

Daiju Uehara

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EDUCATION

University of Texas at Austin

Austin, TX

Ph. D., Aerospace Engineering, Adviser: Dr. Jayant Sirohi

expected Summer 2019

M. S., Aerospace Engineering, Adviser: Dr. Jayant Sirohi

Summer 2017

University of Tokyo

Tokyo, Japan

B. S., Aerospace Engineering

March 2014

Thesis: "Experimental investigation of composite materials for a fan blade of turbo fan engines"

Design Project: "Conceptual design of a high efficiency turbo shaft engine for tilt-rotor helicopters"

Coursework: Fluid Dynamics, Experimental Methods in Flow Velocity Measurement, CFD, Advanced Compressible Flow, Advanced Dynamics, Structural Dynamics, Solid Mechanics, FEA, Mechatronics, Turbulent Flow, Space Propulsion, Space Engineering Elements, Structure and Design of Rocket/Jet Engines.

GRADUATE RESEARCH/ENGINEERING EXPERIENCE

NASA Jet Propulsion Laboratory

Pasadena, CA

Summer Intern, JPL Robotics, Computer Vision Group

- **Energy modeling of VTOL aircraft for Titan exploration** June 2018 – Aug 2018
 - Aerial vehicles design for exploration of Saturn's icy moon, Titan.
 - Flight power modeling of the Titan Aerial Daughtercraft mission concepts, where small-scale (e.g. < 10 kg) VTOL aircraft (quadcopter and tailsitter) would conduct multiple sorties from a mothership (lander or balloon) to collect samples from the Titan's surface.
 - Mission feasibility and affordability were investigated based on performance analysis of the VTOL aircraft with environmental parameters of Titan.
 - A research paper based on collaborative work with NASA/JPL has been accepted and submitted to the IEEE Aerospace conference 2019.

University of Texas at Austin – Dept. of Aerospace Engineering

Austin, TX

Graduate Research Assistant, UT Aeroelasticity Lab

- **Airloads estimation from measurements of rotor hub loads and blade deformation** October 2018 – Present
 - Estimating aerodynamic forces on a helicopter rotor blade based on measured structural blade deformation and rotor thrust.
 - Inertial loads (structural loads) on a rotating rotor blade is calculated based on numerical differentiation of measured blade deformation with a regularization approach and is subtracted from rotor thrust to estimate integrated aerodynamic loadings.
 - The goal is to understand complex helicopter rotor loads mechanism through experimental work, with reduction of time and cost for measurement.
 - The 5-page abstract of this work has been submitted to the 75th Vertical Flight Society international forum in 2019.
- **Measurement of transient passage loads/deformations of a coaxial counter-rotating rotor** March 2018 – Sep 2018

- Measuring transient forces and deformation of a rotor blade due to periodic blade passages in a coaxial, counter-rotating rotor system, with validation of a comprehensive numerical model of the rotor system.
- The main purpose was to investigate the fundamental aerodynamic and structural dynamic phenomena responsible for the transient loading.
- This collaborative work with the Technical University of Munich has been presented and published at the 44th European Rotorcraft Forum 2018.
- **Automated operational modal analysis of a rotor blade** Nov 2017 – May 2018
 - Conducted automation of output-only modal analysis, called operational modal analysis, of a rotating helicopter rotor blade to identify its modal parameters in rotating frame.
 - Developed a computational tool that applies mathematical algorithms to the measured blade deformation data.
 - The goal of automation of the modal identification process was to minimize the number of steps of operational modal analysis that have to be performed manually by an analyst.
 - This work has been presented and published at the 74th American Helicopter Society International Annual Forum in 2018 and was awarded as a **Dynamic Session Best Paper**.
- **Operational modal analysis of an extremely flexible rotor blade** June 2017 – Nov 2017
 - Applied operational modal analysis to a 0.4 m-diameter extremely flexible helicopter rotor blade.
 - Extracted the natural frequencies, damping ratios, and mode shapes of the rotating blade from the structural blade deformation data.
 - Investigated the stability boundary of the extremely flexible helicopter rotor blade as a function of root pitch angle and rotational speed.
 - This work was presented at the 6th Asian/Australian Rotorcraft Forum 2017 and was awarded as a **Test & Evaluation Session Best Paper**.
- **Deformation measurement of a helicopter rotor blade with non-contact optical approach** June 2017 – Nov 2017
 - Measured 3D deformation of a 0.4 m-diameter extremely flexible rotor blade in hover by non-contact optical photographing measurement technique, called Digital Image Correlation (DIC) algorithm.
 - Designed the specialized experiment set up for DIC measurement, such as a pulsed laser strobe setting, high-speed stereoscopic camera settings, fluorescence paint on the blade, and data acquisition system.
- **Quantification of swirl recovery in a coaxial rotor system** June 2016 – May 2017
 - Explored the swirl recovery, the reduction of an energy loss, of a coaxial counter-rotating helicopter rotor system and quantified the effect of aerodynamic interactions between the upper and lower rotors.
 - Measured the thrust and power of each rotor at different test conditions in a coaxial counter-rotating and co-rotating rotor systems and compared performance to extract the energy loss.
 - This work has been presented and published at the 73th American Helicopter Society International Annual Forum in 2017.
- **Performance measurement of a coaxial, counter-rotating rotor system** Aug 2014 – May 2016
 - Experimentally investigated performance and vibratory hub loads of a Mach-scale coaxial counter-rotating rotor in hover and forward flight with NI PXI DAQ system.
 - Designed (by CAD) and fabricated (with hands-on machining) the key components of the coaxial rotor stand including main shafts, swashplates, push rods, a belt-driven power train, and a 1m-radius composite rotor blade.

UNDERGRADUATE ENGINEERING/RESEARCH EXPERIENCE

- University of Tokyo – Dept. of Aerospace Engineering** Tokyo, Japan
Design Project (Individual project) Dec 2013 - Mar 2014
- Conceptualized a new turbo-shaft engine for application to tilt-rotor.
 - Performed temperature and pressure calculations of the internal combustion process.
- Undergraduate Research Assistant* Apr 2013 - Nov 2013
- Assisted research of CFRP sandwich panel application to next-generation fan blade of jet engine with JAXA (Japan Aerospace Exploration Agency).
 - Established compression testing for determining behavior of CFRP-Aluminum honeycomb composite panels under crushing loads.
- ARLISS – A Rocket Launch for International Student Satellites** Sep 2012, NV, United States
Team Manager Apr 2012 – Aug 2012, Tokyo, Japan
- Performed structural analysis and mechanical design of an airplane-shaped UAV.
 - Won third prize out of 17 teams in competition.

TEACHING EXPERIENCE

- Teaching Assistant*, Structural Dynamics Jan 2015 – May 2018
- Enriched the undergraduate learning experience of Structural Dynamics, by providing and grading weekly assignments and mid-term/final exams, as well as offering office hours.
 - Lectured 50-60 undergraduates as a substitute instructor.
- Private Tutor* Jan 2010 – Mar 2014
- Instructed several high school students who aimed to pass college entrance exams in Japan.

TECHNICAL SKILLS

Programming/Software: MATLAB, SOLIDWORKS (CSWA CERTIFIED), LABVIEW, LaVision Davis (Software for non-contact optical measurement), MICROSOFT OFFICE

Research techniques: Laser Doppler Velocimetry (LDV), Digital Image Correlation (DIC), Particle Image Velocimetry (PIV), Experimental Modal Analysis, Digital and Analog Signal Acquisition and Processing

Machining: Milling machine, lathe, grinder, band saw and other basic machining skills

PUBLICATIONS/PRESENTATIONS/POSTERS

Papers

- **Uehara, D.** and Matthies, L., “Energy Modeling of VTOL Aircraft for Titan Aerial Daughtercraft (TAD) Concepts”, conference proceeding submitted to IEEE Aerospace Conference 2019, Big Sky, MT, March 2019.
- **Uehara, D.**, Johnson, C., and Sirohi, J., “Transient Blade Deformation Measurement of a Coaxial Rotor System”, conference proceeding submitted to AIAA SciTech Forum and Exposition, San Diego, CA, January 2019.
- **Uehara, D.**, Sirohi, J., Feil, R., and Rauleder, J., “Measurement of Transient Blade Passage Loads of a Coaxial Counter-Rotating Rotor in Hover”, conference proceeding of 44th European Rotorcraft Forum, Delft, The Netherlands, September 2018.
- **Uehara, D.**, Eitner, M., and Sirohi, J., “Automated Operational Modal Identification of a Rotor Blade”, conference proceeding of AHS International 74th Annual Forum, Phoenix, Arizona, May 2018. (**Dynamics Session Best Paper Award**)

- **Uehara, D.**, Cameron, C., and Sirohi, J., “Deformation Measurement and Modal Identification of an Extremely Flexible Rotor Blade”, conference proceeding of 6th Asian-Australian Rotorcraft Forum/Heli Japan, Kanazawa, Japan, Nov 2017. (**Test & Evaluation Session Best Paper Award**)
- **Uehara, D.** and Sirohi, J., “Quantification of Swirl Recovery in a Coaxial Rotor System”, conference proceeding of AHS International 73rd Annual Forum conference proceeding, Fort Worth, Texas, May 2017.
- Cameron C., **Uehara D.**, and Sirohi J., “Transient Hub Loads and Blade Deformation of a Mach-Scale Coaxial Rotor in Hover”, conference proceeding of 56th AIAA/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, AIAA SciTech, Orlando, FL, January 2015.

Presentations

- “Measurement of Transient Blade Passage Loads of a Coaxial Counter-Rotating Rotor in Hover”, 44th European Rotorcraft Forum, Delft, The Netherlands, September 2018.
- “Energy Estimation Modeling of VTOL Aircraft for Titan Aerial Daughtercraft (TAD) Concepts”, Autonomy Seminar Series, NASA Jet Propulsion Laboratory, Pasadena, CA, August 2018.
- “A Comprehensive Experimental Study of a Model-scale Coaxial Counter-rotating Rotor System”, JPL Robotics Section Talks, NASA Jet Propulsion Laboratory, Pasadena, CA, August 2018.
- “Automated Operational Modal Identification of a Rotor Blade”, AHS International 74th Annual Forum, Phoenix, Arizona, May 2018.
- “Inflow Dynamics Measurements and Low-Order Modeling for Single and Coaxial Rotors”, Vertical Lift Research Center of Excellence Annual Meeting, Inn & Conference Center, The University of Maryland, College Park, MD, November 2017.
- “Deformation Measurement and Modal Identification of an Extremely Flexible Rotor Blade”, 6th Asian-Australian Rotorcraft Forum/Heli Japan, Kanazawa, Japan, November 2017.
- “Quantification of Swirl Recovery in a Coaxial Rotor System”, AHS International 73rd Annual Forum conference proceeding, Fort Worth, Texas, May 2017.
- “Inflow Dynamics Measurements and Low-Order Modeling for Single and Coaxial Rotors”, Vertical Lift Research Center of Excellence Kick-off Meeting, Inn & Conference Center, The University of Maryland, College Park, MD, December 2016.
- “Comprehensive Loads, Pressures and Performance Measurements on Coaxial Rotors for High-Speed Compounds”, JAXA invited seminar, JAXA Chofu Aerospace Center, Tokyo, Japan, December 2015.

Posters

- “Automated Operational Modal Identification of a Rotor Blade”, External Advisory Committee (EAC 2018) Poster Session, Austin, TX, April 2018.
- “Deformation Measurement and Modal Identification of an Extremely Flexible Rotor Blade”, Graduate and Industry Networking Event (GAIN 2018) Poster Session, Austin, TX, January 2018. (**Department Research Award**)

MEDIA APPEARANCES

Vertical Flight Foundation Scholar Spot Light in Vertiflite Sep/Oct 2018	August 2018
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HONORS/AWARDS/

Best Paper Award of Dynamics Session at 74 th AHS international Forum	July 2018
Vertical Flight Foundation Eugene K. Liberatore Scholarship	March 2018
University Graduate Continuing Fellowship or 2018-2019	February 2018
Department Research Award at GAIN 2018 Poster Session	January 2018
Professional Development Award	December 2017

Best Paper Award of Test & Evaluation II Session at 6 th ARF	November 2017
CMSSM Graduate Student Travel Award	November 2017
Vertical Flight Foundation Tom Woods Honorary Scholarship	May 2017
3 rd Prize at ARLISS – A Rocket Launch for International Student Satellites	August 2012

MEMBERSHIP

The American Institute of Aeronautics and Astronautics (AIAA) student membership	Nov 2018
74 th AHS International Annual Forum Student Volunteer	May 2017
73 rd AHS International Annual Forum Student Volunteer	May 2017
72 rd AHS International Annual Forum Student Volunteer	May 2016
American Helicopter Society Membership	May 2016