Wout De Backer, Ph.D.

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Profile

Aerospace engineer with theoretical knowledge and practical background in aircraft design, machine and robotic cell design, structural analysis & design, composite design, additive manufacturing and processing of thermoplastic materials with relevant experience in project planning and project management, including resource allocation.

Education

Ph.D. in Mechanical Engineering, focus Robotic Additive Manufacturing **Dec. '17**
- University of South Carolina - McNair Center (Columbia, South Carolina, USA)
- Dissertation: Multi-Axis Multi-Material FFF with Continuous Fiber Reinforcement

M.S. in Aerospace Engineering, focus Aerospace Structures & Design Methodologies **Dec. '13**
- Delft University of Technology (Delft, The Netherlands)
- Exchange semester at University of Kansas (Lawrence, Kansas, USA)
- Thesis: Improved Modeling of Static Analysis of Compression loaded-UD FRP Composites

B. S. in Aerospace Engineering, focus Aircraft Design **Jun. '11**
- Delft University of Technology (Delft, The Netherlands)
- Senior Design: Design of a High Capacity transport airship for A380 fuselage sections

Industry & Research Experience

Research Assistant Professor for SC SmartState Center at USC (Columbia, South Carolina, USA) **Present**

Technical Responsibilities:
- Programming and integration of industrial robots
- Proposal writing

Managerial Responsibilities:
- Leading a diverse team of undergraduate and graduate researchers
- Hosting industry guests and facilitating laboratory tours

Educational Responsibilities:
- Instructor for Aircraft Systems & Aircraft Design

Post-Doctoral Researcher for SC SmartState Center at USC (Columbia, South Carolina, USA) **Dec '19**

2 years

Technical Responsibilities:
- Programming of Numerical Control software (in-house python tools)
- Designing and manufacturing of industrial mechatronic PLC systems
- Programming and integration of industrial robots (KUKA, YASKAWA)
- Operating 3D printers with continuous fiber and expanding capabilities
- Writing research proposals, statements of work and update reports

Managerial Responsibilities:
- Leading a diverse team of 15 undergraduate and graduate researchers
- Interviewing and hiring of research assistants
- Designing, structuring, organizing and optimizing the laboratory
- Hosting industry guests and facilitating laboratory tours (est. 2 per week)
- Allocating resources and budgeting for 8 projects, totaling $2.4M

Graduate Research Assistant for USC-McNair Center (Columbia, South Carolina, USA) **Dec '17**

3 years, 4 months

Technical Responsibilities:
- Develop multi-axis robotic continuous fiber & plastic 3D printing
- Designed and manufactured industrial mechatronic systems
- Designed and Integrated Programmable Logic Controllers
- Programmed of Numerical Control software (in-house python tools)
- Programmed and integrated industrial robots (KUKA)

Managerial Responsibilities:
- Lead a diverse team of up to 10 undergraduate and graduate researchers
- Interviewed and hiring of research assistants
- Designing, structuring, organizing and optimizing the laboratory
- Hosted industry guests and facilitating laboratory tours (est. 2 per week)

Student Manufacturing Engineer for CleanERA (Delft, The Netherlands) **Aug. '12**

11 months

Responsibilities:
- Manufactured carbon-fiber parts with vacuum infusion process
- Managerial tasks (time-keeping, organizing, informing superiors)
- Administrative tasks (report writing)

Academic & Teaching Experience

Undergraduate Aerospace Program Committee Member for USC — **Present**

Responsibilities:
- Propose improvements to the USC Undergraduate Aerospace Program
- Design laboratory Experiments
- Facilitate and design the build-out of the lab facilities

10 months

Conference Assistant and representative for USC-AIAA and USC-McNair Center — **Present**

Responsibilities:
- USC-Representative: SC-ACE ('15, '16, '17, '18), CAMX'16
- AIAA-Representative: SC-ACE ('15, '16, '17, '18), CSM-SC'17, AIAA R2
- Assistant for Conferences: SC-ACE ('15, '16, '17, '18), PLM'16

4 years, 7 months

Capstone Senior Design Project Advisor or Customer for USC — **Present**

Responsibilities:
- Designed 7 senior design projects, for both external and internal projects
- Fulfilled Faculty Advisor role for 2 projects for TIGHITCO, Inc.
- Fulfilled Customer role for 5 projects
- Reviewed team progress and planning on a two-weekly schedule
- Critically reviewed and corrected team designs and reports

3 years, 7 months

Instructor: Mini lecture series "Intro to Rocket Science" for AIAA section at USC — **May '17**

Responsibilities:
- Taught and prepared teaching material: *10 sessions of 50min, 17 students*
- Advised students on club projects

7 months

Instructor: Mini lecture series "Fundamentals of Aircraft Design" for AIAA section at USC — **Nov. '16**

Responsibilities:
- Taught and prepared teaching material: *10 sessions of 50min, 20 students*
- Advised students on club projects

11 months

Teaching assistant for Catia V6 Course at USC (Columbia, South Carolina, USA) — **May '15**

Responsibilities:
- Proctored the class and assisted students during the lectures
- Taught course material: *20 sessions of 1.5 hours, 27 students*
- Graded homework and provided feedback

5 months

Selected Publications

CAMX 2020	A Minimally Intrusive Impact Detection System for Aircraft Moveables using Random Forest, *J. O. Ondeck, W. De Backer, M. J. L. Van Tooren,* CAMX Conference proceedings 2020 - Orlando, FL, USA - Sept. 21-24/2020
CAMX 2020	Effects Of Material Characteristics And Equipment Configuration On Profilometry Scanning Results For Error Mitigation, *L. Ai, V. Soltangharaei, W. De Backer, P. Ziehl, M. J. L. Van Tooren,* CAMX Conference proceedings 2020 - Orlando, FL, USA - Sept. 21-24/2020
SciTech 2020	In-Process Monitoring of Continuous Fiber Additive Manufacturing through Force/Torque Sensing on the Nozzle, *W. De Backer, P. Sinkez, I. Chhabra, M. van Tooren, A. Bergs,* AIAA SciTech – Orlando, FL, USA – Jan. 6-10/2020
AIAA RII 2018 (Best paper)	Design for Multi-Axis Fused Filament Fabrication with Continuous Fiber Reinforcement: Unmanned Aerial Vehicle Applications, *P. Sinkez, W. De Backer,* AIAA Region 2 Student Conference – Mobile, AL, USA – Apr. 4-7/2018
SciTech 2018	Multi-Axis Multi-Material Fused Filament Fabrication with Continuous Fiber Reinforcement, *W. De Backer, M. van Tooren, A. Bergs,* AIAA SciTech – Kissimmee, FL, USA – Jan. 8-12/2018
CAD 2017	Manufacturability Analysis for Additive Manufacturing Using a Novel Feature Recognition Technique, *Y. Shi, Y. Zhang, S. Baek, W. De Backer, R. Harik*, accepted for CAD Journal
CAMX 2016	Selective Directional Reinforcement of Structures for Multi-Axis Additive Manufacturing, *S. Doherty, W. De Backer, A. Bergs, R. Harik, M. van Tooren, I. Rekleitis,* CAMX Conference proceedings 2016 - Anaheim, CA, USA
CAD 2016	Automated Reconstruction of Continuous Robotic Motion from G-Code Patterns, *W. De Backer, M. Kirkpatrick, R. Harik, J. Tarbutton*, 13th annual CAD-Conference Proceedings - Vancouver, BC, Canada
CIRP 2016	Build Orientation Determination for Multi-material Deposition Additive Manufacturing with Continuous Fibers, *Y. Zhang, W. De Backer, R. Harik, A. Bernard*, 26th CIRP Design Conference Proceedings, Stockholm, Sweden
TMCE 2016	A Framework for Automated Additive-Subtractive Manufacturing of Multi-Material Composites, *W. De Backer, R. Harik, M.J. van Tooren, J.A. Tarbutton, Z. Gurdal*, Conference proceedings, TMCE 2016 - Aix-en-Provence, France

SAMPE 2013	Mechanistic Fatigue Modeling for Continuous Fiber-Reinforced Polymer Matrix Composites, *Y. Xue , W. De Backer , F. Abdi , C. Kassapoglou*, SAMPE 2013 - Long Beach CA

Skills

Computer	- **Technical:** Catia (V5 & V6), Abaqus CAE, Matlab, Maple, Patran/Nastran, Genworks' GDL, NLR's GSP, TUDelft's Kolibri, NX-Unigraphics (V7.5), Autodesk Inventor (V2016), ANSYS Fluent (V14, V16), ANSYS ICEM CFD, Xfoil, MCQ Composites, MCQ Metals, Genoa, Creo Parametric 2.0, Kuka Workvisual (V3.1, V4), Kuka Sim Pro (V2.2), Kuka Office Lite, RoboDK, Arduino IDE, Various 3d printing software (Cura, Slic3r, Simplify3D, Repetier), TIA Portal
	- **Other:** LaTeX (MikTeX, TeXnicCenter), Microsoft Office (Word, Excel, PowerPoint, Visio, Project), Joomla! (web editing), 3D Studio Max, Microsoft XP/Vista/7/8/10
Languages	- Dutch (Native), English (Fluent bilingual), French (Conversational)
Other	- 3D Design, hand/engineering drawing, website design - Proven metal working skills using common shop tools (including CNC & waterjet cutting) - Composite Manufacturing knowledge using VARTM and Prepreg materials - Advanced KUKA Robot operating skills, including manipulation of the end-effector, writing programs, and back-end programming of functions and subroutines - Experience with industrial EtherCAT and Ethernet/IP communication protocols - Programmed several automation systems using Siemens PLC hardware and TIA Portal

Interests

AIAA	Columbia & Midlands Vice-Chair of the Carolinas section of the American Institute of Aeronautics & Astronautics. Faculty advisor for the UofSC AIAA student chapter
3D Printing & Robotics	Designed and built several functional FFF 3D-printers
Model Aviation	Multi-copter and fixed-wing model design and operation
3D Modeling	Create aircraft and scenes in Autodesk 3D Studio Max. Strongly interested in Computer Generated Imagery (CGI), animation and CAD/CAM

Awards

20-Twenties, 2016	One of the 2016 Aviation week and AIAA's Tomorrow's Engineering Leaders' Award: The 20-Twenties, recognized for contributions to the field of study and beyond Washington DC, USA

Patents

2018	Systems and methods for printing 3-dimensional objects from thermoplastics
(Pending)	*- PPA number pending*
2017	3d Printing System Nozzle Assembly For Printing Of Fiber Reinforced Parts
(Pending)	*- PCT/US2016/048570*
2016	3D Printed Continuous Fiber Reinforced Part
(Pending)	*- PPA/62/478,132*
2016	Composite Continuous Filament for Additive Manufacturing
(Pending)	*- PCT/US2017/033983*

Certifications

TIA Portal, 2018	SIEMENS TIA Portal Workshop for Educators, S7-1200
CATIA, 2017	Certified V5 Associate – Part Design; Dassault Systemes, Certificate ID C-J82UP6D4X
CATIA, 2016	CATIA V5 Fundamentals, McNAIR Center for Aerospace Innovation & Research