CMTS (Continuous Multi-Tow Shearing) for High-Volume Production of Complex Composite Parts

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Aerospace Industry - Automation
Tow Steering

- Lay-up on complex doubly curved moulds
  - [2] Coburn et al. 2015

- Structural efficiency through variable-stiffness structures
Limitations of Current Technology

- In plane bending of tapes → defects:
  - Fibre Buckling
  - Width affects steering abilities

- Minimum Steering Radius
  - ATL: 6000 mm for 150 mm wide tape
  - AFP: 630 mm for 3.175 mm wide tow [4]

Continuous Tow Shearing (CTS)

- **Minimum steering radius** ➔ 30 mm for 8 mm wide tow
- **Decoupling of width and minimum steering radius**

Continuous Multi-Tow Shearing (CMTS)

Tape laying machine capable of

- **High Quality** steered laminates
- **High Production Rates.**
Operation of CMTS Prototype

Steering Radius: **155 mm**
for 90 mm wide tape

cf. ATL: 6000 mm for 150 mm wide tape
AFP: 630 mm for 3.175 mm wide tow
Material Parameters affect Quality

Resin Pocket Areas vs Position

- Tows 1-10
- Tows 11-30
- Tows 31-40

Percentage of Resin Area (%)

X Position (mm)
Future Direction

• Quality
  – Characterization of different materials
  – Identification of key requirements for the optimal material format

• Productivity
  – Detachable Shearing mechanism
  – Operation mode of CMTS

• Mechanical Properties
  – Effect of shearing on mechanical properties
Thank you for your Attention!

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