

<b>Research theme</b>	Composite Materials
<b>Research title</b>	Scatter Reduction in peel test results of a butt-joint reduction
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<b>Company</b>	Fokker Aerostructures
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## *Background*

The research is performed at Fokker Aerostructures, as part of the TAPAS 2 project and concerned the butt-joint technology that is invented at Fokker. The technology consists of a thermoplastic skin-stiffener construction, made without the use of flanges or bolts. This offers a lighter and lower cost alternative than aluminum construction. The construction is made of a skin, web, cap and two fillers that are consolidated within an autoclave.

The construction needs to be qualified by means of allowable values, giving a lower bound value for 90% of the population, influenced by mean and standard deviation. The determination of these values is done by peel tests. These test show significant spread, influencing the allowable.

## *Assignment*

The focus of this thesis is to investigate the scatter behavior that became apparent in previous test data. The problems that this scatter is resulting in are mainly concerning the B-allowable values. The B-value is determined with the use of the standard deviation, which is on his turn a measurement for the scatter. With a higher standard deviation a lower B-value is the result. Low B-values, induced by large scatter within test results, will cause problems for Limit loads and Ultimate load.

Possible sources of scatter are identified as: Fiber orientation in the fillers, PEKK foil at skin/filler interface, length of the samples, skin lay-up and residual stress as a result of the production process

## *Results*

There is no influence of fiber orientation on the butt-joint performance found with the current study. The long samples have a negative effect on the spread within the results, but also have a negative effect on the mean strength. A different skin lay-up results in less failure of the first top plies and increases the bending stiffness of the skin. Higher strength is found with a higher matrix crack resistant skin, with this higher strength also a higher absolute standard deviation can be accepted.

The PEKK foil is not beneficial for the strength of the butt-joint, reducing the allowable values. The effect of the residual deformation on the spread and strength is not discovered due to the complexity of the phenomenon. The residual deformation is influenced by several factors that are not taken into account in this study.

## *Personal experience*

During this thesis I had the opportunity to not only use theoretical knowledge but also do some practical work for preparation and performing the tests. Furthermore this was the first experience I acquired, of working in an internationally recognized business. I learned to be more convinced of my capabilities and to be more assertive.

The guidance and supervision at Fokker I had at Fokker were very pleasing. I was part of the team, and everyone was open to help or answer my questions. The contact with other colleagues was good, not only professional or work related but also on an informal level.