to facilitate the development of an integrated framework for optimized self-sensing structures capable of diagnosis and prognosis. This effort included the development of demonstrators and educational activities, including comprehensive training programs. The Action has yielded significant outputs aligned with its objectives, including numerous journal publications, the organization of four training schools, and the submission of large collaborative grant applications. Notably, the Action has produced three core publications focusing on computational design, structural health monitoring in aerospace structures, and wireless communication. The outcomes of this work provide crucial data and insights to establish inspection frameworks, potentially leading to reduced operating costs and, ultimately, the delivery of safer and more environmentally sustainable air transport solutions.

Achievement of MoU objectives, deliverables and additional outputs/ achievements

MoU objectives

The Action reported the achievement of the following objectives and their dependence on the Action networking.

MoU objective	Level of achievement reported by Action	Dependence reported by Action	Dependence assessed by Rapporteur
Development of a common understanding and definition of the subject matter: Produce, define and publish state of the art documents for main research strands: optimisation, damage detection, energy harvesting, wireless communications, signal processing and data management.	76 - 100%	High	High
Coordination of experimentation and performance assessment of technology: Identify universal parameters for testing the aspects of an aerospace SHM system. These standards will be documented and published to encourage global acceptance to allow cross laboratory comparisons within.	76 - 100%	High	High
Coordination of information seeking, identification, collection and/or data curation: Coordinate, compare and bring together results of related research with the aim of defining optimised approaches to improve the monitoring and management of EU aerospace structures.	76 - 100%	High	High
Input to stakeholders: Develop strong academic/industrial links with major aerospace companies, supply chain and SMEs to ensure creation, adoption and transfer of developed network knowledge.	76 - 100%	High	Medium
Dissemination of research results to the general public or to stakeholders.	76 - 100%	Medium	Medium
Create bridges between academia and industry stakeholders in international networks that cover aerospace structures, damage detection, energy harvesting, wireless communication and optimisation.	76 - 100%	Medium	Medium
Build critical mass through the training and development of highly skilled professionals in this Action's research area and in new emerging related technologies.	76 - 100%	High	High
Foster the sharing and cross fertilisation of research across the related research areas (Mechanical and Electrical Engineering, Computer Science, Mathematics, Materials Science and Industry), which are highly complementary, but currently separate.	76 - 100%	High	High

Dependence = dependence of the achievement (of each MoU objective) on the Action networking.

Rapporteur assessment of the achievement of MoU objectives that the Action reported as achieved (76-100%)

The Action did achieve all the above objectives that it reported were more than 75% achieved.

Action explanation regarding MoU objectives reported as not fully achieved (less than 76%)

The table below shows the Action's explanation and the Rapporteur's analysis thereof for any MoU objectives that the Action reported as not fully achieved.

MoU Objective that was reported as not fully achieved	Action's explanation	Rapporteur's analysis
The Action did not report any objectives as 25% or less achieved.		

General Assessment of MoU objectives

The level of ambition of the MoU objectives was **High**
Overall, **the Action achieved all MoU Objectives.**

Deliverables

Delivery and level of dependence of deliverables reported by Action

Deliverable	Timing deliverable	Dependence reported by Action*
(Working Group 1) Publication, specification and guidelines for a representative wing structure	Delivered	High
(Working Group 1) Publications and report on the state of the art techniques, methods and criteria for the optimisation of aircraft designs	Delivered	High
(Working Group 1) Report on the development of business cases for industry	Not delivered, but foreseen within 2 years	Medium
(Working Group 1) Report and publications on the power consumption of current processing approaches and methods for delivering improvement in damage detection	Delivered	High
(Working Group 2) Publication of test protocols for aerospace SHM systems for dissemination	Delivered	High
(Working Group 2) Strategic plan identifying routes to TRL9 and also including state of art	Delivered	High
(Working Group 2) Online platform (OneDrive/Google) for sharing validated data sets and signal processing algorithms	Not delivered, but foreseen within 2 years	High
(Working Group 2) Final review and publication of prognosis methodologies on aerospace structures	Delivered	High
(Working Group 3) Publication of state of art on energy harvesting/power management	Delivered	High
(Working Group 3) Publication of positions linked to vibration and temperature gradients in aerospace applications	Delivered	High
(Working Group 3) Publication of standardised approaches for the comparison of new and existing devices	Delivered	High
(Working Group 3) Final review and publication of power availability on aerospace structures	Delivered	High
(Working Group 4) Definition and publication of the state of art on wireless technologies	Delivered	High
(Working Group 4) Creation of an online repository, using already established approaches, open source code that researchers can utilise and adapt	Delivered	High
(Working Group 4) Publication of a framework and set of guidelines for future signal processing and data management approaches linked to industry requirements	Not delivered, but foreseen within 2 years	High
(Working Group 4) Publication of guidelines for lower power signal processing for dissemination	Delivered	High
(Working Group 5) Definition and publication of state of art on signal processing so future developments in signal processing can be measured and assessed	Delivered	High
(Working Group 5) Creation of an online repository, using already established damage detection approaches, of open source code that researchers can utilise and adapt	Delivered	High

(Working Group 5) Publication of a framework and set of guidelines for future signal processing and data management approaches linked to industry requirements	Delivered	High
(Working Group 5) Publication of guidelines for lower power signal processing techniques for aerospace applications	Delivered	High

* Dependence reported by Action = the extent to which the delivery of the deliverable was dependent on the Action networking

Rapporteur analysis of level of delivery of deliverables

The level of delivery of the deliverables reported above is assessed as follows.

The deliverables that have actually been delivered are of a very high quality and aligned with the CA objectives. It is understandable that a couple of deliverables were not delivered primarily due to the pandemic, nevertheless given their direct link with industry, it is highly suggested they should be followed up in the coming months/years (as already indicated).

- **Analysis of deliverables reported by the Action as delivered**

The deliverables that the Action reported as delivered are confirmed.

- **Analysis of deliverables reported by the Action as not delivered but delivery foreseen within 2 years**

Deliverable	Plans to ensure delivery within two years
(Working Group 1) Report on the development of business cases for industry	Despite facing significant delays caused by the COVID-19 pandemic, our engagement with industry was markedly impeded. Nevertheless, we persevered by showcasing the potential benefits of our core technological processes through a series of conference and workshop presentations.
Deliverable	Plans to ensure delivery within two years
(Working Group 2) Online platform (OneDrive/Google) for sharing validated data sets and signal processing algorithms	Under the Virtual Mobility Grant (VMG), detailed in the report accessible on our website, we meticulously examined and assessed various approaches to accomplishing this objective. A critical component of our review focused on the necessity of funding to sustain access to data that couldn't be covered by COST. During the conclusive MC meeting in Porto, a framework was mutually agreed upon, paving the way for its establishment within the next two years.
Deliverable	Plans to ensure delivery within two years
(Working Group 4) Publication of a framework and set of guidelines for future signal processing and data management approaches linked to industry requirements	There is a publication in-press that covers this deliverable - Paweł Dymora, Mirosław Mazurek, Kamil Łyczko, Zdenek Hadas, Analysis of the time slot length impact of selected data link layer protocols (B-MAC, X-MAC, and LMAC) on energy resource consumption in WSNs

The plans described by the Action to ensure the delivery within two years are credible.

- **Analysis of deliverables reported by Action as not delivered and delivery not foreseen**

The Action did not report any deliverables as not delivered and delivery not foreseen.

- **Analysis of the level of dependence on the Action networking of the achievement of the deliverables**

The dependence on the Action networking of the achievement of the deliverables reported by the Action is confirmed

General Assessment of deliverables

The level of ambition of the deliverables was **high**
Overall, **the Action achieved all deliverables**

Additional outputs / achievements

Co-authored Action publications

The Action reported 34 publications on the topic of the Action, co-authored by at least two Action participants from two countries participating in the Action, and for which the Action networking was necessary. The full list of publications appears in Annex I.

Action networking was necessary for ALL of the listed publications

The:

- **Quality** of the Action's co-authored publications is **excellent**.
The quality of the publications is excellent as evidenced by some of the high impact journals these were published in.
- **Significance** of the Action's co-authored publications is **excellent**.
The work is of high significance and contribution to the field.
- **Relevance** to the Action of the Action's co-authored publications is **excellent**.
The work is highly relevant to the field as evidenced through the high impact journals some of the work was published in.
- **Quantity** of the Action's co-authored publications is **excellent**.
The number of publications i.e. thirty four is considered to be very high for such a COST action.

Projects and proposals resulting from Action activities

The Action reported the following projects resulting from Action activities involving at least one Action participant, and for which the Action networking was necessary.

Title	Main proposer name	Funder
Autonomous honeybee colony monitoring system powered by hive	Saša Zelenika, Croatia	National
BAANG - Building twinning Actions in smart Aviation with eNvironmental Gains	Zdenek Hadas	H2020 - Horizon Europe

In addition the Action reported 10 proposals resulting from Action activities involving at least one Action participant, and for which the Action networking was necessary.

Relevance of the Action's proposals and/ or projects is **excellent**

Quantity of the Action's proposals and/ or projects is **excellent**

Action networking was necessary for ALL of the listed proposals / projects

Other Outputs / Achievements

The table below shows the other outputs / achievements and level of dependence on the Action networking reported by the Action and the Rapporteur's assessment thereof.

Other Output / Achievement reported by Action	Dependence reported by Action	Dependence assessed by Rapporteur
---	-------------------------------	-----------------------------------

<p>Boljanović S., Carpinteri A., Computational analysis of a surface corner crack under cyclic loading, Procedia Structural Integrity, the 1st Virtual European Conference on Fracture, VECF1 /online/ June 29-July 1, 2020, December 2020, vol. 28, pp.2370-2377, Elsevier, ISSN 2452-3216</p>	<p>High</p>	<p>High</p>
<p>11th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 1-3 September 2021 The session "Optimising Design for Inspection" dedicated to the COST Action CA 18203, but also open to the external contributors. The session chaired by prof. dr. Elena Jasiūnienė (Kaunas University of Technology)</p>	<p>High</p>	<p>High</p>
<p>10th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 2-4 September 2020 The session "Optimising Design for Inspection" dedicated to the COST Action CA 18203, but also open to the external contributors. The session chaired by prof. dr. Rhys Pullin (Cardiff University) and prof. dr. Elena Jasiūnienė (Kaunas University of Technology)</p>	<p>High</p>	<p>High</p>
<p>PhD Thesis: Ondřej Rubeš: Nonlinear Energy Harvesting Devices (PhD thesis led by Zdeněk Hadaš), 2022, Brno University of Technology, CZ. https://www.vut.cz/en/students/final-thesis/detail/137874</p>	<p>High</p>	<p>High</p>
<p>Master Thesis: Petr Sosna: Dynamic model of nonlinear oscillator with piezoelectric layer (master thesis led by Zdeněk Hadaš), 2021, Brno University of Technology, CZ. https://www.vut.cz/en/students/final-thesis/detail/131634</p>	<p>High</p>	<p>High</p>
<p>Masters Thesis: Simona Sijková: Design of tester of piezoelectric PVDF layers (master thesis led by Zdeněk Hadaš), 2020, Brno University of Technology, CZ. https://www.vut.cz/en/students/final-thesis/detail/124325</p>	<p>High</p>	<p>High</p>
<p>Masters Thesis: Jan Bolcek: Computational analysis of piezoelectric skin utilization for energy harvesting and sensing applications on vibrating structures (master thesis led by Oldřich Ševeček), 2022, Brno University of</p>	<p>High</p>	<p>High</p>

Technology, CZ. https://www.vut.cz/en/students/final-thesis/detail/139459		
Masters Thesis: Etienne BELLANGER, "Optimization of a representative wing component using a Genetic Algorithm", TU Delft, October 2023. https://repository.tudelft.nl/islandora/object/uuid:935d227d-65a9-4f22-8cb7-09c1a6c04044	High	High
Trišović Nataša, Ribeiro Pedro, Manoach Emil, Gavrilović Marko (2023). Random vibrations of a beam with a breathing crack, 641 EUROMECH Colloquium on Non-smooth Dynamical Systems, Dublin, Ireland, 11-13th December, 2023, European Mechanics Society (EUROMECH), Book of Abstract, https://641.euromech.org/	High	High
Masters Thesis: Beatriz da Silva Henriques "Static and Dynamic Analysis of an Airplane Wing Representative Structure for Damage Detection" 2021 https://hdl.handle.net/10216/136667	High	High
Masters Thesis: Tiago António da Silva Soares " Optimization of an airplane wing representative structure for vibration and buckling" 2022 https://hdl.handle.net/10216/144550	High	High
Nataša Trišović, Pedro Ribeiro, Emil Manoach https://641.euromech.org/	High	High
Nataša Trišovic, Wei Li, Marko Gavrilovic, Corneliu Banesa Birtok, Ognjen Ristic, Milica Milic, Radoslav Radulovic, Zaga Trišovic, Ana Virginia Socalici: Effects of changing design parameters, International Scientific And Professional Conference, Politehnika 2023, Organizer: Academy of Applied Technical Studies, Belgrade, December 15, Belgrade, https://skup-politehnika.atssb.edu.rs/ , Conference Proceedings (electronic device) https://skup-politehnika.atssb.edu.rs/	High	High
Trišović Nataša, Li Wei, Lazović-Kapor Tatjana, Gavrilović Marko,	High	High

<p>Radulović Radoslav, Milić Milica, Baneasa Birtok Corneliu (2023), The Modern Approach to Optimizing Mechanical Systems, 9th International Scientific Conference on Advances in Mechanical Engineering (ISCAME), the Book of Abstracts, 2023 Trans Tech Publications Ltd, Switzerland, Trans Tech Publications, ISBN: 9783036414454.</p> <p>https://www.scientific.net/book/book-of-abstracts-from-9th-international-scientific-conference-on-advances-in-mechanical-engineering/978-3-0364-1445-4</p>		
<p>Trišović Nataša, Li Wei, Jeremić Olivera, Ristić Ognjen, Sedak Miloš, Petrović Ana (2023). Sensitivity Analysis in Dynamic Systems: Exploring Insights, 9th International Scientific Conference on Advances in Mechanical Engineering (ISCAME), the Book of Abstracts, 2023 Trans Tech Publications Ltd, Switzerland, 2, 113-113. Trans Tech Publications, ISBN: 9783036414454. https://www.scientific.net/book/book-of-abstracts-from-9th-international-scientific-conference-on-advances-in-mechanical-engineering/978-3-0364-1445-4</p> <p>https://www.scientific.net/book/book-of-abstracts-from-9th-international-scientific-conference-on-advances-in-mechanical-engineering/978-3-0364-1445-4</p>	High	High
<p>Jeremić Olivera, Wei Li, Trišović Nataša, Socalici Ana Virginia, Baneasa Birtok Corneliu, Lazović-Kapor Tatjana, Petrović Ana (2023), Refinement of the Finite Element Model for Enhanced Structural Analysis, 9th International Scientific Conference on Advances in Mechanical Engineering (ISCAME), the Book of Abstracts, 2023 Trans Tech Publications Ltd, Switzerland, 2, 44-44, 2023 Trans Tech Publications Ltd, Switzerland, editors: Mihály Csüllög and Dr. Tamas Mankovits, ISBN: 9783036414454. https://www.scientific.net/book/book-of-abstracts-from-9th-international-scientific-conference-on-advances-in-mechanical-engineering/978-3-0364-1445-4</p> <p>https://www.scientific.net/book/book-of-abstracts-from-9th-international-scientific-conference-on-advances-in-mechanical-engineering/978-3-0364-1445-4</p>	High	High

engineering/978-3-0364-1445-4		
<p>Experimental Characterisation of Performances of Optimized Piezoelectric Energy Harvesters. Gljušćić, P.; Zelenika, S.; Perčić, M.; Kamenar, E. In Proceedings of the 21st International Conference & Exhibition, Virtual, 7–10 June 2021; pp. 131–134.</p> <p>https://www.researchgate.net/publication/352322959_Experimental_characterisation_of_performances_of_optimized_piezoelectric_energy_harvesters</p>	High	High
<p>Experimental study of the effect of plectrum parameters on the performances of plucked piezoelectric energy harvesters. Markovic, E.; Zelenika, S.; Gljušćić, P.; Perčić, M. In Proceedings of the 22nd International Conference of the European Society for Precision Engineering and Nanotechnology (EUSPEN), Geneva, Switzerland, 30 May–3 June 2022; pp. 73–76</p> <p>https://www.researchgate.net/publication/361137294_Experimental_study_of_the_effect_of_plectrum_parameters_on_the_performances_of_plucked_piezoelectric_energy_harvesters</p>	High	High
<p>Experimental study of the effect of plectrum parameters on the performances of plucked piezoelectric energy harvesters. Markovic, E.; Zelenika, S.; Gljušćić, P.; Perčić, M. In Proceedings of the 22nd International Conference of the European Society for Precision Engineering and Nanotechnology (EUSPEN), Geneva, Switzerland, 30 May–3 June 2022; pp. 73–76</p> <p>https://www.researchgate.net/publication/361137294_Experimental_study_of_the_effect_of_plectrum_parameters_on_the_performances_of_plucked_piezoelectric_energy_harvesters</p>	High	High
<p>Vesović V. Mitra, Jovanović Ž. Radiša, Perišić B. Natalija, Sretenović Dobrić A. Aleksandra, Modeling Heat – Flow Prototype Dryer Using ANFIS Optimized by PSO, The 6th International Symposium on Agricultural</p>	High	High

<p>Engineering 2023, 19th–21st Oct 2023, Belgrade–Zemun, Serbia</p> <p>http://efaidnbnmnnibpcajpcgclclefindmkaj/http://isae.agrif.bg.ac.rs/archive/Abstracts_ISAE_2023.pdf</p>		
<p>Ivana Atanasovska: Nonlinearity behaviour of thin composite plates with stress concentrators, Book of Abstracts - 3rd Conference on Nonlinearity, Belgrade, September 4-8, 2023, Publisher: Serbian Academy of Nonlinear Sciences, Belgrade, Serbia, 2023, Editors: Branko Dragovich, Željko Čupić, ISBN 978-86-905633-8-8, pp. 26."</p>	High	High
<p>SPECIAL SESSION 1 - Optimizing Design for Inspection – ODIN, 1st International Conference on Mathematical Modelling in Mechanics and Engineering, Mathematical Institute of the Serbian Academy of Sciences and Arts, Belgrade, 08.-10. September 2022, Editors: Ivana Atanasovska, Milan Cajić, Danilo Karličić, Session Chair: Nataša Trišović, pp.133-147.</p> <p>https://www.mi.sanu.ac.rs/~icme/icme2024/assets/docs/Booklet%20of%20Abstracts_ICME_2022.pdf</p>	High	High
<p>Ivana Atanasovska, Dejan Momcilovic: FAILURE ANALYSIS OF ATR 72 TOW BAR – OPPORTUNITY FOR RE-DESIGN FOR INSPECTION – Book of abstracts: 10th EASN Virtual International Conference on Innovation in Aviation & Space to the Satisfaction of the European Citizens, 2-4. September, 2020., Salerno, Italy, pp.75</p>	High	High
<p>Analysis of the time slot length impact of selected data link layer protocols (B-MAC, X-MAC, and LMAC) on energy resource consumption in WSNs (in press)</p> <p>Paweł Dymora, Mirosław Mazurek, Kamil Łyczko, Zdenek Hadas,</p>	High	High
<p>Ziaja, D., Jurek, M., Śliwa, R., Wiater, A., Kulpa, M.. DIC application for damage detection in FRP composite specimens based on an example of a shearing test., 7th Edition SMS Smart Materials and Surfaces 2022 SMS Conference and Exhibition 26-28 October 2022, Athens, Greece</p>	High	High
<p>D. Kordos, T. Rogalski, R. Śliwa, P. Grzybowski, Transmission information system for taxiing on the</p>	High	High

aprons and taxiways using RFID technology, 12th EASN International Conference on Innovation in Aviation & Space for opening New Horizons, 18-20 Oct.(2022)		
Ćosić M., Boljanović S., Dojčinović M., Cavitation erosion behavior of aluminium based alloys, In: Proceedings of the 15th International Conference on Accomplishments in Mechanical and Industrial Engineering, DEMI 2021, Banja Luka, Republic of Srpska, Bosnia and Herzegovina, May 28-29, 2021, pp. 379-382, Faculty of Mechanical Engineering, University of Banja Luka, ISBN 978-99938-39-92-7.	High	High
Boljanović S, Posavljak S., Maksimović S., Fatigue endurance analysis of a surface stress raiser, In: Proceedings of the 15th International Conference on Accomplishments in Mechanical and Industrial Engineering, DEMI 2021, Banja Luka, Republic of Srpska, Bosnia and Herzegovina, May 28-29, 2021, pp. 299-304, Faculty of Mechanical Engineering, University of Banja Luka, ISBN 978-99938-39-92-7.	High	High
Papanaboina, Mastan Raja; Jasiuniene, Elena; Samaitis, Vykintas; Zukauskas, Egidijus. Structural health monitoring of multi-layered CFRP panel using ultrasonic guided waves // 11th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 1-3 September 2021: book of abstracts. [S.l.] : EASN. 2021, p. 112.	High	High
Smagulova, Damira; Samaitis, Vykintas; Papanaboina, Mastan Raja; Jasiuniene, Elena. A case study on ultrasonic guided wave inspection of aerospace components – is ‘in-situ’ feasible? // 10th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 2-4 September 2020: book of abstracts. [S.l.] : EASN. 2020, p. 76	High	High
Gljuščić, P.; Zelenika, S. Assessment of performances of optimized piezoelectric energy harvesters for wearables // Proc. 20th Int. EUSPEN Conf. 2020, pp. 49-52	High	High
Gljuščić, P.; Zelenika, S.; Perčić, M.; Kamenar E. Experimental	High	High

characterisation of performances of optimized piezoelectric energy harvesters // Proc. 21th Int. EUSPEN Conf., 2021, pp. 131-134.		
Gljušćić, P.; Zelenika, S. Coupled electromechanical behaviour of kinetic energy harvesters for SHM, Int. Conf. Advances in EH Technol. – ICAEHT 2021.	High	High
Gljušćić, Petar; Zelenika, Saša. Energy harvesting for wearable applications, Engineering power : bulletin of the Croatian Academy of Engineering, 15 (2020), 4, pp. 15-21	High	High

The quality, quantity and dependence (on the Action networking) of the other outputs/ achievements was assessed as follows.

All outputs and achievements, which is a very high number (34), were of high dependency on the Action networking. It is difficult to distinguish between them, because all are of more or less the same level.

Assessment of additional outputs and achievements (including co-authored publications and proposals/ projects)

The level of ambition of additional outputs and achievements was **high**.
Overall, **the Action achieved > 4 valid Additional Outputs / Achievements**.

General Assessment

The Action's outputs and achievements are **excellent**.

Impacts

The Action reported the following impacts (the short- to long-term scientific, technological, and / or socioeconomic changes produced by a COST Action, directly or indirectly, intended or unintended) that have resulted, or might result, from the Action.

Description of the impact	Type of impact	Timing of impact
<p>Development of validated test data from a wing structure test (as approved by Airbus) has and will create significant impact. Initially, from the first test, the data produced will be the subject of a paper, to be submitted in November 2021 that unites the following universities (including four ITC countries and three Early Career Researchers):</p> <ul style="list-style-type: none"> • Delft University of Technology, Faculty of Aerospace Engineering, Delft, The Netherlands • Mathematical Institute of the Serbian Academy of Sciences and Arts, Belgrade, Serbia • University of Belgrade, Faculty of Mechanical Engineering, Belgrade, Serbia • Institut National des Sciences Appliquées de Rouen, Laboratory of Mechanics, Rouen, France • Politecnico di Torino, DIMEAS, Torino, Italy • Karadeniz Technical University, Department of Mechanical Engineering, Trabzon, Turkey • University of Porto, Department of Mechanical Engineering, Porto, Portugal • Cardiff University, School of Engineering, Cardiff, UK <p>In addition, the test data that includes key components of this network, will be added to the project Website (January 2021). This data will be made available to all Network participants and be the focus of an Airbus approved on line seminar day in June 2021. The data will be used by participants for their own publications and conferences. In addition, a second test, based on the above paper will be completed providing significant opportunities for STSM/ECR/ITC to access a large scale test with their own equipment.</p>	<ul style="list-style-type: none"> • Scientific / Technological 	<p>Achieved</p>
<p>Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: In full agreement with the chair's assessment - the validation/approval by Airbus demonstrates the significance of the work to the field given the OEM's global industrial leadership on the subject.</p>		
<p>The international network has experienced remarkable growth, fostering new collaborations among countries that had not previously engaged in the action. Consequently, a series of workshops, meetings, and training schools were organized among the diverse participants, yielding a wealth of proposals, projects, and publications.</p>	<ul style="list-style-type: none"> • Scientific / Technological 	<p>Achieved</p>
<p>Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Valid and evidenced through the large network impacted by the action.</p>		
<p>To enhance our impact in the field of optimisation, design and inspection, we have increased scientific and technical publications, as well as organising special sessions at international conferences</p>	<ul style="list-style-type: none"> • Scientific / Technological 	<p>Achieved</p>

dedicated to this domain.		
Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Confirmed. Nothing further to add to the comments made by the chair.		
Establishing multi-disciplinary teams has enabled researchers to broaden their knowledge base. This has led to the generation of new technologies through the integration of diverse fields, resulting in the publication of scientific papers and the submission of proposals, while fostering new collaborations. The career prospects of individuals have been enhanced by the increase in proposals, projects, and publications. Ultimately, society stands to benefit from the development of these novel technologies.	<ul style="list-style-type: none"> • Scientific / Technological • Societal 	Achieved
Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Highly valid, relevant and significant - nothing further to add to the Chair's comments.		
By enhancing the mobility of researchers, particularly Early Career Researchers and those from ITC countries, we have seen new collaborations and the attainment of career advancements.	<ul style="list-style-type: none"> • Scientific / Technological • Economic 	Achieved
Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Valid, relevant and significant - nothing further to add to the Chair's comments.		
The dissemination of scientific and technological advancements has been achieved through the implementation of four Training Schools. Both participants and the general public have benefited from this exchange of knowledge. Consequently, the dissemination of scientific knowledge has expanded, leading to enhanced career prospects and accelerating both societal and economic impact.	<ul style="list-style-type: none"> • Scientific / Technological • Economic • Societal 	Achieved
Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Highly valid, relevant and significant - nothing further to add to the Chair's comments.		
Integration of developed approaches linked to damage detection, inspection and wireless technologies within aerospace structures.	<ul style="list-style-type: none"> • Scientific / Technological • Economic • Societal 	Foreseen five-to-ten years
Validity, relevance and significance (in particular importance and timeliness) of the impact reported by the Action: Valid, relevant and significant. Given the foreseen timing impact of five-to-ten years, it is important that further work continues to further substantiate the achievements to date.		

The extent to which the Action has advanced the careers, skills and networks of researchers including ECIs (as described by the Action) is excellent.

General assessment of impacts

The Action's impacts are best described as follows.
Multiple highly significant impacts are reasonably foreseen, at least one of which is already observed [Excellent]

Dissemination and exploitation of Action results (other than co-authored Action publications listed previously)

Dissemination meetings funded by the Action (possible only until 31st October 2021)

Action website

<http://www.odin-cost.com>

The:

- openness and user-friendliness of the Action website are good
- content of the Action website (programmes and minutes of all events present, all outputs/deliverables accessible from website) is good

The Action website was an effective means of disseminating the Action.

Other dissemination activities

The following other dissemination activities reported by the Action were effective and added value

Item/activity	Dedicated session in conferences 11th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 1-3 September 2021 The session "Optimising Design for Inspection" dedicated to the COST Action CA 18203, but also open to the external contributors. The session chaired by prof. dr. Elena Jasiūnienė (Kaunas University of Technology) 10th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 2-4 September 2020 The session "Optimising Design for Inspection" dedicated to the COST Action CA 18203, but also open to the external contributors. The session chaired by prof. dr. Rhys Pullin (Cardiff University) and prof. dr. Elena Jasiūnienė (Kaunas University of Technology)
Target Audience	The target audience was academia and industry. The EASN conference is Europe's primary conference on Aerospace Structures. The 2021 conference had 9 Keynotes, 69 virtual sessions, 377 technical presentations, 422 remote participants, 85 aviation and aerospace projects and representatives from 31 countries. This is the ideal forum for this COST Network.
Outcome of the activity	The conference sessions resulted in a new collaboration between two new universities and increased awareness of Network Activities.
Hyperlink	https://easnconference.eu/2021/agenda

Item/activity	SPECIAL SESSION 1 - Optimizing Design for Inspection – ODIN, 1st International Conference on Mathematical Modelling in Mechanics and Engineering, Mathematical Institute of the Serbian Academy of Sciences and Arts, Belgrade, 08.-10. September 2022, Editors: Ivana Atanasovska, Milan Cajić, Danilo Karličić, Session Chair: Nataša Trišović, pp.133-147.
Target Audience	The target audience was academia and industry partners from across Europe
Outcome of the activity	The conference sessions resulted in new awareness of Network Activities.
Hyperlink	https://www.mi.sanu.ac.rs/~icme/icme2024/assets/docs/Booklet%20of%20Abstracts_ICME_2022.pdf

Exploitation activities

No exploitation activities were reported by the Action.

Assessment of Action dissemination and exploitation

The effectiveness of the Action's dissemination and exploitation approach (other than co-authored publications) is assessed as follows:

Highly effective approach - nothing further to add to the Chair's comments.

Assessment of Action dissemination and exploitation activities:

There were many highly effective Action activities focusing on dissemination of Action results [Excellent]

Action Success(es)

The following table shows the success(es) reported by the Action and the Action Rapporteur's comment.

Success reported by Action	Action Rapporteur comment
<p>By nurturing scientific diversity spanning disciplines, countries, and cultures, the Action has significantly enhanced networking opportunities, research initiatives, and career pathways for its participants. This inclusive approach has not only enriched the shared knowledge base but has also cultivated a global community of researchers, offering a wealth of insights and perspectives from various backgrounds. These diverse perspectives have been instrumental in tackling intricate challenges in the optimisation and inspection aerospace structures. This success is underpinned by our co-authored book "Structural Health Monitoring Damage Detection Systems for Aerospace" that presents the state-of-the-art in SHM technologies for aerospace has been downloaded 155,000 times.</p>	<p>Highly successful outcome as evidenced through the Chair's description above.</p>
<p>The success of the Action lies in its pivotal role in spearheading ground breaking advancements within the realm of inspection and optimisation of aerospace structures. The Action's prolific output of scientific publications underscores its central role in driving forward the development of integrating inspection at design. This achievement transcends conventional boundaries, introducing innovative energy harvesting and wireless approaches and applying them to structures. This pioneering work represents a transformative breakthrough in aerospace inspection, pushing the industry toward greener and more environmentally conscious applications due to lightweight material use. The Action's contribution in this sphere is not only noteworthy but also instrumental in enhancing the environmental footprint of the aerospace industry.</p>	<p>In full agreement with the chair's comments - valid successful outcome.</p>

Other matters

Added value of extension

The validity of the Action's description of the added value of the extension is as follows: The request for extension was fully justified given the global pandemic, and the extension proved invaluable for the completion of the action.

Difficulties in implementing the Action

The Action Rapporteur made the following observations regarding difficulties in implementing the Action:

None observed.

Suggestions for improvements to COST framework / procedures

The Action Rapporteur did not suggest any changes to the COST framework .

Emerging topics / developments in the field of the Action

The Action reported the following emerging topics / developments in the field of the Action.

- There were no emerging topics or potentially important future developments identified during the Action that could potentially be addressed by future COST activities.

The Action Rapporteur made the following comment on the emerging topics / developments in the field reported by the Action.

In full agreement with the chair.

Action Rapporteur

This Final Assessment Report was submitted on 2024-05-24 by:
Dr Kenneth Chircop
UNIVERSITA TA MALTA
Malta

Annex 1: List of publications

The Action reported 34 publications on the topic of the Action, co-authored by at least two Action participants from two countries participating in the Action, and for which the Action networking was necessary.

Co-authored Action publications - peer-reviewed

Title	Energy Harvesting Technologies for Structural Health Monitoring of Airplane Components—A Review
Authors	Saša Zelenika ; Zdenek Hadas ; Sebastian Bader ; Thomas Becker ; Petar Gljuščić ; Jiri Hlinka; Ludek Janak; Ervin Kamenar ; Filip Ksica ; Theodora Kyratsi; Loucas Louca ; Miroslav Mrlík ; Adnan Osmanović; Vikram Pakrashi ; Ondrej Rubes ; Oldřich Ševeček; José Silva ; Pavel Tofel; Bojan Trkulja; Runar Unnthorsson ; Jasmin Velagić; Željko Vrcan
DOI	doi:10.3390/s20226685
Type	Journal article
Published in	Sensors
Published by	MDPI AG
ISSN	1424-8220
Subjects	Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry
Link	https://www.mdpi.com/1424-8220/20/22/6685/pdf

Title	Structural Health Monitoring Damage Detection Systems for Aerospace
DOI	doi:10.1007/978-3-030-72192-3
Type	Book
Published in	Springer Aerospace Technology
Published by	Springer International Publishing
ISSNs	1869-1730 ; 1869-1749
Links	https://link.springer.com/content/pdf/10.1007/978-3-03-0-72192-3.pdf ; https://link.springer.com/content/pdf/10.1007/978-3-03-0-72192-3

Title	Model analysis of bucket wheel excavator SchRs 630 strength
Authors	A. Petrović; D. Ignjatović; S. Sedmak; V. Milošević-Mitić; N. Momčilović ; N. Trišović ; L. Jeremić
DOI	doi:10.1016/j.engfailanal.2021.105451
Type	Journal article
Published in	Engineering Failure Analysis
Published by	Elsevier BV
ISSN	1350-6307
Subjects	General Engineering; General Materials Science
Links	https://api.elsevier.com/content/article/PII:S1350630721003113?httpAccept=text/xml ; https://api.elsevier.com/content/article/PII:S1350630721003113?httpAccept=text/plain

Title Fatigue-resistance evaluations for mixed mode damages under constant amplitude and overload

Authors Slobodanka Boljanović; Stevan Maksimović; Andrea Carpinteri

DOI [doi:10.1016/j.tafmec.2020.102599](https://doi.org/10.1016/j.tafmec.2020.102599)

Type Journal article

Published in Theoretical and Applied Fracture Mechanics

Published by Elsevier BV

ISSN [0167-8442](https://www.elsevier.com/locate/01678442)

Subjects Applied Mathematics; Mechanical Engineering; Condensed Matter Physics; General Materials Science

Links <https://api.elsevier.com/content/article/PII:S0167844220301750?httpAccept=text/xml>;
<https://api.elsevier.com/content/article/PII:S0167844220301750?httpAccept=text/plain>

Title Computational Failure Analysis under Overloading

Authors Slobodanka Boljanović; [Andrea Carpinteri](#)

DOI [doi:10.3390/met11101509](https://doi.org/10.3390/met11101509)

Type Journal article

Published in Metals

Published by MDPI AG

ISSN [2075-4701](https://www.mdpi.com/journal/met)

Subjects General Materials Science; Metals and Alloys

Link <https://www.mdpi.com/2075-4701/11/10/1509/pdf>

Title Numerical Analysis and Experimental Verification of Damage Identification Metrics for Smart Beam with MFC Elements to Support Structural Health Monitoring

Authors [Andrzej Koszewnik](#); [Kacper Lesniewski](#); [Vikram Pakrashi](#)

DOI [doi:10.3390/s21206796](https://doi.org/10.3390/s21206796)

Type Journal article

Published in Sensors

Published by MDPI AG

ISSN [1424-8220](https://www.mdpi.com/journal/sensors)

Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry

Link <https://www.mdpi.com/1424-8220/21/20/6796/pdf>

Title Advances in Dielectric Thin Films for Energy Storage Applications, Revealing the Promise of Group IV Binary Oxides

Authors [José P. B. Silva](#); [Koppole C. Sekhar](#); Hao Pan; [Judith L. MacManus-Driscoll](#); Mário Pereira

DOI [doi:10.1021/acsenergylett.1c00313](https://doi.org/10.1021/acsenergylett.1c00313)

Type Journal article

Published in ACS Energy Letters

Published by American Chemical Society (ACS)

ISSNs [2380-8195](https://www.acs.org/journals/energ); [2380-8195](https://www.acs.org/journals/energ)

Subjects Materials Chemistry; Energy Engineering and Power

Technology; Fuel Technology; Renewable Energy, Sustainability and the Environment; Chemistry (miscellaneous)

Link <https://pubs.acs.org/doi/pdf/10.1021/acseenergylett.1c00313>

Title An Assessment of the Effect of Progressive Water Absorption on the Interlaminar Strength of Unidirectional Carbon/Epoxy Composites Using Acoustic Emission

Authors [Faisal Almudaihesh](#); [Stephen Grigg](#); Karen Holford; [Rhys Pullin](#); Mark Eaton

DOI [doi:10.3390/s21134351](https://doi.org/10.3390/s21134351)

Type Journal article

Published in Sensors

Published by MDPI AG

ISSN [1424-8220](#)

Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry

Link <https://www.mdpi.com/1424-8220/21/13/4351/pdf>

Title Modelling of the fatigue strength degradation due to a semi-elliptical flaw

Authors Slobodanka Boljanović; [Andrea Carpinteri](#)

DOI [doi:10.1016/j.finmec.2021.100020](https://doi.org/10.1016/j.finmec.2021.100020)

Type Journal article

Published in Forces in Mechanics

Published by Elsevier BV

ISSN [2666-3597](#)

Links <https://api.elsevier.com/content/article/PII:S2666359721000111?httpAccept=text/xml>;
<https://api.elsevier.com/content/article/PII:S2666359721000111?httpAccept=text/plain>

Title Computational analysis of a surface corner crack under cyclic loading

Authors Slobodanka Boljanović; Andrea Carpinteri

DOI [doi:10.1016/j.prostr.2020.11.084](https://doi.org/10.1016/j.prostr.2020.11.084)

Type Journal article

Published in Procedia Structural Integrity

Published by Elsevier BV

ISSN [2452-3216](#)

Links <https://api.elsevier.com/content/article/PII:S2452321620307459?httpAccept=text/xml>;
<https://api.elsevier.com/content/article/PII:S2452321620307459?httpAccept=text/plain>

Title Kinetic Energy Harvesting for Wearable Medical Sensors

Authors [Petar Gljuščić](#); [Saša Zelenika](#); [David Blažević](#); [Ervin Kamenar](#)

DOI [doi:10.3390/s19224922](https://doi.org/10.3390/s19224922)

Type Journal article
 Published in Sensors
 Published by MDPI AG
 ISSN [1424-8220](#)
 Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry
 Link <https://www.mdpi.com/1424-8220/19/22/4922/pdf>

Title Development and experimental validation of self-powered wireless vibration sensor node using vibration energy harvester
 Authors Ondrej Rubes; Jan Chalupa; Filip Ksica; Zdenek Hadas
 DOI [doi:10.1016/j.ymssp.2021.107890](https://doi.org/10.1016/j.ymssp.2021.107890)
 Type Journal article
 Published in Mechanical Systems and Signal Processing
 Published by Elsevier BV
 ISSN [0888-3270](#)
 Subjects Computer Science Applications; Mechanical Engineering; Aerospace Engineering; Civil and Structural Engineering; Signal Processing; Control and Systems Engineering
 Links <https://api.elsevier.com/content/article/PII:S0888327021002855?httpAccept=text/xml>;
<https://api.elsevier.com/content/article/PII:S0888327021002855?httpAccept=text/plain>

Title A Numerical Model for Experimental Designs of Vibration-Based Leak Detection and Monitoring of Water Pipes Using Piezoelectric Patches
 Authors Favour Okosun; [Mert Celikin](#); [Vikram Pakrashi](#)
 DOI [doi:10.3390/s20236708](https://doi.org/10.3390/s20236708)
 Type Journal article
 Published in Sensors
 Published by MDPI AG
 ISSN [1424-8220](#)
 Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry
 Link <https://www.mdpi.com/1424-8220/20/23/6708/pdf>

Title Non-linear dynamics of a stiffened composite laminated panel with debonds
 Authors Beatriz da Silva Henriques; [Pedro Ribeiro](#); Marcelo F.S.F. de Moura; Rhys Pullin
 DOI [doi:10.1016/j.compstruct.2023.117233](https://doi.org/10.1016/j.compstruct.2023.117233)
 Type Journal article
 Published in Composite Structures
 Published by Elsevier BV
 ISSN [0263-8223](#)
 Links <https://api.elsevier.com/content/article/PII:S0263822323005792?httpAccept=text/xml>;
<https://api.elsevier.com/content/article/PII:S02638223>

[23005792?httpAccept=text/plain](https://doi.org/10.3390/app13179687)

Title Delamination Localization in Multilayered CFRP Panel Based on Reconstruction of Guided Wave Modes
 Authors [Mastan Raja Papanaboina](#); [Elena Jasiuniene](#); [Vykintas Samaitis](#); Liudas Mažeika; [Paulius Griškevičius](#)
 DOI [doi:10.3390/app13179687](https://doi.org/10.3390/app13179687)
 Type Journal article
 Published in Applied Sciences
 Published by MDPI AG
 ISSN [2076-3417](#)
 Link <https://www.mdpi.com/2076-3417/13/17/9687/pdf>

Title Numerical Analysis of Guided Waves to Improve Damage Detection and Localization in Multilayered CFRP Panel
 Authors [Mastan Raja Papanaboina](#); [Elena Jasiuniene](#); [Egidijus Žukauskas](#); Liudas Mažeika
 DOI [doi:10.3390/ma15103466](https://doi.org/10.3390/ma15103466)
 Type Journal article
 Published in Materials
 Published by MDPI AG
 ISSN [1996-1944](#)
 Link <https://www.mdpi.com/1996-1944/15/10/3466/pdf>

Title The Defect Identification and Localization using Ultrasonic Guided Waves in Aluminum Alloy
 Authors Mastan Raja Papanaboina; Elena Jasiuniene
 DOI [doi:10.1109/MetroAeroSpace51421.2021.9511673](https://doi.org/10.1109/MetroAeroSpace51421.2021.9511673)
 Type Proceedings article
 Published in 2021 IEEE 8th International Workshop on Metrology for AeroSpace (MetroAeroSpace)
 Published by IEEE
 Link <http://xplore.staging.ieee.org/ielx7/9511649/9511650/09511673.pdf?arnumber=9511673>

Title Control of a DC motor using feedback linearization and gray wolf optimization algorithm
 Authors [Mitra Vesović](#); Radiša Jovanović; Nataša Trišović
 DOI [doi:10.1177/16878132221085324](https://doi.org/10.1177/16878132221085324)
 Type Journal article
 Published in Advances in Mechanical Engineering
 Published by SAGE Publications
 ISSNs [1687-8132](#); [1687-8140](#)
 Links <http://journals.sagepub.com/doi/pdf/10.1177/16878132221085324>; <http://journals.sagepub.com/doi/full-xml/10.1177/16878132221085324>

Title Experimental Characterization of Optimized Piezoelectric Energy Harvesters for Wearable Sensor Networks

Authors	Petar Gljušćić ; Saša Zelenika
DOI	doi:10.3390/s21217042
Type	Journal article
Published in	Sensors
Published by	MDPI AG
ISSN	1424-8220
Link	https://www.mdpi.com/1424-8220/21/21/7042/pdf
<hr/>	
Title	Analysis of Influencing Parameters Enhancing the Plucking Efficiency of Piezoelectric Energy Harvesters
Authors	Saša Zelenika; Petar Gljušćić ; Andrea Barukčić; Marko Perčić
DOI	doi:10.3390/s23063069
Type	Journal article
Published in	Sensors
Published by	MDPI AG
ISSN	1424-8220
Link	https://www.mdpi.com/1424-8220/23/6/3069/pdf
<hr/>	
Title	Sensitivity analysis of numerical model parameters for optimized PEH responses
Authors	Petar Gljušćić; Saša Zelenika
DOI	doi:10.21595/jve.2022.22910
Type	Journal article
Published in	Journal of Vibroengineering
Published by	JVE International Ltd.
ISSNs	1392-8716 ; 2538-8460
Link	https://www.extrica.com/article/22910/pdf
<hr/>	
Title	Heat Flow Process Identification Using ANFIS-GA Model
Authors	Mitra Vesović; Radiša Jovanović
DOI	doi:10.15308/Sinteza-2023-44-51
Type	Proceedings article
Published in	Proceedings of the International Scientific Conference - Sinteza 2023
Published by	Singidunum University
Link	http://portal.sinteza.singidunum.ac.rs/Media/files/2023/44-51.pdf
<hr/>	
Title	The Latest Advances in Wireless Communication in Aviation, Wind Turbines and Bridges
Authors	Romana Ewa Śliwa; Paweł Dymora ; Mirosław Mazurek ; Bartosz Kowal ; Michał Jurek ; Damian Kordos ; Tomasz Rogalski ; Paweł Flaszynski ; Piotr Doerffer; Krzysztof Doerffer; Stephen Grigg; Runar Unnthorsson
DOI	doi:10.3390/inventions7010018
Type	Journal article
Published in	Inventions
Published by	MDPI AG
ISSN	2411-5134
Link	https://www.mdpi.com/2411-5134/7/1/18/pdf

<p>Title</p> <p>Authors</p> <p>DOI</p> <p>Type</p> <p>Published in</p> <p>Published by</p> <p>ISSNs</p> <p>Link</p>	<p>Defect Types</p> <p>Nadimul Faisal; Ömer Necati Cora; Muhammed Latif Bekci; Romana Ewa Śliwa; Yehuda Sternberg; Shashank Pant; Richard Degenhardt; Anil Prathuru doi:10.1007/978-3-030-72192-3_3</p> <p>Book chapter</p> <p>Structural Health Monitoring Damage Detection Systems for Aerospace</p> <p>Springer International Publishing 1869-1730; 1869-1749 https://link.springer.com/content/pdf/10.1007/978-3-030-72192-3_3</p>
<p>Title</p> <p>Authors</p> <p>DOI</p> <p>Type</p> <p>Published in</p> <p>Published by</p> <p>ISSN</p> <p>Links</p>	<p>DIC application for damage detection in FRP composite specimens based on an example of a shearing test</p> <p>Dominika Ziaja; Michał Jurek; Romana Śliwa; Agnieszka Wiater; Maciej Kulpa doi:10.1007/s43452-024-00859-z</p> <p>Journal article</p> <p>Archives of Civil and Mechanical Engineering</p> <p>Springer Science and Business Media LLC 1644-9665 https://link.springer.com/content/pdf/10.1007/s43452-024-00859-z.pdf; https://link.springer.com/article/10.1007/s43452-024-00859-z/fulltext.html</p>
<p>Title</p> <p>Authors</p> <p>DOI</p> <p>Type</p> <p>Published in</p> <p>Published by</p> <p>ISSN</p> <p>Link</p>	<p>Deep Feature Extraction Based on AE Signals for the Characterization of Loaded Carbon Fiber Epoxy and Glass Fiber Epoxy Composites</p> <p>Primož Potočnik; Martin Misson; Roman Šturm; Edvard Govekar; Tomaž Kek doi:10.3390/app12041867</p> <p>Journal article</p> <p>Applied Sciences</p> <p>MDPI AG 2076-3417 https://www.mdpi.com/2076-3417/12/4/1867/pdf</p>
<p>Title</p> <p>Authors</p> <p>DOI</p> <p>Type</p> <p>Published in</p> <p>Published by</p> <p>ISSNs</p> <p>Links</p>	<p>Mathematical modeling and experimental investigation of a composite beam failure - Case study</p> <p>Milica Milic; Jelena Svorcan; Nemanja Zoric; Ivana Atanasovska; Dejan Momcilovic doi:10.1177/09544062231179078</p> <p>Journal article</p> <p>Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science</p> <p>SAGE Publications 0954-4062; 2041-2983 http://journals.sagepub.com/doi/pdf/10.1177/09544062231179078; http://journals.sagepub.com/doi/full-xml/10.1177/09544062231179078</p>

Title	Concept of Autonomous Self-Sensing Metamaterial Structures for Future Aircraft
Authors	Jan Bajer; Filip Ksica ; Petr Marcian ; Miroslav Hrstka ; Jan Navratil ; Zdenek Hadas
DOI	doi:10.1109/MetroAeroSpace57412.2023.10189988
Type	Proceedings article
Published in	2023 IEEE 10th International Workshop on Metrology for AeroSpace (MetroAeroSpace)
Published by	IEEE
Link	http://xplore.staging.ieee.org/ielx7/10189920/10189924/10189988.pdf?arnumber=10189988
<hr/>	
Title	Design Concept and Test Results of Electromechanical Metamaterial Structure for Sensing and Energy Harvesting Applications
Authors	Zdenek Hadas; Vojtech Slaby; Jan Bajer; Alena Filkova; Filip Ksica; Petr Marcian
DOI	doi:10.1109/ME54704.2022.9983153
Type	Proceedings article
Published in	2022 20th International Conference on Mechatronics - Mechatronika (ME)
Published by	IEEE
Link	http://xplore.staging.ieee.org/ielx7/9982720/9982814/09983153.pdf?arnumber=9983153
<hr/>	
Title	Experimentally Verified Analytical Models of Piezoelectric Cantilevers in Different Design Configurations
Authors	Zdenek Machu; Ondrej Rubes ; Oldrich Sevecek; Zdenek Hadas
DOI	doi:10.3390/s21206759
Type	Journal article
Published in	Sensors
Published by	MDPI AG
ISSN	1424-8220
Link	https://www.mdpi.com/1424-8220/21/20/6759/pdf
<hr/>	
Title	Experimental and Numerical Analysis of Multiple Low-Velocity Impact Damages in a Glass Fibered Composite Structure
Authors	Kaleeswaran Balasubramaniam ; Dominika Ziaja ; Michał Jurek ; Piotr Fiborek ; Paweł Malinowski
DOI	doi:10.3390/ma14237268
Type	Journal article
Published in	Materials
Published by	MDPI AG
ISSN	1996-1944
Link	https://www.mdpi.com/1996-1944/14/23/7268/pdf
<hr/>	
Title	Regression Models Evaluation of Short-Term Traffic Flow Prediction
Authors	Paweł Dymora; Mirosław Mazurek; Maksymilian Jucha

DOI [doi:10.1007/978-3-031-37720-4_5](https://doi.org/10.1007/978-3-031-37720-4_5)
Type Book chapter
Published in Lecture Notes in Networks and Systems
Published by Springer Nature Switzerland
ISSNs [2367-3370](#); [2367-3389](#)
Link https://link.springer.com/content/pdf/10.1007/978-3-031-37720-4_5

Title Performance Analysis of a Real-Time Data Warehouse System Implementation Based on Open-Source Technologies
Authors Paweł Dymora; Gabriel Lichacz; Mirosław Mazurek
DOI [doi:10.1007/978-3-031-37720-4_6](https://doi.org/10.1007/978-3-031-37720-4_6)
Type Book chapter
Published in Lecture Notes in Networks and Systems
Published by Springer Nature Switzerland
ISSNs [2367-3370](#); [2367-3389](#)
Link https://link.springer.com/content/pdf/10.1007/978-3-031-37720-4_6

Title Evaluating the Usefulness of Audible Acoustics as a Damage Detection Method in Large Composite Structures
Authors Marwan Naaman; Matthew Pearson; Rhys Pullin; Faisal Almudaihesh; Stephen Grigg
DOI [doi:10.1007/978-3-031-07322-9_86](https://doi.org/10.1007/978-3-031-07322-9_86)
Type Book chapter
Published in Lecture Notes in Civil Engineering
Published by Springer International Publishing
ISSNs [2366-2557](#); [2366-2565](#)
Link https://link.springer.com/content/pdf/10.1007/978-3-031-07322-9_86
