

**Dr. Tobias Ecker**

Deutsches Zentrum für Luft- und Raumfahrt (DLR)  
Institute for Aerodynamics and Flow Technology, *Spacecraft Department*  
TOBIAS.ECKER@DLR.DE

**Education**

- 2015            **VIRGINIA TECH**  
*Ph.D. in Aerospace Engineering (Aero-Hydrodynamics)*  
Dissertation: Turbulence Statistics and Eddy Convection in Heated Supersonic Jets  
([Link](#))
- 2011            **VIRGINIA TECH**  
*M.S. in Aerospace Engineering (Aero-Hydrodynamics)*  
Thesis: Experimental Investigation of Particle Lag behind a Shock Wave using a Novel  
Laser Doppler Accelerometer ([Link](#))
- 2008            **UNIVERSITY OF APPLIED SCIENCES TRIER**  
*B.Eng. in Mechanical Engineering (General Mechanical Engineering)*  
Thesis: Simulation of a Multiphase Flow in a Spraying System

**Honors & Awards (selected)**

- 2015            Graduate Student Marshall  
  
Departmental nominee for *Outstanding PhD student of the college of engineering* award  
Finalist for *Graduate student of the year* award
- 2013            Division of Fluid Dynamics (DFD) of the American Physical Society (APS) travel grant  
(\$500)
- 2012            U.S. Air Force Office of Scientific Research travel grant (\$ 1,000)
- 2009–11        Fulbright Scholarship

**Research Experience**

- 09/2015–        **Postdoctoral Researcher**, *Spacecraft department*, Institute for Aerodynamics and Flow  
Technology, German Aerospace Center (DLR), Göttingen
- 05/2015–07/2015   **Postdoctoral Researcher (Adjunct faculty of Aerospace and Ocean Engineering)**
- 01/2012–05/2015   **Graduate Research Assistant**  
  
*Vortical Flow and Diagnostics Laboratory* (Dr. K. T. Lowe), Department of Aerospace &  
Ocean Engineering, Virginia Tech
- 08/2011–12/2011   **Graduate Research Assistant**, *BODY lab/AETHER lab* (Dr. C. Rylander/Dr. P. Vlachos),  
Department of Mechanical Engineering, Virginia Tech
- 08/2009–08/2011   **Graduate Research Assistant**, *Turbulence Flow Research Group* (Dr. R.L. Simpson), De-  
partment of Aerospace & Ocean Engineering, Virginia Tech
- 08/2008–07/2009   **Graduate Research Assistant**, *Lehr- und Forschungsbereich Strömungsmechanik* (Prof.  
Dr.-Ing C. Simon), University of Applied Sciences Trier

### Teaching Experience

- 2014–15      *AOE 3114 Compressible Aerodynamics*, Head Teaching Assistant (Spring 2014), Teaching Assistant (Spring 2015)
- 2012–14      *AOE 4234 Aerospace Propulsion Systems*, Head Teaching Assistant
- 2013          *AOE 5114 High Speed Aerodynamics*, Teaching Assistant
- 2012          *AOE 5454 Advanced Aerospace and Ocean Engineering Instrumentation*, Teaching Assistant

### Journal Articles

- 2017          **Ecker T.**, Lowe K.T., and Ng W.F., “On the Distribution and Scaling of Convective Wavespeeds in the Shear Layers of Heated Supersonic Jets”, *Flow, Turbulence and Combustion*, Vol. 98, No. 2, pp. 355–366, 2017 (first online 6 July 2016); doi: [10.1007/s10494-016-9752-3](https://doi.org/10.1007/s10494-016-9752-3)
- 2015          Hood R. L., Andriani A. T., **Ecker T.**, Robertson J. L, and Rylander C. G., “Characterizing thermal augmentation of convection-enhanced drug delivery with the fiberoptic microneedle device”, *Engineering*, Vol. 1, Issue (3) : 344 -350, 2015; doi: [10.15302/J-ENG-2015077](https://doi.org/10.15302/J-ENG-2015077)
- Ecker T.**, Lowe K.T., and Ng W.F., “Eddy Convection in Developing Heated Supersonic Jets”, *AIAA Journal*, Vol. 53, No. 11, pp. 3305-3315, 2015; doi:[10.2514/1.J053946](https://doi.org/10.2514/1.J053946)
- Ecker T.**, Lowe K.T. and Ng W.F., “A rapid response 64-Channel Photomultiplier tube camera for high-speed flow velocimetry”, Technical Design Note, *Measurement Science and Technology*, 26(027001), 2015; doi:[10.1088/0957-0233/26/2/027001](https://doi.org/10.1088/0957-0233/26/2/027001)
- 2014          **Ecker T.**, Brooks D.R., Lowe K.T. and Ng W.F., “Development and application of a point Doppler velocimeter featuring two-beam multiplexing for time-resolved measurements of high speed flow”, *Experiments in Fluids*, 55(9), 1819, 2014; doi:[10.1007/s00348-014-1819-0](https://doi.org/10.1007/s00348-014-1819-0)

### Conference Articles

- 2017          Dumont E., Stappert S., **Ecker T.**, Wilken J., Karl S., Krummen S., Sippel M., “Evaluation of Future Ariane Reusable VTOL Booster stages”, *8th International Astronautical Congress (IAC)*, Adelaide, Australia, 25-29 September 2017;
- Ecker T.**, Karl S., Hanneman K., “Modeling of Aluminum Particle Combustion in Solid Rocket Combustion Chambers”, *AIAA Energy and Power (53rd AIAA/SAE/ASEE Joint Propulsion Conference)*, 2017; doi:[10.2514/6.2017-4781](https://doi.org/10.2514/6.2017-4781)
- Ecker T.**, Karl S., Dumont E., Stappert S., Krause D., “A Numerical Study on the Thermal Loads during a Supersonic Rocket Retro-propulsion Maneuver”, *AIAA Energy and Power (53rd AIAA/SAE/ASEE Joint Propulsion Conference)*, 2017; doi:[10.2514/6.2017-4878](https://doi.org/10.2514/6.2017-4878)

- 2016 **Ecker T.**, Lowe K.T., Ng W.F., “Development of Doppler global velocimetry for the measurement of eddy convective velocities”, *18th International Symposium on Applications of Laser and Imaging Techniques to Fluid Mechanics*, Lisbon, Portugal, 04-7 July 2016;
- Ecker T.**, Lowe K.T., Ng W.F., Henderson B.S and Leib S.J, “Velocity Statistics and Spectra in Three-Stream Jets”, *54th AIAA Aerospace Sciences Meeting, AIAA SciTech Forum*, (AIAA 2016-0029) ), 2016; doi:[10.2514/6.2016-1633](https://doi.org/10.2514/6.2016-1633)
- Ecker T.**, Lowe K.T. and Ng W.F., “Scale-up of the Time-Resolved Doppler Global Velocimetry Technique”, *54th AIAA Aerospace Sciences Meeting, AIAA SciTech Forum*, (AIAA 2016-0029) ), 2016; doi:[10.2514/6.2016-0029](https://doi.org/10.2514/6.2016-0029)
- 2015 **Ecker T.**, Lowe K.T. and Ng W.F., “On the Distribution and Scaling of Convective Wavespeeds in the Shear Layers of Heated Supersonic Jets”, *the ninth Symposium on Turbulence and Shear Flow Phenomena (TSFP-9)*, Melbourne, Australia, June 30 to July 3 2015
- Ecker T.**, Lowe K.T. and Ng W.F., “An experimental study of the role of core intermittency in equivalent jet noise sources”, *the ninth Symposium on Turbulence and Shear Flow Phenomena (TSFP-9)*, Melbourne, Australia, June 30 to July 3 2015
- 2014 **Ecker T.**, Lowe K.T. Ng W.F., Brooks D.R., AIAA 2014-3742, “Fourth-order Spectral Statistics in the Developing Shear Layers of Hot Supersonic Jets”, *50th AIAA/ASME /SAE/ASEE Joint Propulsion Conference*, Cleveland, Ohio, 28 - 30 July 2014; doi:[10.2514/6.2014-3742](https://doi.org/10.2514/6.2014-3742)
- 2014 Cadel D.R., **Ecker T.** and Lowe K.T , “Volumetric Vector Velocity Measurements in a Hot Supersonic Jet”, *17th International Symposium on Applications of Laser Techniques to Fluid Mechanics*, Lisbon, Portugal, 07-10 July, 2014;
- Ecker T.**, Brooks D.R., Lowe K.T. and Ng W., “Spectral analysis of over-expanded cold jets via point Doppler velocimetry”, *Proceedings of 52th AIAA Aerospace Sciences Meeting*, AIAA 2014-1103, National Harbor, Maryland, USA, Jan. 13-17 2014; doi:[10.2514/6.2014-1103](https://doi.org/10.2514/6.2014-1103)
- Cadel D.R., **Ecker T.** and Lowe K.T, “Time-Domain Cross-Correlation Scan DGV (CCS-DGV) for Mean-Velocity Boundary Layer Measurements”, *Proceedings of 52th AIAA Aerospace Sciences Meeting*, AIAA 2014-1104, National Harbor, Maryland, USA, Jan.13-17 2014; doi: [10.2514/6.2014-1104](https://doi.org/10.2514/6.2014-1104)
- Brooks D.R., **Ecker T.**, Lowe K.T. and Ng W.F., “Experimental Reynolds Stress Spectra in Hot Supersonic Round Jets”, *Proceedings of 52th AIAA Aerospace Sciences Meeting*, AIAA 2014-1227, National Harbor, Maryland, USA, Jan. 13-17 2014; doi:[10.2514/6.2014-1227](https://doi.org/10.2514/6.2014-1227)
- 2013 Hood R.L., **Ecker T.**, Andriani R.T., Rossmeisl J., Robertson J. and Rylander C.G., “Augmenting convection-enhanced delivery through simultaneous co-delivery of fluids and laser energy with a fiber optic microneedle device ”, *Proc. SPIE 8576, Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications XIII*, 85760G, Paper 8576-15, March 20 2013; doi:[10.1117/12.2004854](https://doi.org/10.1117/12.2004854)

- 2012      Lowe K.T., Ng W.F, and **Ecker T.**, "Early Development of Time-Resolved Volumetric Doppler Velocimetry for New Insights in Hot Supersonic Jet Noise", *Proceedings of 18th AIAA/CEAS Aeroacoustics Conference (33rd AIAA Aeroacoustics Conference)*, AIAA 2012-2273, Colorado Springs, Colorado, 4 - 6 June 2012; doi:[10.2514/6.2012-2273](https://doi.org/10.2514/6.2012-2273)
- Ecker T.**, Lowe K.T. and Simpson R.L., "Novel Laser Doppler Acceleration Measurements of Particle Slip through a Shock Wave", *Proceedings of 50th AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition*, AIAA 2012-0694, Nashville, Tennessee, USA, Jan. 9-12 2012; doi:[10.2514/6.2012-694](https://doi.org/10.2514/6.2012-694)

### **Presentations (Presenting author)**

- 2017      **Zilker F.**, Ecker T., Dumont E., Hannemann K. , "Aerothermal Analysis of Reusable First Stage Launcher during Re-Entry Retro-Propulsion", *DGLR 18. STAB-Workshop*, Göttingen, November 7-8 2017.
- Ecker T.**, "Modeling of Aluminum Particle Combustion in Solid Rocket Combustion Chambers", *DLR Göttingen, Institute of Aerodynamics and Flow Technology Kolloquium*, Göttingen, October 27 2017.
- 2016      Karl. S, **Ecker T.**, Hannemann K., "A numerical study on the wall heat flux during the Falcon 9 supersonic retro-propulsion maneuver", *DLR Göttingen, Institute of Aerodynamics and Flow Technology Kolloquium*, Göttingen, August 26 2016.
- 2013      **Ecker, T.**, Brooks, D. R., Lowe, K. T., and Ng, W. F., "Quantitative image processing of high-speed Schlieren of a hot supersonic jet", *Bulletin of the American Physical Society*, Volume 58, Number 18, Abstract ID: BAPS.2013.DFD.M24.7, 2013
- 2012      Hood R. L., **Ecker T.**, Andriani R., Lombardi C., Chen Y., Robertson J., Rossmeisl J., and Rylander C. G. , "Fiberoptic Microneedle Device for Convection Enhanced Drug Delivery to Malignant Glioma", The 4th Annual Metropolitan Biophotonics Symposium, Baltimore, Maryland, USA, March 19 2012
- Hood R.L.**, **Ecker T.**, Rossmeisl J., Robertson J. and Rylander C.G., "Improving Convection-Enhanced Delivery through Photothermal Augmentation of Fluid Dispersal", *Proceedings of ASME 2012 Summer Bioengineering Conference*, SBC 2012-80720, Fajardo, Puerto Rico, USA, June 20-23 2012; doi:[10.1115/SBC2012-80720](https://doi.org/10.1115/SBC2012-80720)
- Ecker T.**, Hood R.L., Rodgers A., Vlachos P.P. and Rylander C.G., "Thermally Augmented Convection Enhanced Drug Delivery Using a Fiberoptic Microneedle Device.", *Proceedings of the ASLMS 32nd Annual Conference*, Gaylord Palms Resort & Convention Center Kissimmee, Florida, USA, April 18-22 2012; doi:[10.1002/lsm.22023](https://doi.org/10.1002/lsm.22023)
- 2011      **Ecker T.** and Rylander C.G., "Modeling of magnetic targeting of therapeutic nanoparticles in a two phase microvessel flow", *Proceedings of ASME 2011 Summer Bioengineering Conference*, SBC2011-53834, Nemacon Woodlands Resort Farmington, Pennsylvania, USA, June 22-25 2011; doi:[10.1115/SBC2011-53834](https://doi.org/10.1115/SBC2011-53834)
- 2010      **Ecker T.**, Wehrstedt J. and Simpson R.L., "Modeling of particle response through an oblique shock", *8th Joint FZD & ANSYS Workshop "Multiphase Flows: Simulation, Experiment and Application"* FZ Dresden-Rossendorf, Germany, June 22-24 2010
- Ecker T.**, Will B.C., "Basic Modeling of a Two-Phase Jet, Coaxial Jet and Application in Industrial Transport", *7th Joint FZD & ANSYS Workshop "Multiphase Flows: Simulation, Experiment and Application"* FZ Dresden-Rossendorf, Germany, May 27-28 2009

### Non Refereed Articles

- 2009            **Ecker T.**, Will B.C. and Simon C., “CFD-Modellierung von Zweiphasigen Freistrahlen und koaxialen Freistrahlen”, *Forschungsbroschüre 2009*, Fachhochschule Trier, Germany, 2009  
(translated title: “CFD Modeling of Two Phase Free Jets and Coaxial Free Jets”)
- Will B.C., **Ecker T.** and Simon C., “Strömungen in Radseitenräumen von Turbomaschinen”, *Forschungsbroschüre 2009*, Fachhochschule Trier, Germany, 2009  
(translated title: “Flow in Sidechambers of Turbomaschinery”)

### Leadership

- 2014–15            Inaugural President *Aerospace & Ocean Engineering Graduate Student Association (AOEGSA)*
- 2013–15            President *Blue Ridge Chapter of the Fulbright Association*
- 2012–13            Vice President *Blue Ridge Chapter of the Fulbright Association*
- 2011–13            Founding member and treasurer *Interdisciplinary Research Honor Society Iota Delta Rho (IDR)*

### Service

- 2013–14            Organization *Fulbright Recruitment Reception*, Blacksburg, VA, (I) April 6, 2013, (II) April 15, 2014
- 2012                Organization committee *2nd Interdisciplinary Research Symposium* at Virginia Tech, Blacksburg, VA November 2, 2012
- 2011–13            Organization committee *Interdisciplinary Research Day (IDR day)* at Virginia Tech, Blacksburg, VA, (I) April 19, 2011, (II) April 10, 2012, (III) April 17, 2013
- 2012                Moderator, *10th Annual VT Undergraduate Research & Prospective Graduate Student Conference 2012*, *27th Annual GSA Research Symposium 2012*
- 2011,14            Reviewer *Paul E. Torgersen Award 2011*, *4th IDR Day 2014*
- 2011                Co-Chair *1st Interdisciplinary Research Symposium* at Virginia Tech, Blacksburg, VA, November 4, 2011

### Affiliations

- Member – Verein der Deutschen Ingenieure (VDI)
- Senior Member – American Institute of Aeronautics and Astronautics (AIAA)
- Reviewer – Journal of Sensors and Sensor Systems (JSSS), Journal of Aerospace Engineering (ASENG)