# A Features and Defects Database for Better Composites Design

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Defects are broadly studied in academic literature [1]. However, simplifications are often made regarding the morphology of such defects. As part of the CerTest project (www.composites-certest.com), a database of composite features and defects is being developed, collating the available knowledge, see Fig. 1. This raises several important questions around what metrics are best suited to describe each defect.
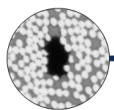
Resin Pockets
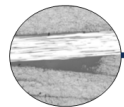
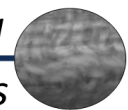*area, shape, location*

ply-drop proximity

Wrinkles
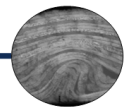
aspect ratio, skewness

maximum angle, location

Voids

area, shape, location

density, proximity

Waviness

maximum angle, area

location, number of plies

Fig.1. Schematic of different types of defects and *some* possible characteristic metrics that can be used.

Case Study: Asymmetry in out-of-plane waviness

Simple sinusoidal shape functions are generally used to describe wavy plies. However, real waviness observed in actual parts, see Fig. 2, is often more complex than this. Initial findings suggest additional metrics, some of which are noted in Fig. 1 above, are needed to get acceptable correlation with the strength of the laminate. This implies that a successful database will require:

1) Examples of real parts to establish the design space of morphologically complex defects in a wide range of parts.

2) Studies on the performance of laminates containing these morphologically complex defects to identify relevant metrics.

These two pieces will benefit greatly from broad industrial engagement and enable the database to yield unique insights, which the entire composites community can benefit from.
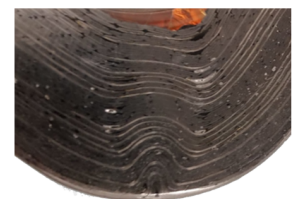

Fig. 2. Image of waviness in corner piece, showing complex morphology including a resin pocket, folds, and asymmetric features.

References

[1] K. Potter "Understanding the origins of defects and variability in composites manufacture". *Proceedings of the International Conferences on Composite Materials*, Edinburgh, UK, 2009.