PRESS RELEASE

Paris, April 25th, 2022

PRELAUNCH OF A NEW JEC GROUP PUBLICATION
DOUBLE-DOUBLE
A new perspective in the manufacture and design of composites

JEC Group is announcing the new publication Double-double – a new perspective in manufacture and design of composites, prepared by Stephen W. Tsai, Aeronautics & Astronautics, Stanford University and edited by Stanford and JEC Group to be available by June 2022.

DD enables homogenization that enables simplicity and robust manufacturing not possible with conventional laminates. With repeated 4-ply building blocks mid-plane symmetry is no longer needed. Ply drops in singles, not in symmetric pairs, placed at the exterior surfaces are easier to layup and prevent defects and wrinkles formed in the laminate interior. Resulting laminates will be tougher and will not warp. There are only two DD stacking sequences to be selected, not hundreds and thousands normally. Interlaminar stress from transverse loading will be the same for all homogenized DD laminates – making design and testing simple. Lightly loaded regions can be thinner that would reduce weight, cost and layup time. With pre-made DD non crimp fabric 1-axis layup is possible without cross-plying. Not only the layup speed can be 6 times faster than conventional methods, DD is less prone to error and visible ply drops make inspection continuous and simple. For design, trace can separate material from geometry factors. Such trace-based master ply stiffness and strength, independent of material factor, make optimization possible and practical. With such rational foundation, data generation may require only one laminate and one batch, not multiple laminates and multiple batches. While several known mysteries remain to be solved DD has come just in time to replace conventional laminates that have so many self-inflicted complications making composites less optimal, more costly and overweight.

In this book numerous insights and shortcuts can bring about benefits of significant proportion. The goal of innovation is to simplify and demystify rather than to complicate. One constant for property or process is great because it can be used to scale. Conceptually simple, DD will take an open mind and dedication to fulfill the promises of the emerging composites started 60 years ago.

"For some time, we have been advocating the use of one parameter for stiffness in trace, one parameter for failure criterion by leveraging Nettles circle, individual ply drops instead of symmetric pairs, one-axis layup with no cross-plying, and one continuous layup without stopping for mid-plane symmetry. We are now advocating one test for interlaminar stress, one laminate for design allowable generation, and one of two stacking sequences for DD to reach homogenization the fastest, and more simplifications to come. All these steps that will make composites easier and lower cost to produce are enabled because of the homogenization of DD laminates. They are like orthotropic metals, but better than real metals because DD can have directional properties; DD can be tapered to save weight with which neither conventional and unconventional laminates, nor metals, can compete," stated Steve Tsaï.

SAVE THE DATE: ATTEND THE PRESENTATION OF THE BOOK @ JEC WORLD ON TUESDAY 3 – 5.15PM TO 6PM AGORA 5

Double-Double: a new perspective in the manufacture and design of composites

- Introduction to the very new book from Professor Steve Tsaï "Double-Double: a new perspective in the manufacture and design of composites"

Thierry Massard, Chief Executive Officer, Think Composites

- Homogenization enabling simplicity and robust manufacturing: what is Double-Double?

Professor Stephen W. Tsaï, Professor (Research) of Aeronautics and Astronautics Emeritus, Standford University (online)

- Double-Double – Exploring the unique manufacturing opportunities

Dr Naresh Sharma, CEO, Nashero

- Optimal Double-Double laminate search and toughness

Dr Albertino Arteiro, Assistant Professor, University of Porto

Moderator: Andrew Mafeld, Founder/Managing Director, Connectra Global

The book "Double-Double: a new perspective in the manufacture and design of composites» will be on sale online by June 2022 at http://www.jeccomposites.com/e-store.

Price: 149 euros HT – 158 euros TTC / Print only / 360 pages

About the author

Stephen W. Tsaï

BE 1952, DEng 1961, Yale. Ford Motor, Washington University, US Air Force Materials Laboratory, Stanford University. Known for his Tsai-Hill failure criterion; lamination parameters with Pagano; Tsai-Wu failure criterion and strength ratios; Halpin-Tsai micromechanics formula; trace, master ply, omni envelopes, and unit circle failure criterion with Melo; double-double laminates; Lam search with Massard and Shah; metallic grid/[±60] CFRP skin for glueless assembly with Zheng, Wang, Kappel, and Jin. He is a member of the US Academy of Engineering since 1995.

About Stanford Composites Design Group

This group has been active in online training workshop on composites design since the early 2005. It has also published several books on design and manufacture of composite materials. One unique feature of this group is to waive the registration for the Composites Design Workshop fee of all graduate students. Hundreds have participated in this semi-annual workshops; the week of July 24, 2022, has been scheduled for the next one.

About JEC Group

JEC Group is the world's leading company dedicated entirely to the development of information and business connections channels and platforms supporting the growth and promotion of the composite materials industry. Publisher of the JEC Composites Magazine - the industry's reference magazine, JEC Group drives global innovation programs and organizes several events in the world, including JEC World (the foremost and world-leading international exhibition dedicated to composite materials and their applications), which takes place every year in Paris.
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