

COST Action Progress Report at 24 months (02/10/2019 to 02/10/2021)

CA18203: Optimising Design for Inspection

The Action was approved by the Committee of Senior Officials (CSO) on 4-6-2019 and has the MoU reference COST 020/19.

This report shows the data entered into e-COST to enable the Action Chair to verify the completeness and accuracy of the report with the MC prior to submitting the report via e-COST in fulfilment of the rules for COST Action Management, Monitoring and Final Assessment.

Action leadership and participants

Leadership positions

Position	Name	Contact details	Country*
Chair	Prof Rhys Pullin	pullinr@cardiff.ac.uk +442920879374	United Kingdom

Position	Name	Contact details	Country*
Vice Chair	Prof Rúnar Unnthorsson	runson@hi.is +3545254954	Iceland

Working groups

#	WG Title	# of participants	WG Leader	Country*
1	Design, Optimisation and Integration	15	Prof Chiara Bisagni c.bisagni@tudelft.nl	Netherlands
2	Damage Detection	15	Prof Elena Jasiuniene elena.jasiuniene@ktu.lt	Lithuania
3	Power management and energy harvesting	15	Prof Zdenek Hadas hadas@fme.vutbr.cz	Czech Republic
4	Wireless Communications	5	Prof Romana Ewa Sliwa rsliwa@prz.edu.pl	Poland
5	Data management and signal processing	10	Prof Markus Sause markus.sause@mrm.uni-augsburg.de	Germany

Other key leadership positions

Position	Name	Contact details	Country*
Science Communication Coordinator	Dr Petar Dimitrov	dipetar@outlook.com	North Macedonia
GH Scientific Representative	Prof Rúnar Unnthorsson	runson@hi.is	Iceland

* The country displayed is:

- for the Action Chair, the country that nominated that person to the Management Committee before they were elected Action Chair;
- for the Vice Chair the country that nominated the person as a Management Committee Member,
- for all other leadership positions, if the person is a MC Member the country displayed is the country of nomination, otherwise it is the country of the person's primary work affiliation.

Participants

COST members having accepted the MoU

AL	02/11/2021	AT	02/11/2021	BE	12/09/2019	BA	11/10/2019	BG	10/10/2019
HR	06/09/2019	CY	18/09/2019	CZ	26/08/2019	DK	23/01/2020	EE	30/09/2019
FI	16/11/2020	FR	15/01/2020	DE	04/07/2019	EL	02/07/2019	HU	02/11/2021
IS	26/06/2019	IE	04/09/2019	IL	19/09/2019	IT	23/07/2019	LV	28/02/2020
LT	24/07/2019	LU	02/11/2021	MT	02/11/2021	MD	02/11/2021	ME	02/11/2021
NL	02/07/2019	MK	17/09/2019	NO	02/11/2021	PL	25/06/2019	PT	28/06/2019
RO	30/12/2019	RS	04/07/2019	SK	02/11/2021	SI	11/09/2019	ZA	02/11/2021
ES	22/07/2019	SE	11/09/2019	CH	02/11/2021	TR	17/07/2019	UK	25/06/2019

Other participants

Institution Name	Country
------------------	---------

Summary

The main aim and objective of the Action is to

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

During its first two years the Action progressed the achievement of this as described below

The Optimised Design for INspection (ODIN) COST Network has made significant progress in developing damage monitoring techniques, energy harvesting approaches and wireless technologies through cross Europe participation. Key publications that discuss and advance the state of the art of the key components of a holistic Structural Health Monitoring (SHM) system have been developed and delivered. Furthermore these have been disseminated through major International conferences. In addition a demonstration platform has been designed, manufactured and tested collaboratively across eight institutions and industry. The resulting data and analysis will support future business cases for introducing SHM systems at the design phase of aircraft leading to cleaner and safer transport solutions.

The Action will implement the following measures in the coming two years to overcome any issues identified in this report as potentially endangering the achievement of the objectives of the Action

There are no major issues identified. The MC committee has identified key activities to engage industry and increase participation but currently all objectives are on target and will be met.

Action website

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

Achievement of MoU objectives, deliverables and additional outputs/ achievements

MoU objectives

Please self-assess and describe the level of achievement of each MoU objective. For any MoU objective that is 25% or less achieved, please add an explanation.

Mou objective	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.
Type of objective	1.a Development of a common understanding/definition of the subject matter
Level of progress	76 - 100%
Description of progress with achieving the MoU objective	<p>The Network has completed this objective through the planned publication of a special issue of the Journal of Sensors (February 2022). The Network contributed two key papers on Energy Harvesting and Wireless technologies. In addition the Network has produced a publication of a book, by Springer.</p> <p>https://www.mdpi.com/journal/sensors/special_issues/Damage_Detection_Systems_for_Aerospace_Applications</p> <p>https://link.springer.com/book/10.1007/978-3-030-72192-3</p>

Mou objective	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.
Type of objective	1.a Development of a common understanding/definition of the subject matter
Level of progress	51 - 75%
Description of progress with achieving the MoU objective	<ol style="list-style-type: none"> 1. Delivered training school on the Fundamentals of Acoustic Emission 2. Delivered a key publication in Energy Harvesting -https://www.mdpi.com/1424-8220/20/22/6685 3. Published a book (open access) on Acoustic Emission - DOI: 10.1007/978-3-030-72192-3.

Mou objective	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.
Type of objective	<p>1.c Coordination of experimentation or testing</p> <p>1.d Comparison and/or performance assessment of a theory, model, methodology, technology or technique</p>
Level of progress	51 - 75%
Description of progress with achieving the MoU objective	<p>A collaborative test has been completed in conjunction with Airbus. The data generated from this test will be archived on the project website for network access. Once completed a web link will be provided to the COST Network. In addition, once available, our Network will host an online seminar which will present how researchers have utilised the data. The event will open to the community.</p> <p>In addition a draft paper focused on Optimisation, based on the same test, highlighting current approaches in Europe has been drafted and will be published early 2022.</p>

Mou objective	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.
Type of objective	1.g Input to stakeholders (e.g. standardization body, policy-makers, regulators, users), excluding commercial applications
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	This objective will remain to the end of the project. However, Airbus has provided significant input to MC meetings and supported the design of a test wing structure for demonstrating technologies. In addition MISTRAS the global leader in Non-Destructive testing has provided a training school in the Fundamentals of AE.

Mou objective	Dissemination of research results to the general public or to stakeholders.
Type of objective	1.i Dissemination of research results to the general public
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	<p>An ongoing objective. Dedicated resources for School Engagement have been drafted and are subject to final editing. In addition the Network has hosted a number of special sessions at international online conferences, most notable EASN - European Aeronautics Science Network e.g.</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>10th EASN virtual international conference on innovation in aviation & space to the satisfaction of the European citizens, 2-4 September 2020</p> <p>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>

Mou objective	Create bridges between academia and industry stakeholders in international networks that cover aerospace structures, damage detection, energy harvesting, wireless communication and optimisation.
Type of objective	2.a Building a community around a topic of scientific and/or socio-economic relevance, allowing for knowledge exchange and the development of a joint research agenda
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	This objective is ongoing, however a collaborative test to demonstrate key technologies to Airbus has been completed and will be the focus of the seminar series. Contacts within Airbus have agreed to advertise the one day seminar.

Mou objective	Build critical mass through the training and development of highly skilled professionals in this Action's research area and in new emerging related technologies.
Type of objective	2.b Building a community around a new or emerging field of research
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	The hosting of training Schools and STSMs have been problematic within this Action due to COVID. However, MISTRAS, the leading global NDT company, has provided a virtual/face to face hybrid training School in October 2021. A further training school in

	Energy Harvesting is planned in the next GP.
Mou objective	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.
Type of objective	2.c Bridging separate fields of science/disciplines to achieve breakthroughs that require an interdisciplinary approach
Level of progress	26 - 50%
Description of progress with achieving the MoU objective	This is an ongoing objective but significant work between disciplines most notable the design and test of the wing structure which is the focus of a publication that will be submitted in November 2021. Furthermore the second test will bring further disciplines from ITC's and ECRs together to test and analyse an optimised wing structure.

Deliverables

This section covers only deliverables that were foreseen for the Action, not additional outputs that were generated during the Action (these additional outputs will be added in the following section). Please select and comment on the progress with achieving each deliverable.

For deliverables that are:

- Delivered, please provide proof to enable the Action Rapporteur to confirm the delivery
- Not delivered but delivery is foreseen within 2 years please explain how the delivery will be achieved
- Not foreseen to be delivered please explain why not

Deliverable	(Working Group 1) Publication, specification and guidelines for a representative wing structure		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	21
Explanation	Delays due to COVID with testing and hence release of publication. Representative test structure was designed, tested and manufactured in June 2021. Planned submission date for publication November 2021.		

Deliverable	(Working Group 1) Publications and report on the state of the art techniques, methods and criteria for the optimisation of aircraft designs		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	21
Explanation	Due to COVID there have been delays in laboratory access for design, test and manufacture. An initial test of the wing structure has been completed. The next phase of work will be to optimise the structure prior to a second test in Spring 2022.		

Deliverable	(Working Group 1) Report on the development of business cases for industry		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	48
Explanation	Delivery Date is September 2023 therefore not expected at this point in time.		

Deliverable	(Working Group 1) Report and publications on the power consumption of current processing approaches and methods for delivering improvement in damage detection		
Progress with achieving deliverable	Delivered	Month deliverable due	12
Proof of progress with achieving the deliverable	https://www.mdpi.com/1424-8220/20/22/6685		

Deliverable	(Working Group 2) Publication of test protocols for aerospace SHM systems for dissemination		
Progress with achieving deliverable	Delivered	Month deliverable due	21
Proof of progress with achieving the deliverable	https://link.springer.com/book/10.1007/978-3-030-72192-3		

Deliverable	(Working Group 2) Strategic plan identifying routes to TRL9 and also including state of art		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	21
Explanation	Again as per previous deliverable this is ongoing and will be completed in next Grant Period.		

Deliverable	(Working Group 2) Online platform (OneDrive/Google) for sharing validated data sets and signal processing algorithms		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	36
Explanation	Future deliverable however, this will be completed by end 2021. The current website will host data from the wing structure test.		

Deliverable	(Working Group 2) Final review and publication of prognosis methodologies on aerospace structures		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	48
Explanation	This is a future objective but it is on schedule.		

Deliverable	(Working Group 3) Publication of state of art on energy harvesting/power management		
Progress with achieving deliverable	Delivered	Month deliverable due	21
Proof of progress with achieving the deliverable	https://www.mdpi.com/1424-8220/20/22/6685		

Deliverable	(Working Group 3) Publication of positions linked to vibration and temperature gradients in aerospace applications		
Progress with achieving deliverable	Delivered	Month deliverable due	24
Proof of progress with achieving the deliverable	https://www.mdpi.com/1424-8220/20/22/6685		

Deliverable	(Working Group 3) Publication of standardised approaches for the comparison of new and existing devices		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	39
Explanation	Future objective but this deliverable is on schedule and will be delivered on time.		

Deliverable	(Working Group 3) Final review and publication of power availability on aerospace structures		
--------------------	--	--	--

Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	48
Explanation	This is a future objective but it is on schedule.		

Deliverable	(Working Group 4) Definition and publication of the state of art on wireless technologies		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	12
Explanation	Submission of paper to special issue journal has been completed and is now under review.		

Deliverable	(Working Group 4) Creation of an online repository, using already established approaches, open source code that researchers can utilise and adapt		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	24
Explanation	This process is linked to the data repository on the website and will be delivered in the next Grant period.		

Deliverable	(Working Group 4) Publication of a framework and set of guidelines for future signal processing and data management approaches linked to industry requirements		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	This is a future objective but it is on schedule.		

Deliverable	(Working Group 4) Publication of guidelines for lower power signal processing for dissemination		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	48
Explanation	This is a future objective but it is on schedule.		

Deliverable	(Working Group 5) Definition and publication of state of art on signal processing so future developments in signal processing can be measured and assessed		
Progress with achieving deliverable	Delivered	Month deliverable due	12
Proof of progress with achieving the deliverable	https://link.springer.com/book/10.1007/978-3-030-72192-3		

Deliverable	(Working Group 5) Creation of an online repository, using already established damage detection approaches, of open source code that researchers can utilise and adapt		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	24
Explanation	As per previous discussion on creation of data repository. This will be an added function to the Action website.		

Deliverable	(Working Group 5) Publication of a framework and set of guidelines for future signal processing and data management approaches linked to industry requirements		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	42
Explanation	This is a future objective but will be delivered on schedule.		

Deliverable	(Working Group 5) Publication of guidelines for lower power signal processing techniques for aerospace applications		
Progress with achieving deliverable	Not delivered, but expected before end of Action	Month deliverable due	48
Explanation	This is a future objective but will be delivered on schedule.		

Additional outputs / achievements

Co-authored Action publications

Please enter below ONLY publications (including publications that are submitted but not yet accepted):

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

Please pay special attention to the COST Excellence and Inclusiveness policy and ensure the inclusion of publications with authors from COST Inclusiveness Target Countries (ITCs), from the underrepresented gender in the Action and from Early Career Investigators/Young researchers.

	Bibliographic data	Countries participating in the Action among authors	Open Access	COST cited?	COST funds?	Relevance to H2020 Societal challenge	Peer Reviewed?
1	<p>doi:10.3390/s20226685</p> <p>Title Energy Harvesting Technologies for Structural Health Monitoring of Airplane Components—A Review</p> <p>Authors Saša Zelenika; Zdenek Hadas; Sebastian Bader; Thomas Becker; Petar Gljušćić; 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</p> <p>DOI doi:10.3390/s20226685</p> <p>Type Journal article</p> <p>Published in Sensors</p> <p>Published by MDPI AG</p> <p>ISSN 1424-8220</p> <p>Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry</p> <p>Link https://www.mdpi.com/1424-8220/20/22/6</p>		Other	Y	Y		Y

		685/pdf						
2	<p>doi:10.1007/978-3-030-72192-3</p> <p>Title</p> <p>DOI</p> <p>Type</p> <p>Published in</p> <p>Published by</p> <p>ISSNs</p> <p>Links</p>	<p>Structural Health Monitoring Damage Detection Systems for Aerospace</p> <p>doi:10.1007/978-3-030-72192-3</p> <p>Book</p> <p>Springer Aerospace Technology</p> <p>Springer International Publishing</p> <p>1869-1730; 1869-1749</p> <p>https://link.springer.com/content/pdf/10.1007/978-3-030-72192-3.pdf;</p> <p>https://link.springer.com/content/pdf/10.1007/978-3-030-72192-3</p>		Other	Y	Y		Y
3	<p>doi:10.1016/j.engfailanal.2021.105451</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>Subjects</p> <p>Links</p>	<p>Model analysis of bucket wheel excavator SchRs 630 strength</p> <p>A. Petrović; D. Ignjatović; S. Sedmak; V. Milošević-Mitić; N. Momčilović; N. Trišović; L. Jeremić</p> <p>doi:10.1016/j.engfailanal.2021.105451</p> <p>Journal article</p> <p>Engineering Failure Analysis</p> <p>Elsevier BV</p> <p>1350-6307</p> <p>General Engineering; General Materials Science</p> <p>https://api.elsevier.com/content/article/PII:S1350630721003113?httpAccept=text/xml;</p> <p>https://api.elsevier.com/content/article/PII:S1350630721003113?httpAccept=text/plain</p>		Other	Y	Y		Y
4	<p>doi:10.1016/j.tafmec.2020.102599</p> <p>Title</p> <p>Authors</p>	<p>Fatigue-resistance evaluations for mixed mode damages under constant amplitude and overload</p> <p>Slobodanka Boljanović; Stevan</p>		Other	Y	Y		Y

	<p>DOI Type Published in</p> <p>Published by ISSN Subjects</p> <p>Links</p>	<p>Maksimović; Andrea Carpinteri doi:10.1016/j.tafmec.2020.102599 Journal article Theoretical and Applied Fracture Mechanics Elsevier BV 0167-8442 Applied Mathematics; Mechanical Engineering; Condensed Matter Physics; General Materials Science https://api.elsevier.com/content/article/PII: S0167844220301750?httpAccept=text/xml ; https://api.elsevier.com/content/article/PII: S0167844220301750?httpAccept=text/pla in</p>						
5	<p>doi:10.3390/met11101509 Title</p> <p>Authors DOI Type Published in Published by ISSN Subjects</p> <p>Link</p>	<p>Computational Failure Analysis under Overloading Slobodanka Boljanović; Andrea Carpinteri doi:10.3390/met11101509 Journal article Metals MDPI AG 2075-4701 General Materials Science; Metals and Alloys https://www.mdpi.com/2075-4701/11/10/1 509/pdf</p>		Other	Y	Y		Y
6	<p>doi:10.3390/s21206796 Title</p> <p>Authors DOI Type</p>	<p>Numerical Analysis and Experimental Verification of Damage Identification Metrics for Smart Beam with MFC Elements to Support Structural Health Monitoring Andrzej Koszewnik; Kacper Lesniewski; Vikram Pakrashi doi:10.3390/s21206796 Journal article</p>		Other	Y	Y		Y

	<p>Published in Published by ISSN Subjects</p> <p>Link</p>	<p>Sensors MDPI AG 1424-8220 Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry https://www.mdpi.com/1424-8220/21/20/6796/pdf</p>						
7	<p>doi:10.1021/acsenergylett.1c00313 Title</p> <p>Authors</p> <p>DOI Type Published in Published by ISSNs Subjects</p> <p>Link</p>	<p>Advances in Dielectric Thin Films for Energy Storage Applications, Revealing the Promise of Group IV Binary Oxides José P. B. Silva; Koppole C. Sekhar; Hao Pan; Judith L. MacManus-Driscoll; Mário Pereira doi:10.1021/acsenergylett.1c00313 Journal article ACS Energy Letters American Chemical Society (ACS) 2380-8195; 2380-8195 Materials Chemistry; Energy Engineering and Power Technology; Fuel Technology; Renewable Energy, Sustainability and the Environment; Chemistry (miscellaneous) https://pubs.acs.org/doi/pdf/10.1021/acsenergylett.1c00313</p>		Other	Y	Y		Y
8	<p>doi:10.3390/s21134351 Title</p> <p>Authors</p> <p>DOI Type Published in Published by</p>	<p>An Assessment of the Effect of Progressive Water Absorption on the Interlaminar Strength of Unidirectional Carbon/Epoxy Composites Using Acoustic Emission Faisal Almudaihesh; Stephen Grigg; Karen Holford; Rhys Pullin; Mark Eaton doi:10.3390/s21134351 Journal article Sensors MDPI AG</p>		Other	Y	Y		Y

	ISSN Subjects Link	1424-8220 Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry https://www.mdpi.com/1424-8220/21/13/4351/pdf					
9	doi:10.1016/j.finmec.2021.100020 Title Authors DOI Type Published in Published by ISSN Links	Modelling of the fatigue strength degradation due to a semi-elliptical flaw Slobodanka Boljanović; Andrea Carpinteri doi:10.1016/j.finmec.2021.100020 Journal article Forces in Mechanics Elsevier BV 2666-3597 https://api.elsevier.com/content/article/PII:S2666359721000111?httpAccept=text/xml ; https://api.elsevier.com/content/article/PII:S2666359721000111?httpAccept=text/plain		Other	Y	Y	Y
10	doi:10.1016/j.prostr.2020.11.084 Title Authors DOI Type Published in Published by ISSN Links	Computational analysis of a surface corner crack under cyclic loading Slobodanka Boljanović; Andrea Carpinteri doi:10.1016/j.prostr.2020.11.084 Journal article Procedia Structural Integrity Elsevier BV 2452-3216 https://api.elsevier.com/content/article/PII:S2452321620307459?httpAccept=text/xml ; https://api.elsevier.com/content/article/PII:S2452321620307459?httpAccept=text/plain		Other	Y	Y	Y

11	<p>doi:10.3390/s19224922</p> <p>Title Kinetic Energy Harvesting for Wearable Medical Sensors</p> <p>Authors Petar Gljušćić; Saša Zelenika; David Blažević; Ervin Kamenar</p> <p>DOI doi:10.3390/s19224922</p> <p>Type Journal article</p> <p>Published in Sensors</p> <p>Published by MDPI AG</p> <p>ISSN 1424-8220</p> <p>Subjects Electrical and Electronic Engineering; Biochemistry; Instrumentation; Atomic and Molecular Physics, and Optics; Analytical Chemistry</p> <p>Link https://www.mdpi.com/1424-8220/19/22/4922/pdf</p>		Other	Y	Y		Y
12	<p>doi:10.1016/j.ymssp.2021.107890</p> <p>Title Development and experimental validation of self-powered wireless vibration sensor node using vibration energy harvester</p> <p>Authors Ondrej Rubes; Jan Chalupa; Filip Ksica; Zdenek Hadas</p> <p>DOI doi:10.1016/j.ymssp.2021.107890</p> <p>Type Journal article</p> <p>Published in Mechanical Systems and Signal Processing</p> <p>Published by Elsevier BV</p> <p>ISSN 0888-3270</p> <p>Subjects Computer Science Applications; Mechanical Engineering; Aerospace Engineering; Civil and Structural Engineering; Signal Processing; Control and Systems Engineering</p> <p>Links https://api.elsevier.com/content/article/PII:S0888327021002855?httpAccept=text/xml; https://api.elsevier.com/content/article/PII:S0888327021002855?httpAccept=text/plain</p>		Other	Y	Y		Y

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

Projects resulting from Action activities

Please enter below all the projects on the topic of the Action resulting from Action activities, involving at least one Action participant, and for which the Action networking was necessary.

The Action reported 0 project(s) and 2 proposal(s) resulting from the Action networking.

#	Title	Countries participating in the Action among proposers	Main proposer name	Funder	Amount	Call identifier	Relevance to H2020 Societal Challenge

Other outputs / achievements

Please enter below any additional outputs/ achievements on the topic of the Action that contribute to the COST mission: “COST enables break-through scientific

developments leading to new concepts and products and thereby contributes to strengthen Europe's research and innovation capacities", and for which the Action networking was necessary (e.g. a patent, standards, white paper).

Output / achievement description	Dependence of achievement on the Action networking
<p>Conference Publications</p> <ol style="list-style-type: none"> 1. Boljanović S., Carpinteri A., Computational analysis of a surface corner crack under cyclic loading, <i>Procedia Structural Integrity</i>, 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. 2. Boljanović S, Posavljak S., Maksimović S., Fatigue endurance analysis of a surface stress raiser, In: <i>Proceedings of the 15th International Conference on Accomplishments in Mechanical and Industrial Engineering, DEMI 2021</i>, 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. 3. Ćosić M., Boljanović S., Dojčinović M., Cavitation erosion behavior of aluminium based alloys, In: <i>Proceedings of the 15th International Conference on Accomplishments in Mechanical and Industrial Engineering, DEMI 2021</i>, 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. 4. 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. 5. 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 6. Gljuščić, P.; Zelenika, S. Assessment of performances of optimized piezoelectric energy harvesters for wearables // <i>Proc. 20th Int. EUSPEN Conf. 2020</i>, pp. 49-52 7. Gljuščić, P.; Zelenika, S.; Perčić, M.; Kamenar E. Experimental characterisation of performances of optimized piezoelectric energy harvesters // <i>Proc. 21th Int. EUSPEN Conf.</i>, 2021, pp. 131-134. 8. Gljuščić, P.; Zelenika, S. Coupled electromechanical behaviour of kinetic energy harvesters for SHM, <i>Int. Conf. Advances in EH Technol. – ICAEHT 2021</i>. 9. Gljuščić, Petar; Zelenika, Saša. Energy harvesting for wearable applications, <i>Engineering power : bulletin of the Croatian Academy of Engineering</i>, 15 (2020), 4, pp. 15-21 10. Gljuščić, Petar; Zelenika, Saša. Experimental characterisation of optimized piezoelectric energy harvesters for wearables, submitted for publication to <i>Sensors</i>. <p>Masters Thesis</p> <ol style="list-style-type: none"> 1. Henriques B. Static and Dynamic Analysis of an Airplane Wing Representative Structure for Damage Detection [Master Thesis led by Ribeiro]. Porto: Faculdade de Engenharia da Universidade do Porto, 2021. <p>Dedicated session in conferences</p>	<p>Medium</p>

1. 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)
2. 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)
- 3.

Impacts

Please describe the 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 in the following table (one impact per line).

Description of the impact, i.e. what will change, and for whom, as a result of what the Action achieved	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>Foreseen by the end of the Action</p>

Please describe how the Action is advancing the careers, skills and network of researchers, including ECIs (for example: joint supervision of graduate and PhD students, research exchanges not funded by the Action, collaborations, Training Schools with ECTS accreditation, joint projects and jobs prospects).

The global pandemic has hindered work in this area. The action will always aim to prioritise those under represented in Engineering and Science, Inclusive Target Countries (ITC), and Early Career Investigators (ECI). This includes providing opportunities for Network management positions, priorities at presenting at seminars and conferences. Training schools are open access but would always prioritise ITC/ECI. In addition members of the Network have completed a draft proposal for an EU ITN network linking industry and academia with joint supervision of PhD students.

The career benefits are mainly to researchers with the following amount of experience after their PhD: ≤ 8 years.

Which of the stakeholders described in the “Plan for involving the most relevant stakeholders” in the Action’s MoU have been engaged and how? What additional stakeholders have been, or will be, engaged and how?

Airbus the global leader in Aerospace manufacturing are heavily involved in the network outputs. Initially they presented and outlined key problems in the second management committee and subsequently have provided steering and guidance in the design, manufacture and test of a representative wing structure. In addition, Airbus has conformed

that data collected during the test program can be made available to the network and will support and advertise a one day seminar on the test data analysis. The representative structure has been developed in advance of the original planned date. The seminar will be instrumental in introducing new industrial partners to the Network. In addition, industrial aerospace partners in Turkey have been identified and have provided steering to the Network. Finally MISTRAS, the global leaders in Acoustic Emission technology have representatives from Greece and the United Kingdom on the network and have provided a training school.

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

Please describe the Action's dissemination and exploitation approach as well as all activities undertaken to ensure dissemination and exploitation of the Action results and the effectiveness of these activities.

Dissemination and exploitation approach of the Action

The Action has advertised at Key international conferences through presentations and special sessions. In addition there is a dedicated LinkedIn page and website: <http://odin-cost.com/>

Dissemination

Dissemination meetings funded by the Action

Title of Dissemination meeting	Meeting date	Meeting country	Action participant	Event name and hyperlink to the website	Title of presentation	Description of added value to the Action
N/A						

Other dissemination activities

E.g. participation to non-Action meetings, e.g. EU Parliament, meetings with policy makers, experts in the field, regional authorities.

Item/activity	Target audience	Outcome	Hyperlink
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	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.	The conference sessions resulted in a new collaboration between two new universities and increased awareness of Network Activities.	https://easnconference.eu/2021/agenda

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)

Exploitation activities

Please describe below any activities undertaken to ensure exploitation (use, in particular in a commercial context) of the Action's achievements.

Item/activity	Target audience	Outcome
N/A		

Other matters

This section is confidential to the Management Committee, the Action Rapporteur and the COST Association, and is not included in the version of the report that is published on the COST website.

Difficulties in implementing the Action

If any difficulties are experienced in the implementation of the Action (e.g. imbalances of participation across the Working Groups, inactive country representatives) please describe these below. Please also describe the efforts made by the MC to address these.

The major issue to date has been the global pandemic and the increased workload of many participants. Priorities for delivering a new approach to teaching severely hampered participants time and availability. In addition, the lack of face to face activities was also problematic. The key action the MC team are employing is the release of the previously mentioned wing test data and the second test. These activities will motivate participants and re-energise the network.

Endangerment Measures

Taking into account the issues identified throughout this report, please summarise the measures the Action will implement in the coming two years to overcome any issues identified as potentially endangering the achievement of the objectives of the Action.

There are no major issues identified. The MC committee has identified key activities to engage industry and increase participation but currently all objectives are on target and will be met.

Suggestions for improvements to COST framework/ procedures

The mandate of the Scientific Committee includes providing advice to the COST Committee of Senior Officials on possible improvements to the COST framework. Please describe below any improvements that you believe should be made to the COST framework.

There are no identified improvements for the COST Framework. Current support, guidance and organisation is exemplary.

Sustaining the network beyond the Action

Are there any plans to sustain the network beyond the end of the Action?

YES

Please describe how the network will be sustained beyond the end of the Action.

The Network will be extended through collaborative grant applications, dedicated conference sessions and shared studentships

Emerging topics/ developments in the field of the Action

Please describe any emerging topics or potentially important future developments identified during the Action and that could potentially be addressed by future COST activities such as Actions S&T Conferences or Exploratory Workshops.

There have been no emerging topics identified during the action that could potentially be addressed by future cos activities.

Annex 1: Types of objectives

1 - Coordination of scientific and technological activities at a European level

- 1.a - Development of a common understanding/definition of the subject matter
- 1.b - Coordination of information seeking, identification, collection and/or data curation
- 1.c - Coordination of experimentation or testing
- 1.d - Comparison and/or performance assessment of a theory, model, methodology, technology or technique
- 1.e - Development of knowledge needing international coordination, pertaining to a new or improved theory, model, methodology, technology or technique
- 1.f - Achievement of a specific tangible output that cannot be achieved without international coordination (e.g. due to practical issues such as database availability, language barriers, availability of infrastructure or know-how, etc.)
- 1.g - Input to stakeholders (e.g. standardization body, policy-makers, regulators, users), excluding commercial applications
- 1.h - Input for future market applications (including cooperation with private enterprises)
- 1.i - Dissemination of research results to the general public
- 1.j - Dissemination of research results to stakeholders (excluding specific input in view of knowledge application)

2 - Community building

- 2.a - Building a community around a topic of scientific and/or socio-economic relevance, allowing for knowledge exchange and the development of a joint research agenda
- 2.b - Building a community around a new or emerging field of research
- 2.c - Bridging separate fields of science/disciplines to achieve breakthroughs that require an interdisciplinary approach
- 2.d - Acting as a stakeholder platform or trans-national practice community, pertaining to a certain area of socio-economical or societal application, or to a certain market sector
- 2.e - Building capacity in the demographic inclusiveness of networks in science and technology, including representation of newly established research groups, Early-Career Investigators, the under-represented gender and teams from countries/regions with less capacity in the field of the Action

Annex 2: Dimensions of successes

1 - Breakthroughs

- 1.a - Scientific breakthrough
- 1.b - Technological breakthrough
- 1.c - Breakthrough in socio-economic or societal applications

2 - Policy contribution

- 2.a - Contribution to regulatory policy
- 2.b - Contribution to environmental, infrastructural or agricultural policy
- 2.c - Contribution to economic or socio-economic policy
- 2.d - Contribution to social, cultural or legal policy

3 - Capacity building

- 3.a - Building capacity in an existing field of science and technology
- 3.b - Building capacity in bridging separate fields of science and technology
- 3.c - Building capacity in a new or emerging field of science and technology
- 3.d - Building capacity in valorising and implementing advances and applications in science and technology
- 3.e - Building capacity in the demographic inclusiveness of networks in science and technology, including representation of newly established research groups, Early-Career Investigators, the under-represented gender and teams from countries/regions with less capacity in the field of the Action