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Review of “Rate dependency and ply thickness influence on transverse cracking evolution in cross-ply laminates”

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^E Editor

Review of version 1

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Reviewer 1 (Anonymous)

Reviewer The authors presented an experimental study aiming to measure the evolution of cracking in cross-ply laminates using infrared thermal imaging. The research protocol is sound and interesting. I recommend its publication after minor amendments. Please, refer to the attached annotated pdf with corrections, suggestions and comments, respectfully addressed for the authors consideration.

Authors Dear Reviewer,
We would like first to thank the valuable comments you made. A detailed answer to your comments is made point by point hereafter:

Reviewer Part 2.2, to lighten the text, I suggest: 5, 50, 500, 1000 and 1400 mm/s.

Authors In fact, as the first two are expressed in mm/min, the modification should have been 0.083, 0.83, 8.3, 100 et 1400 mm/s. The authors are not quite sure that this modification which must be made throughout the article is fully necessary to improve the paper readability.

Reviewer Recommended modification in the text (note of the technical editor: minor phrasing corrections)

Authors Correction has been done and can be monitored with the text crossed out in the document. When the text has been modified, the new elements have been added in blue color.

Reviewer Fig. 13: Please, increase font to the same size as the other two graphs.

Authors The plot has been modified to fit with your comment.

Reviewer Fig. 16: It would be interesting to have the same scale for the three images, e.g. 0 to 3°C. This could better show the impact of the loadings...

Authors In principle, we fully agree with your comment. Unfortunately, we have tried different colorbars and it is not possible to find a unique scale that allows the highlighting of the phenomenon related to this figure: the appearance of oblique cracks. It is important to note that the images

come from tests at different displacement rates and that the slower the test, the more time the temperature increase linked to the appearance of a crack has to diffuse before the end of the test. It is therefore not easy to compare the amplitude of heating between these different tests.

Reviewer 2 (Anonymous)

Reviewer This paper is very interesting and well written with detailed descriptions of the experimental setup, methods and the measured data. The paper shall be recommended for publication if the authors address the items below:

Authors We would like first to thank the valuable comments you made. A detailed answer to your comments is made point by point hereafter:

Reviewer How does infrared thermography compare to other optical techniques such as digital image correlation (DIC)? What are the advantages or disadvantages? Alternatively, some researchers even quantified the crack density using high-resolution optical cameras, see Particle-toughened interlayers enhance mechanical response of composite laminates: see [10.1016/j.compscitech.2019.107761](https://doi.org/10.1016/j.compscitech.2019.107761).

Authors As it was mentioned in Berthe and Ragonet (2018). “Passive infrared thermography measurement of transverse cracking evolution in cross-ply laminates”. Strain 54.6, the main difficulty with these techniques is their application for higher loading rates. Indeed, in order to increase the acquiring frequency of the visible camera used to monitor the speckle pattern, one has to reduce the spatial resolution, which is a key point for crack detection in such test. To the author’s knowledge, there is currently no high-resolution camera with a sufficiently high spatial resolution to monitor transverse crack appearance in cross ply laminate under dynamic loadings. The main advantage of infrared thermography is to monitor the dissipated energy due to the crack appearance, which can be captured with a quite small spatial resolution. The main disadvantage is the current limitation of acquisition frequency, which is almost 10 times lower than for visible sensor. Consequently, the extension of this methodology to higher loading rate than 1 m/s is currently not possible.

Reviewer In section 2.2, the authors cited that “Transverse crack propagation in $[0_m/90_n]$ s can be considered as instantaneous from side to side”. This should be formulated a bit more carefully, e.g. ‘considered as almost instantaneously’. In Berthelot: “In the case of static tests, most cracks cross almost instantaneously the full width of the test specimen from edge to edge”.

Authors Correction has been done.

Reviewer This paper produced a lot of valuable data. It would be interesting to show the onset laminate strain as well (in addition to the stress) with the mean values and standard deviations. A particular reason is a better comparison with the previous studies by Parvizi et al. (1978). The thinnest laminate tested in the present paper was $[0/90_2/0]$, where the 90_2 layer has a thickness of $2 \times 0.27 \text{ mm} = 0.54 \text{ mm}$. This inner layer thickness of 0.54 mm was found to be the threshold value in Fig. 3 in Parvizi et al. (1978), therefore there should be no trend in the onset strain. What did the authors find regarding the onset strain (laminate) depending on the thickness?

Authors Thank you for this comment which indeed enriches the data from this work. Several tables in the article have been completed with the information concerning the deformation levels. For example, the deformation for the first crack or for the last one. The new Table 4 in the article seems to show that no variation is observed for the different configurations given the scatter.

Reviewer Providing the final failure strain (laminate) would be greatly appreciated and valuable. The ultimate laminate stress appears to be higher for the thin laminate, but it could be attributed to the higher fraction of the 0 plies. Hence, looking at the ultimate failure strain would further support the 0 ply dominated failure mechanism at the final specimen failure.

Authors The final failure strains have been added to Table 3 and almost no variation is observed with the different configuration for that value.

Reviewer This paper presents a great amount of data. But the plots can be enhanced, e.g. by unifying the plot style. Most of the plots are scatter (markers) plots, whereas Fig. 12 also has connecting lines

between the dots/markers. If lines are used, it must be a step curve, since the measured number of cracks is discrete, hence the crack density evolution cannot be continuous, unless the rate of crack density increase is too high for the measurement method to be captured.

Authors The plot has been modified to fit with your comment.

Editor's assessment (Julien Réthoré)

January 21, 2022 - 7:58 PM :

The authors sent a revised version of their paper. They did not make all the corrections suggested by Reviewer 1 but they provided convincing reasons for not applying the requested changes. The comments of Reviewer 2 are carefully addressed what gives an increased scientific value to the paper.

November 28, 2021 - 11:21 AM :

Two very positive reviews have been received for this paper. The first review suggested minor revisions and gave an excellent rating for the paper. Despite the second reviewer (Reviewer 2) suggested "Revise and resubmit", I don't think his comments need major modifications in the paper to be addressed. For these reasons, I accepted the paper after checking that the minor changes asked by the reviewers were carefully addressed by the authors.

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