CISB | CENTRO DE PESQUISA E INOVAÇÃO SUECO-BRASILEIRO

4th Annual Meeting

Advanced 3D Fabrics for Composites

Fredrik Winberg

Chairman, CEO, Co-founder - Biteam AB, Sweden

BITEAM

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No Textiles, No Composites

Composite material = Textile + Matrix

Textiles are central to composites as they provide:

- Lightness
- Mechanical performance
- Reliability
- Functionality
- Shape and dimensions

Textiles Drive Composites' Evolution

Type 1	Type 2	Type 3	Type 4
Short fibers	Filaments	2D Fabrics	3D Fabrics
No integration	No in-plane integration	In-plane integration	Through-thickness integration
Prone to delaminate in all directions	Prone to delaminate in two directions	Plies prone to delaminate in one direction	No plies to delaminate

Next generation composites

3D Fabrics for Next Generation Composites

Suitable for primary load bearing application

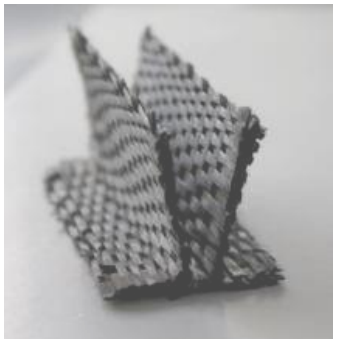
They achieve the main requirements:

- High reliability through delamination resistance
- Increased mechanical performance
- Near net-shape and dimensions
- Cost effectiveness
- Easy handling and use
- Enabling quick product prototyping

Latest Advancements in 3D Fabrics

Two types of 3D fabric pre-forms are needed
for primary load bearing applications

Profiled Cross-section Beams



They are solutions for:
- Modular construction
- Stiffening
- High impact absorption

Ready Object-like Items

They are solutions for:
- Machine-able components
- Jointing/fitting
- Functionally moving parts

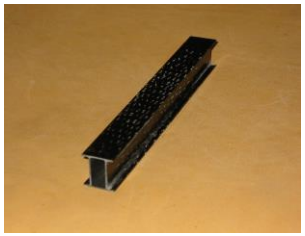
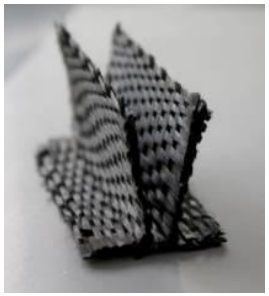
New Technologies for 3D Fabrics

Innovative 3D fabric-forming processes developed

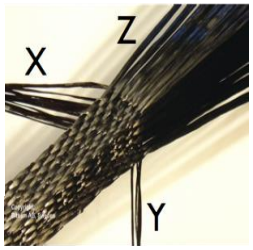
Fundamentally different working principles

3D-Weaving	- Direct profile production - Fiber orientation 0/90/90 - Solid, shell, tubular types
Add-on Weaving	- Direct profile production - Fiber orientation 0/90/90/+/- - Solid, shell, tubular types
Uniaxial Noobing	- Direct close to object-like form - Fiber orientation 0/90/90 - Solid

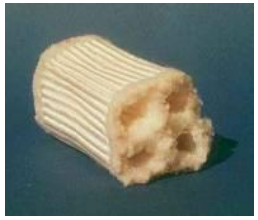
Profiled Beams from 3D-Weaving

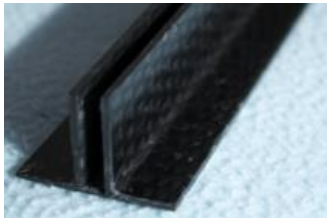












Solid, shell, tubular type profiles directly producible

Profiled Beams from Add-on Weaving

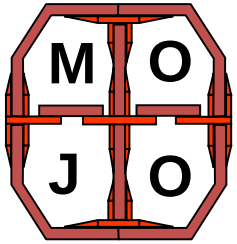
Beams with fiber orientations in Flanges 0°/90° and Web +/- 45°

Object-like Items from Uniaxial Noobing

Rods, bars, cubes, plates, brackets, bearing housing etc. directly producible

Biteam in EU Projects

Modular Joints for Aircraft Composite Structures



Cost Effective Reinforcement of Fastener

Partners:

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- **Biteam**, Sweden
- **KTH** (Royal Institute of Technology) Sweden
- **Dassault Aviation**, France
- **Eurocopter,** Germany
- **EADS/Airbus Corporate Center for Research** Germany and France
- **EADS** (Deutschland GmbH, Military Air Systems) Germany
- **SABCA** (Société Anonyme Belge de Constructions Aéronautiques) Belgium
-- **DLR** (Deutsches Zentrum für Luft- und Raumfahrt e.V.) Germany
- **UP** (University of Patras) Greece
- **VZLU** (Vyzkumny a zkusebni letecky ustav, a.s.) Czech Republic
- and others

Biteam in SAAB Aerospace GF Demo Project

Swedish Research Project

Partners:

- **SAAB Aero**
- **BITEAM**
- **ELITKOMPOSIT**
- **NOVATOR**
- **CREO Dynamics**
- **EXOVA LTD, UK**
- **SICOMP**
- **COMPRASER Labs**
- **KTH** (Royal Institute of Technology)
- **LTH** (Linköping University of Technology

Biteam's Academic Partner

Dept. of Aeronautical and Vehicle Engineering

Division of Lightweight Structures

Royal Institute of Technology,
Stockholm

Biteam

Internationally recognised leading actor
in the growing segment of 3D fabrics

Demonstrated production methods
through working prototypes

Patented processes and materials

Exhibiting annually at JEC Show, Paris, since 2001

Future

3D structures with through thickness fibres enables
a new way of thinking when designing composites.

The new 3D technologies are still in its childhood
where we only have scratched the surface
of its opportunities.
The full potential and possibilities
of these 3D technologies are yet to be discovered!

Thank you for your attention!

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