UNMANNED MAINTENANCE IN OFFSHORE WIND

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AIRTuB Dissemination log

(TEHE119002)

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AIRTuB meetings:

- 13-09-19 : Kick-off meeting AIRTuB project at HZ-UAS and Scalda in Vlissingen and presentation of the Smart Industry label
- 16-09-20 : Robotisation in Offshore wind – streaming live event from Futureland Maasvlakte met NWEA & Blauwe Cluster
- 21-09-21 : Annual AIRTuB event / TKI-WoZ Live – De KAAP Vlissingen
- 12-04-22 : AIRTuB dissemination event WP1 - TU Delft
- 20-05-22 : AIRTuB dissemination event WP5 - Qlayers - Delft
- 22-09-22 : AIRTuB dissemination event WP2 en 3 - HZ/Scalda – de KAAP Vlissingen
- 14-10-22 : AIRTuB dissemination event WP4, 6 en 7 - ENTRANCE Groningen
- 24-11-22 : AIRTuB final dissemination event NLR – Marknesse

Meetings in which the AIRTuB project was presented / discussed:

- 09-10-19 : Round-table at Offshore Energy E&C with SPARTA
- 07-11-19 : Deelname aan kick-off FIXAR innovatieproject
- 13-11-19 : Matchmaking sessie Wind meets Maak AYOP regio
- 11-12-19 : korte introductie tijdens Q-meeting Van Oord / Siemens
- 10-01-20 : Sustainable Service Logistics for OWF's bijeenkomst – EnTranCe Groningen
- 16-01-20 : SPARTA Offshore Wind Benchmarking Workshop
- 04-02-20 : Presentatie op Matchmaking Day TKI WoZ 2020
- 18-02-20 : Presentatie at Conferentie Innovation in Offshore Wind Liverpool
- 30-09-20 : Masterclass Innovatie in Offshore wind – DOB Academy
- 25-11-20 : Grensoverschrijdende Samenwerking - Seminar Platform Energy Port Zeeland
- 13-04-21 : Feestelijke opening de KAAP Vlissingen
- 22-06-21 : Blade maintenance event
- 20-10-21 : Maintenance Technology and Robotics event - KIC-MPi
- 11-04-22 : Werkbezoek Ministerie van Economische Zaken en Klimaat (M. Adriaansens) - Vlissingen
- 14-04-22 : Nacelle-Go-live event - Vlissingen
- 24-05-22 : Studiebezoek Virginia Coastal Policy Center (William & Mary Law School) - Vlissingen
- 08-06-22 : Bezoek delegatie OWIC (samenwerkingsovereenkomst getekend) - Vlissingen
- 23-06-22 : Presentatie bij het DroneWest event – Oostende
- 15-09-22 : Presentatie bij de 'ontbijtbijeenkomst Platform EnergyPort Zeeland'
- 21-09-22 : Tribologie event by "Bond voor Matrialenkennis'- Vlissingen
- 03-11-22 : Aanwezigheid bij en promotie van Zephyros en AIRTuB op 'De dag van het Klimaat akkoord' - Utrecht
- 01-12-22 : Kerstborrel PEPZ (samen met Orsted) en internationale RVO delegatie in de KAAP – Vlissingen

Guest lectures in which the AIRTuB project has been discussed:

- 10-12-19 : Minor Asset Management TU Delft Faculty of Aerospace Eng. & Wind Energy
- 11-12-20 : Minor Asset Management TU Delft Faculty of Aerospace Eng. & Wind Energy – on-line edition
- 11-02-21 : HZ-UAS Minor Offshore Renewable Energy
- 02-12-21 : HZ-UAS Minor Offshore Renewable Energy
- 07-12-21 : Minor Asset Management TU Delft Faculty of Aerospace Eng. & Wind Energy
- 19-05-22 : HZ-UAS Minor Offshore Renewable Energy
- 07-06-22 : Frontiers to Maintenance- U-Twente
- 01-12-22 : HZ-UAS Minor Offshore Renewable Energy

Publications / video's / interviews:

- Voorjaar 2022 : Launch van de Fieldlab Zephyros LinkedIn pagina
- 31-01-22 : Opname van on-line colleges voor de 'Nationale AI cursus' - Vlissingen
- 14-04-22 : Nieuwsartikel WCM website - https://www.worldclassmaintenance.com/succesful-airtub-event-sensors-for-damage-inspection-of-wind-turbine-blades/
- 05-05-22 : Nieuwsartikel WCM website - https://www.worldclassmaintenance.com/succesful-airtub-event-smart-maintenance-for-offshore-windturbine-blades-by-robotized-coating-technology/
- 21-10-22 : Artikel in WCM jaaroverzicht
- 25-10-22 : Nieuwsartikel WCM website - https://www.worldclassmaintenance.com/interesting-airtub-event-erosion-modeling-and-repair-recipe/
- 23-08-22 : Opname van een vlog voor een TKI-WoZ webinar over Maintenance – Vlissingen
- 15-09-22 : Opname van een video over het AIRTuB project – Delft
- 15-09-22 : Project in the Spotlight – TKI-WoZ
- 03-11-22 : Interview RTLZ op Dag van Klimaatakkoord - https://www.worldclassmaintenance.com/airtub-bij-rtl-nieuws-energietransitie-loopt-vertraging-op/
- 24-11-22 : AIRTuB deliverables film NLR
- 2019 Interview in Offshore Industry:Fieldlab-Zephyros-LR.pdf (worldclassmaintenance.com)
- Publicatie op website TKI-WoZ: Zephyros AIRTuB - Topsector Energie
- Publicatie op website Wind Innovators: Subsidy for Fieldlab Zephyros project… | Offshore Wind Innovators
- Publicatie op CoE-W&E: Fieldlab Zephyros start met project AIRTub | Centre of Expertise Water and Energy (coe-we.com)
- Publicatie op website Energy Port Zeeland: Fieldlab Zephyros start met project AIRTub | Centre of Expertise Water and Energy (coe-we.com)
- Nieuwsbericht Energy Port Zeeland: Living Lab Fieldlab Zephyros de KAAP biedt ruimte voor onderwijs en ontwikkeling
- Nieuwsbericht in PZC: https://www.pzc.nl/zeeuws-nieuws/drie-miljoen-subsidie-voor-drone-die-windmolens-repareert~a70e8219/
- Nieuwsbericht Windenergy: https://www.windenergie-nieuws.nl/16/fieldlab-zephyros-ontvangt-subsidie-voor-smart-maintenance-innovatieproject-airtub/
- Demonstratievideo van Fusion Engineering: Fusion Engineering windtunnel_withlog_lq.mp4

Substantive publications and presentations:

- Remote Ultrasonic Inspection of Offshore Wind Turbine Blades, D.J. Platenkamp, V.S.V. Dhanisetty, A. Chabok, A.F. Bosch, NLR-CR-2021-177
- Cheng, L., Nokhbatolfoghahai, A., Groves, R. M., & Veljkovic, M. (2022, June). Acoustic Emission-Based Detection in Restricted-Access Areas Using Multiple PZT Disc Sensors. In European Workshop on Structural Health Monitoring: EWSHM 2022-Volume 1 (pp. 619-629). Cham: Springer International Publishing.
- Cheng, L., Nokhbatolfoghahai, A., Groves, R.M. and Veljkovic, M 2023. "Using Deep Learning for multi-sensor data fusion of signals from commercial acoustic emission and piezoelectric disc sensors". Structural Control and Health Monitoring, Under review.
- A Literature Survey on Remote Inspection of Offshore Wind Turbine Blades, Automated Inspection and Repair of Turbine Blades (AIRTuB) - WP1, J.S. Hwang, D.J. Platenkamp, R.P. Beukema, NLR-CR-2020-223, May 2021
- Off-Shore Wind Turbine Blade Erosion Inspection Sensors using an Unmanned Vehicles – WP1, J.S. Hwang, R. Beukema, A. Anisimov, NLR-CR-2021-248 (DRAFT)
- Anisimov, A. G., Beukema, R., Hwang, J., Nijssen, R., & Groves, R. M. (2021, June). AIRTuB: towards automated inspection of leading edge erosion of wind turbine blades by shape analysis. In Multimodal Sensing and Artificial Intelligence: Technologies and Applications II (Vol. 11785, p. 117850W). SPIE.
- K. Vimalakanthan *CFD transition model for rough surfaces* TNO 2021 R12579, Public report, December 2021
- K. Vimalakanthan *Aerodynamic performance prediction of eroded and rough wind turbine blade sections using RANS CFD. EERA workshop on blade erosion from the perspective of loads, controls and aerodynamics*, December 14, 2022 SP4 WORKSHOP on Blade Erosion from the prospective of loads, controls and aerodynamics | EERA JP Wind
- I. Lallelis *Model Validation for Simulating the Effects of Leading Edge Erosio*n Hanze/TNO Student thesis report, January 2019.
- O. Shamir: *Analysis of LM wind tunnel measurements at erosion*. Public Hanze report, November 2020
- J. Nwaehie: *Automation of IRPWIND roughness experiment*, InHolland/TNO Student thesis report September 2020
- M.J. Vermeulen: *Erosion on wind turbine blade wind tunnel test,* NLR-CR-2021-516, September 2021
- Kisorthman Vimalakanthan, Harald van der Mijle Meijer, Iana Bakhmet, and Gerard Schepers *Performance modeling of eroded wind turbine blade using CFD*, Preprint for Journal of Wind Energy Science https://wes.copernicus.org/preprints/wes-2022-65/
- J.G. Schepers et al: *Summary of Airtub WP6.1 results*, TNO report
- Literature review of structural and non-structural wind turbine blade damage, Rogier Nijssen, Emilio Manrique, TNO 2020 R10402, September 10, 2020.

Op de WCM AIRTuB webpage zijn publicaties en AIRTuB presentaties met een link beschikbaar. Onderstaand een aantal hieruit..

- AIRTuB onderzoekt mogelijke kostenreductie door geautomatiseerd onderhoud | Hanze
- Remote Ultrasonic Inspection of Offshore Wind Turbine Blades – NLR
- Recording of the AIRTuB event 'Erosion modeling and repair recipe' d.d. 14.10.2022
- Article Fieldlab Zephyros in PortNews
- AIRTuB-publication door TU Delft: AIRTuB: towards automated inspection of leading edge erosion of wind turbine blades by shape analysis
- **Presentations workshop/demo Blade Maintenance d.d. 22 juli 2021**
    - Jason Hwang: Literature study review NLR
    - Robin Maljaars: Presentation Driving Factors in the LCOE trend of offshore wind power.
    - Robin Maljaars: Research report Driving Factors in the LCOE trend of offshore wind power
    - Loek van der Linden: Link naar Spotting erosion in SCADA dating from live wind turbines.
- AIRTuB WP1 report NLR – A Literature Survey on Remote Inspection of Offshore Wind Turbine Blades
- TNO report Literature review of wind turbine blade structural and non-structural damages.

Artist Impressions / Project roll-up banners (distributed over all partners and exposed at several events)