



UPWARDS

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## UPWARDS

*A Horizon 2020  
project funded  
by the European  
Union*

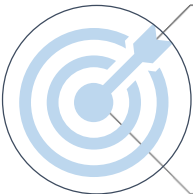
**Understanding of the Physics of Wind Turbine and Rotor Dynamics through an Integrated Simulation Framework**



**UPWARDS** project aims to make the development of bigger and better designed wind turbines possible, thus increasing the capacity of societies all over Europe and the rest of the world to harness wind-energy.



**UPWARDS** gathers a consortium of 11 partners (companies, research institutes and universities) across 8 countries and 2 continents.



**UPWARDS** is an European Commission (EC) backed project that promises to make achieving ambitious sustainability goals a reality.

### Coordinator

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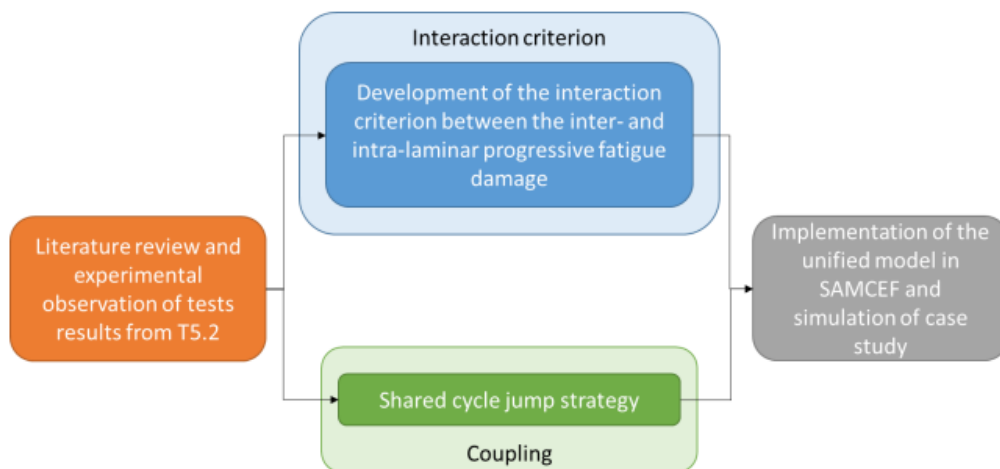
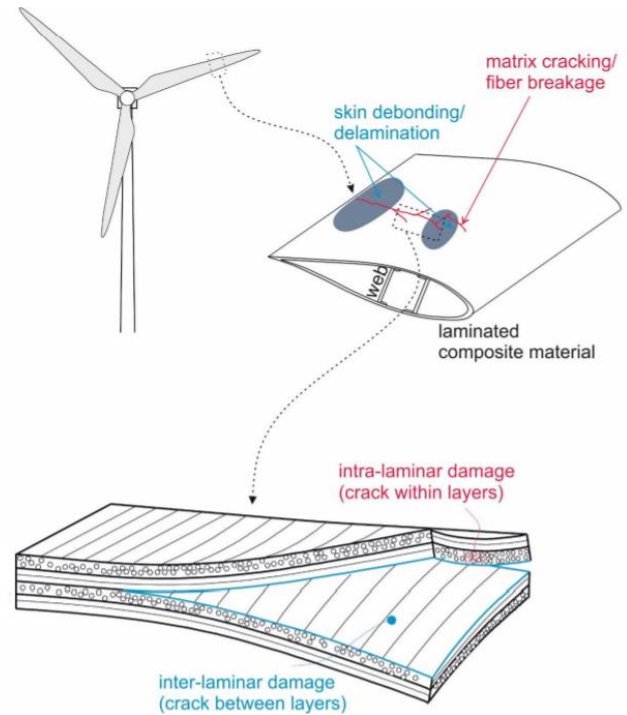
The UPWARDS project has received funding from the European Union's Horizon 2020 research and innovation programme under GA No. 763990. The information on this presentation reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



## Our last public deliverable – Unified fatigue damage model and software implementation in SAMCEF : [Link](#)

Laminated composite materials are used extensively in wind turbine blades due to their high mechanical performances and good fatigue resistance compared to metals. However, the occurring damage mechanisms are more complex in composite materials due to anisotropy, heterogeneity and defects (due to their nature but also due to the manufacturing process).

In order to be able to design safe structures made of composite materials, understanding and predicting the occurrence of damage events and their interplay is essential. This work focusses on the interaction between damage mechanisms occurring at the intra- and inter-laminar regions of the laminate under both static and fatigue loading. A dedicated formulation is developed in order to initiate delamination (inter-laminar damage) from matrix cracking (intra-laminar damage) in the numerical framework implemented in the Simcenter Samcef solver. To this end, the inter- and intra-laminar damage models presented in tasks 5.1 and 5.2 are coupled and synchronized in terms of fatigue cycles. The unified numerical tool is employed to exemplify the predicted mechanical behaviour in an open hole specimen. The results show that the interfacial stiffness is reduced to zero at the regions with high intra-laminar damage, thus modelling a delamination caused by the coalescence of micro-delaminations arising at the crack tips of transverse matrix cracks.



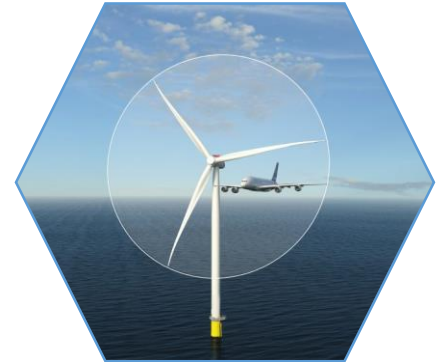
**Figure: Workflow in Task 5.3**

## UPWARDS - a project represented in international events

In the second half of 2021, our partners our partners have participated in various international trade fairs dealing with the energy, sustainable development and wind energy sectors. Despite a difficult year due to the health crisis, which forced the cancellation or postponement of many events, the UPWARDS project was represented at three major events at the end of 2021 :

- **Harvard Annual Meeting – Science and Democracy Network** : [link](#)

Wageningen University, represented by Helena Solman, participated in this online meeting in June. This network discussed questions around the ethics and the politics of technologies and processes of societal transformation. It was an opportunity for our partner WUR to mention its researches on wind Energy.



- **NAFEMS World Congress – Salzburg (October)** :

Our partner SAMTECH (now SIEMENS) presented its researches carried out in our project in this event. More specifically, the work presented dealt with the of a finite implementation and validation element method to model interlaminar fatigue damage for continuous composite material.

- **The international Composite Conference – Liege (October)** :

SAMTECH (now SIEMENS) participated to this event to present its about a finite element method for accurate fatigue-driven interlaminar damage propagation simulation for composite structures.

## Upcoming events where you can find UPWARDS

| Event                    | Place and date               | Partner involved | Topic presented  |
|--------------------------|------------------------------|------------------|--|
| Energy Storage Summit    | London (UK)<br>February 2022 | SIEMENS          | Modeling of wind turbines in a cosimulation environment between a computational fluid dynamics and a computational flexible mechanisms codes |
| Wind Europe Annual Event | Bilbao (Spain)<br>April 2022 | UL               | The global work done around the UPWARDS project  |

**Follow us on our various networks to stay informed of other events we will be attending !**

**Find this articles and more information on UPWARD'S website :** <https://www.upwards-wind.eu/>

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