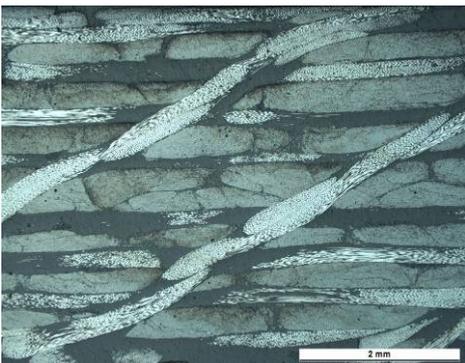


# Stitched Dry Fibre Preforms

Carbon fibre composites are well established in aircraft production as well as in other advanced applications such as wind turbine blades, motor and marine sports where they are used to provide lightweight, high performance components. Conventionally composites were seen as a high cost option but a change of production technique from autoclave processed prepreg to liquid resin infused dry fibre offers the potential for significant cost savings. Further efficiencies can be made by using dry fibre preforms to reduce handling and lay-up time.

QinetiQ's automated facility for production of through-thickness reinforced dry fibre preforms uses robotic stitching and tufting techniques. Structural health monitoring systems have also been incorporated into thick section composites using these techniques.



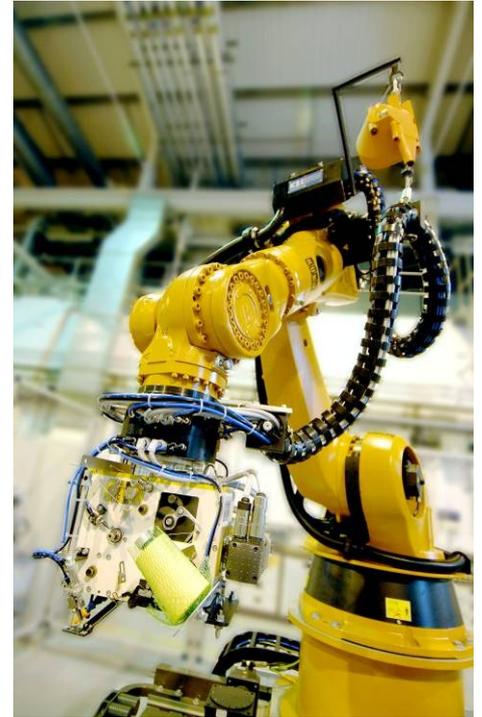
This equipment includes 3 single-sided techniques -tufting, blind stitching and 2-needle stitching. It can handle:

- Large 3D shaped preforms – up to 3m x 2m
- Thick composite – up to 40mm
- Wide range of sewing threads including carbon

Additionally we can provide a fully integrated design capability for preform development and can undertake the processing of preforms using a wide range of resins and infusion techniques including Resin Transfer Moulding (RTM)

The robot is mounted on a 5 metre rail to enable production of large components typical of those required by the aircraft industry and it is teamed with three heads, each providing a different single sided stitching capability allowing both preform production and addition of through thickness reinforcement. The heads are fully interchangeable and the industry standard equipment can be run in automatic mode making it equally suitable for both research and production purposes.

The equipment was supplied by KSL, part of the German Keilmann Group

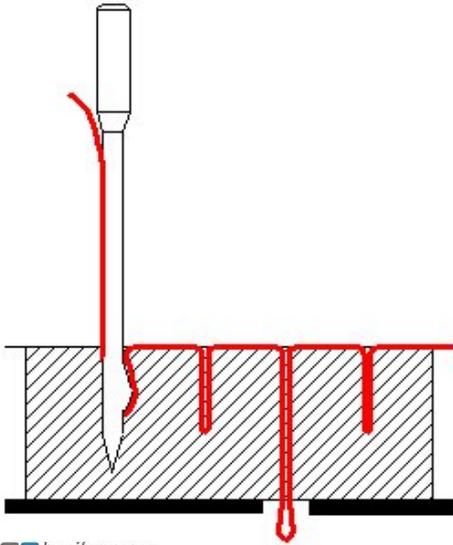


The technology has been developed on a number of UK Government funded collaborative projects including 'Next Generation Composite Wing

This automated facility complements an existing Z-pinning capability and facilitates wide ranging research and development into both Z-direction reinforcement and preform production.

The three stitching heads are described overleaf

## Tufting

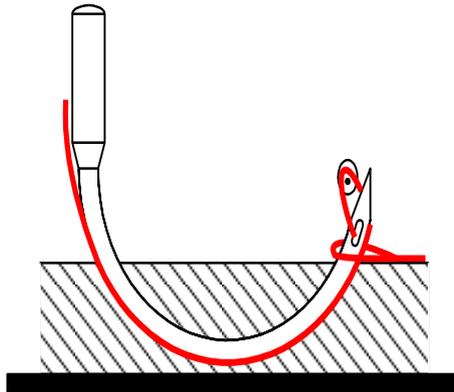


keilmann  
group

Tufting is primarily a technique for providing through thickness reinforcement and this electronically controlled tufting head has the following features:

- variable stitch distance - 2-10 mm
- maximum material thickness up to 40 mm
- sewing speed up to 600 rpm
- tufting possible in variable angle to Z-axis
- interchangeable stitching head

## Blind Stitching

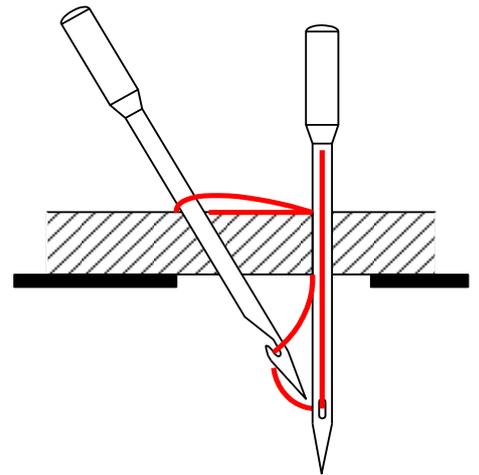


keilmann  
group

This preform production technique uses a curved needle to perform single-sided stitching and is well established in conventional sewing industries. The blind stitch head has the following features:

- adjustable thread tension
- material thickness 2-8 mm
- sewing foot - height-adjustable
- sewing speed up to 500 rpm
- stitch length 5-10 mm
- interchangeable stitching head

## Two-needle single sided stitching



keilmann  
group

This technique was developed specially for composite preform production and uses a conventional eyed needle teamed with a hooked needle to catch the thread and form the stitch. The 2-Needle stitch head has the following features:

- stitch length 2-10 mm
- maximum material thickness up to 20 mm
- sewing speed up to 500 rpm



### **Contact:**

Robert West

AEG CS-TI

**QinetiQ**

Cody Technology Park

Ively Road, Farnborough, GU14 0LX

Tel: +44 (0)1252 394014

rwest@qinetiq.com

www.QinetiQ.com

Or Central Enquiries +44(0)8700 100 942

**QinetiQ**